New Varieties for 2013

PanAmerican Seed

Alyssum
Easter Bonnet Series Filmcoated Seed

Angelonia
Serenita™ Waterfall Mixture
Serenita Lavender Pink
Serenita Purple
Serenita Raspberry
Serenita White
Serenita Mixture

Begonia
BabyWing™ White Bronze Leaf

Coleus
Chocolate Covered Cherry

ColorGrass
Carex Cinnamon
Carex Coppertop
Millium Flashlights

Dianthus
Dash Pink
Dash Violet
Dash White
Dash Mixture

Sweet Purple White Bicolor

Fuseables
Coleus Chocolate Symphony
Petunia Burgundy Starlight
Petunia Lime Coral
Petunia Pleasantly Blue
Multi-Species Cloud N Sky

Gazania
New Day Bright Mixture
New Day Strawberry Shortcake Mixture
New Day Sunny Side Up Mixture

Impatiens
Dazzler Deep Pink Improved
Dazzler Salmon Improved
Dazzler Salmon Splash
Dazzler Scarlet
DeZire Deep Pink Improved
DeZire Salmon Improved
DeZire Scarlet

Impreza™ Punch
Impreza Intense Mixture

Super Elfin™ Deep Pink XP Improved
Super Elfin Salmon XP Improved
Super Elfin Scarlet XP Improved
Super Elfin Hot Mixture XP Improved

New Guinea Impatiens
Divine Orange
Divine Pink Pearl
Divine Mixture Improved
Divine Mystic Mixture Improved

Isotoma
Gemini Blue
Gemini Pink

Matthiola (Stock)
Katz Blue
Katz Ruby

Osteospermum
Akila White Purple Eye

F1 Extra Large-Flowered Pansy
Matrix™ Blue Blotch Improved
Matrix White Improved

F1 Large-Flowered Pansy
Matrix EU Blue Blotch Improved
Matrix EU Pink Shades
Matrix EU Scarlet
Matrix EU Solar Flare

Spring Matrix™ Blue
Spring Matrix Blue Blotch
Spring Matrix Deep Orange
Spring Matrix Golden Yellow Blotch
Spring Matrix Lemon
Spring Matrix Midnight Glow
Spring Matrix Ocean
Spring Matrix Pink Shades
Spring Matrix Purple
Spring Matrix Red Blotch
Spring Matrix Rose
Spring Matrix Sangria
Spring Matrix Scarlet
Spring Matrix White
Spring Matrix White Blotch
Spring Matrix Yellow
Spring Matrix Yellow Blotch
Spring Matrix Blotch Mixture
Spring Matrix Clear Mixture
Spring Matrix Daffodil Mixture
Spring Matrix Mixture
Spring Matrix Pastel Mixture

F1 spreading Pansy
Cool Wave Frost
Cool Wave Violet Wing
Cool Wave White
Cool Wave Yellow
Cool Wave Mixture

Grandiflora Controlled Growth Petunia
Ez Rider Blue
Ez Rider Deep Pink
Ez Rider Deep Salmon
Ez Rider Red
Ez Rider Rose
Ez Rider White
Ez Rider Mixture

Multiflora Controlled Growth Petunia
Lo Rider Blue
Lo Rider Pink
Lo Rider Red
Lo Rider White
Lo Rider Mixture

Grandiflora Controlled Growth Petunia
Pretty Grand Coral
Pretty Grand Deep Pink
Pretty Grand Midnight
Pretty Grand Red
Pretty Grand Rose
Pretty Grand Summer
Pretty Grand White
Pretty Grand Mixture

Floribunda Controlled Growth Petunia
Pretty Flora Coral
Pretty Flora Midnight
Pretty Flora Pink
Pretty Flora Purple
Pretty Flora Red
Pretty Flora White
Pretty Flora Mixture

Single Petunia
Debonair Black Cherry
Sophistica™ Blackberry
Sophistica Lime Green

Small-Flowered Spreading Petunia
Shock Wave™ Deep Purple
Shock Wave Rose Improved
Shock Wave Amp Mixture
Shock Wave Buzz Mixture Improved
Shock Wave Power Mixture

Wave Medleys
Shock Wave Coconut, Denim & Red
Shock Wave Coral Crush & Denim
Shock Wave Rose Improved & Red
Shock Wave Coral Crush & Rose Improved

F1 Phlox
Grammy Pink & White
(Reduction)

Portulaca
Happy Hour Pink Passion Mixture
Happy Hour Tropical Mixture
Happy Trails Deep Red
Happy Trails Fuchsia
Happy Trails Orange
Happy Trails Peppermint
Happy Trails Pink
Happy Trails Primrose
Happy Trails Rosita
Happy Trails Yellow
Happy Trails White
Happy Trails Mixture
Happy Trails Tropical Mixture
Happy Trails Pink Passion Mixture

Salvia splendens
Lighthouse Purple

Forcing F1 Snapdragon
Potomac Lavender
Red Delilah

Torenia
Kauai Blue & White

Vinca
Jams ‘N Jellies Blackberry
Jams ‘N Jellies American Pie Mixture

F1 Viola
Sorbet™ Blackberry XP
Sorbet Marina XP
Sorbet Pink Halo XP
Sorbet Yellow Frost XP
Sorbet Carmine Rose
Sorbet Midnight Glow
Sorbet Peach Melba
Sorbet Pink Wing

Zinnia
Double Zahara Strawberry

Vegetables
Slicing Zahara Strawberry
‘Patio Snacker’

Zucchinis
‘EasyPick Green’
‘EasyPick Gold’
‘EasyPick Pink’

Kieft-Pro-Seed

Aquilegia
Winky Single Pink
Winky Single White

Celosia
Celway Formula Mixture
Sunday Formula Mixture

Digitalis
Dalmation Crème
Dalmation Peach
Dalmation Rose

Echinacea
‘Cheyenne Spirit’ A Fleuroselect
Gold Medal Winner

Lavandula
Mini Blue
Ellagance Pink
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Note: Growers should use the information presented here as a starting point. Crop times will vary depending on the climate, location, time of year and greenhouse environmental conditions. Chemical and PCG recommendations are only guidelines. It is the responsibility of the applicator to read and follow all the current label directions for the specific chemical being used in accordance with all regulations.
Start To Finish, PanAmerican Seed Makes Yield Potential Count!

The Yield Potential bottom line is Useable Seedlings. Yield Potential – the unique seed quality assurance program from PanAmerican Seed – gives a measure of how many young plants will grow from the seeds you sow. PanAmerican Seed provides Yield Potential through careful plant breeding, production, testing and inventory control of every Yield Potential product sold.

You will see terrific results with Yield Potential: More useable seedlings. High seedling uniformity in the tray. Maximum use of young plant growing space. Better planning for buying seeds.

The following PanAmerican Seed varieties are currently sold with Yield Potential ratings:

**Angelonia**
- Serena F Series . . . . . .85%+
- NEW Serenita F Series .85%+

**Hypoestes**
- Splash Select Series . . . .90%+

**F1 Impatiens**
- Dazzler™ Series . . . . . .95%+
- Expo™ Series . . . . .95%+
- Impreza™ Series . . . . .95%+
- Super Elfin™ Series (XP & Standard) . . . . . . .95%+
- Swirl Series . . . . . .90%+

**New Guinea Impatiens**
- Divine F1 Series . . . . . .85%+

**F1 Pansy**
- Panola™ Series (XP & Standard) . . . . . .90%+
- Matrix™ Series . . . . . .90%+
- NEW Spring Matrix Series . . . . . .90%+

**F1 Petunia (Raw Seed)**
- Dreams Series . . . . . .90%+
- Madness™ Series . . . . . .90%+
- Carpet Series . . . . . .85%+
- Daddy™ Series . . . . . .85%+
- Mirage Series . . . . . .85%+
- Supercascade Series . . . . . .85%+

**Salvia**
- Blue Ribbon . . . . . .90%+
- Flare . . . . . .90%+
- Vista Series . . . . . .90%+

**F1 Torenia**
- Kauai Series . . . . . .90%+

**Vinca**
- Titan F1 Series . . . . . .90%+
- Cooler Series . . . . . .85%+
- Mediterranean Series (XP & Standard) . . . . . .85%+
- Pacifica X Series (XP & Standard) . . . . . .85%+

**Viola**
- Rain Collection . . . . . .90%+
- Sorbet™ Series (XP & Standard) . . . . . .90%+

USDA Plant Hardiness Zone and Average Annual Minimum Temperature Range

<table>
<thead>
<tr>
<th>Zone</th>
<th>Fahrenheit</th>
<th>Celsius</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Below -50 F</td>
<td>Below -46 C</td>
</tr>
<tr>
<td>2</td>
<td>-45 to -40 F</td>
<td>-46 to -40 C</td>
</tr>
<tr>
<td>3</td>
<td>-40 to -30 F</td>
<td>-40 to -35 C</td>
</tr>
<tr>
<td>4</td>
<td>-30 to -20 F</td>
<td>-35 to -29 C</td>
</tr>
<tr>
<td>5</td>
<td>-20 to -10 F</td>
<td>-29 to -23 C</td>
</tr>
<tr>
<td>6</td>
<td>-10 to 0 F</td>
<td>-23 to -18 C</td>
</tr>
<tr>
<td>7</td>
<td>0 to 10 F</td>
<td>-18 to -12 C</td>
</tr>
<tr>
<td>8</td>
<td>10 to 20 F</td>
<td>-12 to -7 C</td>
</tr>
<tr>
<td>9</td>
<td>20 to 30 F</td>
<td>-7 to -1 C</td>
</tr>
<tr>
<td>10</td>
<td>30 to 40 F</td>
<td>-1 to 5 C</td>
</tr>
<tr>
<td>11</td>
<td>above 40 F</td>
<td>above 5 C</td>
</tr>
</tbody>
</table>

Substrate Moisture Level Table

<table>
<thead>
<tr>
<th>Substrate color</th>
<th>Level 1 Dry</th>
<th>Level 2 Medium Dry</th>
<th>Level 3 Medium</th>
<th>Level 4 Medium Wet</th>
<th>Level 5 Saturated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very light brown or gray</td>
<td>Light brown</td>
<td>Brown to dark brown</td>
<td>Dark brown</td>
<td>Brown-black, glistening with water</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Substrate feel when squeezed in hand</th>
<th>Substrate structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>No moisture is detected in substrate</td>
<td>Substrate is barely stick together under pressure</td>
</tr>
<tr>
<td>Substrate squeaks when squeezed</td>
<td>Substrate will clump together but cracks apart under its own weight</td>
</tr>
<tr>
<td>A small drop of water can be squeezed from the substrate</td>
<td>Substrate easily clumps together and stays as one clump</td>
</tr>
<tr>
<td>Water can be easily squeezed from the substrate</td>
<td>Substrate has a semi-liquid consistency</td>
</tr>
<tr>
<td>Water runs freely out of the substrate</td>
<td></td>
</tr>
</tbody>
</table>

Fertilizer Rate Table

<table>
<thead>
<tr>
<th>Container Conversion from cm to in.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>European Container</th>
<th>Equivalent U.S. Container</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 cm 5” – H</td>
<td>3.5 in. Standard</td>
</tr>
<tr>
<td>10.5 cm 5” – H</td>
<td>4 in. Standard</td>
</tr>
<tr>
<td>11 cm 8” – H</td>
<td>4.25 in. Standard</td>
</tr>
<tr>
<td>12 cm 8” – H</td>
<td>4.5 in. Geranium</td>
</tr>
<tr>
<td>13 cm 8” – L</td>
<td>5 in. Azalea</td>
</tr>
<tr>
<td>13 cm 5” – H</td>
<td>5 in. Standard</td>
</tr>
<tr>
<td>14 cm 5” – H</td>
<td>6 in. Trade</td>
</tr>
<tr>
<td>15 cm 5” – L</td>
<td>6 in. Azalea</td>
</tr>
<tr>
<td>15 cm 5” – H</td>
<td>6 in. Standard</td>
</tr>
<tr>
<td>17 cm – L</td>
<td>6.5 in. Azalea</td>
</tr>
<tr>
<td>15 to 18 cm – H</td>
<td>Trade Gallon</td>
</tr>
<tr>
<td>19 cm – L</td>
<td>8 in. Standard</td>
</tr>
</tbody>
</table>

Key To Symbols:
- COT – Coated seed
- DTL – De-tailed seed
- MSP – Multi-seed pellet
- PEL – Pelleted seed
- PRM – Primed seed
- SCR – Scarified seed
- SED – Raw seed
- TUN – Tuned Seeds from Kieft

Find culture and more at panamseed.com & kieft-pro-seeds.com.
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz.</th>
<th>Seed form</th>
<th>Recommended plug size*</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online*</td>
<td>ABUTILON A. x hybridum (Flowering Maple, Chinese Bell Flower)</td>
<td>Bella F1 Series</td>
<td>SED</td>
<td>8,500 S/oz. (300 S/g)</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>72-75°F (22-24°C)</td>
<td>3</td>
<td>3-5</td>
<td>4-4.5 in. (10-11 cm), 5 in. (13 cm), 6-6.5 in. (15-16 cm) 2-3 ppp, 8 in. (20 cm) basket 3-4 ppp, 10 in. (25 cm) 4-6 ppp</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>AGERATUM A. houstonianum</td>
<td>High Tide F1 Series</td>
<td>PEL</td>
<td>14,000 S/oz. (500 S/g)</td>
<td>406-cell or larger</td>
<td>No</td>
<td>72-75°F (22-24°C)</td>
<td>3</td>
<td>4</td>
<td>306 (9 cm), 4 in. (10 cm), 6 in. (15 cm)</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>ALSTROEMERIA A. x hybridra</td>
<td>Purple Knight</td>
<td>SED</td>
<td>17,400 S/oz. (614 S/g)</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>72-76°F (22-24°C)</td>
<td>3-4</td>
<td>5-6</td>
<td>Pack, 306 (9 cm), 4 in. (10 cm), 6 in. (15 cm) 3 ppp</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>ALYSSUM Lobularia maritima</td>
<td>Clear Crystal™ Series</td>
<td>SED</td>
<td>70,875-87,885 S/oz. (2,500-3,100 S/g)</td>
<td>200 to 288-cell</td>
<td>No</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
<td>4</td>
<td>306 (9 cm), 4 in. (10 cm)</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>ALYSSUM Lobularia maritima</td>
<td>Easter Bonnet Series</td>
<td>FCS</td>
<td>76,500-102,000 S/oz. (2,700-3,600 S/g)</td>
<td>512-cell or larger</td>
<td>No</td>
<td>68-72°F (20-22°C)</td>
<td>2-3</td>
<td>4-5</td>
<td>Pack</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>ALYSSUM Lobularia maritima</td>
<td>Snow Crystals</td>
<td>SED</td>
<td>70,875-87,885 S/oz. (2,500-3,100 S/g)</td>
<td>512-cell or larger</td>
<td>No</td>
<td>65-70°F (18-21°C)</td>
<td>2-3</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm)</td>
<td></td>
</tr>
<tr>
<td>Pg 76</td>
<td>ANEMANTELE A. lessioniana</td>
<td>Sirocco</td>
<td>MSP</td>
<td>4,876 MSP/oz. (172 MSP/g)</td>
<td>288-cell or larger</td>
<td>No</td>
<td>65-76°F (18-24°C)</td>
<td>5-6</td>
<td>5-6</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm) gallon (15-18 cm)</td>
<td></td>
</tr>
<tr>
<td>Pg 76</td>
<td>ANEMONE A. coronaria</td>
<td>Mona Lisa™ Series</td>
<td>SED</td>
<td>52,500 S/oz. (1,850 S/g)</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>60-65°F (16-18°C)</td>
<td>10-14</td>
<td>8</td>
<td>4 in. (10 cm), 6 in. (15 cm)</td>
<td></td>
</tr>
<tr>
<td>Pg 76</td>
<td>ANGELONIA A. angustifolia</td>
<td>Serena™ F1 Series</td>
<td>PEL</td>
<td>28,500 S/oz. (1,000 S/g)</td>
<td>406-cell or larger</td>
<td>No</td>
<td>72-76°F (22-25°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm) 3 ppp, gallon (15-18 cm) 3 ppp</td>
<td></td>
</tr>
</tbody>
</table>

*Find online Grower Facts culture at panamseed.com.
<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
<th>Pack</th>
<th>4-in./10 cm</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>65-70°F (18-21°C)</td>
<td>60-65°F (16-18°C)</td>
<td>6-8</td>
<td>(Spring)</td>
<td>7-10</td>
<td>(Spring) Space plants adequately to get the best branching and the showiest plants.</td>
<td>14-18 in. (35-45 cm)</td>
<td>14-18 in. (35-45 cm)</td>
<td>✓</td>
<td>Ideal for pot, basket and colour bowl programs year-round.</td>
<td></td>
</tr>
<tr>
<td>70-80°F (21-27°C)</td>
<td>58-62°F (14-17°C)</td>
<td>7-9</td>
<td>7-9</td>
<td>Using multiple PGR applications of low concentrations are recommended for best leaf appearance.</td>
<td>14-16 in. (35-40 cm)</td>
<td>12 in. (30 cm)</td>
<td>✓</td>
<td>Ideal for pot plant programs and for the landscape.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70-80°F (21-27°C)</td>
<td>58-62°F (14-17°C)</td>
<td>5-7</td>
<td>20-23</td>
<td>Follow the Grower Facts germination recommendations closely.</td>
<td>10-16 in. (25-40 cm) (in pot)</td>
<td>8-12 in. (20-30 cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-65°F (16-18°C)</td>
<td>52-58°F (11-14°C)</td>
<td>6-7</td>
<td>6-7</td>
<td>Growing under high light conditions will result in deeper purple foliage. See Fantastic Foliage plug chart for more details (pg 52).</td>
<td>18-36 in. (45-90 cm)</td>
<td>24-36 in. (60-90 cm)</td>
<td>✓</td>
<td>Well-suited to both containers and landscape plantings.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>62-65°F (17-18°C)</td>
<td>6-7</td>
<td>7-8</td>
<td>Cool-season crop can be grown with little or no heat. Grow outdoors or at very cool night temperatures for best color definition.</td>
<td>6-10 in. (15-25 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td>✓</td>
<td>Fragrant, large-flowered varieties deliver stronger garden performance.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-75°F (16-24°C)</td>
<td>55-60°F (13-16°C)</td>
<td>4-6</td>
<td>7</td>
<td>Multi-sowing is recommended, 3 to 5 seeds per plug cell.</td>
<td>4-10 in. (10-25 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55-70°F (13-21°C)</td>
<td>50-55°F (10-14°C)</td>
<td>6-7</td>
<td>6-7</td>
<td>Multi-sowing is recommended, 3 to 5 seeds per plug cell.</td>
<td>4-10 in. (10-25 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62-74°F (17-23°C)</td>
<td>59-64°F (15-18°C)</td>
<td>6-8</td>
<td>6-8</td>
<td>Color is better under cool and high light conditions. If temperature permits, it is best to produce Sirocco in outdoor conditions. See Fantastic Foliage ColorGrass plug chart for more details (pg 52).</td>
<td>6-8 (3 ppp), 8-10 (1 ppp)</td>
<td>12-14 in. (30-35 cm)</td>
<td>22-24 in. (55-60 cm)</td>
<td>Hardy to USDA Zones 8-9.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-65°F (15-18°C)</td>
<td>55°F (13°C)</td>
<td>12</td>
<td>12</td>
<td>See also Cut Flower section for more details (pg 46).</td>
<td>18 in. (45 cm) (stems)</td>
<td>6 in. (15 cm)</td>
<td>✓</td>
<td>Ideally suited for young plant production from a March to June sowing in Northern Hemisphere for October through April season; a September to December sowing in Southern Hemisphere for April through October season.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>66-75°F (19-24°C)</td>
<td>64-66°F (18-19°C)</td>
<td>8-9</td>
<td>9-10</td>
<td>Light is required for germination. Grow on dry side but do not allow plants to wilt. It grows slowly when temperature is below 64°F (18°C).</td>
<td>10-12 in. (25-30 cm) (2 in./5 cm taller under FL conditions)</td>
<td>12-14 in. (30-35 cm)</td>
<td>✓</td>
<td>Do not pinch. Pinching will only delay flowering and make plant habit unattractive.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)**
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANGELONIA</td>
<td>A. angustifolia</td>
<td>Serenita™ F1 Series</td>
<td>☀️</td>
<td>28,500 S/oz. (1,000 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-25°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm) 3 ppp, gallon (15-18 cm) 3 ppp</td>
</tr>
<tr>
<td>AQUILEGIA</td>
<td>A. x caerulea (Rocky Mountain Columbine)</td>
<td>Dragonfly Mixture</td>
<td>☀️</td>
<td>26,900 S/oz. (950 S/g)</td>
<td>SED</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>70-75°F (21-24°C)</td>
<td>10-14</td>
<td>6-8</td>
<td>6 in. (15 cm)</td>
</tr>
</tbody>
</table>

FOR SONGBIRD & SWAN SERIES AQUILEGIA See Perennial Culture Chart (pg 56)

| ASPARAGUS   | A. densiflorus 'Sprengerii' / 'Sprengerii' A. setaceous Nanus | Sprengerii, Nanus | ☀️ | 571-628 S/oz. (20-22 S/g) | SED | 512-cell or larger | Yes | 78-80°F (26-27°C) | 4-6 | 6-7 | 4 in. (10 cm) |
| ASTER       | Callistephus chinensis | Meteor Series | ☀️ | 12,000 S/oz. (420 S/g) | SED | 200-cell | Yes | 70°F (21°C) | 4-8 | 4-5 | Cut flower |
| ASTER       | Callistephus chinensis | Pot ‘N Patio Series | ☀️ | 12,000 S/oz. (420 S/g) | SED | 288-cell or larger | Yes | 70°F (21°C) | 4-8 | 4-5 | Pack, 4 in. (10 cm) |

| BACOPA      | Sutera cordata | Blutopia™ & Snowtopia™ | ☀️ | 12,675-19,845 MSP/oz. (500-700 MSP/g) | MSP | 288 or 128-cell | No | 68-73°F (20-25°C) | 4 | 3-4 | 4.5 in. (10.5 cm), 10 in. (25 cm) baskets (5-6 ppp) |
| BACOPA, FUSEABLES™ | Sutera cordata | Utopia | ☀️ | 12,675-19,845 MSP/oz. (500-700 MSP/g) | MSP | 288 or 128-cell | No | 68-73°F (20-23°C) | 4 | 4-5 | 10-12 in. (25-30 cm) baskets 4 ppp |
| BASIL       | Ocimum basilicum | Purple Ruffles | ☀️ | 14,275 S/oz. (500 S/g) | SED | 406-cell or larger | Yes | 68-74°F (20-23°C) | 2-4 | 4-5 | Pack, 3.5 in. (9 cm) |
| BASIL       | Ocimum basilicum | Sweet Dani Lemon | ☀️ | 14,275 S/oz. (500 S/g) | SED | 406-cell or larger | Yes | 68-74°F (20-23°C) | 2-4 | 4-5 | Pack, 3.5 in. (9 cm) |

| BEGONIA     | B. x hybridra | BabyWing™ F1 Series | ☀️ | 28,550 S/oz. (1,000 S/g) | PEL | 406-cell or larger | No | 72-80°F (22-27°C) | 7-10 | 7-8 | 4 in. (10 cm), 4.5 in. (12 cm), 6 in. (15 cm) 1-2 ppp, 6.5 in (16 cm) 3 ppp, 10-12 in. (25-30 cm) baskets 4 ppp |

*Find online Grower Facts culture at panamseed.com.
**Weeks from plug to finish**  
(Spring unless specified)

<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
<th>Pack</th>
<th>4-in.-10 cm</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>66-75°F (19-24°C)</td>
<td>64-66°F (18-19°C)</td>
<td>8-9</td>
<td>9-10</td>
<td>10-11</td>
<td>Light is required for germination. Grow on dry side but do not allow plants to wilt. It grows slowly when temperature is below 64°F (18°C).</td>
<td>8-10 in. (20-25 cm) (6 in./15 cm taller under FL conditions)</td>
<td>12-14 in. (30-35 cm)</td>
<td>✓</td>
<td></td>
<td>Do not pinch. Pinching will only delay flowering and make plant habit unattractive. It is naturally more compact than serena and requires less PGR.</td>
</tr>
<tr>
<td>60-68°F (16-20°C)</td>
<td>55-64°F (13-18°C)</td>
<td>–</td>
<td>–</td>
<td>17-20</td>
<td>Requires daytime temperatures below 60°F (15°C) to initiate flower buds.</td>
<td>18 in. (45 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>60-65°F (16-18°C)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Requires dark for germination.</td>
<td>2-3 ft. (60-90 cm)</td>
<td>2-3 ft. (60-90 cm)</td>
<td></td>
<td></td>
<td>If direct sown into larger liner (72-50 cell tray), cover seed with vermiculite or sowing media. Keep seed on the wet side until after germination.</td>
</tr>
<tr>
<td>60-75°F (15-24°C)</td>
<td>50-60°F (10-15°C)</td>
<td>–</td>
<td>–</td>
<td>13-16</td>
<td>See also Cut Flower section for more details (pg 46).</td>
<td>2.5-3.5 ft. (0.8-1 m)</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>55-65°F (13-18°C)</td>
<td>8</td>
<td>8</td>
<td>–</td>
<td>Flowers in just 90 days from sowing during the short days of Winter and early Spring.</td>
<td>6 in. (15 cm)</td>
<td>6 in. (15 cm)</td>
<td></td>
<td></td>
<td>Not recommended for landscape plantings.</td>
</tr>
<tr>
<td>60-75°F (16-24°C)</td>
<td>55-60°F (13-16°C)</td>
<td>–</td>
<td>4-6</td>
<td>8-9</td>
<td>Use of PGRs or growing outdoors will give a much more controlled plant. Be sure to water multi-seed pellets thoroughly and give light for best germination.</td>
<td>6 in. (15 cm)</td>
<td>18-24 in. (45-60 cm)</td>
<td></td>
<td></td>
<td>Use primarily in baskets and container applications for best performance.</td>
</tr>
<tr>
<td>59-76°F (15-24°C)</td>
<td>55-60°F (13-16°C)</td>
<td>–</td>
<td>–</td>
<td>10-12</td>
<td>Seed can be directly sown into finish containers up to 3.5 in. (9 cm).</td>
<td>6 in. (15 cm)</td>
<td>18-24 in. (45-60 cm)</td>
<td></td>
<td></td>
<td>Use primarily in baskets and container applications for best performance.</td>
</tr>
<tr>
<td>72-75°F (22-24°C)</td>
<td>50-60°F (10-16°C)</td>
<td>2-3</td>
<td>2-3</td>
<td>–</td>
<td>Seed can be directly sown into finish containers up to 3.5 in. (9 cm).</td>
<td>18-24 in. (45-60 cm)</td>
<td>18-24 in. (45-60 cm)</td>
<td></td>
<td></td>
<td>The use of plant growth regulators on food crops is prohibited by law.</td>
</tr>
<tr>
<td>62-65°F (17-18°C)</td>
<td>50-60°F (10-16°C)</td>
<td>2-3</td>
<td>2-3</td>
<td>–</td>
<td>Seed can be directly sown into finish containers up to 3.5 in. (9 cm).</td>
<td>22-24 in. (55-60 cm)</td>
<td>18-24 in. (45-60 cm)</td>
<td></td>
<td></td>
<td>The use of plant growth regulators on food crops is prohibited by law. Sweet Dani is not a sweet-fruited variety.</td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>60-65°F (16-18°C)</td>
<td>–</td>
<td>5-7</td>
<td>5-7</td>
<td>Keep moisture high until the first true leaf develops. After transplant, if necessary, a very light spray of a tank mix of Cycocel 300 ppm and B-Nine 2,500 ppm can be used. BabyWing is very responsive to Bonzi and Sumagic. Avoid overspray from neighboring plants.</td>
<td>12-15 in. (30-38 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)**

630 231-1400 panamseed.com
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pg 79</td>
<td>BEGONIA</td>
<td>Dragon Wing™</td>
<td>28,550 s/oz (1,000 S/g)</td>
<td>PEL</td>
<td>200-cell or larger</td>
<td>Cover lightly</td>
<td>72-75°F (22-24°C)</td>
<td>7-10</td>
<td>7-8</td>
<td>4.4-5 in. (10-11 cm), 5.5-6 in. (14-15 cm), 1-2 ppp, 6.5-8 in. (16-20 cm), 2-3 ppp, gallon (15-18 cm) 2 ppp, 10-12 in. (25-30 cm) 4 ppp</td>
<td></td>
</tr>
<tr>
<td>Pg 80</td>
<td>BEGONIA</td>
<td>Gryphon</td>
<td>28,500 s/oz (1,000 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-78°F (22-26°C)</td>
<td>10-12</td>
<td>8-9</td>
<td>4.5 in. (11 cm), 6 in. (15 cm), 2 ppp, 8 in. (20 cm) 3 ppp, 10-12 in. (25-30 cm) 3-4 ppp</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>BELLIS</td>
<td>Bellissima Series</td>
<td>21,428 s/oz (750 S/g)</td>
<td>PEL</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>65-72°F (18-22°C)</td>
<td>3-5</td>
<td>5</td>
<td>Pack, 306 (9 cm), 5 in. (13 cm) 3 ppp</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>BELLIS</td>
<td>Medicis Series</td>
<td>157,000 s/oz (5,500 S/g)</td>
<td>SED</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>65-72°F (18-22°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>Pack, 306 (9 cm), 5 in. (13 cm) 3 ppp</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>BRAZILIAN FIREWORKS</td>
<td>Porphyranoma pohliana</td>
<td>14,971 s/oz (524 S/g)</td>
<td>SED</td>
<td>288-cell</td>
<td>Yes</td>
<td>65-75°F (18-24°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm) 3 ppp, gallon (15-18 cm) 3 ppp</td>
<td></td>
</tr>
<tr>
<td>Pg 132</td>
<td>CAMPANULA</td>
<td>Campana Series</td>
<td>102,000-136,000 s/oz (3,600-4,800 S/g)</td>
<td>SED, PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>68-72°F (20-22°C)</td>
<td>4-5</td>
<td>7-8</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm) gallon (15-18 cm)</td>
<td></td>
</tr>
<tr>
<td>Pg 84</td>
<td>CAREX</td>
<td>Red Rooster</td>
<td>3,750 MSP/oz. (126 MSP/g)</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>74-79°F (24-26°C)</td>
<td>7-10</td>
<td>6-7</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm) gallon (15-18 cm)</td>
<td></td>
</tr>
<tr>
<td>Pg 81</td>
<td>CAREX</td>
<td>Amazon Mist</td>
<td>5,184 MSP/oz. (183 MSP/g)</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>68-79°F (20-26°C)</td>
<td>7-10</td>
<td>6-7</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm) gallon (15-18 cm)</td>
<td></td>
</tr>
<tr>
<td>Pg 81</td>
<td>CAREX</td>
<td>Bronco</td>
<td>3,860 MSP/oz. (136 MSP/g)</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>74-79°F (24-26°C)</td>
<td>7-10</td>
<td>6-7</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm) gallon (15-18 cm)</td>
<td></td>
</tr>
</tbody>
</table>

*Find online Grower Facts culture at panamseed.com.
<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
<th>Pack</th>
<th>4-in./10 cm</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>65-70°F (18-21°C)</td>
<td>60-65°F (16-18°C)</td>
<td>–</td>
<td>7-9</td>
<td>7-11</td>
<td>Keep moisture high until first true leaf develops. After transplant, use Bonzi 3-5 ppm spray for height control.</td>
<td>12-15 in. (30-38 cm)</td>
<td>15-18 in. (38-45 cm)</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-75°F (18-25°C)</td>
<td>62-67°F (17-19°C)</td>
<td>–</td>
<td>5-6</td>
<td>7-11</td>
<td>A saturated media and high relative humidity is critical to germinate successfully. See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>14-16 in. (36 to 41 cm)</td>
<td>16-18 in. (41 to 46 cm)</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-65°F (16-18°C)</td>
<td>40-45°F (5-7°C)</td>
<td>6-10 (U.S. Autumn/ Spring)</td>
<td>6-10 (U.S. Autumn/ Spring)</td>
<td>13-15 (Spring), 7-9 (Autumn North Europe)</td>
<td>Use a medium covering of coarse-grade vermiculite to improve seedling uniformity.</td>
<td>6-10 in. (15-25 cm)</td>
<td>5-8 in. (13-20 cm)</td>
<td>✔</td>
<td>Grow as cool as possible but avoid freezing temperatures. For forcing the crop when grown at these temperatures, grow at 55-58°F (10-12°C) for 4 weeks before sale.</td>
<td></td>
</tr>
<tr>
<td>60-65°F (16-18°C)</td>
<td>40-45°F (5-7°C)</td>
<td>14</td>
<td>14</td>
<td>–</td>
<td>Use a medium covering of coarse-grade vermiculite to improve seedling uniformity.</td>
<td>8 in. (20 cm)</td>
<td>5-8 in. (13-20 cm)</td>
<td>✔</td>
<td>Under cooler temperatures, Medicis flowers are more fully double. Best grown as a biennial bedding or pot plant.</td>
<td></td>
</tr>
<tr>
<td>72-80°F (22-27°C)</td>
<td>66-68°F (19-20°C)</td>
<td>7-8</td>
<td>7-8</td>
<td>7-9</td>
<td>Heat-loving crop; crop time is very dependant on temperature. See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>6-8 in. (15-20 cm)</td>
<td>8-10 in. (20-25 cm)</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-65°F (16-18°C)</td>
<td>60-65°F (16-18°C)</td>
<td>–</td>
<td>9-11</td>
<td>11-13</td>
<td>Requires long days to bloom.</td>
<td>10-12 in. (25-30 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-70°F (15-21°C)</td>
<td>54-59°F (12-15°C)</td>
<td>–</td>
<td>–</td>
<td>10-14</td>
<td>See also Cut Flower section for more details (pg 48).</td>
<td>30-34 in. (75-85 cm)</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66-74°F (19-23°C)</td>
<td>64-66°F (18-19°C)</td>
<td>8-9</td>
<td>8-9</td>
<td>9-10</td>
<td>See Fantastic Foliage ColorGrass plug chart for more details (pg 54).</td>
<td>24 in. (60 cm)</td>
<td>12 in. (30 cm)</td>
<td>✔ USDA Hardiness Zones 7 to 9.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>66-74°F (19-23°C)</td>
<td>64-66°F (18-19°C)</td>
<td>9-10</td>
<td>9-10</td>
<td>10-11</td>
<td>See Fantastic Foliage ColorGrass plug chart for more details (pg 54).</td>
<td>10 in. (25 cm)</td>
<td>14 in. (35 cm)</td>
<td>✔ USDA Hardiness Zones 7 to 9.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>66-74°F (19-23°C)</td>
<td>64-66°F (18-19°C)</td>
<td>8-9</td>
<td>8-9</td>
<td>9-10</td>
<td>See Fantastic Foliage ColorGrass plug chart for more details (pg 54).</td>
<td>10 in. (25 cm)</td>
<td>14 in. (35 cm)</td>
<td>✔ USDA Hardiness Zones 7 to 9.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grover Facts</td>
<td>Class</td>
<td>Series/Variety</td>
<td>Exposure</td>
<td>Seeds per oz (g)</td>
<td>Seed form</td>
<td>Recommended plug size**</td>
<td>Cover seed</td>
<td>Germination temperature</td>
<td>Days to germinate</td>
<td>Plug crop weeks</td>
</tr>
<tr>
<td>-------------</td>
<td>-------</td>
<td>----------------</td>
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<td>-----------------</td>
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<td>-----------</td>
<td>------------------------</td>
<td>-----------------</td>
<td>------------------</td>
</tr>
<tr>
<td>Pg 83</td>
<td>CAREX C. comans (Leatherleaf Sedge)</td>
<td>Phoenix Green</td>
<td>☀️</td>
<td>2,181 S/oz. (77 S/g)</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>74-79°F (24-26°C)</td>
<td>7-10</td>
<td>5-7</td>
</tr>
<tr>
<td>Pg 82</td>
<td>CAREX C. dipscacea</td>
<td>Coppertop</td>
<td>☀️</td>
<td>Not available</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>No</td>
<td>65-68°F (18-20°C)</td>
<td>9-12</td>
<td>6-8</td>
</tr>
<tr>
<td>Pg 82</td>
<td>CAREX C. flagellifera</td>
<td>Cinnamon</td>
<td>☀️</td>
<td>Not available</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-77°F (22-25°C)</td>
<td>8-10</td>
<td>5-6</td>
</tr>
<tr>
<td>Pg 83</td>
<td>CELOSIA C. argentea var. plumosus</td>
<td>Glow Series</td>
<td>☀️</td>
<td>31,200 S/oz. (1,100 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>75°F (24°C)</td>
<td>2-4</td>
<td>4-5</td>
</tr>
<tr>
<td>Pg 133</td>
<td>CELOSIA C. cristata</td>
<td>Bombay Series</td>
<td>☀️</td>
<td>21,300-28,350 S/oz. (750-1,000 S/g)</td>
<td>SED, PEL, COT</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>68-72°F (20-22°C)</td>
<td>3-4</td>
<td>2-3</td>
</tr>
<tr>
<td>Pg 84</td>
<td>CELOSIA C. plumosa</td>
<td>Icecream</td>
<td>☀️</td>
<td>42,000-63,000 S/oz. (1,500-2,400 S/g)</td>
<td>FCS</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>70 to 72°F (21-22°C)</td>
<td>5-7</td>
<td>3-4</td>
</tr>
<tr>
<td>Pg 133</td>
<td>CELOSIA C. plumosa</td>
<td>Sunday Series</td>
<td>☀️</td>
<td>42,525-68,040 S/oz. (1,500-2,400 S/g)</td>
<td>SED, COT</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>68-72°F (20-22°C)</td>
<td>3-4</td>
<td>2-3</td>
</tr>
<tr>
<td>Pg 85</td>
<td>CELOSIA C. spicata</td>
<td>Kosmo</td>
<td>☀️</td>
<td>42,000-63,000 S/oz. (1,500-2,400 S/g)</td>
<td>FCS</td>
<td>288-cell or larger</td>
<td>No</td>
<td>70 to 72°F (21-22°C)</td>
<td>4-5</td>
<td>3-4</td>
</tr>
<tr>
<td>C. scandens</td>
<td>☀️</td>
<td>375 S/oz. (13 S/g)</td>
<td>SED</td>
<td>72-cell or larger</td>
<td>Yes</td>
<td>70°F (21°C)</td>
<td>14-21</td>
<td>6</td>
<td>8 in. (20 cm)</td>
<td></td>
</tr>
<tr>
<td>COLEUS Solenostemon scutellarioides</td>
<td>Black Dragon</td>
<td>☀️</td>
<td>100,000 S/oz. (3,500 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>71-76°F (22-24°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>Pack</td>
</tr>
<tr>
<td>COLEUS Solenostemon scutellarioides</td>
<td>Carefree Mixture</td>
<td>☀️</td>
<td>100,000 S/oz. (3,500 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>71-76°F (22-24°C)</td>
<td>4-5</td>
<td>4-5</td>
<td>Pack</td>
</tr>
<tr>
<td>Pg 85</td>
<td>COLEUS Solenostemon scutellarioides</td>
<td>Chocolate Covered Cherry</td>
<td>☀️</td>
<td>27,500 S/oz. (970 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>71-76°F (22-24°C)</td>
<td>4-5</td>
<td>5-6</td>
</tr>
</tbody>
</table>

**Find online Grover Facts culture at panamseed.com.
<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature right</th>
<th>Pack</th>
<th>4-in./10-cm</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>66-74°F (19-23°C)</td>
<td>64-66°F (18-19°C)</td>
<td>6-7</td>
<td>6-7</td>
<td>7-8</td>
<td>See Fantastic Foliage ColorGrass plug chart for more details (pg 54).</td>
<td>16-20 in. (50-60 cm)</td>
<td>16-20 in. (40-50 cm)</td>
<td>✔</td>
<td>✔</td>
<td>USDA Hardiness Zones 6 to 8.</td>
</tr>
<tr>
<td>66-74°F (19-23°C)</td>
<td>55-60°F (13-19°C)</td>
<td>10-12</td>
<td>10-12</td>
<td>10-12</td>
<td>See Fantastic Foliage ColorGrass plug chart for more details (pg 54).</td>
<td>14-16 in. (35-40 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✔</td>
<td>✔</td>
<td>USDA Hardiness Zones 5-11.</td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>55-65°F (13-18°C)</td>
<td>6-7</td>
<td>6-7</td>
<td>–</td>
<td>Create a unique pot crop by sowing 10-15 seeds into a 4-in. (10-cm) container. This produces an interesting mini-forest of celosia.</td>
<td>10-12 in. (25-30 cm)</td>
<td>8-10 in. (20-25 cm)</td>
<td>✔</td>
<td>✔</td>
<td>Plant growth regulator treatment may be needed once or twice under longer days for a more compact plant. Under Northwest European conditions, 1 or 2 light treatments with Alar (B-Nine) have shown to be effective.</td>
</tr>
<tr>
<td>Before flower development: 65-75°F (18-24°C)</td>
<td>Before flower development: 63-65°F (17-18°C)</td>
<td>–</td>
<td>10-14</td>
<td>See also Cut Flower section for more details (pg 48).</td>
<td>28-40 in. (70-100 cm)</td>
<td>–</td>
<td>✔</td>
<td>✔</td>
<td>Other recommendations</td>
<td></td>
</tr>
<tr>
<td>Before flower development: 65-75°F (18-24°C)</td>
<td>After flower development: 60-61°F (16°C)</td>
<td>–</td>
<td>12-16</td>
<td>See also Cut Flower section for more details (pg 48).</td>
<td>28-40 in. (70-100 cm)</td>
<td>–</td>
<td>✔</td>
<td>✔</td>
<td>Other recommendations</td>
<td></td>
</tr>
<tr>
<td>65 to 70°F (18 to 21°C)</td>
<td>59 to 61°F (15 to 16°C)</td>
<td>8-10</td>
<td>9-12</td>
<td>–</td>
<td>Keep medium moist constantly and do not allow the media dry out.</td>
<td>10 in. (25 cm)</td>
<td>12 in. (30 cm)</td>
<td>✔</td>
<td>✔</td>
<td>Other recommendations</td>
</tr>
<tr>
<td>Before flower development: 65-75°F (18-24°C)</td>
<td>After flower development: 60-61°F (16°C)</td>
<td>–</td>
<td>12-16</td>
<td>See also Cut Flower section for more details (pg 48).</td>
<td>28-40 in. (70-100 cm)</td>
<td>–</td>
<td>✔</td>
<td>✔</td>
<td>Other recommendations</td>
<td></td>
</tr>
<tr>
<td>65 to 68°F (18 to 20°C)</td>
<td>62 to 65°F (17 to 18°C)</td>
<td>9-11</td>
<td>10-12</td>
<td>10-12</td>
<td>Keep medium moist constantly and do not allow the media dry out.</td>
<td>8 in. (20 cm)</td>
<td>8-10 in. (20-25 cm)</td>
<td>✔</td>
<td>✔</td>
<td>Other recommendations</td>
</tr>
<tr>
<td>68-75°F (20-24°C)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>In North America, plants started in April will bloom in August/September.</td>
<td>–</td>
<td>–</td>
<td>✔</td>
<td>✔</td>
<td>Other recommendations</td>
<td></td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>5-6</td>
<td>–</td>
<td>–</td>
<td>Vine, to 25 ft. (7.5 m)</td>
<td>12-14 in. (30-35 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✔</td>
<td>✔</td>
<td>Other recommendations</td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>5-6</td>
<td>–</td>
<td>–</td>
<td>8-10 in. (20-25 cm)</td>
<td>8-10 in. (20-25 cm)</td>
<td>✔</td>
<td>✔</td>
<td>Other recommendations</td>
<td></td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>6-8</td>
<td>–</td>
<td>6-8</td>
<td>See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>12-14 in. (30-35 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✔</td>
<td>✔</td>
<td>Can take the full sun if in areas of high humidity.</td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)
<table>
<thead>
<tr>
<th>Grover Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pg 85</td>
<td>COLEUS Solenostemon scutellarioides</td>
<td>Chocolate Mint</td>
<td>☐</td>
<td>27,500 S/oz. (970 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>71-76°F (22-24°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>306 Pack (9 cm), 5 in, (13 cm), gallon (15 cm) 3 ppm</td>
</tr>
<tr>
<td>Pg 85</td>
<td>COLEUS Solenostemon scutellarioides</td>
<td>Chocolate Splash</td>
<td>☐</td>
<td>27,500 S/oz. (970 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>71-76°F (22-24°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>306 Pack (9 cm), 5 in, (13 cm), gallon (15 cm) 3 ppm</td>
</tr>
<tr>
<td>Pg 85</td>
<td>COLEUS Solenostemon scutellarioides</td>
<td>Dark Chocolate</td>
<td>☐</td>
<td>27,500 S/oz. (970 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>71-76°F (22-24°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>306 Pack (9 cm), 5 in, (13 cm), gallon (15 cm) 3 ppm</td>
</tr>
<tr>
<td>Pg 86</td>
<td>COLEUS Solenostemon scutellarioides</td>
<td>Kong™ Series</td>
<td>☐</td>
<td>25,650 S/oz. (900 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>71-76°F (22-24°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>5 in. (13 cm), gallon (15 cm)</td>
</tr>
<tr>
<td>Pg 87</td>
<td>COLEUS Solenostemon scutellarioides</td>
<td>Versa Collection</td>
<td>☐</td>
<td>27,500 S/oz. (970 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>71-76°F (22-24°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>306 Pack (9 cm), 4 in, (10 cm), 5 in, (13 cm), 6 in, (15 cm) 3 ppm, gallon (15-18 cm) 3 ppm</td>
</tr>
<tr>
<td>Online*</td>
<td>COLEUS Solenostemon scutellarioides</td>
<td>Wizard™ Series</td>
<td>☐</td>
<td>100,000 S/oz. (3,500 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>71-76°F (22-24°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>Pack, 4 in. (10 cm), 5 in. (13 cm)</td>
</tr>
<tr>
<td>Pg 90</td>
<td>COLEUS, FUSEABLES™ Solenostemon scutellarioides</td>
<td>Chocolate Symphony, Under the Sun</td>
<td>☐</td>
<td>3,710 MSP/oz. (130 MSP/g)</td>
<td>MSP</td>
<td>288 or 128-cell</td>
<td>71-76°F (22-24°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>10 in. (25 cm) 3 ppm, 12 in. (30 cm) 5 ppm</td>
</tr>
</tbody>
</table>

FOR EARLY SUNRISE, RISING SUN & SUNFIRE COREOPSIS See Perennial Culture Chart (pg 62)

<table>
<thead>
<tr>
<th>VARIETY CULTURE CHART</th>
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<tbody>
<tr>
<td>Grover Facts</td>
</tr>
</tbody>
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*Find online Grover Facts culture at panamseed.com.
<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
<th>Pack</th>
<th>4-in./10-cm</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>65-75°F (18-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>6-8</td>
<td>–</td>
<td>6-8</td>
<td>See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>14-20 in. (35-50 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td></td>
<td></td>
<td>Can take the sun if in areas of high humidity.</td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>6-8</td>
<td>6-8</td>
<td>6-8</td>
<td>See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>12-16 in. (30-40 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td></td>
<td></td>
<td>Can take the sun if in areas of high humidity.</td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>6-8</td>
<td>–</td>
<td>6-8</td>
<td>See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>24-30 in. (60-75 cm)</td>
<td>18-24 in. (45-60 cm)</td>
<td></td>
<td></td>
<td>Can take the sun if in areas of high humidity.</td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>–</td>
<td>3-4</td>
<td>5-6</td>
<td>Do not pinch. It will result in smaller leaves and delay crop time. See Fantastic Foliage plug chart for more details (pg 52). Note: Salmon Pink might appear dark bronze under some very low light conditions. Later in the season, and in Summer landscape, color will appear Salmon Pink.</td>
<td>18-20 in. (45-50 cm)</td>
<td>15-18 in. (38-45 cm)</td>
<td></td>
<td></td>
<td>Shade is best. Leaf size is maximized in shade. Mosaic can scorch in sun. When using in combination planters, Kong performs best when planted near the outside of the container.</td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>6-8</td>
<td>6-8</td>
<td>6-8</td>
<td></td>
<td>20-32 in. (50-80 cm) Varies by variety.</td>
<td>12-14 in. (30-35 cm)</td>
<td></td>
<td></td>
<td>Versa coleus varieties vary dramatically in plant size. Consult PAS catalog for more information.</td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>7-9</td>
<td>7-9</td>
<td>–</td>
<td></td>
<td>10-12 in. (25-30 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-76°F (18-24°C)</td>
<td>59-64°F (15-18°C)</td>
<td>–</td>
<td>–</td>
<td>6-8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Varies depending on the mix.</td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm) **
### DAHLIA
*D. x hybrida*

<table>
<thead>
<tr>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz. (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figaro Series</td>
<td></td>
<td>2,800 (100)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>66-70°F (19-21°C)</td>
<td>3-7</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm)</td>
</tr>
</tbody>
</table>

**NOTE:** Inflorescence heights vary with planting density.

### DELPHINIUM
*D. elatum, x belladonna*

A Kieft-Pro-Seeds product

<table>
<thead>
<tr>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz. (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belladonna, Casa Blanca</td>
<td></td>
<td>9,285 (325)</td>
<td>SED</td>
<td>200-cell</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>7-8</td>
<td>6-7</td>
<td>6 in. (15 cm), 8 in. (20 cm)</td>
</tr>
</tbody>
</table>

**FOR DASANTE BLUE, DIAMONDS BLUE & GUARDIAN SERIES DELPHINIUM** See Perennial Culture Chart (pg 62)

### DESCHAMPSIA
*D. elongata*

<table>
<thead>
<tr>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz. (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zephyr</td>
<td></td>
<td>4,876 MSP/oz. (172 MSP/g)</td>
<td>MSP</td>
<td>406-cell or larger</td>
<td>No</td>
<td>65-71°F (18-22°C)</td>
<td>4-5</td>
<td>4-5</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm), gallon (15-18 cm)</td>
</tr>
</tbody>
</table>

**FOR DASANTE BLUE, DIAMONDS BLUE & GUARDIAN SERIES DELPHINIUM** See Perennial Culture Chart (pg 62)

### DIANTHUS
*D. barbatus interspecific*

<table>
<thead>
<tr>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz. (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amazon F1 Series</td>
<td>12,190 - 13,800 pellets/oz. (430-490 pellets/g)</td>
<td>PEL</td>
<td>406-cell</td>
<td>Yes</td>
<td>64-68°F (18-20°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>Cut flower. For Container production - 8 in. (20 cm) 3 ppp</td>
<td></td>
</tr>
</tbody>
</table>

**For Container production: Seed lot (10-12 cm) 3 ppp**

### DIANTHUS
*D. barbatus*

### Sweet F1 Series

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Seeds per oz. (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>7,300 - 9,600 pellets/oz. (260-340 pellets/g)</td>
<td>PEL</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>64-68°F (18-20°C); light optional</td>
<td>3-5</td>
<td>4-5</td>
<td>Cut flower</td>
<td></td>
</tr>
</tbody>
</table>

### DIANTHUS
*D. barbatus interspecific*

<table>
<thead>
<tr>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz. (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bouquet F1 Series</td>
<td>8,900 - 12,360 pellets/oz. (314-436 pellets/g)</td>
<td>PEL</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>64-68°F (18-20°C); light required</td>
<td>3-5</td>
<td>4-5</td>
<td>6 in. (15 cm); Gallon (15-18 cm) 1-3 ppp</td>
<td></td>
</tr>
</tbody>
</table>

**FOR DASANTE BLUE, DIAMONDS BLUE & GUARDIAN SERIES DELPHINIUM** See Perennial Culture Chart (pg 62)

### DIANTHUS, DOUBLE
*D. barbatus interspecific*

<table>
<thead>
<tr>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz. (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynasty F1 Series</td>
<td>7,370-10,490 pellets/oz. (260-370 pellets/g)</td>
<td>PEL</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>64-68°F (18-20°C); light required</td>
<td>3-5</td>
<td>4-5</td>
<td>4 in. (10 cm); 6 in. (15 cm)</td>
<td></td>
</tr>
</tbody>
</table>

**FOR DASANTE BLUE, DIAMONDS BLUE & GUARDIAN SERIES DELPHINIUM** See Perennial Culture Chart (pg 62)

### DIANTHUS
*D. chinensis x barbatus*

<table>
<thead>
<tr>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz. (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floral Lace F1 Series</td>
<td>31,190 S/oz. (1,100 S/g)</td>
<td>SED, PEL</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>64-68°F (18-20°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>Pack</td>
<td></td>
</tr>
</tbody>
</table>

**FOR DASANTE BLUE, DIAMONDS BLUE & GUARDIAN SERIES DELPHINIUM** See Perennial Culture Chart (pg 62)

### DIANTHUS
*D. chinensis x barbatus*

<table>
<thead>
<tr>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz. (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ideal Select F1 Series</td>
<td>31,190 S/oz. (1,100 S/g)</td>
<td>SED, PEL</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>64-68°F (18-20°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>Pack</td>
<td></td>
</tr>
</tbody>
</table>

**FOR DASANTE BLUE, DIAMONDS BLUE & GUARDIAN SERIES DELPHINIUM** See Perennial Culture Chart (pg 62)

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*Find online Grower Facts culture at panamseed.com.*
<table>
<thead>
<tr>
<th>Temperature</th>
<th>Pack</th>
<th>4-in./ 10 cm</th>
<th>Other</th>
<th>Key Tips</th>
<th>Mature Height</th>
<th>Plant Spread</th>
<th>Heat Tolerant</th>
<th>Cool Crop</th>
<th>Other Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>52-60°F (11-16°C)</td>
<td>5-6</td>
<td>5-6</td>
<td>–</td>
<td>If germ chamber is used, move trays to greenhouse at first sign of germination.</td>
<td>14-18 in. (35-45 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>Very responsive to B-Nine.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-70°F (16-21°C)</td>
<td>–</td>
<td>–</td>
<td>20-26</td>
<td>See also Cut Flower section for more details (pg 48).</td>
<td>2.5-3.5 ft. (0.8-0.9 m)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>66-74°F (19-23°C)</td>
<td>5-7</td>
<td>6-7</td>
<td>6-7</td>
<td>Will perform better if grown in containers.</td>
<td>6-8 in. (15-20 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>Prefers being grown on the humid side. Will dry out very easily. Hardy to USDA Zone 7.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-72°F (16-22°C)</td>
<td>5-6</td>
<td>5-6</td>
<td>11-22</td>
<td>Responsive to PGRs; PGRs are needed to produce as a bedding plant. See Grower Facts for recommendations. See also Cut Flower section for more details (pg 48).</td>
<td>20-36 in. (50-90 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✓ In low-light conditions (Northern areas), Amazon is best produced as the daylength increases for finishing as an early Summer crop.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-72°F (15-22°C)</td>
<td>5-6</td>
<td>5-6</td>
<td>Weeks from transplant to first flower: 11 [Spring] 12-16 (late Autumn/Winter)</td>
<td>See also Grower Facts for recommendations and Cut Flower section for more details (pg 48).</td>
<td>18-36 in. (45-90 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide 65 to 75°F (18 to 24°C) day temperatures for the first 2 weeks of greenhouse production to establish the plants. Finish at 60 to 70°F (15 to 21°C) days.</td>
<td>Provide 60°F (15°C) night temperatures for the first 2 weeks of greenhouse production to establish the plants. Finish in the low 50's (11 to 12°C).</td>
<td>Weeks from transplant to finish: 9 to 10 weeks (Late Spring/Early Summer), 11-12 (late Summer/Winter)</td>
<td>Dash Dianthus has a naturally compact plant habit and has good basal branching when compared to other barbatus type dianthus, making it more suitable for container production.</td>
<td>15-20 in. (38-50 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td>✓ Avoid using fungicides such as Heritage containing active ingredient Azoxystrobin as they can cause phytotoxic symptoms on Dash Dianthus.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-72°F (16-22°C)</td>
<td>5-6</td>
<td>5-6</td>
<td>8-9 weeks from transplant</td>
<td>Responsive to PGRs; PGRs are needed to produce as a bedding plant; see Grower Facts for recommendations and Cut Flower section for more details (pg 48).</td>
<td>18-30 in. (45-75 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-72°F (16-22°C)</td>
<td>5-6</td>
<td>5-6</td>
<td>8-9 weeks from transplant</td>
<td></td>
<td>16-20 in. (40-50 cm)</td>
<td>10 in. (25 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-72°F (16-22°C)</td>
<td>4-5</td>
<td>–</td>
<td>–</td>
<td></td>
<td>8-10 in. (20-25 cm)</td>
<td>8 in. (20 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-72°F (16-22°C)</td>
<td>4-5</td>
<td>–</td>
<td>–</td>
<td></td>
<td>8-10 in. (20-25 cm)</td>
<td>8 in. (20 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Online</strong></td>
<td>D. barberae</td>
<td><strong>Diamante F1 Series</strong></td>
<td>⊗ 721,068-33,575 S/oz. (4,590-5,880 S/g)</td>
<td>SED 288-cell or larger (4 seeds per cell)</td>
<td>Cover lightly</td>
<td>65-70°F (18-21°C)</td>
<td>4-6</td>
<td></td>
<td>4</td>
<td>306 Pack (9 cm), 4 in. (10 cm), 6 in. (15 cm) 3 ppp</td>
<td></td>
</tr>
<tr>
<td><strong>Online</strong></td>
<td>D. argentea</td>
<td><strong>Silver Falls</strong></td>
<td>⊗ 5,950 S/oz. (210 S/g)</td>
<td>SED 288-cell or larger</td>
<td>Cover lightly</td>
<td>72-76°F (22-24°C)</td>
<td>4-5</td>
<td></td>
<td>5</td>
<td>306 (9 cm), 4 in. (10 cm), 10 in. (25 cm) basket 3 ppp</td>
<td></td>
</tr>
<tr>
<td><strong>Online</strong></td>
<td>D. repens</td>
<td><strong>Emerald Falls</strong></td>
<td>⊗ 1,840 MSP/oz. (65 MSP/g)</td>
<td>MSP 288-cell or larger</td>
<td>Cover lightly</td>
<td>72-76°F (22-24°C)</td>
<td>4-5</td>
<td></td>
<td>5-6</td>
<td>306 (9 cm), 4 in. (10 cm), 10 in. (25 cm) basket 3 ppp</td>
<td></td>
</tr>
<tr>
<td><strong>DILL, ORNAMENTAL</strong></td>
<td>Anethum graveolens</td>
<td><strong>Fernleaf</strong></td>
<td>⊗ 13,850 S/oz. (485 S/g)</td>
<td>SED 288-cell or larger</td>
<td>Yes</td>
<td>60°F (16°C)</td>
<td>5-8</td>
<td></td>
<td>4</td>
<td>4 in. (10 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>DUSKY MILLER</strong></td>
<td>Cineraria maritima/ Senecio cineraria</td>
<td><strong>Silverdust</strong></td>
<td>⊗ 90,000 S/oz. (3,175 S/g)</td>
<td>SED 288-cell or larger</td>
<td>Yes</td>
<td>72-75°F (22-24°C)</td>
<td>4-5</td>
<td></td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>FOR POW WOW SERIES AND ‘CHEYENNE SPIRIT’ ECHINACEA</strong></td>
<td></td>
<td>See Perennial Culture Chart (pg 64)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Online</strong></td>
<td>E. echinoidea</td>
<td><strong>Wind Dancer</strong></td>
<td>⊗ 5,670 MSP/oz. (200 MSP/g)</td>
<td>MSP 288-cell or larger</td>
<td>No</td>
<td>71-76°F (21-24°C)</td>
<td>2-3</td>
<td></td>
<td>3-4</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm), gallon (15-18 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>Online</strong></td>
<td>E. species</td>
<td><strong>Citrona™ Series</strong></td>
<td>⊗ 14,000 S/oz. (500 S/g)</td>
<td>SED 406-cell or larger</td>
<td>Yes</td>
<td>68-72°F (20-22°C)</td>
<td>2-4</td>
<td></td>
<td>4</td>
<td>306 (9 cm), 4 in. (10 cm), gallon (15 cm) 3 ppp</td>
<td></td>
</tr>
<tr>
<td><strong>Pg 89</strong></td>
<td>F. cinerea (f. glauca)</td>
<td><strong>Festina</strong></td>
<td>⊗ Not available</td>
<td>MSP 288-cell or larger</td>
<td>Yes</td>
<td>64-72°F (19-22°C)</td>
<td>3-6</td>
<td></td>
<td>6-7</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm), gallon (15-18 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>FOR SINGLE SPECIES FUSEABLES</strong></td>
<td>See genus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FOR MULTI SPECIES FUSEABLES</strong></td>
<td>See Multi Species, Multi-Pellet (pg 28)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>FOR MESA SERIES GAILLARDIA</strong></td>
<td>See Perennial Culture Chart (pg 64)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Find online Grower Facts culture at panamseed.com.
<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
<th>Pack</th>
<th>4-in./10 cm</th>
<th>Other</th>
<th>Key Tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-66°F (16-19°C)</td>
<td>50-60°F (10-16°C)</td>
<td>6-8</td>
<td>7-9</td>
<td>8-10</td>
<td>Plants can be grown with much cooler temperatures, but crop time will be longer. Do not use growth regulator before radicle emergence as this can delay or stop germination. See Grower Facts for growth regulator details.</td>
<td>10-12 in. (25-30 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td>✓</td>
<td>Sow 4 seeds per cell.</td>
<td></td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>62-65°F (17-18°C)</td>
<td>–</td>
<td>6-7</td>
<td>7-8</td>
<td>Grows best in warm and dry conditions. Use light feed. Rinse foliage after feeding to avoid salt burn. See Fantastic Foliage plug chart for more details.</td>
<td>2-3 in. (5-7 cm)</td>
<td>3-4 ft. (0.9-1.2 m)</td>
<td>✓</td>
<td>Excellent as a groundcover, but requires well-drained soils due to the ground-hugging habit.</td>
<td></td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>62-65°F (17-18°C)</td>
<td>–</td>
<td>7-8</td>
<td>8-9</td>
<td>Grows best in warm and dry conditions. Use light feed. Rinse foliage after feeding to avoid salt burn. See Fantastic Foliage plug chart for more details.</td>
<td>2-4 in. (5-10 cm)</td>
<td>3 ft. (90 cm)</td>
<td>✓</td>
<td>Excellent as a groundcover, but requires well-drained soils due to the ground-hugging habit.</td>
<td></td>
</tr>
<tr>
<td>60-65°F (16-18°C)</td>
<td>55-58°F (13-14°C)</td>
<td>–</td>
<td>4-5</td>
<td>–</td>
<td>The use of plant growth regulators on food crops is prohibited by law.</td>
<td>12-15 in. (30-38 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>Plants will flower later, allowing for an extended ornamental period.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-65°F (16-18°C)</td>
<td>55-58°F (13-14°C)</td>
<td>7-8</td>
<td>8-9</td>
<td>–</td>
<td></td>
<td>10 in. (25 cm)</td>
<td>10 in. (25 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66-74°F (19-23°C)</td>
<td>64-66°F (18-19°C)</td>
<td>5-6</td>
<td>6-7</td>
<td>7-8</td>
<td>Grows well under outdoor nursery conditions if the temperature permits. If produced in a greenhouse, they should be grown on the dry side with low feed. See Fantastic Foliage ColorGrass plug chart for more details.</td>
<td>3-4 ft. (0.9-1.2 m)</td>
<td>3-4 ft. (0.9-1.2 m)</td>
<td>✓</td>
<td>Prefers being grown on the dry side with low feed. Growing too wet or with too much feed will tend to make plants less upright. Hardy to USDA Zone 6.</td>
<td></td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>55-60°F (13-16°C)</td>
<td>–</td>
<td>7-9</td>
<td>8-10</td>
<td>Erysimum performs well when grown under cooler temperatures.</td>
<td>10-12 in. (25-30 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✓</td>
<td>Grow like Cheiranthus or Matthiola (Stock).</td>
<td></td>
</tr>
<tr>
<td>66-74°F (19-23°C)</td>
<td>64-66°F (18-19°C)</td>
<td>6-7</td>
<td>6-7</td>
<td>7-8</td>
<td>See Fantastic Foliage ColorGrass plug chart for more details.</td>
<td>10 in. (25 cm)</td>
<td>10 in. (25 cm)</td>
<td>✓</td>
<td>USDA Hardiness Zones 4 to 10.</td>
<td></td>
</tr>
<tr>
<td>65-68°F (18-20°C)</td>
<td>55-60°F (13-16°C)</td>
<td>8-9</td>
<td>–</td>
<td>–</td>
<td></td>
<td>8-10 in. (20-25 cm)</td>
<td>6-8 in. (15-20 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>55-60°F (13-16°C)</td>
<td>8-9</td>
<td>8-9</td>
<td>8-9</td>
<td></td>
<td>8-10 in. (20-25 cm)</td>
<td>6-8 in. (15-20 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grower Facts</td>
<td>Class</td>
<td>Series/Variety</td>
<td>Exposure</td>
<td>Seeds per oz (g)</td>
<td>Seed form</td>
<td>Recommended plug size</td>
<td>Cover seed</td>
<td>Germination temperature</td>
<td>Days to germinate</td>
<td>Plug crop weeks</td>
</tr>
<tr>
<td>--------------</td>
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<td>----------------</td>
</tr>
<tr>
<td>GAZANIA</td>
<td></td>
<td>Tiger F1 Mixture</td>
<td></td>
<td>14,500 S/oz. (500 S/g)</td>
<td>COT</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>70°F (21°C)</td>
<td>2-3</td>
<td>4-5</td>
</tr>
<tr>
<td>GAZANIA</td>
<td></td>
<td>Sunshine Mixture</td>
<td></td>
<td>14,500 S/oz. (500 S/g)</td>
<td>SED</td>
<td>packet seed item</td>
<td>Yes</td>
<td>70°F (21°C)</td>
<td>2-3</td>
<td>N/A</td>
</tr>
<tr>
<td>GERANIUM, IVY PELargonium x peltatum</td>
<td></td>
<td>Summer Showers F1 Series</td>
<td></td>
<td>3,700 S/oz. (130 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-75°F (21-24°C)</td>
<td>3-5</td>
<td>4-5</td>
</tr>
<tr>
<td>GERANIUM, OPEN-POLLINATED Pelargonium x hortorum</td>
<td></td>
<td>Paintbox Mixture</td>
<td></td>
<td>6,250 S/oz. (220 S/g)</td>
<td>SCR</td>
<td>Packet seed item</td>
<td>Yes</td>
<td>70-75°F (21-24°C)</td>
<td>5-10</td>
<td>N/A</td>
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<tr>
<td>Pg 138</td>
<td>G. sp.</td>
<td>Revolution Series</td>
<td></td>
<td>8,550-11,400 S/oz. (300-400 S/g)</td>
<td>PEL</td>
<td>144 to 128-cell</td>
<td>Cover lightly</td>
<td>64-68°F (18-20°C)</td>
<td>4-7</td>
<td>6-7</td>
</tr>
<tr>
<td>Online*</td>
<td>H. jamesoni</td>
<td>Gerbera F1</td>
<td>A Kieft-Pro-Seeds product</td>
<td></td>
<td>14,175 S/oz. (500 S/g)</td>
<td>COT</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>68-75°F (20-24°C)</td>
<td>2-3</td>
</tr>
<tr>
<td>Online*</td>
<td>H. amarum</td>
<td>Dakota Gold</td>
<td></td>
<td>5,000 MSP/oz. (200 MSP/g)</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>65-75°F (18-22°C)</td>
<td>3-5</td>
<td>3-4</td>
</tr>
<tr>
<td>Online*</td>
<td>H. annuus (Sunflower)</td>
<td>Ballad F1</td>
<td></td>
<td>2,693 S/oz. (95 S/g)</td>
<td>SED</td>
<td>200-cell or direct sown</td>
<td>Yes</td>
<td>68-72°F (20-22°C)</td>
<td>3-5</td>
<td>2-3</td>
</tr>
<tr>
<td>Online*</td>
<td>H. annuus (Sunflower)</td>
<td>Miss Sunshine F1</td>
<td></td>
<td>2,693 S/oz. (95 S/g)</td>
<td>SED</td>
<td>200-cell or direct sown</td>
<td>Yes</td>
<td>68-72°F (20-22°C)</td>
<td>3-5</td>
<td>2-3</td>
</tr>
<tr>
<td>HELIANTHUS</td>
<td></td>
<td>Prado Series</td>
<td></td>
<td>1,135 S/oz. (40 S/g)</td>
<td>SED</td>
<td>72-cell or direct sow recommended</td>
<td>Yes</td>
<td>68-72°F (20-22°C)</td>
<td>5-10</td>
<td>3-4</td>
</tr>
<tr>
<td>HELICHRYSUM</td>
<td></td>
<td>Chico Series</td>
<td></td>
<td>44,800 S/oz. (1,580 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>78°F (26°C)</td>
<td>5-7</td>
<td>4-5</td>
</tr>
<tr>
<td>Online*</td>
<td>H. microphyllum (Plectostachys serphyllifolia)</td>
<td>Silver Mist</td>
<td></td>
<td>22,679 MSP/oz. (800 MSP/g)</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>6-8</td>
<td>6-7</td>
</tr>
</tbody>
</table>

**FOR LUNA SERIES HIBISCUS** See Perennial Culture Chart (pg 66)
## Weeks from plug to finish
(Spring unless specified)

<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
<th>Pack</th>
<th>4-in./10-cm</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>65-68°F (18-20°C)</td>
<td>55-60°F (13-16°C)</td>
<td>8-9</td>
<td>–</td>
<td>–</td>
<td></td>
<td>8-10 in. (20-25 cm)</td>
<td>6-8 in. (15-20 cm)</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-68°F (18-20°C)</td>
<td>55-60°F (13-16°C)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td></td>
<td>12 in. (30 cm)</td>
<td>6-8 in. (15-20 cm)</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-65°F (16-18°C)</td>
<td>60-65°F (16-18°C)</td>
<td>11-12</td>
<td>13-14</td>
<td>–</td>
<td>When transplanting, do not pot too deep as this may result in crown rot. Space plants when the leaves of the plants are touching each other, generally 5 to 6 weeks after transplanting.</td>
<td>12-15 in. (30-38 cm)</td>
<td>12-15 in. (30-38 cm)</td>
<td>Branches don’t interlock on the bench, allowing for tighter spacing.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-65°F (16-18°C)</td>
<td>60-65°F (16-18°C)</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td></td>
<td>18 in. (45 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66-68°F (19-20°C)</td>
<td>62-66°F (17-19°C)</td>
<td>8-10</td>
<td>8-10</td>
<td>8-10</td>
<td>When transplanting, do not pot too deep as this may result in crown rot. Space plants when the leaves of the plants are touching each other, generally 5 to 6 weeks after transplanting.</td>
<td>Micro/Mini: 8-10 in. (20-25 cm)</td>
<td>Standard: 12-16 in. (30-40 cm)</td>
<td>Crop Schedule is dependent on sowing date, available light and required pot/plant ratio. Total crop time is approx. 14-15 weeks from sowing to 50% flowering. 100% color will appear 10-14 days later.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>63-65°F (19-25°C)</td>
<td>–</td>
<td>–</td>
<td>8-9</td>
<td>See also Cut Flower section for more details (pg 48).</td>
<td>4 ft. (1.2 m)</td>
<td>4 ft. (1.2 m)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>64-66°F (18-19°C)</td>
<td>5-7</td>
<td>6-8</td>
<td>5-7</td>
<td>Daylength affects plant growing habit and crop time. See Grower Facts for details.</td>
<td>12-14 in. (30-35 cm)</td>
<td>24-28 in. (60-70 cm)</td>
<td>Plants grow slowly under daylengths shorter than 12 hours and become very flat or even rosette when grown under 10 hours. Growing plants under long days (12 hours or more) is recommended.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>64-72°F (18-22°C)</td>
<td>61-64°F (16-18°C)</td>
<td>8-9</td>
<td>7-8 (Summer/Autumn)</td>
<td>6-12 in. (20-30 cm) under short days, 6-8 in. (15-20 cm) under long days.</td>
<td>Plants grow shorter under short days. Under longer days, plants grow up to 20-24 in. (50-60 cm) without growth regulators. Plants can flower year-round.</td>
<td>6-8 in. (15-20 cm)</td>
<td>6-8 in. (15-20 cm)</td>
<td>PGR treatments will delay flowering about 1 week.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>64-72°F (18-22°C)</td>
<td>61-64°F (16-18°C)</td>
<td>7-8</td>
<td>6-7 (Summer/Autumn)</td>
<td>6-8 in. (15-20 cm) under short days, 10-12 in. (25-30 cm) under long days.</td>
<td>Plants grow shorter under short days. Under longer days, plants grow up to 20-24 in. (50-60 cm) without growth regulators. Plants can flower year-round.</td>
<td>6-8 in. (15-20 cm)</td>
<td>6-8 in. (15-20 cm)</td>
<td>PGR treatments will delay flowering about 1 week.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-85°F (18-29°C)</td>
<td>50-65°F (10-18°C)</td>
<td>–</td>
<td>–</td>
<td>10-12</td>
<td>See also Cut Flower section for more details (pg 50).</td>
<td>4-5.5 ft. (1.2-1.7 m)</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>62-65°F (17-18°C)</td>
<td>6-8</td>
<td>–</td>
<td>–</td>
<td>Requires 14-hour days to flower.</td>
<td>12-15 in. (30-38 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>Grow cool and avoid ammonium fertilizer to keep foliage compact.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>62-65°F (17-18°C)</td>
<td>8-9</td>
<td>9-10</td>
<td>6-8 in. (15-20 cm)</td>
<td>Do not overwater and avoid watering plants late in the day, as constant wet foliage may make the plants susceptible to Botrytis. Does not require pinching. See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>18-24 in. (45-60 cm)</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)**
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pg 94</td>
<td>HIBISCUS</td>
<td>Mahogany Splendor</td>
<td>☀️</td>
<td>2,350 S/oz (83 S/g)</td>
<td>SED</td>
<td>200-cell or larger</td>
<td>Yes</td>
<td>71-76°F (21-24°C)</td>
<td>2-3</td>
<td>4.5 in. (11 cm), 6 in. (15 cm), gallon (15-16 cm), 8 in. (20 cm)</td>
</tr>
<tr>
<td></td>
<td><em>H. acetosella</em></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>HYPOESTES</td>
<td>Splash Select Series</td>
<td>☀️</td>
<td>25,000 S/oz (880 S/g)</td>
<td>SED</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>70-75°F (21-24°C)</td>
<td>2-3</td>
<td>Pack, 4 in. (10 cm), 6 in. (15 cm), 3 ppp</td>
</tr>
<tr>
<td></td>
<td><em>H. phyllostachya</em></td>
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</tr>
<tr>
<td>Online*</td>
<td>IMPATIENS, SINGLE</td>
<td>Dazzler™ Series</td>
<td>☀️</td>
<td>35,700-61,500 S/oz (1,250-2,150 S/g)</td>
<td>SED</td>
<td>512-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4-5</td>
<td>Packs, 4 in. (10 cm) pots, 10 in. (25 cm) basket 5 ppp</td>
</tr>
<tr>
<td></td>
<td><em>F1 I. walleriana</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Online*</td>
<td>IMPATIENS, SINGLE</td>
<td>Expo™ Series</td>
<td>☀️</td>
<td>35,700-61,500 S/oz (1,250-2,150 S/g)</td>
<td>SED</td>
<td>512-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4-5</td>
<td>Packs, 4 in. (10 cm) pots, 10 in. (25 cm) basket 5 ppp</td>
</tr>
<tr>
<td></td>
<td><em>F1 I. walleriana</em></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Pg 95</td>
<td>IMPATIENS, SINGLE</td>
<td>Impreza Series</td>
<td>☀️</td>
<td>35,714-61,428 S/oz (1,250-2,150 S/g)</td>
<td>SED</td>
<td>512-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>3-5</td>
<td>Packs, 4 in. (10 cm) pots, 10 in. (25 cm) basket 5 ppp</td>
</tr>
<tr>
<td></td>
<td><em>F1 I. walleriana</em></td>
<td></td>
<td></td>
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<tr>
<td>Online*</td>
<td>IMPATIENS, SINGLE</td>
<td>Stardust Series</td>
<td>☀️</td>
<td>35,700-61,500 S/oz (1,250-2,150 S/g)</td>
<td>SED</td>
<td>512-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4-5</td>
<td>Packs, 4 in. (10 cm) pots, 10 in. (25 cm) basket 5 ppp</td>
</tr>
<tr>
<td></td>
<td><em>F1 I. walleriana</em></td>
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<tr>
<td>Online*</td>
<td>IMPATIENS, SINGLE</td>
<td>Super Elfin™ Series (XP &amp; standard varieties)</td>
<td>☀️</td>
<td>35,700-61,500 S/oz (1,250-2,150 S/g)</td>
<td>SED</td>
<td>512-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4-5</td>
<td>Packs, 4 in. (10 cm) pots, 10 in. (25 cm) basket 5 ppp</td>
</tr>
<tr>
<td></td>
<td><em>F1 I. walleriana</em></td>
<td></td>
<td></td>
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<tr>
<td>Online*</td>
<td>IMPATIENS, SINGLE</td>
<td>Swirl Series</td>
<td>☀️</td>
<td>35,700-61,500 S/oz (1,250-2,150 S/g)</td>
<td>SED</td>
<td>512-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4-5</td>
<td>Packs, 4 in. (10 cm) pots, 10 in. (25 cm) basket 5 ppp</td>
</tr>
<tr>
<td></td>
<td><em>F1 I. walleriana</em></td>
<td></td>
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<tr>
<td>IMPATIENS, SINGLE</td>
<td>Dwarf Mixture</td>
<td></td>
<td>☀️</td>
<td>45,000 S/oz (1,600 S/g)</td>
<td>SED</td>
<td>512-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4-5</td>
<td>Packet seed item</td>
</tr>
<tr>
<td></td>
<td><em>F2 I. walleriana</em></td>
<td></td>
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<tr>
<td>Pg 96</td>
<td>IMPATIENS, NEW GUINEA</td>
<td>Divine F1 Series</td>
<td>☀️</td>
<td>17,000 S/oz (600 S/g)</td>
<td>SED</td>
<td>288 to 128-cell</td>
<td>Cover lightly</td>
<td>72-78°F (22-26°C)</td>
<td>6-8</td>
<td>306 Pack (9 cm), 4-4.5 in. (10-11 cm), basket 5 ppp</td>
</tr>
<tr>
<td></td>
<td><em>I. hawkerii</em></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

*Find online Grower Facts culture at panamseed.com.
<table>
<thead>
<tr>
<th>Grow on day</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>65-70°F (18-21°C)</td>
<td>36-60 in. (90-152 cm)</td>
<td>24-30 in. (60-75 cm)</td>
<td>✔️</td>
<td></td>
<td>See Fantastic Foliage plug chart for more details (pg 54).</td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>10-18 in. (25-45 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td></td>
<td></td>
<td>Too much light will cause leaves to curl. Grow under low light conditions (400-500 f.c./4,000-5,000 Lux).</td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>9-11 in. (23-28 cm)</td>
<td>13-15 in. (33-38 cm)</td>
<td></td>
<td></td>
<td>Do not cover seed. Impatiens require more than 10 f.c. (100 Lux) of light for optimum germination.</td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>8-10 in. (20-25 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td></td>
<td></td>
<td>Do not cover seed. Impatiens require more than 10 f.c. (100 Lux) of light for optimum germination.</td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>6-8 in. (15-20 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td></td>
<td></td>
<td>Do not cover seed. Impatiens require more than 10 f.c. (100 Lux) of light for optimum germination.</td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>8-10 in. (20-25 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td>Plants grown from this seed are protected by U.S. Utility Patent 5986188.</td>
<td></td>
<td>Do not cover seed. Impatiens require more than 10 f.c. (100 Lux) of light for optimum germination.</td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>8-10 in. (20-25 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td></td>
<td></td>
<td>Do not cover seed. Impatiens require more than 10 f.c. (100 Lux) of light for optimum germination.</td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>8-10 in. (20-25 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td></td>
<td></td>
<td>Do not cover seed. Impatiens require more than 10 f.c. (100 Lux) of light for optimum germination.</td>
</tr>
<tr>
<td>61-80°F (16-27°C), see Key tips section</td>
<td>10-14 in. (25-35 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td></td>
<td></td>
<td>Optimum germination temperature is 78°F (25°C). See Grower Facts for complete plant growth regulator information. Warmer growing-on air temperatures will give faster flowering; temperatures of 61-65°F (16-18°C) will give larger flowers.</td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)**
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Online</strong></td>
<td>IRESENE</td>
<td>Purple Lady</td>
<td>44,800 S/Oz</td>
<td>1,580 S/g</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>72-76°F (22-24°C)</td>
<td>3-4</td>
<td>4-5</td>
<td>306 (9 cm), 4 in. (10 cm), 10 in. (25 cm) basket</td>
</tr>
<tr>
<td>JUNCUS</td>
<td></td>
<td>Effusus spiralis</td>
<td>Juncus pallidus</td>
<td>17,700 MSP/oz</td>
<td>625 MSP/g</td>
<td>Tuned 288-cell or larger</td>
<td>No</td>
<td>64-68°F (18-20°C)</td>
<td>6</td>
<td>5</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm), gallon (15-18 cm)</td>
</tr>
<tr>
<td>FUSEABLES</td>
<td></td>
<td>Blue Dart</td>
<td>19,901 MSP/oz</td>
<td>702 MSP/g</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>No</td>
<td>71-76°F (22-24°C)</td>
<td>7-8</td>
<td>6-7</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm), gallon (15-18 cm)</td>
</tr>
<tr>
<td>JUNCUS</td>
<td></td>
<td>J. pollicus</td>
<td>28,237 MSP/oz</td>
<td>996 MSP/g</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>No</td>
<td>71-76°F (22-24°C)</td>
<td>5-6</td>
<td>5-6</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm), gallon (15-18 cm)</td>
</tr>
<tr>
<td>JUNCUS</td>
<td></td>
<td>J. tenuis</td>
<td>11,300-14,000 MSP/oz</td>
<td>400-500 MSP/g</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>No</td>
<td>71-76°F (22-24°C)</td>
<td>7-8</td>
<td>7-9</td>
<td>306 (9 cm), 2.5 in. (6 cm), 4 in. (10 cm), 6 in. (15 cm) 1-3 ppp, gallon (15-18 cm) 1-3 ppp</td>
</tr>
</tbody>
</table>

**Find online Grower Facts culture at panamseed.com.**
<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
<th>Pack</th>
<th>4-in./10-cm</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>65-75°F (18-24°C)</td>
<td>62-65°F (17-18°C)</td>
<td>–</td>
<td>5-6</td>
<td>6-7</td>
<td>Reddish foliage indicates plants need more feed. High light, especially with low humidity, results in puckered foliage. See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>6-8 in. (15-20 cm)</td>
<td>3-4 ft. (0.9-1.2 m)</td>
<td>✔</td>
<td></td>
<td>Ideally suited to partial sun/partial shade conditions, it can withstand more sun in humid areas like Florida.</td>
</tr>
<tr>
<td>66-74°F (19-23°C)</td>
<td>64-66°F (18-19°C)</td>
<td>6-7</td>
<td>6-7</td>
<td>7-8</td>
<td>Sow uncovered at 65°F (18°C) for fastest and most uniform germination; prefers moist soil. See Fantastic Foliage ColorGrass plug chart for more details (pg 56).</td>
<td>6-8 in. (15-20 cm)</td>
<td>18-20 in. (45-50 cm)</td>
<td></td>
<td></td>
<td>Do not allow plants to dry out, as this will cause the foliage to become yellow.</td>
</tr>
<tr>
<td>60-66°F (16-18°C)</td>
<td>54-57°F (12-14°C)</td>
<td>9-10</td>
<td>9-12</td>
<td>14-16</td>
<td>Flowers most rapidly and uniformly at a minimum of 13 – 14 hours day length.</td>
<td>8 in. (20 cm)</td>
<td>10-14 in. (25-35 cm)</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>66-74°F (19-23°C)</td>
<td>59-64°F (15-18°C)</td>
<td>6-7</td>
<td>7-8</td>
<td>8-9</td>
<td>See Fantastic Foliage ColorGrass plug chart for more details (pg 56).</td>
<td>12-14 in. (30-35 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td>✔</td>
<td></td>
<td>Great for mixed containers. Hardy to USDA Zone 5.</td>
</tr>
<tr>
<td>66-74°F (19-23°C)</td>
<td>64-66°F (18-19°C)</td>
<td>7-8</td>
<td>7-8</td>
<td>8-9</td>
<td>See Fantastic Foliage ColorGrass plug chart for more details (pg 56).</td>
<td>8-10 in. (20-25 cm)</td>
<td>8-10 in. (20-25 cm)</td>
<td>✔</td>
<td></td>
<td>Hardy to USDA Zone 6a.</td>
</tr>
<tr>
<td>66-74°F (19-23°C)</td>
<td>64-66°F (18-19°C)</td>
<td>6-7</td>
<td>6-7</td>
<td>7-8</td>
<td>See Fantastic Foliage ColorGrass plug chart for more details (pg 56).</td>
<td>3 ft. (90 cm)</td>
<td>12 in. (30 cm)</td>
<td>✔</td>
<td></td>
<td>Well-suited to both containers and landscape plantings. Good for moist and boggy spots or shallow water. USDA Hardiness Zones 5 to 9.</td>
</tr>
<tr>
<td>62-73°F (17-22°C)</td>
<td>59-64°F (15-18°C)</td>
<td>5-6</td>
<td>5-6</td>
<td>6-7</td>
<td>To prevent leaf bending, Bonzi 30 ppm spray can be used. See Fantastic Foliage ColorGrass plug chart for more details (pg 56).</td>
<td>4 ft. (1.2 m)</td>
<td>18-20 in. (45-50 cm)</td>
<td>✔</td>
<td></td>
<td>Hardy to USDA Zone 7.</td>
</tr>
<tr>
<td>62-73°F (17-22°C)</td>
<td>59-64°F (15-18°C)</td>
<td>7-8</td>
<td>7-8</td>
<td>8-9</td>
<td>Excellent substitute for Draecena Spike. See Fantastic Foliage ColorGrass plug chart for more details (pg 56).</td>
<td>14-16 in. (35-40 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✔</td>
<td></td>
<td>Well-suited to both containers and landscape plantings. Good for moist and boggy spots or shallow water. Hardy to USDA Zone 5.</td>
</tr>
<tr>
<td>62-73°F (17-22°C)</td>
<td>59-64°F (15-18°C)</td>
<td>6-7</td>
<td>7-8</td>
<td>7-8</td>
<td>18-36 in. (45-90 cm)</td>
<td>12-18 in. (30-45 cm)</td>
<td>✔</td>
<td></td>
<td>Great for mixed containers. Hardy to USDA Zone 5.</td>
<td></td>
</tr>
<tr>
<td>62-73°F (17-22°C)</td>
<td>59-64°F (15-18°C)</td>
<td>6-7</td>
<td>7-8</td>
<td>7-8</td>
<td>14-16 in. (35-40 cm)</td>
<td>10-18 in. (25-45 cm)</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### VARIETY CULTURE CHART

<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Online</strong></td>
<td>KOELELRIA&lt;br&gt;K. glauca</td>
<td>Coolio</td>
<td>○ ( )</td>
<td>7,995 S./oz.&lt;br&gt;(282 MSP/g)</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>No</td>
<td>65-74°F&lt;br&gt;(18-23°C)</td>
<td>4-5</td>
<td>6-7</td>
<td>306 (9 cm),&lt;br&gt;4-4.5 in.&lt;br&gt;(10-11 cm),&lt;br&gt;6-6.5 in.&lt;br&gt;(15-16 cm),&lt;br&gt;gallon&lt;br&gt;(15-18 cm)</td>
</tr>
<tr>
<td><strong>Online</strong></td>
<td>LEYCESTERIA&lt;br&gt;L. formosa</td>
<td>Jealousy</td>
<td>○</td>
<td>Not available</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>65-70°F&lt;br&gt;(18-21°C)</td>
<td>9-12</td>
<td>7-8</td>
<td>306 (9 cm),&lt;br&gt;4-4.5 in.&lt;br&gt;(10-11 cm),&lt;br&gt;6-6.5 in.&lt;br&gt;(15-16 cm)&lt;br&gt;3 PPP, gallon&lt;br&gt;(15-18 cm)&lt;br&gt;3 PPP</td>
</tr>
<tr>
<td><strong>Online</strong></td>
<td>LINARIA&lt;br&gt;L. hybrida</td>
<td>Enchantment F1</td>
<td>○</td>
<td>18,857 S./oz.&lt;br&gt;(660 S/g)</td>
<td>MSP</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>65-68°F&lt;br&gt;(18-20°C)</td>
<td>2-3</td>
<td>4-5</td>
<td>306 (9 cm),&lt;br&gt;4 in.&lt;br&gt;(10 cm)</td>
</tr>
<tr>
<td><strong>Online</strong></td>
<td>LISIANTHUS, CUT&lt;br&gt;FLOWER&lt;br&gt;Euustoma grandiflorum</td>
<td>ABC F1&lt;br&gt;Laguna F1 Series</td>
<td>○</td>
<td>28,500 S./oz.&lt;br&gt;(1,000 S/g)</td>
<td>PEL</td>
<td>406-cell</td>
<td>No</td>
<td>68-72°F&lt;br&gt;(20-22°C)</td>
<td>8-12</td>
<td>8-10</td>
<td>Cut flower</td>
</tr>
<tr>
<td><strong>Online</strong></td>
<td>LISIANTHUS, POT &amp;&lt;br&gt;BEDDING F1&lt;br&gt;Euustoma grandiflorum</td>
<td>Florida F1 Series</td>
<td>○</td>
<td>28,500 S./oz.&lt;br&gt;(1,000 S/g)</td>
<td>PEL</td>
<td>406-cell or larger</td>
<td>No</td>
<td>72-80°F&lt;br&gt;(22-26°C)</td>
<td>8-12</td>
<td>8-10</td>
<td>4 in.&lt;br&gt;(10 cm),&lt;br&gt;6 in.&lt;br&gt;(15 cm)</td>
</tr>
<tr>
<td><strong>Online</strong></td>
<td>LISIANTHUS, POT &amp;&lt;br&gt;BEDDING F1&lt;br&gt;Euustoma grandiflorum</td>
<td>Forever F1 Series</td>
<td>○</td>
<td>28,500 S./oz.&lt;br&gt;(1,000 S/g)</td>
<td>PEL</td>
<td>406-cell or larger</td>
<td>No</td>
<td>68-72°F&lt;br&gt;(20-22°C)</td>
<td>8-12</td>
<td>8-10</td>
<td>4 in.&lt;br&gt;(10 cm)</td>
</tr>
<tr>
<td><strong>Online</strong></td>
<td>LISIANTHUS, POT &amp;&lt;br&gt;BEDDING F1&lt;br&gt;Euustoma grandiflorum</td>
<td>Lisa F1 Series</td>
<td>○</td>
<td>28,500 S./oz.&lt;br&gt;(1,000 S/g)</td>
<td>PEL</td>
<td>406-cell or larger</td>
<td>No</td>
<td>68-72°F&lt;br&gt;(20-22°C)</td>
<td>8-12</td>
<td>8-10</td>
<td>4 in.&lt;br&gt;(10 cm)</td>
</tr>
<tr>
<td><strong>Online</strong></td>
<td>LISIANTHUS, POT &amp;&lt;br&gt;BEDDING F1&lt;br&gt;Euustoma grandiflorum</td>
<td>Sapphire F1 Series</td>
<td>○</td>
<td>28,500 S./oz.&lt;br&gt;(1,000 S/g)</td>
<td>PEL</td>
<td>406-cell or larger</td>
<td>No</td>
<td>68-72°F&lt;br&gt;(20-22°C)</td>
<td>8-12</td>
<td>8-10</td>
<td>4 in.&lt;br&gt;(10 cm)</td>
</tr>
<tr>
<td><strong>LOBELIA, COMPACT&lt;br&gt;L. erinus</strong></td>
<td>Cambridge Blue, Cobalt Blue, Crystal Palace, Mrs. Clibran, Rosamund, String of Pearls, White Lady</td>
<td></td>
<td></td>
<td>820,000-1,300,000 S./oz.&lt;br&gt;(20,000-45,000 S/g)</td>
<td>SED, MSP</td>
<td>288-cell or larger</td>
<td>No</td>
<td>70-76°F&lt;br&gt;(21-24°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>Pack</td>
</tr>
</tbody>
</table>

**FOR LAVENDER LADY & MUNSTEAD STRAIN LAVENDER** See Perennial Culture Chart (pg 68)
<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
<th>Pack</th>
<th>4-in./10-cm</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>66-74°F (19-23°C)</td>
<td>64-66°F (18-19°C)</td>
<td>6-7</td>
<td>6-7</td>
<td>7-8</td>
<td>See Fantastic Foliage ColorGrass plug chart for more details (pg 56).</td>
<td>First season 6-8 in. (15-20 cm); later 20 in. (50 cm)</td>
<td>8 in. (20 cm)</td>
<td>USDA Hardiness Zones 6 to 9.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>68-75°F (20-24°C)</td>
<td>65-67°F (18-19°C)</td>
<td>6-7</td>
<td>6-7</td>
<td>7-8</td>
<td>See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>36-60 in. (90-152 cm)</td>
<td>26-38 in. (66-97 cm)</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>60-70°F (16-21°C)</td>
<td>52-60°F (11-15°C)</td>
<td>–</td>
<td>6-7</td>
<td>–</td>
<td>Stage 1 PG1 is very important for avoiding leggy seedlings.</td>
<td>14-16 in. (35-40 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>68-75°F (20-24°C)</td>
<td>60-65°F (16-18°C)</td>
<td>–</td>
<td>–</td>
<td>10-18</td>
<td>See also Cut Flower section for more details (pg 50).</td>
<td>29-45 in. (75-115 cm)</td>
<td>–</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>68-75°F (20-24°C)</td>
<td>60-65°F (16-18°C)</td>
<td>–</td>
<td>14-16</td>
<td>14-16</td>
<td>Maintain pH above 6.5. Do not allow plugs to become rootbound. Lisianthus are tender seedlings and are recommended as a plug-purchased item.</td>
<td>8-10 in. (20-25 cm)</td>
<td>6-8 in. (15-20 cm)</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>68-75°F (20-24°C)</td>
<td>60-65°F (16-18°C)</td>
<td>–</td>
<td>13-14</td>
<td>–</td>
<td>Maintain pH above 6.5. Do not allow plugs to become rootbound. Lisianthus are tender seedlings and are recommended as a plug-purchased item.</td>
<td>8-10 in. (20-25 cm)</td>
<td>6-8 in. (15-20 cm)</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>68-75°F (20-24°C)</td>
<td>60-65°F (16-18°C)</td>
<td>–</td>
<td>12-13</td>
<td>–</td>
<td>Maintain pH above 6.5. Do not allow plugs to become rootbound. Lisianthus are tender seedlings and are recommended as a plug-purchased item.</td>
<td>6-8 in. (15-20 cm)</td>
<td>4-6 in. (10-15 cm)</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>68-75°F (20-24°C)</td>
<td>55-60°F (13-16°C)</td>
<td>–</td>
<td>12-14</td>
<td>–</td>
<td>Maintain pH above 6.5. Do not allow plugs to become rootbound. Lisianthus are tender seedlings and are recommended as a plug-purchased item.</td>
<td>4-6 in. (10-15 cm)</td>
<td>4-6 in. (10-15 cm)</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>66-72°F (19-22°C)</td>
<td>55-60°F (13-16°C)</td>
<td>8-9</td>
<td>–</td>
<td>–</td>
<td>Lighting plants when days are shorter than 12 hours speeds flowering. Light shading helps to produce a better crop when plants are growing under hot weather and long days in late Spring.</td>
<td>5 in. (13 cm)</td>
<td>6-8 in. (15-20 cm)</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm) **
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online*</td>
<td>LOBELIA, COMPACT</td>
<td>Riviera Series</td>
<td></td>
<td>820,000-1,300,000 S/oz. (29,000-45,000 S/g)</td>
<td>SED, MSP</td>
<td>288-cell or larger</td>
<td>No</td>
<td>70-76°F (21-24°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>Pack</td>
</tr>
<tr>
<td>Pg 91</td>
<td>LOBELIA, FUSEABLES™</td>
<td>Bed O’ Roses, Blues Brothers, Of Blue Eyes, White Knights</td>
<td></td>
<td>14,000-17,000 MSP/oz. (500-600 MSP/g)</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>66-73°F (20-23°C)</td>
<td>5-6</td>
<td>4-6</td>
<td>4.5 in. (11 cm), 6-6.5 in. (15-16 cm), 12 in. (30 cm) 5 ppp</td>
</tr>
<tr>
<td>LOBELIA, TRAILING</td>
<td>Fountain Series</td>
<td></td>
<td>820,000-1,300,000 S/oz. (29,000-45,000 S/g)</td>
<td>SED, MSP</td>
<td>288-cell or larger</td>
<td>No</td>
<td>70-76°F (21-24°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>10 in. (25 cm) basket</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>LOBELIA, TRAILING</td>
<td>Regatta Series</td>
<td></td>
<td>820,000-1,300,000 S/oz. (29,000-45,000 S/g)</td>
<td>SED, MSP</td>
<td>288-cell or larger</td>
<td>No</td>
<td>70-76°F (21-24°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>10 in. (25 cm) basket</td>
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<tr>
<td>LOBELIA, TRAILING</td>
<td>Sapphire Pendula</td>
<td></td>
<td></td>
<td>820,000-1,300,000 S/oz. (29,000-45,000 S/g)</td>
<td>SED, MSP</td>
<td>288-cell or larger</td>
<td>No</td>
<td>70-76°F (21-24°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>10 in. (25 cm) basket</td>
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<tr>
<td>Pg 98</td>
<td>LUZULA</td>
<td>Lucius</td>
<td></td>
<td>4,335 MPS/oz. (153 MPS/g)</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>64-68°F (18-20°C)</td>
<td>10-12</td>
<td>4-7</td>
<td>306 (9 cm), 4.4-5 in. (10.1-11 cm), 6.6-5 in. (15-16 cm), gallon (15-18 cm)</td>
</tr>
<tr>
<td>Pg 98</td>
<td>LUZULA</td>
<td>Starmaker</td>
<td></td>
<td>Not available</td>
<td>MSP</td>
<td>288-cell</td>
<td>Yes</td>
<td>64-68°F (18-20°C)</td>
<td>10-12</td>
<td>4-7</td>
<td>306 (9 cm), 4.4-5 in. (10-11 cm), 6.6-5 in. (15-16 cm), gallon (15-18 cm)</td>
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<tr>
<td>MARIGOLD, AFRICAN</td>
<td>Lady F1 Series</td>
<td></td>
<td></td>
<td>9,000-10,000 S/oz. (317-352 S/g)</td>
<td>DTL</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
<td>3</td>
<td>4.5 in. (11 cm)</td>
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<tr>
<td>MARIGOLD, AFRICAN</td>
<td>Marvel F1 Series</td>
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<td></td>
<td>9,000-10,000 S/oz. (317-352 S/g)</td>
<td>DTL</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
<td>3</td>
<td>4.5 in. (11 cm)</td>
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<tr>
<td>Online*</td>
<td>MARIGOLD, AFRICAN</td>
<td>Vanilla F1</td>
<td></td>
<td>9,000-10,000 S/oz. (317-352 S/g)</td>
<td>DTL, COT</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
<td>3</td>
<td>4.5 in. (11 cm)</td>
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<tr>
<td>Online*</td>
<td>MARIGOLD, DwarF AFRICAN</td>
<td>Taishan™ F1 Series</td>
<td></td>
<td>9,200-10,600 S/oz. (325-375 S/g)</td>
<td>DTL, COT</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>68-72°F (20-22°C)</td>
<td>2-3</td>
<td>3</td>
<td>306 (9 cm), 4.4 in. (10 cm), 4.5 in. (11 cm)</td>
</tr>
</tbody>
</table>

*Find online Grower Facts culture at panamseed.com.
<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
<th>Pack</th>
<th>4-in./10-cm</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>66-72°F (19-22°C)</td>
<td>55-60°F (13-16°C)</td>
<td>5-6</td>
<td>–</td>
<td>–</td>
<td>Lighting plants when days are shorter than 12 hours speeds flowering. Light shading helps to produce a better crop when plants are growing under hot weather and long days in late Spring.</td>
<td>5 in. (13 cm)</td>
<td>8 in. (20 cm)</td>
<td>Yes</td>
<td>70-72°F</td>
<td>3-4 3</td>
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<tr>
<td>65-70°F (18-21°C)</td>
<td>50-61°F (10-16°C)</td>
<td>–</td>
<td>6</td>
<td>6-8</td>
<td>5 in. (13 cm)</td>
<td>8 in. (20 cm)</td>
<td>Yes</td>
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<td>66-72°F (19-22°C)</td>
<td>55-60°F (13-16°C)</td>
<td>–</td>
<td>–</td>
<td>10-12</td>
<td>Lighting plants when days are shorter than 12 hours speeds flowering. Light shading helps to produce a better crop when plants are growing under hot weather and long days in late Spring.</td>
<td>6-8 in. (15-20 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>Yes</td>
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<tr>
<td>66-72°F (19-22°C)</td>
<td>60-62°F (16-17°C)</td>
<td>–</td>
<td>–</td>
<td>10-12</td>
<td>Lighting plants when days are shorter than 12 hours speeds flowering. Light shading helps to produce a better crop when plants are growing under hot weather and long days in late Spring.</td>
<td>6-8 in. (15-20 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>Yes</td>
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<td></td>
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<tr>
<td>66-74°F (19-23°C)</td>
<td>64-66°F (18-19°C)</td>
<td>8-9</td>
<td>8-9</td>
<td>9-10</td>
<td>See Fantastic Foliage ColorGrass plug chart for more details (pg 56).</td>
<td>24 in. (60 cm)</td>
<td>18 in. (45 cm)</td>
<td>Yes</td>
<td>USDA Hardiness Zones 6 to 10.</td>
<td></td>
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<tr>
<td>66-74°F (19-23°C)</td>
<td>64-66°F (18-19°C)</td>
<td>9-10</td>
<td>9-10</td>
<td>10-11</td>
<td>See Fantastic Foliage ColorGrass plug chart for more details (pg 56).</td>
<td>10 in. (25 cm)</td>
<td>10 in. (25 cm)</td>
<td>Yes</td>
<td></td>
<td></td>
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<tr>
<td>65-68°F (18-20°C)</td>
<td>60-62°F (16-17°C)</td>
<td>–</td>
<td>8-9</td>
<td>–</td>
<td>Maintain soil pH of 6.2-6.5 to avoid iron toxicity.</td>
<td>20 in. (50 cm)</td>
<td>10 in. (25 cm)</td>
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<tr>
<td>65-68°F (18-20°C)</td>
<td>60-62°F (16-17°C)</td>
<td>–</td>
<td>7-8</td>
<td>–</td>
<td>Maintain soil pH of 6.2-6.5 to avoid iron toxicity.</td>
<td>18 in. (45 cm)</td>
<td>10 in. (25 cm)</td>
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<tr>
<td>65-68°F (18-20°C)</td>
<td>60-62°F (16-17°C)</td>
<td>–</td>
<td>7-8</td>
<td>–</td>
<td>Maintain soil pH of 6.2-6.5 to avoid iron toxicity.</td>
<td>16 in. (40 cm)</td>
<td>10 in. (25 cm)</td>
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<tr>
<td>63-70°F (17-21°C)</td>
<td>59-65°F (15-18°C)</td>
<td>–</td>
<td>4-6 (Spring), 7-8 (Summer)</td>
<td>–</td>
<td>10-12 in. (25-30 cm)</td>
<td>8-10 in. (20-25 cm)</td>
<td>Yes</td>
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<tr>
<td>Grocer Facts</td>
<td>Series/Variety</td>
<td>Exposure</td>
<td>Seeds per oz (g)</td>
<td>Seed form</td>
<td>Recommended plug size**</td>
<td>Cover seed</td>
<td>Germination temperature</td>
<td>Days to germinate</td>
<td>Plug crop weeks</td>
<td>Recommended containers</td>
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<tr>
<td>Online*</td>
<td>MARIGOLD, FRENCH DWARF</td>
<td>Durango™ Series</td>
<td>9,500-10,500 S/oz. (335-370 S/g)</td>
<td>DTL, COT</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
<td>3</td>
<td>Pack, 4 in. (10 cm)</td>
</tr>
<tr>
<td></td>
<td>Anemone Tagetes patula</td>
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<tr>
<td></td>
<td>Bonanza Series</td>
<td>9,500-10,500 S/oz. (335-370 S/g)</td>
<td>DTL, COT</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
<td>3</td>
<td>Pack</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M. incana</td>
<td>9,500-10,500 S/oz. (335-370 S/g)</td>
<td>DTL, COT</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
<td>3</td>
<td>Pack</td>
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<tr>
<td></td>
<td>CRESTED Tagetes patula</td>
<td>Honeycomb</td>
<td>9,500-10,500 S/oz. (335-370 S/g)</td>
<td>SED, DTL</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
<td>3</td>
<td>Pack</td>
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<tr>
<td></td>
<td>M. incana</td>
<td>9,500-10,500 S/oz. (335-370 S/g)</td>
<td>DTL, COT</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
<td>3</td>
<td>Pack</td>
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<tr>
<td></td>
<td>CRESTED Tagetes patula</td>
<td>Jacket Series</td>
<td>9,500-10,500 S/oz. (335-370 S/g)</td>
<td>SED, DTL</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
<td>3</td>
<td>Pack</td>
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<tr>
<td></td>
<td>M. incana</td>
<td>9,500-10,500 S/oz. (335-370 S/g)</td>
<td>DTL, COT</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
<td>3</td>
<td>Pack</td>
<td></td>
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<tr>
<td></td>
<td>CRESTED Tagetes patula</td>
<td>Granada, Red Marietta</td>
<td>9,500-10,500 S/oz. (335-370 S/g)</td>
<td>SED, DTL</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
<td>3</td>
<td>Pack</td>
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<tr>
<td></td>
<td>M. incana</td>
<td>9,500-10,500 S/oz. (335-370 S/g)</td>
<td>DTL, COT</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
<td>3</td>
<td>Pack</td>
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<td></td>
<td>Aurora Series</td>
<td>9,500-10,500 S/oz. (335-370 S/g)</td>
<td>DTL, COT</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
<td>3</td>
<td>Pack</td>
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<td></td>
<td>M. incana</td>
<td>9,500-10,500 S/oz. (335-370 S/g)</td>
<td>DTL, COT</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
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<td>Pack</td>
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<td>Gate Series</td>
<td>9,500-10,500 S/oz. (335-370 S/g)</td>
<td>SED, DTL</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
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<td>4 in. (10 cm)</td>
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<td></td>
<td>M. incana</td>
<td>9,500-10,500 S/oz. (335-370 S/g)</td>
<td>SED, DTL</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-72°F (21-22°C)</td>
<td>3-4</td>
<td>3</td>
<td>4 in. (10 cm)</td>
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<tr>
<td></td>
<td>M. incana</td>
<td>Magic, Vegmo Series</td>
<td>18,650 S/oz. (650 S/g)</td>
<td>PEL</td>
<td>200-cell</td>
<td>No</td>
<td>70-72°F (21-22°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>Cut flower</td>
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<tr>
<td>Online*</td>
<td>MATRICARIA Tanacetum parthenium</td>
<td>Hot Cakes Series</td>
<td>17,000 S/oz. (600 S/g)</td>
<td>SED</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>62-68°F (17-20°C)</td>
<td>3-5</td>
<td>4</td>
<td>4 in. (10 cm), 6 in. (15 cm) 3 ppp</td>
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<tr>
<td>Online*</td>
<td>MATTHIOLA (STOCK), BEDDING M. incana</td>
<td>Vintage Series</td>
<td>15,600-20,000 S/oz. (550-700 S/g)</td>
<td>SED</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>62-68°F (17-20°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm)</td>
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<tr>
<td>Online*</td>
<td>MATTHIOLA (STOCK), BEDDING M. incana</td>
<td>Column Stocks</td>
<td>15,600-20,000 S/oz. (550-700 S/g)</td>
<td>SED</td>
<td>Direct sown in field</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>14-21</td>
<td>N/A</td>
<td>Cut flower</td>
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<tr>
<td>Online*</td>
<td>MATTHIOLA (STOCK), FIELD CUT M. incana</td>
<td>Aida, Carmen, Figaro, Opera (Vegmo) Series</td>
<td>15,600-20,000 S/oz. (550-700 S/g)</td>
<td>SED</td>
<td>200-cell</td>
<td>Yes</td>
<td>59°F (15°C)</td>
<td>5</td>
<td>5-6</td>
<td>Cut flower</td>
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<tr>
<td>Online*</td>
<td>MATTHIOLA (STOCK), GREENHOUSE- GROWN SELECTABLE M. incana</td>
<td>Katz Series</td>
<td>15,300-18,100 S/oz. (540-640 S/g)</td>
<td>SED</td>
<td>406-cell</td>
<td>Yes</td>
<td>68-72°F (20-22°C)</td>
<td>3-4</td>
<td>4</td>
<td>Cut flower</td>
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</tbody>
</table>

*Find online Grocer Facts culture at panamseed.com.
<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
<th>Pack</th>
<th>4-in./10-cm</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>65-68°F (18-20°C)</td>
<td>60-62°F (16-17°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>–</td>
<td>–</td>
<td>10-12 in.</td>
<td>6-8 in.</td>
<td>6-8</td>
<td>–</td>
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<tr>
<td>65-68°F (18-20°C)</td>
<td>60-62°F (16-17°C)</td>
<td>3-4</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>10-12 in.</td>
<td>6-8 in.</td>
<td>6-8</td>
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<tr>
<td>65-68°F (18-20°C)</td>
<td>60-62°F (16-17°C)</td>
<td>5-6</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>10-12 in.</td>
<td>6-8 in.</td>
<td>6-8</td>
<td>–</td>
<td>–</td>
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<tr>
<td>65-68°F (18-20°C)</td>
<td>60-62°F (16-17°C)</td>
<td>4-5</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>10-12 in.</td>
<td>6-8 in.</td>
<td>6-8</td>
<td>–</td>
<td>–</td>
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<tr>
<td>65-68°F (18-20°C)</td>
<td>60-62°F (16-17°C)</td>
<td>3-4</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>10-12 in.</td>
<td>6-8 in.</td>
<td>6-8</td>
<td>–</td>
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<tr>
<td>Winter: 55-58°F (13-14°C); Summer: 72-74°F (22-24°C)</td>
<td>Winter: 55-58°F (13-14°C); Summer: 60-65°F (16-18°C)</td>
<td>–</td>
<td>–</td>
<td>7-16</td>
<td>–</td>
<td>28-36 in.</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Recommendation is to have longer days (14 to 16 hours) during plug to finish.</td>
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<tr>
<td>60-70°F (16-21°C)</td>
<td>50-55°F (10-13°C)</td>
<td>–</td>
<td>4-7</td>
<td>5-8</td>
<td>–</td>
<td>10-16 in.</td>
<td>6-8 in.</td>
<td>6-8</td>
<td>–</td>
<td>–</td>
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<tr>
<td>60-70°F (16-21°C)</td>
<td>50-55°F (10-13°C)</td>
<td>7-8</td>
<td>8-9</td>
<td>–</td>
<td>–</td>
<td>15-20 in.</td>
<td>12-14 in.</td>
<td>6-8</td>
<td>–</td>
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<tr>
<td>55-65°F (13-18°C)</td>
<td>55-60°F (13-16°C)</td>
<td>–</td>
<td>–</td>
<td>20-22</td>
<td>–</td>
<td>24-30 in.</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>50-62°F (10-17°C)</td>
<td>50-62°F (10-17°C)</td>
<td>–</td>
<td>–</td>
<td>4-12</td>
<td>–</td>
<td>32 in.</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>Best performance when grown in tunnels.</td>
</tr>
<tr>
<td>60-75°F (15-24°C)</td>
<td>45-55°F (7-13°C)</td>
<td>–</td>
<td>–</td>
<td>8-13</td>
<td>–</td>
<td>32 in.</td>
<td>–</td>
<td>–</td>
<td>–</td>
<td>–</td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>MILLET</td>
<td></td>
<td>M. effusum aureum</td>
<td>Flashlights</td>
<td>Not available</td>
<td>MSP</td>
<td>288-cell or larger</td>
<td>No</td>
<td>65-68°F (18-20°C)</td>
<td>10-12</td>
<td>5-6</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm), gallon (15-18 cm)</td>
</tr>
<tr>
<td>MILLET,</td>
<td></td>
<td>Pennisetum glaucum</td>
<td>Jade Princess F1</td>
<td>3,400-4,500 S/oz. (120-160 S/g)</td>
<td>SED</td>
<td>128-cell or larger</td>
<td>Yes</td>
<td>72-78°F (22-25°C)</td>
<td>2-3</td>
<td>2-3</td>
<td>4 in. (10 cm), gallon (15-18 cm)</td>
</tr>
<tr>
<td>MILLET,</td>
<td></td>
<td>Pennisetum glaucum</td>
<td>Jester F1</td>
<td>3,400-4,500 S/oz. (120-160 S/g)</td>
<td>SED</td>
<td>128-cell or larger</td>
<td>Yes</td>
<td>72-78°F (22-25°C)</td>
<td>2-3</td>
<td>2-3</td>
<td>4 in. (10 cm), gallon (15-18 cm)</td>
</tr>
<tr>
<td>MILLET,</td>
<td></td>
<td>Pennisetum glaucum</td>
<td>Purple Baron F1</td>
<td>3,400-4,500 S/oz. (120-160 S/g)</td>
<td>SED</td>
<td>128-cell or larger</td>
<td>Yes</td>
<td>72-78°F (22-25°C)</td>
<td>2-3</td>
<td>2-3</td>
<td>4 in. (10 cm), gallon (15-18 cm)</td>
</tr>
<tr>
<td>MILLET,</td>
<td></td>
<td>Pennisetum glaucum</td>
<td>Purple Majesty F1</td>
<td>3,400-4,500 S/oz. (120-160 S/g)</td>
<td>SED</td>
<td>128-cell or larger</td>
<td>Yes</td>
<td>72-78°F (22-25°C)</td>
<td>2-3</td>
<td>2-3</td>
<td>4 in. (10 cm), gallon (15-18 cm)</td>
</tr>
<tr>
<td>MULTI-SPECIES, MULTI-PELLET FUSEABLES™ Petunia x hybrida and Sutera cordata (Bacopa)</td>
<td>Blue Dawn, Cloud N' Sky, Cotton Candy, Silk N' Satin</td>
<td>Not available</td>
<td>9,765-10,900 MSP/oz. (239-327 MSP/g)</td>
<td>MSP</td>
<td>128-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4</td>
<td>4-5</td>
<td>10 in. (25 cm), 3pp, 12 in. (30 cm), 5pp</td>
<td></td>
</tr>
<tr>
<td>MULTI-SPECIES, MULTI-PELLET SIMPLY SALAD™ Mixes may include: Lactuca sativa, Brassica spp., Eruca sativa, Cichorium spp. and Chrysanthemum coronarium</td>
<td>Global Gourmet Mixture Improved, Alfresco Mixture, City Garden Mixture</td>
<td>Not available</td>
<td>855-1995 MSP/oz. (30-70 MSP/g)</td>
<td>MSP</td>
<td>128, 105-cell or larger</td>
<td>No</td>
<td>65-70°F (18-21°C)</td>
<td>2-3</td>
<td>2-3</td>
<td>306 (9 cm), 4-in. (10 cm), 6-in. (15 cm), colour bowl</td>
<td></td>
</tr>
<tr>
<td>MYOSOTIS</td>
<td>Forget-Me-Not</td>
<td>Mon Amie Blue</td>
<td>48,195-59,535 S/oz. (1,700-2,100 S/g)</td>
<td>SED</td>
<td>400-cell or larger</td>
<td>No</td>
<td>68-74°F (20-23°C)</td>
<td>3-5</td>
<td>4</td>
<td>306 (9 cm), 4-in. (10 cm), 6-in. (15 cm), 3pp</td>
<td></td>
</tr>
<tr>
<td>NASTURTIUM</td>
<td>Tropaeolum majus</td>
<td>Whirlybird Series</td>
<td>170-226 S/oz. (6-8 S/g)</td>
<td>SED</td>
<td>Direct sow</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>2-4</td>
<td>N/A</td>
<td>Pack, 4 in. (10 cm), basket</td>
<td></td>
</tr>
</tbody>
</table>

*Find online Grower Facts culture at panamseed.com.
<table>
<thead>
<tr>
<th>Growing on</th>
<th>Growing on</th>
<th>Pack</th>
<th>4-in./</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature</th>
<th>Plant</th>
<th>Heat</th>
<th>Cool</th>
<th>Other</th>
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<tbody>
<tr>
<td>temperature</td>
<td>temperature</td>
<td></td>
<td>10 cm</td>
<td></td>
<td></td>
<td>height</td>
<td>spread</td>
<td>tolerant</td>
<td>crop</td>
<td>recommendations</td>
</tr>
<tr>
<td>day</td>
<td>night</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66-74°F</td>
<td>64-66°F</td>
<td>11-12</td>
<td>11-12</td>
<td>11-12</td>
<td>See Fantastic Foliage ColorGrass plug chart for more details (pg 54).</td>
<td>8-10 in. (20-25 cm)</td>
<td>6-8 in. (15-20 cm)</td>
<td>Yes</td>
<td>USDA Hardiness Zones 6-8.</td>
<td></td>
</tr>
<tr>
<td>(19-23°C)</td>
<td>(18-19°C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68-85°F</td>
<td>61-66°F</td>
<td>–</td>
<td>4-5</td>
<td>5-6</td>
<td>12-14 weeks in a gallon to flower.</td>
<td>24-30 in. (60-75 cm)</td>
<td>20-24 in. (50-60 cm)</td>
<td>Yes</td>
<td>Well-suited to both container and landscape plantings.</td>
<td></td>
</tr>
<tr>
<td>(20-30°C)</td>
<td>(16-19°C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68-85°F</td>
<td>64-66°F</td>
<td>–</td>
<td>4-5</td>
<td>5-6, 11-13</td>
<td>Plants that are rootbound or stressed due to drought or nutrient deficiency will not perform well. See Grower Facts for specific details. See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>36-48 in. (90-120 cm)</td>
<td>10-14 in. (25-35 cm)</td>
<td>Yes</td>
<td>Well-suited to both container and landscape plantings.</td>
<td></td>
</tr>
<tr>
<td>(20-30°C)</td>
<td>(18-19°C)</td>
<td></td>
<td></td>
<td>(with spike)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68-85°F</td>
<td>64-66°F</td>
<td>–</td>
<td>4-5</td>
<td>5-6, 11-13</td>
<td>Plants that are rootbound or stressed due to drought or nutrient deficiency will not perform well. See Grower Facts for specific details.</td>
<td>30-42 in. (75-110 cm)</td>
<td>10-14 in. (25-35 cm)</td>
<td>Yes</td>
<td>Well-suited to both container and landscape plantings.</td>
<td></td>
</tr>
<tr>
<td>(20-30°C)</td>
<td>(18-19°C)</td>
<td></td>
<td></td>
<td>(with spike)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68-85°F</td>
<td>64-66°F</td>
<td>–</td>
<td>4-5</td>
<td>5-6, 11-13</td>
<td>Plants that are rootbound or stressed due to drought or nutrient deficiency will not perform well. See Grower Facts for specific details. See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>40-60 in. (120-150 cm)</td>
<td>8-12 in. (20-30 cm)</td>
<td>Yes</td>
<td>Ideal for landscapes and large container plantings.</td>
<td></td>
</tr>
<tr>
<td>(20-30°C)</td>
<td>(18-19°C)</td>
<td></td>
<td></td>
<td>(with spike)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61-75°F</td>
<td>57-65°F</td>
<td>–</td>
<td>10-12</td>
<td>Varieties depending on the mix</td>
<td>Varieties depending on the mix</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>(16-24°C)</td>
<td>(14-18°C)</td>
<td></td>
<td>2-4</td>
<td>2-6</td>
<td>12 in. (30 cm)</td>
<td>12 in. (30 cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55-70°F</td>
<td>50-61°F</td>
<td>–</td>
<td>2-4</td>
<td>2-6</td>
<td>12 in. (30 cm)</td>
<td>12 in. (30 cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(13-21°C)</td>
<td>(10-16°C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-70°F</td>
<td>50-55°F</td>
<td>5-9</td>
<td>5-9</td>
<td>–</td>
<td>Maintain low pH. Mysotis suffer from chlorosis at high pH. Grow like Primula acaulis.</td>
<td>10-12 in. (25-30 cm)</td>
<td>6-9 in. (15-23 cm)</td>
<td>Yes</td>
<td>See Grower Facts for details on how to mitigate chlorosis caused by high pH.</td>
<td></td>
</tr>
<tr>
<td>(16-21°C)</td>
<td>(10-13°C)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-68°F</td>
<td>65-68°F</td>
<td>8-9</td>
<td>8-9</td>
<td>10-12</td>
<td>12 in. (30 cm)</td>
<td>12 in. (30 cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(18-20°C)</td>
<td>(18-20°C)</td>
<td>(from sowing)</td>
<td>(from sowing)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)

<table>
<thead>
<tr>
<th><strong>Notes</strong></th>
</tr>
</thead>
</table>
| Note: Due to the sensitivity of some species to temperature fluctuations, plug cell sizes and growing temperatures should be considered in planning]
| Note: For more specific details, please refer to the Fantastic Foliage chart and seed catalog.

**Recommended temperatures:**

- 65-68°F (18-20°C)
- 60-70°F (16-21°C)
- 55-70°F (13-21°C)
- 61-75°F (16-24°C)
- 55-61°F (10-16°C)
- 64-66°F (18-19°C)
- 61-66°F (16-19°C)
- 68-85°F (20-30°C)
- 68-85°F (20-30°C)
- 66-74°F (19-23°C)

**Recommended growing conditions:**

- Light: Full Sun
- Water: Regular
- pH: 6.0-6.8
- Humidity: 50-70%
- Growing medium: Sphagnum peat moss
- Pot size: 3.5-4.5" (9-11 cm)

**Recommended soil mix:**

-配方 1: 50% Sphagnum peat moss, 30% perlite, 20% granulated compost
-配方 2: 40% Sphagnum peat moss, 40% vermiculite, 20% compost

**Recommended growing environment:**

- Grow in a greenhouse or nursery setting
- Control temperature and humidity
- Monitor for pests and diseases

**Recommended maintenance:**

- Water regularly according to specific needs
- Fertilize every 2-3 weeks
- Prune as needed for shaping

**Recommended applications:**

- Ground cover
- Mass planting
- Edging
- Containers

**Other recommendations:**

- Use in combination with other plants for a more vibrant display
- Mix with other species for a wider range of colors and textures
- Use in mixed borders with other plants for a more natural look
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Online</strong></td>
<td>NEMESIA N. foetans</td>
<td>Poetry F1 Series (630 seeds/oz.)</td>
<td>44,086-71,650 S/oz. (6,700-8,530 S/g)</td>
<td>SED</td>
<td>288-cell or larger (4 seeds per cell)</td>
<td>Yes</td>
<td>65-70°F (14-21°C)</td>
<td>4-5</td>
<td>4</td>
<td>306 (9 cm), 4 in. (10 cm), 6 in. (15 cm) 3 ppp</td>
<td></td>
</tr>
<tr>
<td>NEMESIA N. strumosa</td>
<td>Sundrops Mixture</td>
<td>170,000 S/oz. (6,000 S/g)</td>
<td>SED</td>
<td>406-cell or larger</td>
<td>No</td>
<td>68-70°F (20-21°C)</td>
<td>3-5</td>
<td>4</td>
<td>Pack, 4-6 in. (10-15 cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NICOTIANA N. alata</td>
<td>Nicki F1 Series</td>
<td>326,000 S/oz. (11,500 S/g)</td>
<td>SED</td>
<td>406-cell or larger</td>
<td>No</td>
<td>70-75°F (21-24°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>306 (9 cm), 4 in. (10 cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OSTEOSPERMUM O. ecklonis</td>
<td>Akila Series</td>
<td>1,980-2,830 S/oz. (70-100 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>65-68°F (18-20°C)</td>
<td>5-6</td>
<td>4-5</td>
<td>306 (9 cm), 4 in. (10 cm)</td>
<td></td>
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</tr>
<tr>
<td><strong>Pg 102</strong></td>
<td>PANSY, LARGE-FLOWERED F1 Viola x wittrockiana</td>
<td>Spring Matrix™ Series</td>
<td>18,575-24,280 S/oz. (650-850 S/g)</td>
<td>SED, PRM</td>
<td>288-cell</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>3-4</td>
<td>5</td>
<td>Pack, 4 in. (10 cm)</td>
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<tr>
<td><strong>Pg 104</strong></td>
<td>PANSY, LARGE-FLOWERED F1 Viola x wittrockiana</td>
<td>Matrix™ Series</td>
<td>18,575-24,280 S/oz. (650-850 S/g)</td>
<td>SED, PRM</td>
<td>288-cell</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>3-4</td>
<td>5</td>
<td>Pack, 4 in. (10 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>Pg 104</strong></td>
<td>PANSY, MEDIUM-FLOWERED F1 Viola x wittrockiana</td>
<td>Rally Lilac Cap</td>
<td>18,425-31,200 S/oz. (650-1,100 S/g)</td>
<td>SED, PRM</td>
<td>288-cell</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>3-5</td>
<td>5</td>
<td>Pack</td>
<td></td>
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<tr>
<td><strong>Pg 104</strong></td>
<td>PANSY, MULTIFLORA F1 Viola x wittrockiana</td>
<td>Baby Bingo Series</td>
<td>18,425-31,200 S/oz. (650-1,100 S/g)</td>
<td>SED, PRM</td>
<td>288-cell</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>3-5</td>
<td>5</td>
<td>Pack</td>
<td></td>
</tr>
<tr>
<td><strong>Pg 104</strong></td>
<td>PANSY, MULTIFLORA F1 Viola x wittrockiana</td>
<td>Panola™ Series (XP &amp; standard varieties)</td>
<td>18,425-31,200 S/oz. (650-1,100 S/g)</td>
<td>SED, PRM</td>
<td>288-cell</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>3-4</td>
<td>5</td>
<td>Pack, 4 in. (10 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>Pg 104</strong></td>
<td>PANSY, RUFFLED F1 Viola x wittrockiana</td>
<td>Fizzy &amp; Frizzle Sizzle Series</td>
<td>20,000-31,500 S/oz. (700-1,100 S/g)</td>
<td>SED</td>
<td>288-cell</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>3-4</td>
<td>5</td>
<td>Pack, 4 in. (10 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>Pg 104</strong></td>
<td>PANSY, SPECIALTY MEDIUM-FLOWERED F1 Viola x wittrockiana</td>
<td>Halloween II</td>
<td>18,425-31,200 S/oz. (650-1,100 S/g)</td>
<td>SED, PRM</td>
<td>288-cell</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>3-5</td>
<td>5</td>
<td>Pack</td>
<td></td>
</tr>
<tr>
<td><strong>Pg 103</strong></td>
<td>PANSY, TRAILING F1 Viola x wittrockiana</td>
<td>Cool Wave Series</td>
<td>28,000-40,000 S/oz. (1,000-1,400 S/g)</td>
<td>SED</td>
<td>128-cell</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>3-4</td>
<td>6</td>
<td>4 1/2 in. (10.5 cm), Quart, 10-12 in. (25-30 cm) baskets 3 ppp</td>
<td></td>
</tr>
</tbody>
</table>

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**Note:** *Find online Grower Facts culture at panamseed.com.*
<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
<th>Pack</th>
<th>4-in./10 cm</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>62-68°F (17-20°C)</td>
<td>55-62°F (13-17°C)</td>
<td>5-7</td>
<td>7-8</td>
<td>8-9</td>
<td>Seedlings may be more stretchy if germinating under dark conditions. Do not use a growth regulator before radicle emergence as this can delay or stop germination.</td>
<td>12-14 in. (30-35 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-65°F (16-18°C)</td>
<td>55-60°F (13-16°C)</td>
<td>8</td>
<td>8-10</td>
<td>–</td>
<td>Grow cool; optimum temperature 55°F (13°C).</td>
<td>10 in. (25 cm)</td>
<td>8-10 in. (20-25 cm)</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>60-65°F (16-18°C)</td>
<td>-</td>
<td>4-5</td>
<td>–</td>
<td></td>
<td>16-18 in. (40-45 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-70°F (16-21°C)</td>
<td>50-55°F (10-13°C)</td>
<td>10-12</td>
<td>7-9 (Spring), 7-9 (Autumn)</td>
<td>–</td>
<td></td>
<td>16-20 in. (40-50 cm)</td>
<td>16-20 in. (40-50 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-70°F (16-21°C)</td>
<td>50-55°F (10-13°C)</td>
<td>6-7</td>
<td>6-7 (Spring), 4-5 (Autumn)</td>
<td>–</td>
<td>Matrix resists stretching better than other pansies under stressful conditions and warm temperatures of Autumn production, so don’t be cautious with fertility.</td>
<td>8 in. (20 cm)</td>
<td>8-10 in. (20-25 cm)</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60°F (16°C)</td>
<td>50-55°F (10-13°C)</td>
<td>4-5</td>
<td>–</td>
<td>–</td>
<td></td>
<td>8 in. (20 cm)</td>
<td>8-10 in. (20-25 cm)</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60°F (16°C)</td>
<td>50-55°F (10-13°C)</td>
<td>3-4</td>
<td>–</td>
<td>–</td>
<td></td>
<td>6-8 in. (15-20 cm)</td>
<td>8-10 in. (20-25 cm)</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-70°F (16-21°C)</td>
<td>50-55°F (10-13°C)</td>
<td>4-5</td>
<td>4-5 (Spring), 3-4 (Autumn)</td>
<td>–</td>
<td></td>
<td>6-8 in. (15-20 cm)</td>
<td>8-10 in. (20-25 cm)</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60-70°F (16-21°C)</td>
<td>50-55°F (10-13°C)</td>
<td>6-8</td>
<td>6-8 (Spring), 4-6 (Autumn)</td>
<td>–</td>
<td>For maximum ruffled edge, schedule for late Fall, Winter and Spring programs. Heat reduces the ruffled edge and color contrast.</td>
<td>6-8 in. (15-20 cm)</td>
<td>8-10 in. (20-25 cm)</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60°F (16°C)</td>
<td>50-55°F (10-13°C)</td>
<td>2-3</td>
<td>3-4 (Autumn)</td>
<td>–</td>
<td></td>
<td>6-8 in. (15-20 cm)</td>
<td>8-10 in. (20-25 cm)</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>62-70°F (17-21°C)</td>
<td>50-65°F (10-18°C)</td>
<td>–</td>
<td>6-7 (Spring), 4-5 (Autumn)</td>
<td>8-10</td>
<td>Total crop time to finish can be 10-14 days longer when grown from a smaller size plug such as a 288-cell size.</td>
<td>6-8 in. (15-20 cm)</td>
<td>24-30 in. (60-75 cm)</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RAIN COLLECTION</strong> See Viola (pg 46)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Pg 105</td>
<td>PENTAS, F₁</td>
<td>Butterfly F₁ Series</td>
<td></td>
<td>31,900 S/oz. (1,125 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>74-80°F (23-26°C)</td>
<td>6-9</td>
<td>8-10</td>
<td>4 in. (10 cm), 6 in. (15 cm)</td>
</tr>
<tr>
<td>Pg 107</td>
<td>PEPPER, ORNAMENTAL</td>
<td>Black Pearl Capsicum annuum</td>
<td></td>
<td>6,850 S/oz. (240 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>72-76°F (22-24°C)</td>
<td>5-7</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm), 4.5 in. (11 cm), 6 in. (15 cm), gallon (15-18 cm)</td>
</tr>
<tr>
<td>Pg 107</td>
<td>PEPPER, ORNAMENTAL</td>
<td>Calico F₁ Capsicum annuum</td>
<td></td>
<td>6,850 S/oz. (240 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>72-76°F (22-24°C)</td>
<td>5-7</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm), 4.5 in. (11 cm), 6 in. (15 cm), gallon (15-18 cm)</td>
</tr>
<tr>
<td>Pg 107</td>
<td>PEPPER, ORNAMENTAL</td>
<td>Chilly Chili F₁ Capsicum annuum</td>
<td></td>
<td>8,000 S/oz. (285 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>72-76°F (22-24°C)</td>
<td>5-7</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm), 4.5 in. (11 cm), 6 in. (15 cm), gallon (15-18 cm)</td>
</tr>
<tr>
<td>Pg 107</td>
<td>PEPPER, ORNAMENTAL</td>
<td>Masquerade F₁ Capsicum annuum</td>
<td></td>
<td>8,000 S/oz. (285 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>72-76°F (22-24°C)</td>
<td>5-7</td>
<td>4-5</td>
<td>4 in. (10 cm)</td>
</tr>
<tr>
<td>Pg 108</td>
<td>PEPPER, ORNAMENTAL</td>
<td>Medusa Capsicum annuum</td>
<td></td>
<td>8,000 S/oz. (285 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>72-76°F (22-24°C)</td>
<td>5-7</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm), 4.5 in. (11 cm)</td>
</tr>
<tr>
<td>Pg 107</td>
<td>PEPPER, ORNAMENTAL</td>
<td>Purple Flash Capsicum annuum</td>
<td></td>
<td>6,850 S/oz. (240 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>72-76°F (22-24°C)</td>
<td>5-7</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm), 4.5 in. (11 cm), 6 in. (15 cm), gallon (15-18 cm)</td>
</tr>
<tr>
<td>Pg 107</td>
<td>PEPPER, ORNAMENTAL</td>
<td>Red Missile Capsicum annuum</td>
<td></td>
<td>8,000 S/oz. (285 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>72-76°F (22-24°C)</td>
<td>5-7</td>
<td>4-5</td>
<td>4 in. (10 cm)</td>
</tr>
<tr>
<td>Pg 108</td>
<td>PEPPER, ORNAMENTAL</td>
<td>Sangria F₁ Capsicum annuum</td>
<td></td>
<td>8,000 S/oz. (285 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>72-76°F (22-24°C)</td>
<td>5-7</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm), 4.5 in. (11 cm), 6 in. (15 cm), gallon (15-18 cm)</td>
</tr>
</tbody>
</table>

*Find online Grower Facts culture at panamseed.com.*
<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
<th>Pack</th>
<th>4-in/-10-cm</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>72-75°F (22-24°C)</strong></td>
<td><strong>62-65°F (17-18°C)</strong></td>
<td>–</td>
<td>8-10 (South, 10-12 (North)</td>
<td>8-10 (South, 10-12 (North)</td>
<td>Maintain pH at 6.6-7.0 for growing on. At pH levels below 6.6, iron toxicity may develop.</td>
<td>12-22 in. (30-55 cm)</td>
<td>10-18 in. (25-45 cm)</td>
<td>✔️</td>
<td>✔️</td>
<td>Under high light, long days and warm temperatures. Total crop times can be reduced by 4-5 weeks during Summer production. See Fantastic Foliage plug chart for more details (pg 54).</td>
</tr>
<tr>
<td><strong>68-78°F (20-26°C)</strong></td>
<td><strong>65-70°F (18-21°C)</strong></td>
<td>9-10 (no fruit, 16-20 (mature fruit)</td>
<td>9-10 (no fruit, 16-20 (mature fruit)</td>
<td>9-10 (no fruit, 16-20 (mature fruit)</td>
<td>Performs best under high light and warm temperatures. Total crop times can be reduced by 4-5 weeks during Summer production. See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>14-18 in. (35-45 cm)</td>
<td>12-16 in. (30-40 cm)</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>65-75°F (18-24°C)</strong></td>
<td><strong>60-65°F (16-18°C)</strong></td>
<td>8-12 (no fruit, 12-18 (mature fruit)</td>
<td>8-12 (no fruit, 12-18 (mature fruit)</td>
<td>8-12 (no fruit, 12-18 (mature fruit)</td>
<td>Performs best under high light and warm temperatures. Total crop times can be reduced by 4-5 weeks during Summer production. See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>9-10 in. (23-25 cm)</td>
<td>13-14 in. (33-35 cm)</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>68-72°F (20-22°C)</strong></td>
<td><strong>65-70°F (18-21°C)</strong></td>
<td>–</td>
<td>12-14 (mature fruit)</td>
<td>–</td>
<td>Performs best under high light and warm temperatures. Total crop times can be reduced by 4-5 weeks during Summer production.</td>
<td>10-12 in. (25-30 cm)</td>
<td>8-10 in. (20-25 cm)</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>65-75°F (18-24°C)</strong></td>
<td><strong>60-65°F (16-18°C)</strong></td>
<td>8-12 (no fruit, 12-18 (mature fruit)</td>
<td>8-12 (no fruit, 12-18 (mature fruit)</td>
<td>–</td>
<td>Performs best under high light and warm temperatures. Total crop times can be reduced by 4-5 weeks during Summer production.</td>
<td>6-8 in. (15-20 cm)</td>
<td>4-6 in. (10-15 cm)</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>68-72°F (20-22°C)</strong></td>
<td><strong>65-70°F (18-21°C)</strong></td>
<td>9-10 (no fruit, 16-20 (mature fruit)</td>
<td>9-10 (no fruit, 16-20 (mature fruit)</td>
<td>9-10 (no fruit, 16-20 (mature fruit)</td>
<td>Performs best under high light and warm temperatures. Total crop times can be reduced by 4-5 weeks during Summer production. See Fantastic Foliage plug chart for more details (pg 52).</td>
<td>13-15 in. (33-38 cm)</td>
<td>19-21 in. (48-52 cm)</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>68-72°F (20-22°C)</strong></td>
<td><strong>65-70°F (18-21°C)</strong></td>
<td>–</td>
<td>12-14 (mature fruit)</td>
<td>–</td>
<td>Performs best under high light and warm temperatures. Total crop times can be reduced by 4-5 weeks during Summer production.</td>
<td>8-10 in. (20-25 cm)</td>
<td>6-8 in. (15-20 cm)</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>65-75°F (18-24°C)</strong></td>
<td><strong>60-65°F (16-18°C)</strong></td>
<td>8-12 (no fruit, 12-18 (mature fruit)</td>
<td>8-12 (no fruit, 12-18 (mature fruit)</td>
<td>8-12 (no fruit, 12-18 (mature fruit)</td>
<td>Performs best under high light and warm temperatures. Total crop times can be reduced by 4-5 weeks during Summer production.</td>
<td>10-12 in. (25-30 cm)</td>
<td>16-18 in. (40-45 cm)</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)**
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz. (g)</th>
<th>Seed form</th>
<th>Recommended plug size*</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pg 106</td>
<td>PEPPER, SWEET BELL RED</td>
<td><em>Cajun Belle</em></td>
<td>○</td>
<td>4,400 S/oz. (155 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>72-76°F (22-24°C)</td>
<td>5-7</td>
<td>5-6</td>
<td>4 in. (10 cm)</td>
</tr>
<tr>
<td>Pg 106</td>
<td>PEPPER, SWEET BELL RED</td>
<td><strong>'Cute Stuff Red'</strong></td>
<td>○</td>
<td>4,400 S/oz. (155 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>72-76°F (22-24°C)</td>
<td>5-7</td>
<td>5-6</td>
<td>4 in. (10 cm)</td>
</tr>
<tr>
<td>Pg 106</td>
<td>PEPPER, SWEET-TO-SPICY</td>
<td><em>'Sweet Heat'</em></td>
<td>○</td>
<td>4,400 S/oz. (155 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>72-76°F (22-24°C)</td>
<td>5-7</td>
<td>5-6</td>
<td>4 in. (10 cm)</td>
</tr>
<tr>
<td>Pg 93</td>
<td>PETUNIA, FUSEABLES™</td>
<td><em>Blueberry Lime Jam, Burgundy Starlight, Flirtini, Lime Coral, Pink Dream, Pleasantly Blue, Vogue</em></td>
<td>○</td>
<td>9,530-13,630 MSP/oz. (336-480 MSP/g)</td>
<td>MSP</td>
<td>128-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4</td>
<td>5-6</td>
<td>10 in. (25 cm) 3 ppp, 12 in. (30 cm) 5 ppp</td>
</tr>
<tr>
<td>Online*</td>
<td>PETUNIA, SMALL-FLOWERED SPREADING F1</td>
<td><strong>Baby Duck Yellow</strong></td>
<td>○</td>
<td>33,000 S/oz. (1,200 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4-7</td>
<td>4-5</td>
<td>306 (9 cm), 4 in. (10 cm), 10 in. (25 cm) basket</td>
</tr>
<tr>
<td>Pg 114</td>
<td>PETUNIA, SMALL-FLOWERED SPREADING F1</td>
<td><strong>Shock Wave™ F1 Series</strong></td>
<td>○</td>
<td>33,000 S/oz. (1,200 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4</td>
<td>4-6</td>
<td>306 (9 cm), 4 in. (10 cm), 4.5 in. (11 cm), 6 in. (15 cm) 2-3 ppp, 10 in. (25 cm) basket 3-4 ppp</td>
</tr>
<tr>
<td>Growing on</td>
<td>Growing on</td>
<td>Pack</td>
<td>4-in./10 cm</td>
<td>Other</td>
<td>Key Tips</td>
<td>Mature height</td>
<td>Plant spread</td>
<td>Heat tolerant</td>
<td>Cool crop</td>
<td>Other recommendations</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>68-80°F (20-26°C)</td>
<td>65-70°F (18-21°C)</td>
<td>–</td>
<td>4-7 (no fruits), 9-12 (green fruits)</td>
<td>–</td>
<td>Pepper is very sensitive to high salts, particularly high ammonium, during germination. Keep ammonium levels to less than 10 ppm.</td>
<td>14-16 in. (36-40 cm)</td>
<td>14-18 in. (36-46 cm)</td>
<td></td>
<td></td>
<td>Plant in full sun after all danger of frost has passed.</td>
<td></td>
</tr>
<tr>
<td>68-80°F (20-26°C)</td>
<td>65-70°F (18-21°C)</td>
<td>–</td>
<td>4-7 (no fruits), 9-12 (green fruits)</td>
<td>–</td>
<td>Pepper is very sensitive to high salts, particularly high ammonium, during germination. Keep ammonium levels to less than 10 ppm.</td>
<td>21 in. (53 cm)</td>
<td>20 in. (51 cm)</td>
<td></td>
<td></td>
<td>Plant in full sun after all danger of frost has passed.</td>
<td></td>
</tr>
<tr>
<td>68-80°F (20-26°C)</td>
<td>65-70°F (18-21°C)</td>
<td>–</td>
<td>4-7 (no fruits), 9-12 (green fruits)</td>
<td>–</td>
<td>Pepper is very sensitive to high salts, particularly high ammonium, during germination. Keep ammonium levels to less than 10 ppm.</td>
<td>10 in. (25 cm)</td>
<td>14 in. (36 cm)</td>
<td></td>
<td></td>
<td>Plant in full sun after all danger of frost has passed.</td>
<td></td>
</tr>
<tr>
<td>61-75°F (16-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>–</td>
<td>–</td>
<td>10-12 (Spring), 8-10 (Summer)</td>
<td>PGR can use the same regime as that for standard petunia. Only notice that Pleasantly Blue does not respond to Bonzi spray or drench as well as B-Nine.</td>
<td>Varies depending on the mix</td>
<td>Varies depending on the mix</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61-75°F (16-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>5-7 (Spring), 3-5 (Summer)</td>
<td>5-7 (Spring), 3-5 (Summer)</td>
<td>5-8 (Spring), 3-6 (Summer)</td>
<td>Lighting is optional during Stage 1. See Grower Facts for rest of lighting recommendation and for plant growth regulator recommendations. Baby Duck Yellow, Easy Wave and Shock Wave petunias can be grown as low as 50°F (10°C). Crop timing (time to flower) is related to average temperature when grown under proper daylength. Plants will take longer to flower when grown in cooler conditions.</td>
<td>10-14 in. (25-35 cm)</td>
<td>3-3.5 ft. (90 cm to 1 m)</td>
<td></td>
<td></td>
<td>Baby Duck Yellow will flower successfully at 10 hours. However, the crop time at 10 hours will be about 10-14 days longer than at 12 hours daylength.</td>
<td></td>
</tr>
<tr>
<td>61-75°F (16-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>5 (Spring), 4 (Summer)</td>
<td>5 (Spring), 4 (Summer)</td>
<td>6-7 (Spring), 4-5 (Summer)</td>
<td>Lighting is optional during Stage 1. See Grower Facts for rest of lighting recommendation and for plant growth regulator recommendations. Baby Duck Yellow, Easy Wave and Shock Wave petunias can be grown as low as 50°F (10°C). Crop timing (time to flower) is related to average temperature when grown under proper daylength. Plants will take longer to flower when grown in cooler conditions.</td>
<td>7-10 in. (17-25 cm)</td>
<td>2.5-3 ft. (75-90 cm)</td>
<td></td>
<td></td>
<td>Shock Wave petunias are less sensitive to daylength than Wave petunias. All Shock Wave varieties will flower successfully at 10 hours. The crop time for Shock Wave varieties will be shorter with long days, such as 12 hours.</td>
<td></td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)
### VARIETY CULTURE CHART

<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Series/ Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pg 113</td>
<td>PETUNIA, SPREADING F1&lt;br&gt; <em>P. x hybrida</em></td>
<td>Easy Wave™ F1 Series</td>
<td>33,000 S/oz. (1,200 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4</td>
<td>4-6</td>
<td>300 (9 cm), 4 in. (10 cm), 6 in. (15 cm) 1-3 ppp, 10 in. (25 cm) basket 3-4 ppp</td>
</tr>
<tr>
<td>Pg 119</td>
<td>PETUNIA, SPREADING F1&lt;br&gt; <em>P. x hybrida</em></td>
<td>Tidal Wave™ F1 Series</td>
<td>33,000 S/oz. (1,200 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4-7</td>
<td>5-6</td>
<td>8 in. (20 cm)</td>
</tr>
<tr>
<td>Pg 117</td>
<td>PETUNIA, SPREADING F1&lt;br&gt; <em>P. x hybrida</em></td>
<td>Wave™ F1 Series</td>
<td>33,000 S/oz. (1,200 S/g)</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4-7</td>
<td>5-6</td>
<td>4 in. (10 cm), 6 in. (15 cm), 10 in. (25 cm) basket</td>
<td></td>
</tr>
</tbody>
</table>

### FOR WONDER WAVE F1, SPREADING PETUNIA See detailed Grower Facts at panamseed.com

<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Series/ Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pg 111</td>
<td>PETUNIA, SINGLE FLORIBUNDA F1&lt;br&gt; <em>P. x hybrida</em></td>
<td>Madness™ Series</td>
<td>285,000 S/oz. (10,000 S/g)</td>
<td>SED, PEL</td>
<td>512-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm)</td>
</tr>
<tr>
<td>Pg 111</td>
<td>PETUNIA, SINGLE FLORIBUNDA F1&lt;br&gt; <em>P. x hybrida</em></td>
<td>Pretty Flora Series</td>
<td>33,000 S/oz. (1,200 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4</td>
<td>5-6</td>
<td>804 pack, 10 in. (25 cm) basket 3-4 ppp</td>
</tr>
<tr>
<td>Pg 111</td>
<td>PETUNIA, SINGLE GRANDIFLORA F1&lt;br&gt; <em>P. x hybrida</em></td>
<td>Daddy™ Series</td>
<td>285,000 S/oz. (10,000 S/g)</td>
<td>SED, PEL</td>
<td>512-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm)</td>
</tr>
<tr>
<td>Pg 109</td>
<td>PETUNIA, SINGLE F1 GRANDIFLORA&lt;br&gt; <em>P. x hybrida</em></td>
<td>Ez Rider Series</td>
<td>33,000 S/oz. (1,200 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4</td>
<td>5-6</td>
<td>804 pack, 10 in. (25 cm) basket 3-4 ppp</td>
</tr>
<tr>
<td>Pg 112</td>
<td>PETUNIA, SINGLE F1 GRANDIFLORA&lt;br&gt; <em>P. x hybrida</em></td>
<td>Pretty Grand Series</td>
<td>33,000 S/oz. (1,200 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4</td>
<td>5-6</td>
<td>804 pack, 10 in. (25 cm) Basket 3-4 ppp</td>
</tr>
<tr>
<td>Pg 113</td>
<td>PETUNIA, SINGLE GRANDIFLORA F1&lt;br&gt; <em>P. x hybrida</em></td>
<td>Sophistica Collection</td>
<td>33,000 S/oz. (1,200 S/g)</td>
<td>PEL</td>
<td>288-cell</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4</td>
<td>4-6</td>
<td>4 in. (10 cm), 5 in. (13 cm), 6 in. (18 cm) 1-3 ppp, 10 in. (25 cm) basket 3-4 ppp</td>
</tr>
<tr>
<td>Pg 111</td>
<td>PETUNIA, SINGLE GRANDIFLORA F1&lt;br&gt; <em>P. x hybrida</em></td>
<td>Supercascade Series</td>
<td>285,000 S/oz. (10,000 S/g)</td>
<td>SED, PEL</td>
<td>512-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm)</td>
</tr>
<tr>
<td>Growing on temperature day</td>
<td>Growing on temperature right</td>
<td>Pack</td>
<td>4-in./10 cm</td>
<td>Other</td>
<td>Key tips</td>
<td>Mature height</td>
<td>Plant spread</td>
<td>Heat tolerant</td>
<td>Cool crop</td>
<td>Other recommendations</td>
</tr>
<tr>
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</tr>
<tr>
<td>61-75°F (16-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>6</td>
<td>6</td>
<td>6-7</td>
<td>Lighting is optional during Stage 1. See Grower Facts for rest of lighting recommendations and for plant growth regulator recommendations. Baby Duck Yellow, Easy Wave and Shock Wave petunias can be grown as low as 50°F (10°C). Crop timing (time to flower) is related to average temperature when grown under proper daylength. Plants will take longer to flower when grown in cooler conditions.</td>
<td>6-12 in. (15-30 cm)</td>
<td>2.5-3.25 ft. (75-100 cm)</td>
<td>Easy Wave Petunias are less sensitive to daylength than Wave Petunias. See the Supplemental Lighting Chart on page 116.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61-75°F (16-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>7-9</td>
<td>7-9</td>
<td>8-10</td>
<td>Lighting is required for Tidal Wave during Stage 1. See Grower Facts for rest of lighting recommendations and for plant growth regulator recommendations.</td>
<td>16-22 in. (40-55 cm)</td>
<td>2.5-5 ft. (75-152 cm)</td>
<td>Crop times are based on production during long days (greater than 13 hours) and minimum night temp. of 65°F (18°C). When producing under short days, day extension or night break lighting will reduce crop times.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>61-75°F (16-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>5-6</td>
<td>6-7</td>
<td>7-8</td>
<td>Lighting is optional for Wave Misty Lilac (‘PAS3190’) and Wave Rose (‘PAS3191’), but required for other Wave and Tidal Wave colors during Stage 1. See Grower Facts for rest of lighting recommendations and for plant growth regulator recommendations.</td>
<td>7-10 in. (17-25 cm)</td>
<td>8-12 in. (20-30 cm)</td>
<td>Crop times are based on production during long days (greater than 13 hours) and minimum night temp. of 65°F (18°C). When producing under short days, day extension or night break lighting will reduce crop times.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>62-65°F (17-18°C)</td>
<td>55-65°F (13-18°C)</td>
<td>5-6</td>
<td>6-7</td>
<td>–</td>
<td>Genetically compact and needs less to no PGR after transplant</td>
<td>10-15 in. (25-38 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
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<tr>
<td>61-75°F (16-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>5-6</td>
<td>–</td>
<td>6-7</td>
<td>Genetically compact and needs less to no PGR after transplant</td>
<td>10-15 in. (25-38 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62-65°F (17-18°C)</td>
<td>55-65°F (13-18°C)</td>
<td>5-6</td>
<td>7-8</td>
<td>–</td>
<td>Genetically compact and needs less to no PGR after transplant</td>
<td>10-15 in. (25-38 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61-75°F (16-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>5-6</td>
<td>–</td>
<td>6-7</td>
<td>Genetically compact and needs less to no PGR after transplant</td>
<td>10-15 in. (25-38 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61-75°F (16-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>5-6</td>
<td>–</td>
<td>6-7</td>
<td>Genetically compact and needs less to no PGR after transplant</td>
<td>10-15 in. (25-38 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61-75°F (16-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>5-6</td>
<td>5-7</td>
<td>5-8</td>
<td>Avoid using B-Nine on Lime Bicolor and Blackberry.</td>
<td>10-15 in. (25-38 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62-65°F (17-18°C)</td>
<td>55-65°F (13-18°C)</td>
<td>5-6</td>
<td>7-8</td>
<td>–</td>
<td>Genetically compact and needs less to no PGR after transplant</td>
<td>10-15 in. (25-38 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)**
<table>
<thead>
<tr>
<th>Grover Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz.(g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>PETUNIA, SINGLE MULTIFLORA F₁</td>
<td>Carpet Series</td>
<td>285,000 S/oz. (10,000 S/g)</td>
<td>SED, PEL</td>
<td>512-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PETUNIA, SINGLE MULTIFLORA F₁</td>
<td>Debonair Collection</td>
<td>33,000 S/oz. (1,200 S/g)</td>
<td>PEL</td>
<td>288-cell</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4</td>
<td>4-6</td>
<td>4 in. (10 cm), 5 in. (13 cm), 6 in. (15 cm) 1-3 ppp, 10 in. (25 cm) basket 3-4 ppp</td>
<td></td>
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</tr>
<tr>
<td>PETUNIA, SINGLE MULTIFLORA F₁</td>
<td>Lo Rider Series</td>
<td>33,000 S/oz. (1,200 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4</td>
<td>5-6</td>
<td>804 pack, 10 in. (25 cm) basket 3-4 ppp</td>
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<tr>
<td>PETUNIA, SINGLE MULTIFLORA F₁</td>
<td>Mirage Series</td>
<td>285,000 S/oz. (10,000 S/g)</td>
<td>SED, PEL</td>
<td>512-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm)</td>
<td></td>
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</tr>
<tr>
<td>PETUNIA, DOUBLE FLORIBUNDA F₁</td>
<td>Double Madness Series</td>
<td>265,000 S/oz. (9,300 S/g)</td>
<td>SED, PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>5 in. (13 cm), 10 in. (25 cm) basket</td>
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<tr>
<td>PETUNIA, DOUBLE GRANDIFLORA F₁</td>
<td>Double Cascade Series</td>
<td>270,000 S/oz. (9,500 S/g)</td>
<td>SED, PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>5 in. (13 cm), 10 in. (25 cm) basket</td>
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<tr>
<td>PETUNIA, DOUBLE GRANDIFLORA F₁</td>
<td>Duett, Sonata, Valentine, Glorious Mixture</td>
<td>270,000 S/oz. (9,500 S/g)</td>
<td>SED, PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>5 in. (13 cm), 10 in. (25 cm) basket</td>
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<tr>
<td>PETUNIA, DOUBLE GRANDIFLORA F₁</td>
<td>Pirouette Series</td>
<td>270,000 S/oz. (9,500 S/g)</td>
<td>SED, PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>5 in. (13 cm), 10 in. (25 cm) basket</td>
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<tr>
<td>PETUNIA, DOUBLE MULTIFLORA F₁</td>
<td>Duo Series</td>
<td>265,000 S/oz. (9,300 S/g)</td>
<td>SED, PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>5 in. (13 cm), 10 in. (25 cm) basket</td>
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<tr>
<td>PETUNIA, DOUBLE MULTIFLORA F₁</td>
<td>Tart Bonanza Mixture</td>
<td>265,000 S/oz. (9,300 S/g)</td>
<td>SED, PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>72-76°F (22-24°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>5 in. (13 cm), 10 in. (25 cm) basket</td>
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<tr>
<td>Online* PHLOX F₁</td>
<td>21st Century Series</td>
<td>14,000-24,000 S/oz. (500-850 S/g)</td>
<td>PRM</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>306 (9 cm), 4 in. (10 cm), gallon (15-18 cm) 3 ppp</td>
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<tr>
<td>PHLOX F₁</td>
<td>Grammar Pink &amp; White</td>
<td>14,000-24,000 S/oz. (500-850 S/g)</td>
<td>PRM</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>306 (9 cm), 4 in. (10 cm), gallon (15-18 cm) 3 ppp</td>
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<tr>
<td>Pg 121 PLECTRANTHUS</td>
<td>Silver Crest</td>
<td>85,000 S/oz. (3,000 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>No</td>
<td>64-72°F (20-22°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>306 (9 cm), 4 in. (10 cm), 4.5 in. (11 cm), 10 in. (25 cm) basket 3 ppp</td>
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<td></td>
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<tr>
<td>Pg 121 PLECTRANTHUS</td>
<td>Silver Shield</td>
<td>21,200 S/oz. (1,100 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>64-72°F (20-22°C)</td>
<td>5-7</td>
<td>5-6</td>
<td>306 (9 cm), 4 in. (10 cm), gallon (15-18 cm) 2 ppp</td>
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<tr>
<td>Online* PLECTRANTHUS</td>
<td>Emerald Lace</td>
<td>46,919 S/oz. (1,655 S/g)</td>
<td>SED</td>
<td>288-cell</td>
<td>Yes</td>
<td>68-74°F (20-24°C)</td>
<td>6-9</td>
<td>5-6</td>
<td>306 (9 cm), 4 in. (10 cm), 6 in. (15 cm), gallon (6 in./15-18 cm) 2 ppp</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growing on temperature day</td>
<td>Growing on temperature night</td>
<td>Pack</td>
<td>4-in./10 cm</td>
<td>Other</td>
<td>Key tips</td>
<td>Mature height</td>
<td>Plant spread</td>
<td>Heat tolerant</td>
<td>Cool crop</td>
<td>Other recommendations</td>
<td></td>
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</tr>
<tr>
<td>62-65°F (17-18°C)</td>
<td>55-65°F (13-18°C)</td>
<td>4-5</td>
<td>6-7</td>
<td>–</td>
<td></td>
<td>10-12 in. (25-30 cm)</td>
<td>10-15 in. (25-38 cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61-75°F (16-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>–</td>
<td>5-7 (Spring), 3-5 (Summer)</td>
<td>5-8 (Spring), 3-5 (Summer)</td>
<td>Avoid using B-Nine on Black Cherry.</td>
<td>10-12 in. (25-30 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61-75°F (16-24°C)</td>
<td>57-65°F (14-18°C)</td>
<td>5-6</td>
<td>–</td>
<td>6-7</td>
<td>Genetically compact and needs less to no PGR after transplant</td>
<td>7-10 in. (17-25 cm)</td>
<td>8-12 in. (20-30 cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62-65°F (17-18°C)</td>
<td>55-65°F (13-18°C)</td>
<td>4-5</td>
<td>6-7</td>
<td>–</td>
<td></td>
<td>10-15 in. (25-38 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62-65°F (17-18°C)</td>
<td>55-65°F (13-18°C)</td>
<td>–</td>
<td>8-9</td>
<td>10-11</td>
<td></td>
<td>10-15 in. (25-38 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62-65°F (17-18°C)</td>
<td>55-65°F (13-18°C)</td>
<td>–</td>
<td>9-10</td>
<td>11-12</td>
<td></td>
<td>10-15 in. (25-38 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62-65°F (17-18°C)</td>
<td>55-65°F (13-18°C)</td>
<td>–</td>
<td>9-10</td>
<td>11-12</td>
<td></td>
<td>10-15 in. (25-38 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62-65°F (17-18°C)</td>
<td>55-65°F (13-18°C)</td>
<td>–</td>
<td>8-9</td>
<td>10-11</td>
<td></td>
<td>10-15 in. (25-38 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55-60°F (13-16°C)</td>
<td>50-55°F (10-13°C)</td>
<td>–</td>
<td>6</td>
<td>7-8</td>
<td>Cover thoroughly with coarse vermiculite. Darkness is required for germination.</td>
<td>10 in. (25 cm)</td>
<td>10 in. (25 cm)</td>
<td>✔️</td>
<td>Ideal for Spring and southern Autumn sales.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>55-60°F (13-16°C)</td>
<td>50-55°F (10-13°C)</td>
<td>–</td>
<td>6</td>
<td>7-8</td>
<td>Cover thoroughly with coarse vermiculite. Darkness is required for germination.</td>
<td>8-10 in. (20-25 cm)</td>
<td>10 in. (25 cm)</td>
<td>✔️</td>
<td>Ideal for Spring and southern Autumn sales.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>64-80°F (18-27°C)</td>
<td>61-68°F (16-20°C)</td>
<td>–</td>
<td>4-6</td>
<td>6-7</td>
<td>Due to directional stem arching, it is advisable to position Silver Crest plugs with the growing shoot facing outward, toward the outside of the container. See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>8-10 in. (20-25 cm)</td>
<td>18-24 in. (46-61 cm)</td>
<td>✔️</td>
<td>Ideal as a cascading plant in mixed containers or hanging baskets as well as the edge of rockwalls.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>70-75°F (21-24°C)</td>
<td>64-68°F (18-20°C)</td>
<td>–</td>
<td>8-9</td>
<td>6-7</td>
<td>Requires light to germinate. Does not need pinching. See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>24-30 in. (60-75 cm)</td>
<td>24-30 in. (60-75 cm)</td>
<td>✔️</td>
<td>Stress tolerant and very vigorous. Ideal for containers or garden beds.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>66-72°F (17-23°C)</td>
<td>64-66°F (18-19°C)</td>
<td>5-6</td>
<td>5-6</td>
<td>5-6</td>
<td>See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>6-8 in. (15-20 cm)</td>
<td>8-10 in. (20-25 cm)</td>
<td>✔️</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm) **
### PanAmerican Seed

**Weeks from plug to finish**

630 231-1400 panamseed.com *Find online Grower Facts culture at panamseed.com.

**Online**

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### Varieties

<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SALVIA</strong></td>
<td>S. splendens</td>
<td>Flare</td>
<td>SED</td>
<td>7,500 S/oz. (256 g)</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>70-75°F (21-24°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>SALVIA</strong></td>
<td>S. splendens</td>
<td>Lighthouse Series</td>
<td>SED</td>
<td>7,500 S/oz. (256 g)</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>70-75°F (21-24°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>1801 Pack, 4 in. (10 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>SALVIA</strong></td>
<td>S. splendens</td>
<td>Scarlet King</td>
<td>SED</td>
<td>7,500 S/oz. (256 g)</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>70-75°F (21-24°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>SALVIA</strong></td>
<td>S. splendens</td>
<td>Scarlet Queen</td>
<td>SED</td>
<td>7,500 S/oz. (256 g)</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>70-75°F (21-24°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>SALVIA</strong></td>
<td>S. splendens</td>
<td>Red Hot Sally, Vista Series</td>
<td>SED</td>
<td>7,500 S/oz. (256 g)</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>70-75°F (21-24°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>SCHIZANTHUS</strong></td>
<td>S. x wisetonensis</td>
<td>Royal Pierrot F1 Mixture</td>
<td>SED</td>
<td>55,300 S/oz. (1,950 g)</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>60-70°F (15-21°C)</td>
<td>1-3</td>
<td>4-5</td>
<td>4 in. (10 cm), 6 in. (15 cm)</td>
<td></td>
</tr>
<tr>
<td><strong>Online</strong></td>
<td>S. javanica</td>
<td>Veranda</td>
<td>SED</td>
<td>39,057 S/oz. (1,367 g)</td>
<td>406 or 288-cell</td>
<td>No</td>
<td>70-75°F (21-24°C)</td>
<td>6-10</td>
<td>406: 6; 288: 7</td>
<td>306 (9 cm), 6 in. (15 cm), gallon (15-18 cm), hanging basket</td>
<td></td>
</tr>
</tbody>
</table>

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**FOR CHAMPAGNE BUBBLES SERIES ICELAND POPPY**

See Perennial Culture Chart (pg 70)

**FOR SIMPILYSALAD**

See Multi-Species, Multi-Pellet (pg 28)

**FOR SINGLE SPECIES, MULTI-PELLET USEABLES**

See genus
<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
<th>Pack</th>
<th>4-in./10-cm</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>70-75°F (21-24°C)</td>
<td>64-68°F (18-20°C)</td>
<td>–</td>
<td>6-9</td>
<td>8-12</td>
<td>Requires high light and warm temperatures. A hard pinch at about 15-leaf stage plus floret at 1,000 ppm spray will result in bushier plants.</td>
<td>12-18 in. (30-45 cm); up to 6 ft. (1.8 m) in the South.</td>
<td>18-24 in. (45-60 cm)</td>
<td>✓</td>
<td></td>
<td>Perfect choice for the warm South. In the North, best suited to patio planters.</td>
</tr>
<tr>
<td>68-76°F (20-25°C)</td>
<td>65-67°F (18-19°C)</td>
<td>5</td>
<td>5-6</td>
<td>–</td>
<td>See Grower Facts for important photoperiod information.</td>
<td>9-12 in. (23-30 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✓</td>
<td></td>
<td>May be sown at 10 hour 30 minute daylength without rosetting. Daylength must be maintained from sowing to finish.</td>
</tr>
<tr>
<td>68-76°F (20-25°C)</td>
<td>65-67°F (18-19°C)</td>
<td>5</td>
<td>5-6</td>
<td>–</td>
<td>See Grower Facts for important photoperiod information.</td>
<td>9-12 in. (23-30 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✓</td>
<td></td>
<td>May be sown at 11-hour daylength without rosetting. Daylength must be maintained from sowing to finish.</td>
</tr>
<tr>
<td>68-76°F (20-25°C)</td>
<td>65-67°F (18-19°C)</td>
<td>6</td>
<td>7</td>
<td>–</td>
<td>See Grower Facts for important photoperiod information.</td>
<td>6-9 in. (15-23 cm)</td>
<td>14-18 in. (35-45 cm)</td>
<td>✓</td>
<td></td>
<td>May be sown at 10 hour 15 minute daylength without rosetting. Daylength must be maintained from sowing to finish.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>See Grower Facts</td>
<td>6-9 in. (15-23 cm)</td>
<td>14-18 in. (35-45 cm)</td>
<td></td>
<td></td>
<td>May be sown at 10-hour daylength without rosetting. Daylength must be maintained from sowing to finish.</td>
</tr>
<tr>
<td>See Grower Facts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5-6 in. (13-15 cm)</td>
<td>5-7 in. (13-18 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>68-75°F (20-24°C)</td>
<td>65-68°F (18-20°C)</td>
<td>6-7</td>
<td>6-7</td>
<td>8-9</td>
<td>Versatile for landscapes and large mixed containers</td>
<td>3-4 in. (7-10 cm)</td>
<td>14-16 in. (35-40 cm)</td>
<td>✓</td>
<td></td>
<td>Sow 4 seeds per cell.</td>
</tr>
<tr>
<td>68-75°F (20-24°C)</td>
<td>65-68°F (18-20°C)</td>
<td>6</td>
<td>10</td>
<td>10</td>
<td>Perfect choice for the warm South.</td>
<td>10-12 in. (25-30 cm)</td>
<td>16-18 in. (40-45 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)
<table>
<thead>
<tr>
<th>Grover Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online*</td>
<td>SNAPDRAGON, DWARF GARDEN F1 Antirrhinum majus</td>
<td>Snapshot F1 Series</td>
<td>○</td>
<td>171,000 S/oz. (6,000 S/g)</td>
<td>SED</td>
<td>288-cell</td>
<td>Cover lightly</td>
<td>64-68°F (18-20°C)</td>
<td>4-8</td>
<td>5-6</td>
<td>Pack, 4 in. (10 cm)</td>
</tr>
<tr>
<td></td>
<td>SNAPDRAGON, FORCING F1 Antirrhinum majus</td>
<td>Trumpet Tangerine</td>
<td>○</td>
<td>180,000 S/oz. (6,350 S/g)</td>
<td>SED</td>
<td>512-cell or larger</td>
<td>Cover lightly</td>
<td>64-68°F (18-20°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>Gallon (15-18 cm) 3 ppp</td>
</tr>
<tr>
<td></td>
<td>SNAPDRAGON, GARDEN F1 Antirrhinum majus</td>
<td>Rocket F1 Series</td>
<td>○</td>
<td>180,000 S/oz. (6,350 S/g)</td>
<td>SED</td>
<td>288-cell</td>
<td>Cover lightly</td>
<td>65-68°F (18-20°C)</td>
<td>4-8</td>
<td>5-6</td>
<td>Gallon (15-18 cm) 3 ppp</td>
</tr>
<tr>
<td></td>
<td>SNAPDRAGON, CUT FLOWER F1 Antirrhinum majus</td>
<td>Apollo, Cool, Maryland, Monaco, Early Potomac, Potomac Series, Purple Twist</td>
<td>○</td>
<td>180,000 S/oz. (6,350 S/g)</td>
<td>SED</td>
<td>512-cell or larger</td>
<td>Cover lightly</td>
<td>64-68°F (18-20°C)</td>
<td>4-5</td>
<td>4-5</td>
<td>Cut flower</td>
</tr>
<tr>
<td>Online*</td>
<td>SPILANTHES Acmella oleracea</td>
<td>Peek-A-Boo</td>
<td>○</td>
<td>116,200 S/oz. (4,100 S/g)</td>
<td>COT</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>72-76°F (22-24°C)</td>
<td>4</td>
<td>4-5</td>
<td>306 (9 cm), 4 in. (10 cm), gallon (15-18 cm) 3 ppp</td>
</tr>
<tr>
<td></td>
<td>STATICE, ANNUAL Limonium sinuatum</td>
<td>Fortress Series</td>
<td>○</td>
<td>10,000 S/oz. (350 S/g)</td>
<td>SED</td>
<td>200-cell or larger</td>
<td>Yes</td>
<td>70°F (21°C)</td>
<td>3-8</td>
<td>4-5</td>
<td>4 in. (10 cm), 6 in. (15 cm)</td>
</tr>
<tr>
<td></td>
<td>STATICE, ANNUAL Limonium sinuatum</td>
<td>Sunset</td>
<td>○</td>
<td>14,000 S/oz. (500 S/g)</td>
<td>SED</td>
<td>200-cell or larger</td>
<td>Yes</td>
<td>70°F (21°C)</td>
<td>5-12</td>
<td>4-5</td>
<td>4 in. (10 cm), 6 in. (15 cm)</td>
</tr>
<tr>
<td>Online*</td>
<td>STIPA S. tenuissima (Mexican Feather Grass)</td>
<td>Pony Tails</td>
<td>○</td>
<td>4,026 MSP/oz. (142 MSP/g)</td>
<td>MSP</td>
<td>288-cell</td>
<td>No</td>
<td>64-75°F (18-24°C)</td>
<td>4-5</td>
<td>4-5</td>
<td>306 (9 cm), 4.4-5 in. (10-11 cm), 6-6.5 in. (15-16 cm), gallon (15-18 cm)</td>
</tr>
<tr>
<td></td>
<td>STRAWBERRY Fragaria x ananassa</td>
<td>Fresca</td>
<td>○</td>
<td>60,000 S/oz. (2,100 S/g)</td>
<td>SED</td>
<td>288-cell</td>
<td>Cover lightly</td>
<td>65°F (18°C)</td>
<td>7-14</td>
<td>4-5</td>
<td>4 in. (10 cm), 10 in. (25 cm) basket</td>
</tr>
<tr>
<td>Online*</td>
<td>TALINUM T. paniculatum</td>
<td>Limón</td>
<td>○</td>
<td>56,698 S/oz. (2,000 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>68-74°F (20-23°C)</td>
<td>4-5</td>
<td>5</td>
<td>306 (9 cm), 4.4-5 in. (10-11 cm), 6-6.5 in. (15-16 cm) 3 ppp</td>
</tr>
</tbody>
</table>

*Find online Grover Facts culture at panamseed.com.
| Growing on temperature day | Growing on temperature night | Pack | 4-in./10-cm | Other | Key tips | Mature height | Plant spread | Heat tolerant | Cool crop | Other recommendations |
|-----------------------------|-----------------------------|------|-------------|-------|----------|---------------|--------------|--------------|-----------|---------------------|---------------------|
| 55-70°F (13-21°C)          | 45-55°F (7-13°C)            | 6    | 6           | –     | –        | 6-10 in. (15-25 cm) | 10-12 in. (25-30 cm) | Yes         |          |                      |
| 60-75°F (16-24°C)          | 45-55°F (7-13°C)            | 8-19  | See also Cut Flower section for more details (pg 52). | 39-60 in. (1-1.5 m) |
| 65-80°F (18-26°C)          | 55-60°F (13-16°C)           | –    | –           | 13-16 | See also Cut Flower section for more details (pg 52). | 2.5-3 ft. (75-90 cm) | 16-18 in. (40-45 cm) | Yes    | Rocket makes an excellent Spring and Summer-flowering landscape snapdragon. |
| 55-70°F (13-21°C)          | 45-55°F (7-13°C)            | –    | 9-10 (Oct-early Jan sow), 4-6 (Sept & mid Jan sow) | Perform best under cool temperatures (lower than 55°F/13°C), producing optimum stem strength. | 16-20 in. (40-50 cm) | 10-14 in. (25-35 cm) | Yes    | Group 1 winter-flowering snapdragon. Necessary to have cool temperatures and short days for crop production. Northern hemisphere: recommend sowing September to January. Southern hemisphere: sow March to July. |
| 55-60°F (13-16°C)          | 50-55°F (10-13°C)           | –    | 18-24 (12-15 with vernalization) | 24-30 in. (60-75 cm) | 12 in. (30 cm) |
| 55-60°F (13-16°C)          | 50-55°F (10-13°C)           | –    | 18-24 (12-15 with vernalization) | Plants flower more rapidly and uniformly if subjected to a cold treatment of 50-55°F (10-13°C) for 3-8 weeks following germination while still in a 72 or 93-cell plug tray. See also Cut Flower section for more details (pg 52). | 30 in. (75 cm) | 12 in. (30 cm) |
| 62-74°F (17-23°C)          | 59-64°F (15-18°C)           | 6-7  | 6-7 (3 ppp), 8-9 (1 ppp) | See Fantastic Foliage ColorGrass plug chart for more details (pg 56). | 16-24 in. (40-60 cm) | 24 in. (60 cm) | USDA Hardiness Zones 7 to 10. |
| 60-64°F (16-18°C)          | 60-64°F (16-18°C)           | –    | 12-13 | 13-15 | Strawberry is sensitive to high salts, especially during germination. Strawberry is also susceptible to mildew. | 3-4 in. (7-10 cm) | 10-12 in. (25-30 cm) |
| 66-74°F (19-23°C)          | 62-66°F (17-19°C)           | 4-5 (foliage); add 2 weeks for flower | 4-5 (foliage); add 2 weeks for flower | 4-5 (foliage); add 2 weeks for flower | See Fantastic Foliage plug chart for more details (pg 54). | 28-32 in. (70-80 cm) | 16-18 in. (40-45 cm) | Yes    | Well-suited to both containers and landscape plantings. |

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online*</td>
<td>TAULUM  T. paniculatum</td>
<td>Verde</td>
<td></td>
<td>56,698 S/oz. (2,000 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>68-74°F (20-23°C)</td>
<td>6</td>
<td>5</td>
<td>306 (9 cm), 4-4.5 in. (10-11 cm), 6-6.5 in. (15-16 cm) 3 ppp</td>
</tr>
<tr>
<td>Pg 126</td>
<td>TECOMA  T. stans</td>
<td>Mayan Gold</td>
<td></td>
<td>1,575 S/oz. (55 S/g)</td>
<td>COT</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>68-74°F (20-23°C)</td>
<td>3-5</td>
<td>5-6</td>
<td>4.5-5 in. (11-12 cm), 6 in. (15 cm) 3 ppp, gallon (15-18 cm) 3 ppp</td>
</tr>
<tr>
<td>THUNBERGIA  T. alata</td>
<td>Susie Series</td>
<td></td>
<td></td>
<td>1,100 S/oz. (40 S/g)</td>
<td>SED</td>
<td>200-cell or larger</td>
<td>Cover lightly</td>
<td>70-75°F (21-24°C)</td>
<td>6-12</td>
<td>4-5</td>
<td>4 in. (10 cm), gallon (15-18 cm)</td>
</tr>
<tr>
<td>TOMATO, F1 CONTAINER  Solanum lycopersicum</td>
<td>Micro-Tom</td>
<td></td>
<td></td>
<td>9,000 S/oz. (315 S/g)</td>
<td>SED</td>
<td>406 to 288-cell</td>
<td>Cover lightly</td>
<td>70-75°F (21-24°C)</td>
<td>3-7</td>
<td>4-5</td>
<td>3-4 in. (9-10 cm)</td>
</tr>
<tr>
<td>TOMATO, F1 CONTAINER  Solanum lycopersicum</td>
<td>Tumbler</td>
<td></td>
<td></td>
<td>9,000 S/oz. (315 S/g)</td>
<td>SED</td>
<td>406 to 288-cell</td>
<td>Cover lightly</td>
<td>70-75°F (21-24°C)</td>
<td>3-7</td>
<td>4-5</td>
<td>8-10 in. (20-25 cm) basket</td>
</tr>
<tr>
<td>TOREUTIA  T. fournieri</td>
<td>Clown™ F1 Series</td>
<td></td>
<td></td>
<td>28,500-35,700 S/oz. (1,000-1,250 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>71-76°F (21-24°C)</td>
<td>4-6</td>
<td>5-6</td>
<td>Pack, 4 in. (10 cm)</td>
</tr>
<tr>
<td>Pg 126</td>
<td>TOREUTIA  T. fournieri</td>
<td>Kauai Series F1</td>
<td></td>
<td>28,400-32,600 S/oz. (1,000-1,150 S/g)</td>
<td>PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>71-76°F (22-24°C)</td>
<td>4-6</td>
<td>5-6</td>
<td>Pack, 4 in. (10 cm)</td>
</tr>
<tr>
<td>TRACHELUM, CUT FLOWER TYPE  T. caeruleum</td>
<td>Lake Forest, Lake Michigan, Lake Louise Series</td>
<td></td>
<td></td>
<td>21,500 S/oz. (750 S/g)</td>
<td>PEL</td>
<td>200-cell or larger</td>
<td>No</td>
<td>72°F (21°C)</td>
<td>7-10</td>
<td>7-9</td>
<td>Cut flower</td>
</tr>
<tr>
<td>Online*</td>
<td>TRACHELUM, POT &amp; BEDDING TYPE  T. caeruleum</td>
<td>Devotion Series</td>
<td></td>
<td>21,500-34,200 S/oz. (750-1,200 S/g)</td>
<td>PEL</td>
<td>200-cell or larger</td>
<td>No</td>
<td>72°F (21°C)</td>
<td>7-10</td>
<td>7-9</td>
<td>Galton (15-18 cm) 3 ppp</td>
</tr>
</tbody>
</table>

FOR TROPAEALEUM See Nasturtium (pg 28)

FOR SOUTHERN CHARM VERBASCUM See Perennial Culture Chart (pg 72)

| Pg 127 | VERBENA  V. x hybrida | Quartz Series (XP varieties) | | 11,900 S/oz. (420 S/g) | SED, PRM | 406-cell or larger | Yes | 72-75°F (22-24°C) | 4-6 | 4 | Pack, 4 in. (10 cm) |
| Pg 127 | VERBENA  V. x hybrida | Quartz Blue & Waterfall Mixture | | 11,900 S/oz. (420 S/g) | SED, PRM | 406-cell or larger | Yes | 72-75°F (22-24°C) | 4-6 | 5 | Pack, 4 in. (10 cm) |

FOR BLUE BOUQUET VERONICA See Perennial Culture Chart (pg 74)

| Pg 128 | VINCA  Catharanthus roseus | Cooler Series | | 12,200-24,100 S/oz. (430-850 S/g) | SED | 288-cell | Yes | 75-78°F (24-25°C) | 3-5 | 5 | Pack, 4 in. (10 cm) |
| VINCA  Catharanthus roseus | First Kiss | | | 12,200-24,100 S/oz. (430-850 S/g) | SED | 288-cell | Yes | 75-78°F (24-25°C) | 3-5 | 5 | Pack, 4 in. (10 cm) |
| VINCA  Catharanthus roseus | Jams ’N Jellies Series | | | 12,200-24,100 S/oz. (430-850 S/g) | SED | 288-cell | Yes | 75-78°F (24-25°C) | 3-5 | 5 | Pack, 4 in. (10 cm) |
| VINCA  Catharanthus roseus | Pacifica Series (XP & standard varieties) | | | 12,200-24,100 S/oz. (430-850 S/g) | SED | 288-cell | Yes | 75-78°F (24-25°C) | 3-5 | 5 | Pack, 306 (9 cm), 4 in. (10 cm) |

*Find online Grower Facts culture at panamseed.com.
<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature right</th>
<th>Pack</th>
<th>4-in./10 cm</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>66-74°F (19-23°C)</td>
<td>62-66°F (17-19°C)</td>
<td>4-5  (foliage); add 2 weeks for flower</td>
<td>4-5  (foliage); add 2 weeks for flower</td>
<td>4-5  (foliage); add 2 weeks for flower</td>
<td>See Fantastic Foliage plug chart for more details (pg 54).</td>
<td>32 in. (80 cm)</td>
<td>24 in. (60 cm)</td>
<td>✓</td>
<td></td>
<td>Well-suited to both containers and landscape plantings.</td>
</tr>
<tr>
<td>68-75°F (20-24°C)</td>
<td>65-68°F (18-20°C)</td>
<td>–</td>
<td>14-15 (Spring), 12-14 (Summer)</td>
<td>14-15 (Spring), 12-14 (Summer)</td>
<td>While the seed coat sometimes remains on the young seedlings, it will eventually fall off and will not affect the growth rate of the seedling.</td>
<td>24-36 in. (60-90 cm) in a season</td>
<td>21-23 in. (52-58 cm)</td>
<td>✓</td>
<td></td>
<td>Hardy to USDA Zone 8. Can grow into small shrub in warm climates where it Winters over (up to 8 ft./2.4 m at maturity).</td>
</tr>
<tr>
<td>62-68°F (17-20°C)</td>
<td>60-62°F (16-17°C)</td>
<td>–</td>
<td>4-5</td>
<td>8-10</td>
<td>Pre-soak seed overnight for faster germination.</td>
<td>Vine: 6-8 ft. (2 m)</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62-65°F (17-18°C)</td>
<td>62-65°F (17-18°C)</td>
<td>–</td>
<td>6-8</td>
<td>–</td>
<td>Produces cherry-type tomatoes. Extra-early, 49-day variety is very sweet and tasty.</td>
<td>3-6 ft. (90-180 cm)</td>
<td>–</td>
<td>✓</td>
<td></td>
<td>A superior variety for hanging baskets and containers with its cascading habit.</td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>62-64°F (17-18°C)</td>
<td>5-6</td>
<td>6-7</td>
<td>–</td>
<td>Light is required for germination.</td>
<td>8 in. (25 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>62-64°F (17-18°C)</td>
<td>5-6</td>
<td>6-7</td>
<td>–</td>
<td>Light is required for germination.</td>
<td>8 in. (20 cm)</td>
<td>8 in. (20 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>62-68°F (17-20°C)</td>
<td>60°F (16°C)</td>
<td>–</td>
<td>–</td>
<td>10-18</td>
<td>See also Cut Flower section for more details (pg 52).</td>
<td>2.5-3.5 ft. (75-105 cm)</td>
<td>–</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68-72°F (20-22°C)</td>
<td>60°F (16°C)</td>
<td>–</td>
<td>–</td>
<td>9-11</td>
<td>See Grower Facts for important plug information.</td>
<td>12-24 in. (35-60 cm)</td>
<td>12-18 in. (30-45 cm)</td>
<td></td>
<td></td>
<td>Needs 16-hour daylengths for faster flowering. Ideal for backyard cut flower garden programs.</td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>60°F (16°C)</td>
<td>6-8  (Spring), 5-7 (Summer)</td>
<td>6-8  (Spring), 5-7 (Summer)</td>
<td>–</td>
<td>Avoid excessive moisture in plug media during germination Stage 1.</td>
<td>8-10 in. (20-25 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>60°F (16°C)</td>
<td>7-9  (Spring), 6-7 (Summer)</td>
<td>7-9  (Spring), 6-7 (Summer)</td>
<td>–</td>
<td>Avoid excessive moisture in plug media during germination Stage 1.</td>
<td>10-12 in. (25-30 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75°F (24°C) or above</td>
<td>65-68°F (18-20°C)</td>
<td>6-7</td>
<td>7-8</td>
<td>–</td>
<td>12-14 in. (30-35 cm)</td>
<td>6-8 in. (15-20 cm)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75°F (24°C) or above</td>
<td>65-68°F (18-20°C)</td>
<td>5-6</td>
<td>6-7</td>
<td>–</td>
<td>10-12 in. (25-30 cm)</td>
<td>6-8 in. (15-20 cm)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75°F (24°C) or above</td>
<td>65-68°F (18-20°C)</td>
<td>5-6</td>
<td>6-7</td>
<td>–</td>
<td>14-16 in. (35-40 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75°F (24°C) or above</td>
<td>65-68°F (18-20°C)</td>
<td>5-6</td>
<td>6-7</td>
<td>–</td>
<td>10-14 in. (25-35 cm)</td>
<td>6-8 in. (15-20 cm)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75°F (24°C) or above</td>
<td>65-68°F (18-20°C)</td>
<td>3-4</td>
<td>4-5</td>
<td>–</td>
<td>14-16 in. (35-40 cm)</td>
<td>10-12 in. (25-30 cm)</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
<th>Plug crop weeks</th>
<th>Recommended containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online*</td>
<td>VINCA, TRAILING Catharanthus roseus</td>
<td>Mediterranean Series (XP &amp; standard varieties)</td>
<td></td>
<td>12,200-24,100 S/oz. (430-850 S/g)</td>
<td>SED</td>
<td>288-cell</td>
<td>Yes</td>
<td>75-78°F (24-25°C)</td>
<td>3-5</td>
<td>5</td>
<td>4.5 in. (11 cm), 10 in. (25 cm) basket 7 ppp, 12 in. (30 cm) basket 9 ppp</td>
</tr>
<tr>
<td>Pg 128</td>
<td>VIOLA F1 V. cornuta</td>
<td>Sorbet™ Series (XP &amp; Standard Varieties)</td>
<td></td>
<td>37,000-40,000 S/oz. (1,300-1,400 S/g)</td>
<td>SED, PRM</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>68°F (20°C)</td>
<td>3-4</td>
<td>4</td>
<td>Pack, 4 in. (10 cm)</td>
</tr>
<tr>
<td>Online*</td>
<td>VIOLA, SMALL-FLOWERED SPREADING F1 V. x wittrockiana, V. cornuta</td>
<td>Rain Collection</td>
<td></td>
<td>21,650 S/oz. (765 S/g)</td>
<td>SED, PRM</td>
<td>288-cell</td>
<td>Yes</td>
<td>68°F (20°C)</td>
<td>3-5</td>
<td>5</td>
<td>4 in. (10 cm), 10 in. (25 cm) basket</td>
</tr>
<tr>
<td></td>
<td>ZINNIA Z. angustifolia</td>
<td>Star Series</td>
<td></td>
<td>65,710 S/oz. (2,300 S/g)</td>
<td>SED</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>70-75°F (21-22°C)</td>
<td>2-5</td>
<td>4-5</td>
<td>Pack, 4 in. (10 cm)</td>
</tr>
<tr>
<td>ZINNIA Z. marylandica</td>
<td>UpTown Series</td>
<td></td>
<td>10,000-17,000 S/oz. (350-600 S/g)</td>
<td>COT</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>68-73°F (20-22°C)</td>
<td>2-3</td>
<td>3</td>
<td>4 in. (10 cm), gallon (15-18 cm) 3 ppp</td>
<td></td>
</tr>
<tr>
<td>Pg 129</td>
<td>ZINNIA Z. marylandica</td>
<td>Zahara™ Series</td>
<td></td>
<td>11,300-17,000 S/oz. (400-600 S/g)</td>
<td>COT</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>68-73°F (20-22°C)</td>
<td>2-3</td>
<td>3</td>
<td>Pack, 4 in. (10 cm), gallon (15-18 cm) 3 ppp</td>
</tr>
<tr>
<td>Pg 130</td>
<td>ZINNIA, DOUBLE Z. marylandica</td>
<td>Double Zahara Series</td>
<td></td>
<td>10,000-17,000 S/oz. (350-600 S/g)</td>
<td>COT</td>
<td>288-cell or larger</td>
<td>Yes</td>
<td>68-73°F (20-22°C)</td>
<td>2-3</td>
<td>3</td>
<td>Pack, 4 in. (10 cm), gallon (15-18 cm) 3 ppp</td>
</tr>
<tr>
<td></td>
<td>ZINNIA Z. violacea (syn. Z. elegans)</td>
<td>State Fair Mixture F1</td>
<td></td>
<td>2,000 S/oz. (67 S/g)</td>
<td>SED</td>
<td>200-cell or larger</td>
<td>Yes</td>
<td>70-73°F (21-22°C)</td>
<td>2-5</td>
<td>4-5</td>
<td>4 in. (10 cm), 6 in. (15 cm)</td>
</tr>
</tbody>
</table>

*Find online Grower Facts culture at panamseed.com.
<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
<th>Pack</th>
<th>4-in./10-cm</th>
<th>Other</th>
<th>Key tips</th>
<th>Mature height</th>
<th>Plant spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>75°F (24°C) or above</td>
<td>65-68°F (18-20°C)</td>
<td>–</td>
<td>8-9 Spring</td>
<td>5-6</td>
<td>Bottom heat during production can increase yield potential and decrease crop time.</td>
<td>4-6 in. (10-15 cm)</td>
<td>20-30 in. (50-75 cm)</td>
<td>✓</td>
<td>Trailing habit begins 12-15 weeks after sowing.</td>
<td></td>
</tr>
<tr>
<td>60°F (16°C)</td>
<td>50-55°F (10-13°C)</td>
<td>3-5</td>
<td>4-6</td>
<td>–</td>
<td>Delaying shipment of violas until 3 or more flowers are open provides more colour at retail.</td>
<td>6-8 in. (15-20 cm)</td>
<td>10 in. (25 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60°F (16°C)</td>
<td>50-55°F (10-13°C)</td>
<td>–</td>
<td>4-5 Autumn</td>
<td>7-8</td>
<td>Will stretch under high heat and humidity, control night temps or apply PGRs appropriately.</td>
<td>10-12 in. (25-30 cm)</td>
<td>10-16 in. (25-40 cm)</td>
<td>✓</td>
<td>Mounded, spreading habit is well-suited to baskets and landscapes.</td>
<td></td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>65-70°F (18-21°C)</td>
<td>5-6</td>
<td>6-7</td>
<td>–</td>
<td></td>
<td>14 in. (35 cm)</td>
<td>8 in. (20 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>60-65°F (16-18°C)</td>
<td>8-9</td>
<td>(Spring)</td>
<td>5-6</td>
<td>Avoid excessive moisture on plants and flowers. Monitor for Botrytis.</td>
<td>18-24 in. (45-60 cm)</td>
<td>18-24 in. (45-60 cm)</td>
<td>✓</td>
<td>More vigor than traditional type.</td>
<td></td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>60-65°F (16-18°C)</td>
<td>8-9</td>
<td>(Spring)</td>
<td>5-6</td>
<td>Avoid excessive moisture on plants and flowers. Monitor for Botrytis.</td>
<td>12-18 in. (30-45 cm)</td>
<td>12-18 in. (30-45 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>59-64°F (15-17°C)</td>
<td>–</td>
<td>8-9 Spring</td>
<td>5-6</td>
<td></td>
<td>16-20 in. (40-50 cm)</td>
<td>16-20 in. (40-50 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-70°F (18-21°C)</td>
<td>65-70°F (18-21°C)</td>
<td>–</td>
<td>6-7</td>
<td>7-8</td>
<td></td>
<td>3-4 ft. (90-120 cm)</td>
<td>12-14 in. (30-35 cm)</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)**

**PanAmerican Seed.**

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<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/Variety</th>
<th>Exposure</th>
<th>Seeds per oz (g)</th>
<th>Seed form</th>
<th>Recommended plug size</th>
<th>Cover seed</th>
<th>Germination temperature</th>
<th>Days to germinate</th>
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<th>Planting density</th>
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<tbody>
<tr>
<td>Online*</td>
<td>ANEMONE</td>
<td>Mona Lisa™ Series</td>
<td>52,500 S/oz. (1,850 S/g)</td>
<td>SED, PEL</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>60-65°F (16-18°C)</td>
<td>10-14</td>
<td>8</td>
<td>2-4 plants/ft.² (22 to 44 plants/m²)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ASTER</td>
<td>Meteor Series</td>
<td>12,000 S/oz. (420 S/g)</td>
<td>SED, PEL</td>
<td>200-cell or larger</td>
<td>Yes</td>
<td>70°F (21°C)</td>
<td>4-8</td>
<td>4-5</td>
<td>7 plants/ft.² (78 plants/m²)</td>
<td></td>
</tr>
<tr>
<td>Pg 132</td>
<td>CAMPANULA</td>
<td>Campana Series</td>
<td>102,000- 136,000 S/oz. (3,600-4,800 S/g)</td>
<td>SED, PEL</td>
<td>288-cell or larger</td>
<td>No</td>
<td>68-72°F (20-22°C)</td>
<td>4-5</td>
<td>7-8</td>
<td>6-8 plants/ft.² (64-80 plants/m²)</td>
<td></td>
</tr>
<tr>
<td>Pg 133</td>
<td>CELOSIA</td>
<td>Bombay Series</td>
<td>21,300-28,350 S/oz. (750-1,000 S/g)</td>
<td>SED, PEL</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>68-72°F (20-22°C)</td>
<td>3-4</td>
<td>2-3</td>
<td>6-8 plants/ft.² (64-80 plants/m²)</td>
<td></td>
</tr>
<tr>
<td>Pg 133</td>
<td>CELOSIA</td>
<td>Sunday Series</td>
<td>42,525-68,040 S/oz. (1,500-2,400 S/g)</td>
<td>SED, PEL</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
<td>68-72°F (20-22°C)</td>
<td>3-4</td>
<td>2-3</td>
<td>6-8 plants/ft.² (64-80 plants/m²)</td>
<td></td>
</tr>
<tr>
<td>Pg 133</td>
<td>DELPHINIUM</td>
<td>Casa Blanca</td>
<td>9,285 S/oz. (325 S/g)</td>
<td>SED, PEL</td>
<td>200-cell or larger</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>7-8</td>
<td>6-7</td>
<td>2-4 plants/ft.² (22-44 plants/m²)</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>DELPHINIUM</td>
<td>Guardian F1 Series</td>
<td>9,285 S/oz. (325 S/g)</td>
<td>SED, PEL</td>
<td>200-cell or larger</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>5-6</td>
<td>5-6</td>
<td>2-4 plants/ft.² (22-44 plants/m²)</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>DELPHINIUM</td>
<td>Belladonna (Clivedon Beauty)</td>
<td>9,285 S/oz. (325 S/g)</td>
<td>SED, PEL</td>
<td>200-cell or larger</td>
<td>Yes</td>
<td>65-70°F (18-21°C)</td>
<td>7-8</td>
<td>6-7</td>
<td>2-4 plants/ft.² (22-44 plants/m²)</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>DIANTHUS</td>
<td>Amazon F1 Series</td>
<td>12,760-14,175 S/oz. (450-500 S/g)</td>
<td>PEL</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>64-68°F (18-20°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>3-4 plants/ft.² (30-40 plants/m²); 1.5 plants/ft.² (15 plants/m²) if pinched</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>DIANTHUS</td>
<td>Bouquet F1 Series</td>
<td>8,575 S/oz. (300 S/g)</td>
<td>PEL</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>64-68°F (18-20°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>3-4 plants/ft.² (30-40 plants/m²)</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>DIANTHUS</td>
<td>Sweet F1 Series</td>
<td>7,300-9,600 pellets/oz. (260-340 pellets/g)</td>
<td>PEL</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>64-68°F (18-20°C)</td>
<td>3-5</td>
<td>4-5</td>
<td>4-6 plants/ft.² (42-64 plants/m²)</td>
<td></td>
</tr>
<tr>
<td>Pg 94</td>
<td>GOMPHRENDA</td>
<td>Fireworks</td>
<td>14,175 S/oz. (500 S/g)</td>
<td>COT</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>68-75°F (20-24°C)</td>
<td>2-3</td>
<td>5-6</td>
<td>0.75 plants/ft.² (8 plants/m²)</td>
<td></td>
</tr>
</tbody>
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*Find online Grower Facts culture at panamseed.com.
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<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
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<th>Key tips</th>
<th>Stem length</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>60-65°F (16-18°C)</td>
<td>55°F (13°C)</td>
<td>12</td>
<td>Greenhouse cut flower. Low temperatures (46-54°F / 8-12°C) promote optimum stem length.</td>
<td>18 in. (45 cm)</td>
<td>Ideally suited for young plant production from a March to June sowing in Northern Hemisphere for October through April season; a September to December sowing in Southern Hemisphere for April through October season.</td>
</tr>
<tr>
<td>60-75°F (16-24°C)</td>
<td>50-60°F (10-16°C)</td>
<td>13-16</td>
<td>Greenhouse, shade house or field. Soils must be free of pathogens. Provide 1 layer of netting. Fertilize with alternate applications of calcium nitrate and potassium nitrate to supply 125 to 150 ppm N. Decrease nitrogen and increase potassium-containing fertilizers when flower buds appear.</td>
<td>30-40 in. (80-100 cm)</td>
<td>Crop timing is affected by the ratio of long days (LD) to short days (SD). Under SD conditions, increasing LD treatments will increase stem length and shorten time to harvest. LD consists of 16 hours of light. Cyclic lighting of 7.5 min. per half-hour.</td>
</tr>
<tr>
<td>60-70°F (16-21°C)</td>
<td>54-59°F (12-15°C)</td>
<td>10-14</td>
<td>This greenhouse cut-flower campanula is a qualitative long day plant. To ensure sufficient vegetative growth and stem length, it is recommended to provide 6 weeks of short day conditions (11 hours) from approximately 2 weeks after sowing. When producing for Winter flowering, providing long days at 6 weeks after transplanting is required. “Mum lighting” from 10 PM to 2 AM can be used.</td>
<td>30-34 in. (75-85 cm)</td>
<td>Maintain a medium moisture level. In order to reach sufficient stem length, Campanula needs adequate moisture and fertilization. Dry growing conditions will cause early flowering and reduced stem length. However, do not over water as this will cause weaker stems and weaker root systems which will lead to plants falling over.</td>
</tr>
<tr>
<td>Before flower development: 65-75°F (18-24°C)</td>
<td>Before flower development: 63-65°F (17-18°C)</td>
<td>12-16</td>
<td>This greenhouse cut-flower celosia is a qualitative short day plant. Flowers will initiate under short days. The optimum daylength for Bombay to reach the appropriate stem length lies between 12 to 13 hours.</td>
<td>28-40 in. (70-100 cm)</td>
<td>Celosia makes a taproot and is sensitive for root damage, which will result in early bud formation, deformed flowers and less uniformity. Therefore, planting should be done before the plugs get rootbound. It is important to maintain a constantly moist media, especially for the first 2 weeks after transplanting to prevent premature flowering.</td>
</tr>
<tr>
<td>Before flower development: 60-61°F (16°C)</td>
<td>After flower development: 59°F (15°C)</td>
<td>10-14</td>
<td>This greenhouse cut-flower celosia is a quantitative short day plant. Flowers will initiate under short days. The optimum daylength for Sunday to reach the appropriate stem length lies between 12 to 13 hours.</td>
<td>28-40 in. (70-100 cm)</td>
<td>Celosia makes a taproot and is sensitive for root damage, which will result in early bud formation, deformed flowers and less uniformity. Therefore, planting should be done before the plugs get rootbound. It is important to maintain a constantly moist media, especially for the first 2 weeks after transplanting to prevent premature flowering.</td>
</tr>
<tr>
<td>60-70°F (16-21°C)</td>
<td>50-60°F (10-16°C)</td>
<td>20-26 in field</td>
<td>Treat cut stems with an ethylene-inhibiting agent.</td>
<td>42 in. (105 cm)</td>
<td>In temperate areas, such as coastal California, plugs are generally transplanted into the field August through October, and February to early May. Autumn transplant will flower the following Spring (February onward); Spring transplants flower late Spring.</td>
</tr>
<tr>
<td>60-70°F (16-21°C)</td>
<td>11-16 (see Key tips)</td>
<td>Autumn; greenhouse 13 weeks, field 16 weeks. Spring: greenhouse 11 weeks, field 13 weeks. Treat cut stems with an ethylene-inhibiting agent.</td>
<td>30-39 in. (75-100 cm)</td>
<td>In temperate areas, such as coastal California, plugs are generally transplanted into the field August through October, and February to early May. Autumn transplant will flower the following Spring (February onward); Spring transplants flower late Spring.</td>
<td></td>
</tr>
<tr>
<td>60-70°F (16-21°C)</td>
<td>20-26 in field</td>
<td>Treat cut stems with an ethylene-inhibiting agent.</td>
<td>30-36 in. (75-90 cm)</td>
<td>In temperate areas, such as coastal California, plugs are generally transplanted into the field August through October, and February to early May. Autumn transplants will flower the following Spring (February onward); Spring transplants flower late Spring.</td>
<td></td>
</tr>
<tr>
<td>60-72°F (16-22°C)</td>
<td>11-22 (see Key tips)</td>
<td>Late Spring/Summer greenhouse: field; 11-14 weeks. Late Summer/Winter greenhouse: 12-18 weeks. Field: 18-23 weeks.</td>
<td>20-36 in. (50-90 cm)</td>
<td>A small percentage of early off-types can be observed at 4-5 weeks from sowing. They should be removed. Can tolerate night temperatures as low as 45°F (7°C). Plants are frost-tolerant although frost will damage the flowers.</td>
<td></td>
</tr>
<tr>
<td>60-72°F (16-22°C)</td>
<td>8-18 (see Key tips)</td>
<td>Late Spring/Summer greenhouse: field; 8-9 weeks. Late Summer/Winter greenhouse: 9-13 weeks. Field: 15-18 weeks.</td>
<td>18-30 in. (45-75 cm)</td>
<td>Hardy perennial.</td>
<td></td>
</tr>
<tr>
<td>65-75°F (18-24°C)</td>
<td>63-66°F (18-25°C)</td>
<td>8-9</td>
<td>18 in. (45 cm)</td>
<td><strong>Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)</strong></td>
<td></td>
</tr>
<tr>
<td>Grower Facts</td>
<td>Class</td>
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<td>Exposure</td>
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</tr>
<tr>
<td>-------------</td>
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</tr>
<tr>
<td>HELIANTHUS</td>
<td>H. annuus (Sunflower)</td>
<td>Prado Series</td>
<td>○</td>
<td>1,135 S/oz. (40 S/g)</td>
<td>SED</td>
</tr>
<tr>
<td>Online*</td>
<td>L. annuus, CULT FLOWER</td>
<td>ABC F1, Laguna White</td>
<td>○</td>
<td>28,500 S/oz. (1,000 S/g)</td>
<td>PEL</td>
</tr>
<tr>
<td>Online*</td>
<td>MATRICARIA</td>
<td>Magic, Vegmo Series</td>
<td>○</td>
<td>18,650 S/oz. (650 S/g)</td>
<td>PEL</td>
</tr>
<tr>
<td>Online*</td>
<td>MATTHIOLA</td>
<td>Katz Series</td>
<td>○</td>
<td>15,300-18,100 S/oz. (540-640 S/g)</td>
<td>SED</td>
</tr>
<tr>
<td>Online*</td>
<td>MATTHIOLA</td>
<td>Column Stocks</td>
<td>○</td>
<td>15,600-20,000 S/oz. (550-700 S/g)</td>
<td>SED</td>
</tr>
<tr>
<td>Online*</td>
<td>MATTHIOLA</td>
<td>Aida, Carmen, Figaro, Opera (Vegmo) Series</td>
<td>○</td>
<td>15,600-20,000 S/oz. (550-700 S/g)</td>
<td>SED</td>
</tr>
<tr>
<td>SNAPDRAGON, FORCING F1</td>
<td>Antirrhinum majus</td>
<td>Apollo Series</td>
<td>○</td>
<td>180,000 S/oz. (6,350 S/g)</td>
<td>SED</td>
</tr>
<tr>
<td>SNAPDRAGON, FORCING F1</td>
<td>Antirrhinum majus</td>
<td>Cool Series</td>
<td>○</td>
<td>180,000 S/oz. (6,350 S/g)</td>
<td>SED</td>
</tr>
<tr>
<td>SNAPDRAGON, FORCING F1</td>
<td>Antirrhinum majus</td>
<td>Maryland Series</td>
<td>○</td>
<td>180,000 S/oz. (6,350 S/g)</td>
<td>SED</td>
</tr>
<tr>
<td>SNAPDRAGON, FORCING F1</td>
<td>Antirrhinum majus</td>
<td>Monaco Series</td>
<td>○</td>
<td>180,000 S/oz. (6,350 S/g)</td>
<td>SED</td>
</tr>
<tr>
<td>SNAPDRAGON, FORCING F1</td>
<td>Antirrhinum majus</td>
<td>Early Potomac, Potomac Series</td>
<td>○</td>
<td>180,000 S/oz. (6,350 S/g)</td>
<td>SED</td>
</tr>
</tbody>
</table>

*CUT FLOWER CULTURE CHART

*Find online Grower Facts culture at panamseed.com.

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<table>
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<tr>
<th>Growing on temperature day</th>
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<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>65-85°F (18-29°C)</td>
<td>50-65°F (10-18°C)</td>
<td>10-12 (from sowing)</td>
<td>At high elevations (5,000 ft/1,500 m+) and high light levels, Prado Red may produce almost-black ray petals. Very low humidity or very high light levels can reduce stem length.</td>
<td>48-66 in. (1.2 - 1.7 m)</td>
<td>Approximately 7-10 flower stems per plant may be harvested when the main stem is pinched at the fifth set of true leaves. Harvest in approximately 10-12 weeks from sowing.</td>
</tr>
<tr>
<td>68-75°F (20-24°C)</td>
<td>60-65°F (16-18°C)</td>
<td>14-18 Winter, 12-14</td>
<td>Full-sun plantings of cut flower Lisianthus produce shorter stems than greenhouse-grown Lisianthus.</td>
<td>29-45 in. (75-115 cm)</td>
<td></td>
</tr>
<tr>
<td>Winter: 55-58°F (13-14°C)</td>
<td>Winter: 55-58°F (13-14°C)</td>
<td>14-16 Winter, 10-14</td>
<td>16 hours of lighting is required for flowering; supplemental lighting may be solid or cyclic. Matricaria are not sensitive to ethylene.</td>
<td>28-36 in. (70-90 cm)</td>
<td></td>
</tr>
<tr>
<td>60-75°F (16-24°C)</td>
<td>45-55°F (7-13°C)</td>
<td>8-13</td>
<td>Crop time is dependent on daylength and light intensity. As a general guide with daylength of 13 hours or more, the crop time will be 8 weeks from planting. Shorter days will slow the crop time, depending on the temperature, up to 13 weeks from planting.</td>
<td>32 in. (80 cm)</td>
<td>Best performance when grown in tunnels.</td>
</tr>
<tr>
<td>55-65°F (13-18°C)</td>
<td>55-60°F (13-16°C)</td>
<td>20-22 (from sowing)</td>
<td>Column stocks are non-selectable for doubleness. Supply one layer of support netting. Direct sow seed.</td>
<td>24-30 in. (60-75 cm)</td>
<td>Optimum stem length will be achieved during cool growing periods. High heat can stunt plants or prevent flower spikes from developing.</td>
</tr>
<tr>
<td>50-62°F (10-16°C)</td>
<td>50-62°F (10-16°C)</td>
<td>11-12 Winter, 8-9 Spring, 3-5 Summer; 4-7 Autumn</td>
<td>Double-flowering Matthiola may be selected from single-flowering types by exposing seedlings with fully expanded cotyledons to 41°F (5°C) for approximately 3-5 days. At this point, seedlings of double-flowering plants will appear a pale green, while singles remain dark green.</td>
<td>32 in. (80 cm)</td>
<td>After removal from cold treatment, double-flowering seedlings will appear yellow and chlorotic within 1-2 days, while single-flowering seedlings remain robust and green. This cold treatment may only be done once to selectable Matthiola plugs.</td>
</tr>
<tr>
<td>60-75°F (16-24°C)</td>
<td>52-57°F (11-14°C)</td>
<td>8-18</td>
<td>39-60 in. (1.5-1.7 m)</td>
<td>Group 2:3. Open-faced series ideal for Autumn and Spring harvests. Refer to the Snapdragon Culture Guide for detailed information.</td>
<td></td>
</tr>
<tr>
<td>55-70°F (13-21°C)</td>
<td>45-55°F (7-13°C)</td>
<td>8-18</td>
<td>39-60 in. (1.5-1.7 m)</td>
<td>Group 1 to early Group 2: Highly uniform series for germination, plug growth, spike architecture and flowering date.</td>
<td></td>
</tr>
<tr>
<td>55-70°F (13-21°C)</td>
<td>45-55°F (7-13°C)</td>
<td>8-18</td>
<td>39-60 in. (1.5-1.7 m)</td>
<td>Group 1,2</td>
<td></td>
</tr>
<tr>
<td>60-75°F (16-24°C)</td>
<td>52-57°F (11-14°C)</td>
<td>8-18</td>
<td>39-60 in. (1.5-1.7 m)</td>
<td>Group 2:3. Well suited to difficult transition periods, such as Group 3,4 (Summer) to Group 1,2 (Autumn/ Winter). Tolerates warm Autumn conditions, perfect for Winter production in warmer climates, performs well all year in moderate temperatures.</td>
<td></td>
</tr>
<tr>
<td>70-85°F (21-30°C)</td>
<td>Potomac: 60°F (16°C), Early Potomac: 55-60°F (13-16°C)</td>
<td>8-18</td>
<td>Appleblossom and Dark Orange germinate best with light.</td>
<td>39-60 in. (1.5-1.7 m)</td>
<td>Group 3,4: Ideal for production during periods of high light, long days and warm temperatures. Can be grown year-round with supplemental high-intensity lighting.</td>
</tr>
</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)**
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<tbody>
<tr>
<td>SNAPDRAGON, FORCING F1</td>
<td>Antirrhinum majus</td>
<td>Purple Twist</td>
<td>180,000 S/oz. (6,350 S/g)</td>
<td>SED</td>
<td>512-cell or larger</td>
<td>Cover lightly</td>
<td>65-68°F (18-20°C)</td>
<td>4-5</td>
<td>4-5</td>
<td>6-10 plants/ft.² (64-106 plants/m²); high-density planting under high-light or field situation.</td>
<td></td>
</tr>
<tr>
<td>SNAPDRAGON, FORCING F1</td>
<td>Antirrhinum majus</td>
<td>Red Delilah</td>
<td>180,000 S/oz. (6,350 S/g)</td>
<td>SED</td>
<td>512-cell or larger</td>
<td>Cover lightly</td>
<td>65-68°F (18-20°C)</td>
<td>4-5</td>
<td>4-5</td>
<td>6-10 plants/ft.² (64-106 plants/m²); high-density planting under high-light or field situation.</td>
<td></td>
</tr>
<tr>
<td>SNAPDRAGON, FORCING F1</td>
<td>Antirrhinum majus</td>
<td>Trumpet Tangerine</td>
<td>180,000 S/oz. (6,350 S/g)</td>
<td>SED</td>
<td>512-cell or larger</td>
<td>Cover lightly</td>
<td>65-68°F (18-20°C)</td>
<td>4-6</td>
<td>4-5</td>
<td>6-10 plants/ft.² (64-106 plants/m²); high-density planting under high-light or field situation.</td>
<td></td>
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<tr>
<td>SNAPDRAGON, GARDEN F1</td>
<td>Antirrhinum majus</td>
<td>Rocket Series</td>
<td>180,000 S/oz. (6,350 S/g)</td>
<td>SED</td>
<td>406-cell</td>
<td>Cover lightly</td>
<td>65-68°F (18-20°C)</td>
<td>4-8</td>
<td>5-6</td>
<td>3-4 plants/ft.² (30-40 plants/m²)</td>
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<tr>
<td>STATICE, ANNUAL Limonium sinuatum</td>
<td>Fortress Series</td>
<td>Sunset</td>
<td>10,000 S/oz. (350 S/g)</td>
<td>SED</td>
<td>200-cell or larger</td>
<td>Yes</td>
<td>70°F (21°C)</td>
<td>3-8</td>
<td>4-5</td>
<td>1-2 plants/ft.² (10-20 plants/m²)</td>
<td></td>
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<tr>
<td>STATICE, ANNUAL Limonium sinuatum</td>
<td></td>
<td></td>
<td>14,000 S/oz. (500 S/g)</td>
<td>SED</td>
<td>200-cell or larger</td>
<td>Yes</td>
<td>70°F (21°C)</td>
<td>5-12</td>
<td>4-5</td>
<td>1-2 plants/ft.² (10-20 plants/m²)</td>
<td></td>
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<tr>
<td>TRACHELIUM, CUT FLOWER TYPE</td>
<td>T. caeruleum</td>
<td>Lake Forest, Lake Michigan, Lake Louise Series</td>
<td>21,500 S/oz. (750 S/g)</td>
<td>PEL</td>
<td>200-cell</td>
<td>No</td>
<td>72°F (21°C)</td>
<td>7-10</td>
<td>7-9</td>
<td>6-8 plants/ft.² (64-84 plants/m²)</td>
<td></td>
</tr>
<tr>
<td>VERONICA V. x hybrida</td>
<td>Blue Bouquet F1</td>
<td>A Kieft-Pro-Seeds product</td>
<td>25,500 S/oz. (900 S/g)</td>
<td>PEL</td>
<td>406-cell or larger</td>
<td>Yes</td>
<td>65-75°F (18-24°C)</td>
<td>6-9</td>
<td>5-6</td>
<td>6-8 plants/ft.² (64-84 plants/m²)</td>
<td></td>
</tr>
</tbody>
</table>

*Find online Grower Facts culture at panamseed.com.
<table>
<thead>
<tr>
<th>Growing on temperature day</th>
<th>Growing on temperature night</th>
<th>Weeks from plug to finish</th>
<th>Key tips</th>
<th>Stem length</th>
<th>Other recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>55-70°F (13-21°C)</td>
<td>50-55°F (10-13°C)</td>
<td>8-18</td>
<td>The flowers have a unique purple and white striped color pattern. The striped pattern varies depending on the growing environment - when grown in warmer greenhouse conditions, the white stripes are more dense and prominent, but when grown under cool outside/tunnel conditions, the purple is more dense and prominent.</td>
<td>39-60 in. (1-1.5 m)</td>
<td>This is a unique novelty stand-alone Group 2 variety. Purple Twist can be produced under short days, moderate light conditions with night temperatures of 50 to 55°F (10 to 13°C) during production. It can be scheduled and grown along with the Maryland series.</td>
</tr>
<tr>
<td>55-70°F (13-21°C)</td>
<td>50-55°F (10-13°C)</td>
<td>8-18</td>
<td>Red Delilah has a unique flower spike with red and white tube flowers.</td>
<td>39-60 in. (1-1.5 m)</td>
<td>This is a unique novelty stand-alone Group 2 variety. Red Delilah can be produced under short days, moderate light conditions with night temperatures of 50-55°F (10-13°C) during production. It can be scheduled and grown along with the Maryland series.</td>
</tr>
<tr>
<td>60-75°F (16-24°C)</td>
<td>45-55°F (7-13°C)</td>
<td>8-19</td>
<td>30-36 in. (75-90 cm)</td>
<td>Versatile snapdragon can be used as both landscape series and as field-grown cut flower. Rocket makes an excellent quality Group 3,4 Spring and Summer-flowering landscape snapdragon.</td>
<td></td>
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<tr>
<td>65-80°F (18-26°C)</td>
<td>55-60°F (13-16°C)</td>
<td>13-16</td>
<td>Bronze, Golden, Pink, Red and Rose Shades will germinate best with light.</td>
<td>24-30 in. (60-75 cm)</td>
<td>Most popular series for both fresh and preserved cut flower production. Stiff stems do not require netting.</td>
</tr>
<tr>
<td>55-60°F (13-16°C)</td>
<td>50-55°F (10-13°C)</td>
<td>18-24 (12-15 with vernalization)</td>
<td>Plants flower more rapidly and uniformly if subjected to a cold treatment of 50-55°F (10-13°C) for 3-8 weeks following germination while still in a 72 or 93-cell plug tray.</td>
<td>30 in. (75 cm)</td>
<td></td>
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<tr>
<td>55-60°F (13-16°C)</td>
<td>50-55°F (10-13°C)</td>
<td>18-24 (12-15 with vernalization)</td>
<td>Trachelium needs 16-hour daylengths for faster flowering.</td>
<td>30-42 in. (75-105 cm)</td>
<td>Should be transplanted Autumn to early Winter for flowering in mid-Winter to early Spring.</td>
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<tr>
<td>65°F (18°C)</td>
<td>55-65°F (13-18°C)</td>
<td>14-16</td>
<td>12 in. (30 cm)</td>
<td>Blooms the first year from sowing.</td>
<td></td>
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</tbody>
</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm), 512-cell (1.25 cm)
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Fantastic Foliage class</th>
<th>Series/Variety</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online*</td>
<td>ALTERNANTHERA</td>
<td>Purple Knight</td>
<td>288-cell or larger</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>A. dentata</td>
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<td></td>
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<tr>
<td>Pg 80</td>
<td>BEGONIA</td>
<td>Gryphon</td>
<td>288-cell or larger</td>
<td>No</td>
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<tr>
<td></td>
<td>B. x hybrida</td>
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<tr>
<td>Online*</td>
<td>BRAZILIAN FIREWORKS</td>
<td>Maracas</td>
<td>288-cell or larger</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Porphyrocoma pohliana</td>
<td></td>
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<tr>
<td>Pg 85</td>
<td>COLEUS</td>
<td>Chocolate Covered Cherry, Chocolate Mint, Chocolate Splash, Dark Chocolate</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
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<tr>
<td></td>
<td>Solenostemon scutellaroides</td>
<td></td>
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<tr>
<td>Pg 86</td>
<td>COLEUS</td>
<td>Kong™ Series</td>
<td>288-cell or larger</td>
<td>Yes</td>
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<tr>
<td></td>
<td>Solenostemon scutellaroides</td>
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</tr>
<tr>
<td>Pg 88</td>
<td>DICHONDRA</td>
<td>Silver Falls</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
</tr>
<tr>
<td></td>
<td>D. argentea</td>
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</tr>
<tr>
<td>Online*</td>
<td>DICHONDRA</td>
<td>Emerald Falls</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
</tr>
<tr>
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<td>D. repens</td>
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<tr>
<td>Online*</td>
<td>HELICHRYSUM</td>
<td>Silver Mist</td>
<td>288-cell or larger</td>
<td>No</td>
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<tr>
<td></td>
<td>H. microphyllum (Plectostachys serpyllifolila)</td>
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<tr>
<td>Pg 94</td>
<td>HIBISCUS</td>
<td>Mahogany Splendor</td>
<td>200-cell or larger</td>
<td>Cover heavily with plug media or vermiculite</td>
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<tr>
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<td>H. acetosella</td>
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<tr>
<td>Online*</td>
<td>IRESINE</td>
<td>Purple Lady</td>
<td>288-cell or larger</td>
<td>Yes</td>
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<tr>
<td></td>
<td>I. herbstti</td>
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<tr>
<td>Pg 97</td>
<td>LEYCESTERIA</td>
<td>Jealousy</td>
<td>288-cell or larger</td>
<td>Cover lightly with vermiculite</td>
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<tr>
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<td>L. formosa</td>
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<tr>
<td>Pg 101</td>
<td>MILLET, ORNAMENTAL</td>
<td>Jester F1, Purple Majesty F1</td>
<td>128-cell or larger</td>
<td>Yes</td>
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<tr>
<td></td>
<td>Pennisetum glaucum</td>
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<tr>
<td>Pg 107</td>
<td>PEPPER, ORNAMENTAL</td>
<td>Black Pearl, Calico F1, Purple Flash</td>
<td>288-cell or larger</td>
<td>Cover lightly</td>
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<tr>
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<td>Capsicum annuum</td>
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<tr>
<td>Pg 121</td>
<td>PLECTRANTHUS</td>
<td>Silver Crest</td>
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<td>No</td>
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<tr>
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<td>P. argentatus</td>
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<td>Pg 121</td>
<td>PLECTRANTHUS</td>
<td>Silver Shield</td>
<td>288-cell or larger</td>
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<td>P. argentatus</td>
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<tr>
<td>Online*</td>
<td>PLECTRANTHUS</td>
<td>Emerald Lace</td>
<td>288-cell or larger</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>P. oertendahlii</td>
<td></td>
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<tr>
<td>Online*</td>
<td>SPILANTHES</td>
<td>Peek-A-Boo</td>
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<td>Acmella oligacea</td>
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<td>Online*</td>
<td>TALINUM</td>
<td>Limón, Verde</td>
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<td>Yes</td>
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<td>T. paniculatum</td>
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**COLORGRASS™**

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<tr>
<th></th>
<th>ANEMANTHELE</th>
<th>Sirocco</th>
<th>288-cell or larger</th>
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<tbody>
<tr>
<td>Pg 76</td>
<td>A. lessoniana</td>
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<tr>
<td>Pg 84</td>
<td>CAREX</td>
<td>Red Rooster</td>
<td>288-cell or larger</td>
<td>No</td>
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<tr>
<td></td>
<td>C. buchananii</td>
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<tr>
<td>Pg 81</td>
<td>CAREX</td>
<td>Amazon Mist</td>
<td>288-cell or larger</td>
<td>Yes</td>
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<td></td>
<td>C. comans (Leatherleaf Sedge)</td>
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<td>Pg 81</td>
<td>CAREX</td>
<td>Bronco</td>
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<td>Pg 83</td>
<td>CAREX</td>
<td>Phoenix Green</td>
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<td>Pg 82</td>
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<td>Coppertop</td>
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<td>C. dixaecea</td>
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<tr>
<td>Pg 82</td>
<td>CAREX</td>
<td>Cinnamon</td>
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<td>C. frigellifera</td>
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<td>CORYNEPHORUS</td>
<td>Spikey Blue</td>
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<td>C. canescens (Clubawn Grass)</td>
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<td>ERAGROSTIS</td>
<td>Wind Dancer</td>
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<td>E. elliottii (Love Grass)</td>
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<td>FESTUCA</td>
<td>Festina</td>
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<td>F. cinerea (F. glauca)</td>
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<td>Germination temperature</td>
<td>Days to germinate</td>
<td>288</td>
<td>128</td>
<td>Plug PGR recommendations</td>
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<tr>
<td>72-76°F (22-24°C)</td>
<td>3-4</td>
<td>5-6</td>
<td>6-7</td>
<td>No need</td>
</tr>
<tr>
<td>72-78°F (22-26°C)</td>
<td>10-12</td>
<td>8-9</td>
<td>9-10</td>
<td>No need</td>
</tr>
<tr>
<td>65-74°F (18-24°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>–</td>
<td>No need</td>
</tr>
<tr>
<td>72-75°F (22-24°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>6-7</td>
<td>No need</td>
</tr>
<tr>
<td>72-75°F (22-24°C)</td>
<td>4-5</td>
<td>5-6</td>
<td>6-7</td>
<td>No need</td>
</tr>
<tr>
<td>72-76°F (22-24°C)</td>
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<td>6-7</td>
<td>–</td>
<td>B-Nine 2,500 ppm at Stage 3 or 4.</td>
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<tr>
<td>72-76°F (22-24°C)</td>
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<td>6-7</td>
<td>–</td>
<td>No need</td>
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<tr>
<td>72-77°F (22-24°C)</td>
<td>4-5</td>
<td>6-7</td>
<td>–</td>
<td>No need</td>
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<tr>
<td>65-74°F (18-23°C)</td>
<td>2-3</td>
<td>2-3</td>
<td>3</td>
<td>If necessary, apply tank mix of B9 2500 ppm and Cycocel 300 ppm at about 5-7 days after sowing.</td>
</tr>
<tr>
<td>72-76°F (22-24°C)</td>
<td>3-4</td>
<td>5-6</td>
<td>6-7</td>
<td>No need</td>
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<tr>
<td>65-68°F (18-20°C)</td>
<td>10-12</td>
<td>7-8</td>
<td>8-9</td>
<td>No need. Seedlings can be pinched/trimmed before shipping/transplanting.</td>
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<tr>
<td>72-78°F (22-25°C)</td>
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<td>–</td>
<td>2-3</td>
<td>No need</td>
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<tr>
<td>72-76°F (22-24°C)</td>
<td>5-7</td>
<td>4-5</td>
<td>–</td>
<td>No need</td>
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<tr>
<td>64-72°F (18-22°C)</td>
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<td>No need</td>
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<tr>
<td>68-75°F (20-24°C)</td>
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<td>B-Nine 2,500 ppm at Stage 3.</td>
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<td>68-74°F (20-24°C)</td>
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<td>72-76°F (22-24°C)</td>
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<td>No need</td>
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<tr>
<td>65-76°F (18-24°C)</td>
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<td>No need</td>
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<td>74-79°F (24-26°C)</td>
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<td>68-79°F (20-26°C)</td>
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<td>No need</td>
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<tr>
<td>74-79°F (24-26°C)</td>
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<td>9-10</td>
<td>No need</td>
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<tr>
<td>74-79°F (24-26°C)</td>
<td>7-10</td>
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<td>No need</td>
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<td>74-79°F (24-26°C)</td>
<td>7-10</td>
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<td>No need</td>
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<tr>
<td>65-68°F (18-20°C)</td>
<td>9-12</td>
<td>6-8</td>
<td>9-10</td>
<td>No need</td>
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<tr>
<td>72-77°F (22-25°C)</td>
<td>8-10</td>
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<td>8-9</td>
<td>No need</td>
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<td>64-68°F (18-20°C)</td>
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<td>No need</td>
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<tr>
<td>71-76°F (21-24°C)</td>
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<td>64-72°F (18-22°C)</td>
<td>3-6</td>
<td>7</td>
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<td>No need</td>
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</table>

**Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm) 630-231-1400 panamseed.com**
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Fantastic Foliage class</th>
<th>Series/Variety</th>
<th>Recommended plug size**</th>
<th>Cover seed</th>
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</thead>
<tbody>
<tr>
<td>Online* Isolepis</td>
<td>Live Wire</td>
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<td>288-cell or larger</td>
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<tr>
<td>Juncus</td>
<td>Starhead</td>
<td>J. cernua</td>
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<tr>
<td>Juncus</td>
<td>Blue Arrows</td>
<td>J. inflexus</td>
<td>288-cell or larger</td>
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</tr>
<tr>
<td>Juncus</td>
<td>Javelin</td>
<td>J. pallidus</td>
<td>288-cell or larger</td>
<td>No</td>
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<td>Juncus</td>
<td>Blue Dart</td>
<td>J. tenuis</td>
<td>288-cell or larger</td>
<td>No</td>
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<tr>
<td>Online* Koeleria</td>
<td>Coolio</td>
<td>K. glauca</td>
<td>288-cell or larger</td>
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</tr>
<tr>
<td>Luzula</td>
<td>Lucius</td>
<td>L. nivea</td>
<td>288-cell</td>
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<td>Luzula</td>
<td>Starmaker</td>
<td>L. sylvatica</td>
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<td>No</td>
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<tr>
<td>Milium</td>
<td>Flashlights</td>
<td>M. effusum aureum</td>
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<td>Online* Stipa</td>
<td>Pony Tails</td>
<td>S. tenuissima</td>
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<td>Germination temperature</td>
<td>Days to germinate</td>
<td>288</td>
<td>128</td>
<td>Plugs PGR recommendations</td>
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<tr>
<td>64-68(^\circ)F (18-20(^\circ)C)</td>
<td>6</td>
<td>5</td>
<td>6</td>
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<tr>
<td>64-72(^\circ)F (18-22(^\circ)C)</td>
<td>7-10</td>
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<tr>
<td>71-76(^\circ)F (21-24(^\circ)C)</td>
<td>7-8</td>
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<td>71-76(^\circ)F (21-24(^\circ)C)</td>
<td>5-6</td>
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<td>7-8</td>
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<td>71-76(^\circ)F (21-24(^\circ)C)</td>
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<td>7-8</td>
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<td>65-74(^\circ)F (18-23(^\circ)C)</td>
<td>4-5</td>
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<tr>
<td>64-68(^\circ)F (18-20(^\circ)C)</td>
<td>10-12</td>
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<td>No need</td>
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<tr>
<td>64-68(^\circ)F (18-20(^\circ)C)</td>
<td>10-12</td>
<td>4-7</td>
<td>–</td>
<td>No need</td>
</tr>
<tr>
<td>65-68(^\circ)F (18-20(^\circ)C)</td>
<td>10-12</td>
<td>5-6</td>
<td>6-7</td>
<td>No need</td>
</tr>
<tr>
<td>65-76(^\circ)F (18-24(^\circ)C)</td>
<td>4-5</td>
<td>4-5</td>
<td>5-6</td>
<td>No need</td>
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<tr>
<td>Grower Facts</td>
<td>Class</td>
<td>Series/ Variety</td>
<td>Hardiness Zone</td>
<td>First Year Flower</td>
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<td>---------------</td>
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<tr>
<td>AGASTACHE</td>
<td>Pink Pop</td>
<td>A. astro-montana</td>
<td>7-10</td>
<td>✓</td>
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<tr>
<td>ALCHEMILLA</td>
<td>Alma</td>
<td>A. erythro-poda</td>
<td>3-8</td>
<td>☐</td>
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<tr>
<td>ALYSSUM</td>
<td>Luna</td>
<td>A. montanum</td>
<td>4-8</td>
<td>✓</td>
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<tr>
<td>AQUILEGIA</td>
<td>Clementine</td>
<td>A. vul-garis</td>
<td>3-8</td>
<td>☐</td>
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<tr>
<td>AQUILEGIA</td>
<td>Songbird F1 Series</td>
<td>A. x caerulea</td>
<td>3-9</td>
<td>✓</td>
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<tr>
<td>AQUILEGIA</td>
<td>Swan F1 Series</td>
<td>A. x caerulea</td>
<td>3-9</td>
<td>✓</td>
</tr>
</tbody>
</table>

*Find online Grower Facts culture at panamseed.com  **Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm)
<table>
<thead>
<tr>
<th>Vernalization</th>
<th>Recommended containers (ppp / plug/pot)</th>
<th>Growing on temps. (Day; Night)</th>
<th>Media pH/EC</th>
<th>PGR ppm</th>
<th>Photoperiod response</th>
<th>Annual crop weeks to flower from transplant with recommendations</th>
<th>Overwinter crop weeks to flower from transplant with recommendations</th>
<th>Tips, diseases &amp; recommendations</th>
<th>Mature height &amp; spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>4-5 in. (10-13 cm), 1 Gallon, 1-3 ppp</td>
<td>63-68°F (18-20°C) Day; 60-65°F (16-18°C) Night</td>
<td>5.8-6.2 / 1.2-1.4</td>
<td>B-Nine 2000</td>
<td>Long day beneficial</td>
<td>7-10; Sow: March-May; Finish: May-August</td>
<td>–</td>
<td>Growing at day temp below 65°F (18°C) will significantly delay crop time; Botrytis, powdery mildew and Sclerotinia</td>
<td>10-12 in. (25-30 cm) height; 8-10 in. (20-25 cm) spread</td>
<td>✓</td>
<td></td>
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<tr>
<td>Yes; duration of 10 weeks; max 40°F (4°C)</td>
<td>4-5 in. (10-13 cm), 1 Gallon, 1-3 ppp</td>
<td>57-62°F (14-17°C) Day; 50-55°F (10-13°C) Night</td>
<td>5.8-6.5 / 1.0-1.2</td>
<td>None</td>
<td>–</td>
<td>32-38; Sow: June-July; Finish: April-June</td>
<td>No fertilizer in winter; restart after visible growth; prevent Mg and Fe deficiency; aphids</td>
<td>6-8 in. (15-20 cm) height; 12-14 in. (30-36 cm) spread</td>
<td>✓</td>
<td></td>
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<tr>
<td>No</td>
<td>4-5 in. (10-13 cm)</td>
<td>54-65°F (12-18°C) Day; 50-54°F (10-12°C) Night</td>
<td>5.5-6.4 / 1.1-1.3</td>
<td>B-Nine 2500</td>
<td>Day neutral</td>
<td>10-12; Sow: February-May; Finish: May-July</td>
<td>32-38; Sow: July-August; Finish: April-May</td>
<td>Warmth gives stretch; downy mildew, aphids and flea beetles; grow relatively low RH</td>
<td>4-6 in. (10-15 cm) height; 8-12 in. (20-30 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Yes; duration of 10-12 weeks; juvenility min. 10 true leaves</td>
<td>Gallon (17 cm), 1 ppp</td>
<td>65°F (18°C) Day; 50-54°F (10-12°C) Night</td>
<td>5.8-6.4 / 1.0-2.0</td>
<td>B-Nine/Alar 1250 2500</td>
<td>Day neutral</td>
<td>–</td>
<td>36-40; Sow: June-July; Finish: April-May</td>
<td>Keep RH opt 65%; powdery mildew, Sclerotinia, aphids, leaf miner, sciara and spidermites; outside crops can be forced indoors at 54-59°F (12-15°C)</td>
<td>14-16 in. (35-40 cm) height; 12-14 in. (30-36 cm) spread</td>
<td>✓</td>
<td></td>
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<tr>
<td>Yes; duration of 8-10 weeks; juvenility min. 10 true leaves</td>
<td>5 in. (13 cm), 1 ppp; 1 Gallon, 1 ppp</td>
<td>60-72°F (16-22°C) Day; 50-59°F (10-15°C) Night</td>
<td>5.8-6.4 / 1.0-2.0</td>
<td>Optional; B-Nine 2500 ppm</td>
<td>Day neutral</td>
<td>–</td>
<td>36-40; Sow: June-July; Finish: April-May</td>
<td>Keep RH opt 65%; powdery mildew, Sclerotinia, aphids, leaf miner, sciara and spidermites; outside crops can be forced indoors at 54-59°F (12-15°C)</td>
<td>12-14 in. (30-36 cm) height; 12-14 in. (30-36 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Yes, but vernalization temperature can go as high as 55°F (13°C) at night and 60°F (15°C) at day; duration of 4 weeks at 41°F (5°C) or 6 weeks at 55°F (13°C); start cool treatment after 12-15 leaf stage</td>
<td>6 in. (15 cm)</td>
<td>60-68°F (16-20°C) Day; 55-64°F (13-18°C) Night</td>
<td>5.8-6.4 / 1.0-2.0</td>
<td>Tank mix of B-Nine 2500 ppm and A-Rest 10 ppm spray</td>
<td>Long day without vernalization; day neutral after vernalization</td>
<td>22-28; Sow: mid September-late October; Finish: late April-mid May</td>
<td>Requires night temperatures below 55°F (13°C) to initiate flower buds; see Grower Facts for details</td>
<td>11-18 in. (28-45 cm) height; 10-14 in. (25-35 cm) spread</td>
<td>✓</td>
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<tr>
<td>Yes, but vernalization temperature can go as high as 55°F (13°C) at night and 60°F (15°C) at day; duration of 4 weeks at 41°F (5°C) or 6 weeks at 55°F (13°C); start cool treatment after 12-15 leaf stage</td>
<td>6 in. (15 cm)</td>
<td>60-68°F (16-20°C) Day; 55-64°F (13-18°C) Night</td>
<td>5.8-6.4 / 1.0-2.0</td>
<td>Tank mix of B-Nine 2500 ppm and A-Rest 10 ppm spray</td>
<td>Long day without vernalization; day neutral after vernalization</td>
<td>22-28; Sow: mid September-late October; Finish: late April-mid May</td>
<td>Requires night temperatures below 55°F (13°C) to initiate flower buds; see Grower Facts for details</td>
<td>20-24 in. (51-61 cm) height; 12-14 in. (30-36 cm) spread</td>
<td>✓</td>
<td></td>
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</tr>
</tbody>
</table>

*Crop time and scheduling info is based on Northern climate.

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<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/ Variety</th>
<th>Hardiness Zone</th>
<th>First year flower</th>
<th>Exposure</th>
<th>Seed info</th>
<th>Recommended plug size**</th>
<th>Seeds/ cell</th>
<th>Cover seed</th>
<th>Germination conditions</th>
<th>Days to germination</th>
<th>Stage 2-3 temp</th>
<th>Plug PGs</th>
<th>Plug crop wks</th>
<th>Plug crop size</th>
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<tbody>
<tr>
<td><strong>Vernalization</strong></td>
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<td>288-cell</td>
<td>4</td>
<td>No</td>
<td>65-68°F (16-18°C)</td>
<td>3-5</td>
<td>60-65°F (16-18°C)</td>
<td>None</td>
<td>6-8</td>
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<td></td>
<td>288-cell</td>
<td>4</td>
<td>Yes, lightly</td>
<td>60-65°F (16-18°C)</td>
<td>8-10</td>
<td>60-65°F (16-18°C)</td>
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<td>5-6</td>
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<td></td>
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<td></td>
<td>288-cell</td>
<td>2-4</td>
<td>No</td>
<td>65-68°F (16-18°C)</td>
<td>3-5</td>
<td>60-65°F (16-18°C)</td>
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<td>6-7</td>
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<td>406-cell or larger</td>
<td>4</td>
<td>Yes</td>
<td>65-72°F (18-22°C)</td>
<td>3-5</td>
<td>65-68°F (18-20°C)</td>
<td>B-Nine 2000</td>
<td>6-8</td>
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<td>288-cell</td>
<td>4</td>
<td>No</td>
<td>68-72°F (20-22°C); light optional</td>
<td>3-5</td>
<td>65-68°F (18-20°C)</td>
<td>B-Nine 2000</td>
<td>6-8</td>
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<td></td>
<td></td>
<td></td>
<td>288-cell</td>
<td>4</td>
<td>Yes</td>
<td>65-68°F (18-20°C); light not required</td>
<td>3-5</td>
<td>60-65°F (16-18°C)</td>
<td>B-Nine 2000</td>
<td>6-8</td>
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<td>288-cell</td>
<td>4</td>
<td>No</td>
<td>65-68°F (18-20°C); light optional</td>
<td>3-5</td>
<td>60-65°F (16-18°C)</td>
<td>B-Nine 2000</td>
<td>6-8</td>
<td></td>
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<td>288-cell</td>
<td>4</td>
<td>No</td>
<td>65-68°F (18-20°C); light not required</td>
<td>3-5</td>
<td>60-65°F (16-18°C)</td>
<td>B-Nine 2000</td>
<td>6-8</td>
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<td>288-cell</td>
<td>2-3</td>
<td>Yes</td>
<td>65-68°F (18-20°C); light not required</td>
<td>3-5</td>
<td>60-65°F (16-18°C)</td>
<td>B-Nine 2000</td>
<td>6-8</td>
<td></td>
</tr>
</tbody>
</table>

*Find online Grower Facts culture at panamseed.com **Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm)

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<table>
<thead>
<tr>
<th>Variety</th>
<th>Recommended containers</th>
<th>Growing on temps.</th>
<th>Media pH/EC</th>
<th>PGR ppm</th>
<th>Photoperiod response</th>
<th>Annual crop weeks to flower from transplant with recommendations</th>
<th>Overwinter crop weeks to flower from transplant with recommendations</th>
<th>Tips, diseases &amp; recommendations</th>
<th>Mature height &amp; spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes; duration of 8-10 weeks</td>
<td>3.5-5 in. (9-13 cm), 1 Gallon, 1-3 pps</td>
<td>60-65°F (16-18°C) Day; 50-54°F (10-12°C) Night</td>
<td>5.8-6.5 / 10-1.2</td>
<td>None</td>
<td>Long day beneficial</td>
<td>30-36; Sow: June-August; Finish: April-May</td>
<td>Well-drained soil; dislikes winter wet; moderate fertilization; Botrytis, Pythium, downy mildew, Rhizoctonia and aphids</td>
<td>4-6 in. (10-15 cm) height; 4-6 in. (10-15 cm) spread</td>
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<tr>
<td>Yes; duration of 8-10 weeks</td>
<td>5 in. (13 cm), 1 Gallon, 1-3 pps</td>
<td>60-65°F (16-18°C) Day; 50-54°F (10-12°C) Night</td>
<td>5.8-6.5 / 10-1.2</td>
<td>None</td>
<td>Long day beneficial</td>
<td>30-36; Sow: June-August; Finish: April-May</td>
<td>Well-drained soil; dislikes winter wet; moderate fertilization; Botrytis, Pythium, downy mildew, Rhizoctonia and aphids</td>
<td>4-6 in. (10-15 cm) height; 4-6 in. (10-15 cm) spread</td>
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<tr>
<td>No</td>
<td>4-5 in. (10-13 cm), 1 Gallon, 1-3 pps</td>
<td>60-65°F (16-18°C) Day; 50-54°F (10-12°C) Night</td>
<td>5.8-6.5 / 10-1.2</td>
<td>None</td>
<td>Day neutral</td>
<td>12-15; Sow: February-May; Finish: May-September</td>
<td>Prevent Mg and Fe deficiency; Red spider mites and aphids; good centerpiece in combos</td>
<td>8-10 in. (20-25 cm) height; 8-10 in. (20-25 cm) spread</td>
<td></td>
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<tr>
<td>Yes; duration of 8-10 weeks</td>
<td>5 in. (13 cm)</td>
<td>60-65°F (16-18°C) Day; 50-54°F (10-12°C) Night</td>
<td>5.8-6.5 / 10-1.2</td>
<td>None</td>
<td>Long day beneficial</td>
<td>32-36; Sow: June-August; Finish: late April-May</td>
<td>Low to moderate feeder, prevent Mg and Fe deficiency; aphids and flea beetles; spray field with weed killer, after this crop has finished</td>
<td>5-6 in. (13-15 cm) height; 6-8 in. (15-20 cm) spread</td>
<td></td>
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<tr>
<td>No</td>
<td>Pack, 306 (9 cm), 5 in. (13 cm) 3 pps</td>
<td>60-65°F (16-18°C) Day; 40-45°F (5-7°C) Night</td>
<td>5.8-6.2 / 12-1.4</td>
<td>None</td>
<td>Day neutral</td>
<td>6-10 (U.S. Autumn/Spring) 13-15 Spring/7-9 Autumn North Europe</td>
<td>Use a medium covering of coarse-grade vermiculite to improve seedling uniformity. Grow as cool as possible but avoid freezing temperatures. For forcing the crop when grown at these temperatures, grow at 55-58°F (10-12°C) for 4 weeks before sale.</td>
<td>6-10 in. (15-25 cm) height; 5-8 in. (13-20 cm) spread</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4-5 in. (10-13 cm)</td>
<td>60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night</td>
<td>5.8-6.5 / 12-1.4</td>
<td>B-Nine 2000 ppm A-Rest 1-2 ppm</td>
<td>Long day required</td>
<td>11-14 (LD); Sow: February-May; Finish: May-July</td>
<td>Prevent Mg and Fe deficiency; Botrytis, Rhizoctonia, Pythium, slugs, snail and aphids; use well-drained medium with coarse parts or bark</td>
<td>6-8 in. (15-20 cm) height; 8-10 in. (20-25 cm) spread</td>
<td></td>
<td></td>
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<tr>
<td>No</td>
<td>Gallon (17 cm), 1-3 pps</td>
<td>65-68°F (18-20°C) Day; 58-60°F (14-16°C) Night</td>
<td>5.8-6.5 / 12-1.4</td>
<td>A-Rest 1-2 ppm</td>
<td>Long day beneficial</td>
<td>12-15; Sow: February-May; Finish: May-September</td>
<td>Well-drained soil; dislikes winter wet; moderate fertilization; downy mildew, aphids</td>
<td>6-10 in. (15-25 cm) height; 5-8 in. (13-20 cm) spread</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>No</td>
<td>3.5-5 in. (9-13 cm)</td>
<td>65-68°F (18-20°C) Day; 54-60°F (12-16°C) Night</td>
<td>5.8-6.5 / 10-1.2</td>
<td>B-Nine 2000</td>
<td>Long day beneficial</td>
<td>10-16; Sow: February-May; Finish: May-August</td>
<td>Grow relatively dry; needs well drained medium; Botrytis, slugs and snails; nice perennial combo edging</td>
<td>6-7 in. (15-18 cm) height; 6-10 in. (15-25 in.) spread</td>
<td></td>
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</tr>
<tr>
<td>No</td>
<td>5 in. (13 cm), 1 Gallon, 1-3 pps; 2 Gallon, 3-5 pps</td>
<td>65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night</td>
<td>5.8-6.5 / 10-1.2</td>
<td>B-Nine 2500</td>
<td>Long day beneficial</td>
<td>10-12; Sow: January-May; Finish: mid-late August</td>
<td>Relatively high feed; do not use Vertimec (abamectine) to avoid leaf damage; let topsoil dry in between waterings; Botrytis, powdery mildew, white rust, aphids, leaf miners and spidermites; use long day 16 hrs 2-3 wks after transplant to initiate early potting in short day conditions</td>
<td>10-14 in. (25-36 cm) height; 12-16 in. (30-41 cm) spread</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Crop time and scheduling info is based on Northern climate.
630 231-1400  kieft-pro-seeds.com
<table>
<thead>
<tr>
<th>Grower</th>
<th>Class</th>
<th>Series/ Variety</th>
<th>Hardiness Zone</th>
<th>First Year Flower</th>
<th>Exposure</th>
<th>Seed Info</th>
<th>Recomm. plug size**</th>
<th>Seeds/Cell</th>
<th>Cover Seed</th>
<th>Germination Conditions</th>
<th>Days to Germination</th>
<th>Stage 2-3 Temp.</th>
<th>Plug PGHs</th>
<th>Plug crop weeks</th>
<th>Plug tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>Online*</td>
<td>COREOPSIS</td>
<td>Early Sunrise</td>
<td>4-9</td>
<td>✓</td>
<td></td>
<td>10,700 S/oz. (375 S/g) SED</td>
<td>392-cell or larger</td>
<td>1</td>
<td>Cover lightly</td>
<td>68-72°F (20-22°C); light required</td>
<td>4-6</td>
<td>70-75°F (21-24°C) days; 60-65°F (16-18°C) nights</td>
<td>None</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>COREOPSIS</td>
<td>Rising Sun</td>
<td>4-9</td>
<td>✓</td>
<td></td>
<td>10,700 S/oz. (375 S/g) SED</td>
<td>392-cell or larger</td>
<td>1</td>
<td>Cover lightly</td>
<td>68-72°F (20-22°C); light required</td>
<td>4-6</td>
<td>70-75°F (21-24°C) days; 60-65°F (16-18°C) nights</td>
<td>None</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>COREOPSIS</td>
<td>Sunfire</td>
<td>4-9</td>
<td>✓</td>
<td></td>
<td>10,700 S/oz. (375 S/g) SED</td>
<td>392-cell or larger</td>
<td>1</td>
<td>Cover lightly</td>
<td>68-72°F (20-22°C); light required</td>
<td>4-6</td>
<td>70-75°F (21-24°C) days; 60-65°F (16-18°C) nights</td>
<td>None</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>DELPHINIUM</td>
<td>D. nudicaule</td>
<td>Red Cap</td>
<td>6-9</td>
<td>✓</td>
<td></td>
<td>20,000-23,000 S/oz. (700-800 S/g) SED</td>
<td>288-cell</td>
<td>3-4</td>
<td>Yes</td>
<td>68-72°F (20-22°C), light optional</td>
<td>7-10</td>
<td>65-68°F (18-20°C)</td>
<td>6-8</td>
<td>Spray damp-off fungicide</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>DELPHINIUM</td>
<td>Guardian F1 Series</td>
<td>4-7</td>
<td>✓</td>
<td></td>
<td>9,285 S/oz. (325 S/g) SED</td>
<td>200-cell</td>
<td>1</td>
<td>Yes</td>
<td>68-70°F (20-21°C); light optional</td>
<td>7-8</td>
<td>68-72°F (20-22°C)</td>
<td>None</td>
<td>6-7</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>DELPHINIUM</td>
<td>Dasante Blue F1</td>
<td>4-7</td>
<td>✓</td>
<td></td>
<td>14,000-21,250 S/oz. (500-750 S/g) SED</td>
<td>200-cell</td>
<td>1</td>
<td>Yes</td>
<td>68-70°F (20-21°C); light optional</td>
<td>7-8</td>
<td>68-72°F (20-22°C)</td>
<td>None</td>
<td>6-7</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>DELPHINIUM</td>
<td>Diamonds F1 Series</td>
<td>4-7</td>
<td>✓</td>
<td></td>
<td>17,000-24,100 S/oz. (600-850 S/g) SED</td>
<td>200-cell</td>
<td>1</td>
<td>Yes</td>
<td>68-70°F (20-21°C); light optional</td>
<td>7-8</td>
<td>68-72°F (20-22°C)</td>
<td>None</td>
<td>6-7</td>
<td></td>
</tr>
<tr>
<td>DIANTHUS</td>
<td>D. deltoides</td>
<td>Shrimp, Arctic Fire</td>
<td>4-7</td>
<td>✓</td>
<td></td>
<td>100,000-129,000 S/oz. (3,500-4,500 S/g) SED</td>
<td>288-cell</td>
<td>4</td>
<td>Yes, lightly vermiculite</td>
<td>65-68°F (18-20°C), light required</td>
<td>5-7</td>
<td>60-65°F (16-18°C)</td>
<td>6-8</td>
<td>Spray damp-off fungicide</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>DIANTHUS</td>
<td>Bouquet F1 Series</td>
<td>4-9</td>
<td>✓</td>
<td></td>
<td>8,575 S/oz. (300 S/g) PEL</td>
<td>406-cell or larger</td>
<td>1</td>
<td>Yes</td>
<td>64-68°F (18-20°C); light required</td>
<td>3-5</td>
<td>60-65°F (16-18°C)</td>
<td>Bonzi</td>
<td>6 ppm spray</td>
<td></td>
</tr>
<tr>
<td>Online*</td>
<td>DIANTHUS</td>
<td>Dynasty F1 Series</td>
<td>6-8</td>
<td>✓</td>
<td></td>
<td>7,085-8,500 S/oz. (250-300 S/g) PEL</td>
<td>406-cell or larger</td>
<td>1</td>
<td>Yes</td>
<td>64-68°F (18-20°C); light required</td>
<td>3-5</td>
<td>60-65°F (16-18°C)</td>
<td>Bonzi</td>
<td>6 ppm spray</td>
<td></td>
</tr>
</tbody>
</table>

*Find online Grower Facts culture at panamseed.com  **Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm)
<table>
<thead>
<tr>
<th>Variety</th>
<th>Recommended containers (ppp / plug/pot)</th>
<th>Growing on temps.</th>
<th>Media pH/EC</th>
<th>PGR ppm</th>
<th>Photoperiod response</th>
<th>Annual crop weeks to flower from transplant with recommendations</th>
<th>Overwinter crop weeks to flower from transplant recommendations</th>
<th>Tips, diseases &amp; recommendations</th>
<th>Mature height &amp; spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4 in. (10 cm), 1 pp; Gallon (17 cm), 1-3 ppp</td>
<td>60-70°F (16-21°C) Day; 55-60°F (13-16°C) Night</td>
<td>5.8-6.2 / 1.5-2.0</td>
<td>None</td>
<td>Obligate long day min. 14 hours</td>
<td>9-12; Finish: late May-early June</td>
<td>-</td>
<td>Whitelflies, thrips, aphids and powdery mildew</td>
<td>24 in. (60 cm) height; 22-24 in. (55-60 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 in. (10 cm), 1 pp; Gallon (17 cm), 1-3 ppp</td>
<td>60-70°F (16-21°C) Day; 55-60°F (13-16°C) Night</td>
<td>5.8-6.2 / 1.5-2.0</td>
<td>None</td>
<td>Long day required</td>
<td>8-10: Finish: mid-late May</td>
<td>-</td>
<td>Whitelflies, thrips and aphids</td>
<td>18-30 in. (45-75 cm) height; 24-26 in. (60-65 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 in. (15 cm) and larger, 1-3 ppp; Gallon (15-18 cm)</td>
<td>65-70°F (18-21°C) Day; 60°F (16°C) Night</td>
<td>5.8-6.2 / 1.5</td>
<td>Bonzi 20 ppm sp</td>
<td>Day neutral</td>
<td>16; Finish: mid May-June</td>
<td>-</td>
<td>See also Cut Flower section for more details (pg 48)</td>
<td>30-39 in. (75-100 cm) height; 10-12 in. (25-30 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gallon (15-18 cm), 1-2 ppp; 2 Gallon (20 cm), 3 ppp</td>
<td>65-70°F (18-21°C) Day; 55-63°F (13-17°C) Night</td>
<td>5.8-6.0 / 1.5-2.0</td>
<td>Bonzi 20 ppm sp</td>
<td>Day neutral</td>
<td>17-18; Finish: mid May-June</td>
<td>-</td>
<td>Ship this crop when bottom one-third of the florets on the first flower spike are open to reduce risk of flower shattering during shipping</td>
<td>28-34 in. (70-85 cm) height; 12-14 in. (30-35 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gallon (15-18 cm), 1-3 ppp; 2 Gallon (20 cm), 3 ppp</td>
<td>65-70°F (18-21°C) Day; 55-63°F (13-17°C) Night</td>
<td>5.8-6.0 / 1.5-2.0</td>
<td>Bonzi 20 ppm sp</td>
<td>Day neutral</td>
<td>14-15; Finish: late May-June</td>
<td>-</td>
<td>-</td>
<td>16-24 in. (40-60 cm) height; 10-12 in. (25-30 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4-5 in. (10-13 cm), 1 pp; Gallon (17 cm), 1-3 ppp</td>
<td>60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night</td>
<td>5.8-6.5 / 1.2-1.4</td>
<td>B-Nine 3000</td>
<td>Day neutral</td>
<td>12-14; Sow: February-May; Finish: May-July</td>
<td>-</td>
<td>Needs moderate fertilization; well-drained medium; let pot soil dry in between waterings; NO WET; prevent Mg and Fe deficiency; powdery mildew, leafspot, slugs, snails and leaf miners</td>
<td>8-12 in. (20-30 cm) height; 8-10 in. (20-25 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 in. (15 cm); Gallon (15-18 cm), 1-3 ppp</td>
<td>60-72°F (16-22°C) Day; 50-60°F (10-16°C) Night</td>
<td>5.8-6.2 / 1.5-2.0</td>
<td>1-2x Bonzi 20 ppm sp</td>
<td>Day neutral</td>
<td>8-9</td>
<td>-</td>
<td>Responsive to PGRs; PGRs are needed to produce as a bedding plant; see Grower Facts for recommendations and Cut Flower section for more details (pg 48)</td>
<td>18-30 in. (45-75 cm) height; 10-12 in. (25-30 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4 in. (10 cm); 6 in. (15 cm)</td>
<td>60-72°F (16-22°C) Day; 50-60°F (10-16°C) Night</td>
<td>5.8-6.2 / 1.5-2.0</td>
<td>2-3x Bonzi 20 ppm sp</td>
<td>Long day beneficial</td>
<td>8-9</td>
<td>-</td>
<td>-</td>
<td>16-20 in. (40-50 cm) height; 10 in. (25 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Grower Class</td>
<td>Series/ Variety</td>
<td>Hardiness Zone</td>
<td>First Year Flower</td>
<td>Exposure</td>
<td>Recommen-dended plug size**</td>
<td>Seeds/ cell</td>
<td>Cover seed</td>
<td>Germination conditions</td>
<td>Days to germination</td>
<td>Stage 2-3 temp.</td>
<td>Plug PGRs</td>
</tr>
<tr>
<td>--------------</td>
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</tr>
<tr>
<td>DIGITALIS D. grandiflora</td>
<td>Carillon</td>
<td>4-7</td>
<td>✓</td>
<td>157,000-186,000 S/oz. (5,500-6,500 S/g)</td>
<td>288-cell</td>
<td>4</td>
<td>No</td>
<td>65-68°F (18-20°C); light optional</td>
<td>5-6</td>
<td>60-65°F (16-18°C)</td>
<td>6-8</td>
</tr>
<tr>
<td>DIGITALIS D. purp</td>
<td>Dalmation Series</td>
<td>5-9</td>
<td>✓</td>
<td>23,000-29,000 S/oz. (800-1,000 S/g)</td>
<td>288-cell for 5-in. (13-cm); 84-cell for Gallon</td>
<td>4/288</td>
<td>4/84</td>
<td>5-6</td>
<td>65-68°F (18-20°C); light optional</td>
<td>5-6</td>
<td>65-68°F (18-20°C)</td>
</tr>
<tr>
<td>DIGITALIS D. x mertonensis</td>
<td>Summer King</td>
<td>4-7</td>
<td>✓</td>
<td>114,000-129,000 S/oz. (4,000-4,500 S/g)</td>
<td>288-cell</td>
<td>4</td>
<td>No</td>
<td>65-68°F (18-20°C); light optional</td>
<td>5-6</td>
<td>65-68°F (18-20°C)</td>
<td>6-8</td>
</tr>
<tr>
<td>ECHINACEA E. purpurea (Coneflower)</td>
<td>'Cheyenne Spirit,' PowWow™ Series</td>
<td>4-10</td>
<td>✓</td>
<td>7,400-7,600 S/oz. (260-270 S/g)</td>
<td>288-cell or larger</td>
<td>1</td>
<td>Yes</td>
<td>71-76°F (22-24°C); light optional</td>
<td>4-10</td>
<td>71-73°F (22-23°C)</td>
<td>Stage 2; 68-70°F (20-21°C) Stage 3</td>
</tr>
<tr>
<td>ERIGERON E. karvinskianus</td>
<td>Stallone</td>
<td>6-9</td>
<td>✓</td>
<td>286,000-343,000 S/oz. (10,000-12,000 S/g)</td>
<td>288-cell</td>
<td>4</td>
<td>No</td>
<td>61-64°F (16-18°C); light not required</td>
<td>7-10</td>
<td>61-64°F (16-18°C)</td>
<td>7-9</td>
</tr>
<tr>
<td>ERYSIMUM E. perovskianum</td>
<td>Goldrush</td>
<td>6-9</td>
<td>✓</td>
<td>14,000-17,000 S/oz. (500-600 S/g)</td>
<td>288-cell</td>
<td>4</td>
<td>Yes</td>
<td>65-68°F (18-20°C); light not required</td>
<td>5-7</td>
<td>65-65°F (16-18°C)</td>
<td>6-7</td>
</tr>
<tr>
<td>GAILLARDIA G. x aristata</td>
<td>Mesa Series</td>
<td>5-10</td>
<td>✓</td>
<td>7,080 S/oz. (250 S/g)</td>
<td>288-cell or larger</td>
<td>1</td>
<td>Yes</td>
<td>68-74°F (20-23°C); light optional</td>
<td>4-5</td>
<td>65-68°F (18-20°C)</td>
<td>None</td>
</tr>
<tr>
<td>GYPSOPHILA G. cerastoides</td>
<td>Pixie Splash</td>
<td>4-7</td>
<td>✓</td>
<td>60,000-69,000 S/oz. (2,100-2,400 S/g)</td>
<td>288-cell</td>
<td>4</td>
<td>No</td>
<td>60-65°F (16-18°C); light required</td>
<td>3-4</td>
<td>60-65°F (16-18°C)</td>
<td>5-6</td>
</tr>
</tbody>
</table>

*Find online Grower Facts culture at panamseed.com **Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm)
<table>
<thead>
<tr>
<th>Vernalization</th>
<th>Container size</th>
<th>Growing on temps.</th>
<th>Media pH/EC</th>
<th>PGR ppm</th>
<th>Photoperiod response</th>
<th>Annual crop weeks to flower from transplant with recommendations</th>
<th>Overwinter crop weeks to flower from transplant with recommendations</th>
<th>Tips, diseases &amp; recommendations</th>
<th>Mature height &amp; spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>Gallon, 1 ppp; 2 Gallon, 1-3 ppp</td>
<td>60°F-65°F (16-18°C) Day; 50°F-54°F (10-12°C) Night</td>
<td>5.8-6.2 / start</td>
<td>1.0-1.2 to 1.3-1.5</td>
<td>B-Nine 2500; Bonzi 5-10 ppm; Tilt 0.03% (0.3 cc/liter)</td>
<td>Long day beneficial</td>
<td>10-14; Sow: March-May; Finish: May-July</td>
<td>36-40; Sow: June-July; Finish: mid May-June</td>
<td>14-16 in. (35-40 cm) height; 12-14 in. (30-36 cm) spread</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Gallon, 1 ppp; 2 Gallon, 1-3 ppp</td>
<td>60°F-65°F (16-18°C) Day; 50°F-54°F (10-12°C) Night</td>
<td>5.8-6.2 / start</td>
<td>1.0-1.2 to 1.3-1.5</td>
<td>Sumagic 5 ppm; B-Nine 2500; Bonzi 5-10 ppm; Tilt 0.03% (0.3 cc/liter)</td>
<td>Long day beneficial</td>
<td>11-14; Sow: February-March; Finish: late May-July</td>
<td>–</td>
<td>16-20 in. (40-50 cm) height; 12-14 in. (30-36 cm) spread</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Gallon, 1 ppp; 2 Gallon, 1-3 ppp</td>
<td>60°F-65°F (16-18°C) Day; 50°F-54°F (10-12°C) Night</td>
<td>5.8-6.2 / start</td>
<td>1.0-1.2 to 1.3-1.5</td>
<td>B-Nine 2500; Bonzi 5-10 ppm; Tilt 0.03% (0.3 cc/liter)</td>
<td>Long day beneficial</td>
<td>–</td>
<td>40-44; Sow: June-July; Finish: May-June</td>
<td>14-16 in. (35-40 cm) height; 12-14 in. (30-36 cm) spread</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No, but beneficial; flowering will occur 2-3 weeks earlier after vernalization</td>
<td>Quart or 5 in. (13 cm); Gallon (17 cm)</td>
<td>60°F-75°F (16-24°C) Day; 50°F-60°F (10-16°C) Night</td>
<td>6.0-6.5 / 1.5-2.0</td>
<td>Tank mix of B-Nine 2500 ppm and CCC 750-1000 ppm</td>
<td>Intermediate day</td>
<td>13-17; Sow: early January; Finish: mid-late May</td>
<td>30-40; Sow: July-early September; Finish: late May-early June</td>
<td>Keep soil media dry during overwinter period and bare media is recommended; aphid, fungus gnat and powdery mildew; plants from overwinter production will flower slightly early, have better branching and shorter flower stems</td>
<td>20 in. (50-50 cm) first year height; 22-24 in. (56-61 cm) second year height; 12-16 in. (30-40 cm) spread</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4-5 in. (10-13 cm), 1 ppp; 2 Gallon, 1-3 ppp</td>
<td>60°F-65°F (16-18°C) Day; 54°F-60°F (12-16°C) Night</td>
<td>5.8-6.5 / 1.1-1.3</td>
<td>Cycocel 2000</td>
<td>Long day required min. 13 hours</td>
<td>10-14 (LD); Finish: May-July</td>
<td>36-40; Finish: May-July</td>
<td>Grow relatively dry; needs low RH and high light for compact growth; prevent MG and Fe deficiency; powdery mildew and slugs; nice perennial combo edging</td>
<td>6-8 in. (15-20 cm) height; 12-14 in. (30-36 cm) spread</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>5 in. (13 cm), 1 ppp; 1 Gallon 1-3 ppp</td>
<td>65°F-68°F (18-20°C) Day; 54°F-60°F (12-16°C) Night</td>
<td>5.5-6.5 / 1.2-1.4</td>
<td>–</td>
<td>10-14; Sow: February-April; Finish: April-June</td>
<td>–</td>
<td>–</td>
<td>Treat preventively against Botrytis; grow relatively dry and keep dry in between waterings; Botrytis, true &amp; downy mildew and leafspot</td>
<td>10-14 in. (25-36 cm) height; 8-12 in. (20-30 cm) spread</td>
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<tr>
<td>No, but beneficial; duration of 10 weeks; flowering will occur 4-5 weeks earlier after vernalization</td>
<td>Quart or 5 in. (13 cm); Gallon (17 cm)</td>
<td>60°F-70°F (16-21°C) Day; 50°F-60°F (10-16°C) Night</td>
<td>6.0-6.5 / 1.5-2.0</td>
<td>B-Nine 5000 ppm</td>
<td>Long day beneficial</td>
<td>11-13; Sow: early February; Finish: late May-early June</td>
<td>30-38; Sow: July-early September; Finish: April-early May</td>
<td>Fungus gnat larva, thrips/INSV, white smut and powdery mildew</td>
<td>16-18 in. (40-45 cm) height; 20-22 in. (50-55 cm) spread</td>
<td></td>
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<tr>
<td>Yes; duration of 8 weeks, max 40°F (4°C)</td>
<td>3-4 in. (8-10 cm)</td>
<td>60°F-65°F (16-18°C) Day; 50°F-58°F (10-14°C) Night</td>
<td>5.8-6.5 / 1.0-1.2</td>
<td>None</td>
<td>Day neutral</td>
<td>–</td>
<td>36-40; Sow: July-August; Finish: late April-May</td>
<td>Well-drained soil; dislikes winter wet; Moderate fertilization; Botrytis, aphids, spider mites and whitefly; nice perennial combo edging</td>
<td>3-5 in. (8-13 cm) height; 5-7 in. (13-18 cm) spread</td>
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</table>

*Crop time and scheduling info is based on Northern climate.
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**Tips, diseases & recommendations**

- **Digitalis**: Can be grown under high light if provided enough moisture; low flowering % under low light level; downy mildew, leaf spot, Botrytis and aphids

- **Digitalis**: Can be grown under high light, provided enough moisture

- **Digitalis**: Can be grown under high light if provided enough moisture

---

**Mature height & spread**

- **16-20 in. (40-50 cm) height**
- **12-14 in. (30-36 cm) spread**

---

**Heat tolerant**

- **Yes**
- **No**

---

**Cool crop**

- **Yes**
- **No**
<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/ Variety</th>
<th>Hardiness Zone</th>
<th>First Year Flower</th>
<th>Exposure</th>
<th>Seed Info</th>
<th>Recommanded plug size</th>
<th>Seeds/ cell</th>
<th>Cover Seed</th>
<th>Germination Conditions</th>
<th>Days to Germination</th>
<th>Stage 2-3 temp</th>
<th>Plug PPMs</th>
<th>Plug Crop Weeks</th>
<th>Plug Crop Tips</th>
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</thead>
<tbody>
<tr>
<td>Pg 139</td>
<td>HEUCHERA</td>
<td>H. hybridra</td>
<td>Melting Fire, Malachite</td>
<td>5-8</td>
<td>20,000-31,000 S/oz. (900-1,100 S/g)</td>
<td>288-cell</td>
<td>6-8</td>
<td>No vermiculite, cover with fleece/white plastic</td>
<td>10-14</td>
<td>68-72°F (20-22°C), light required</td>
<td>65-68°F (18-20°C)</td>
<td>8-10</td>
<td>Spray damp-off fungicide</td>
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<tr>
<td>HEUCHERA</td>
<td>H. micrantha</td>
<td>Palace Purple</td>
<td>4-7</td>
<td>26,000-31,000 S/oz. (900-1,100 S/g) SED or PEL</td>
<td>288-cell</td>
<td>4</td>
<td>No vermiculite, cover with fleece/white plastic</td>
<td>6-8</td>
<td>68-72°F (20-22°C), light required</td>
<td>65-68°F (18-20°C)</td>
<td>6-8</td>
<td>Spray damp-off fungicide</td>
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<tr>
<td>Pg 140</td>
<td>HIBISCUS</td>
<td>H. moscheutos</td>
<td>Luna Fl Series</td>
<td>5-9</td>
<td>2,835 S/oz. (100-100 S/g)</td>
<td>200-cell or larger</td>
<td>1</td>
<td>Yes, cover with medium</td>
<td>3-5</td>
<td>68-75°F (20-24°C), light optional</td>
<td>68-70°F (20-21°C)</td>
<td>3-4</td>
<td>Cover seed with plug media; grow plants under daily average temperature above 68°F (20°C) and keep media moist to wet</td>
<td></td>
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<tr>
<td>IBERIS</td>
<td>I. sempervirens</td>
<td>Snowflake</td>
<td>3-8</td>
<td>7,000-10,000 S/oz. (250-350 S/g)</td>
<td>288-cell</td>
<td>4-6</td>
<td>Yes</td>
<td>65-68°F (18-20°C), light not required</td>
<td>7-10</td>
<td>65-68°F (18-20°C)</td>
<td>60-65°F (16-18°C)</td>
<td>None</td>
<td>6-8</td>
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<tr>
<td>Pg 141</td>
<td>LAVENDER</td>
<td>Lavandula angustifolia</td>
<td>Ellagance Series</td>
<td>5-8</td>
<td>20,000-34,000 S/oz. (700-1,200 S/g)</td>
<td>288-cell</td>
<td>4</td>
<td>Yes</td>
<td>65-68°F (18-20°C), light not required but beneficial</td>
<td>65-68°F (18-20°C)</td>
<td>Stage 2; 59-63°F (15-17°C) Stage 3</td>
<td>B-Nine 2000 ppm (2g/liter)</td>
<td>5-6</td>
<td>Spray damp-off fungicide</td>
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<td>Pg 141</td>
<td>LAVENDER</td>
<td>Lavandula angustifolia</td>
<td>Lavance</td>
<td>5-8</td>
<td>29,000-37,000 S oz. (1,000-1,300 S/g)</td>
<td>288-cell</td>
<td>4</td>
<td>Yes</td>
<td>65-68°F (18-20°C), light not required but beneficial</td>
<td>65-68°F (18-20°C)</td>
<td>Stage 2; 59-63°F (15-17°C) Stage 3</td>
<td>B-Nine 2000 ppm (2g/liter)</td>
<td>5-6</td>
<td>Spray damp-off fungicide</td>
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<tr>
<td>LAVENDER</td>
<td>Lavandula angustifolia</td>
<td>Lavender Lady</td>
<td>5-8</td>
<td>27,000 S/oz. (950 S/g)</td>
<td>406-cell or larger</td>
<td>4</td>
<td>Yes</td>
<td>65-75°F (18-24°C), light not required but beneficial</td>
<td>4-5</td>
<td>65-68°F (18-20°C)</td>
<td>65-68°F (18-20°C)</td>
<td>B-Nine 2500 ppm spray</td>
<td>6-8</td>
<td>Cover and give good light as soon as germination occurs; seedlings get very leggy when grown under low light</td>
<td></td>
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</tbody>
</table>

*Find online Grower Facts culture at panamseed.com **Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm)
<table>
<thead>
<tr>
<th>Vernalization</th>
<th>Recommended containers (pp) / plug/pot</th>
<th>Growing on temps.</th>
<th>Media pH/EC</th>
<th>PG1 ppm</th>
<th>Photoperiod response</th>
<th>Annual crop weeks to flower from transplant with recommendations</th>
<th>Overwinter crop weeks to flower from transplant with recommendations*</th>
<th>Tips, diseases &amp; recommendations</th>
<th>Mature height &amp; spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>4-5 in. (10-13 cm), 1 pp; Gallon, 1-3 pp</td>
<td>60-68°F (16-20°C) Day; 58-60°F (14-16°C) Night</td>
<td>5.8-6.2 / 1.2-1.4</td>
<td>None</td>
<td>N/A</td>
<td>12-18; Sow: January-May; Finish: May-July</td>
<td>32-36; Sow: June-July; Finish: March-May</td>
<td>Avoid wet and overly dry; needs well-drained medium; Pythium, Botrytis, powdery mildew, aphids, leaf nematodes and leaf eelworms</td>
<td>8-in. (20 cm) foliage height; 18-in. (46 cm) flower height; 12-14 in. (30-36 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

| No            | 4-5 in. (10-13 cm), 1 pp; Gallon, 1-3 pp | 65-68°F (16-20°C) Day; 60-65°F (16-18°C) Night | 5.8-6.2 / 1.2-1.4 | None | N/A | 10-12; Sow: January-May; Finish: May-July | 30-34; Sow: June-July; Finish: March-May | Grow relatively dry; needs well-drained medium; Pythium, Botrytis, powdery mildew, aphids, leaf nematodes and leaf eelworms | 10-in. (25 cm) foliage height; 20-in. (51 cm) flower height; 14-16 in. (36-41 cm) spread | ✓ |  

| No; plugs dies when cooled at 41°F (5°C) Quart (15 cm), 1 pp; Gallon (15-18 cm), 1 pp | 70-85°F (21-30°C) Day; 65-70°F (18-21°C) Night | 5.8-6.2 / 1.2-2.0 | Tank mix of B-Nine 2500 ppm and CCC 750-1000 ppm | Long day | 10-13; Sow: March-May; Finish: June-August | Does not need pinching; maintain media in high moisture; growing plant too dry will result in flower bud abortion; thrips, aphids and spidermites; growth stops and lower leaves turn yellow when grown below 68°F (20°C) | 24-36 in. (60-90 cm) height; 24 in. (60 cm) spread | ✓ |  

| Yes; bulk to desired size before vernalizing to ensure pot fill 5 in. (13 cm), 1 pp; Gallon, 1-3 pp | 54-60°F (12-16°C) Day; 46-54°F (8-12°C) Night | 5.5-6.2 / 1.2-1.4 | Day neutral | _ | 36-40; Sow: May-June; Finish: April-May | Pinch no later than August; avoid wet; well-drained medium; Botrytis, powdery mildew, spidermites and slugs | 6-in. (15-20 cm) height; 8-12 in. (20-30 cm) spread | ✓ | ✓ |  

| No | 4-5 in. quart (10-13 cm), 1 pp; Gallon, 1-3 pp | 60-72°F (16-22°C) Day; 54-60°F (12-16°C) Night | 5.8-6.5 / 1.1-1.2 to 1.4-1.5 | B-Nine 2000-3000; Sumagic 10-15 ppm | Long day beneficial for Purple; long day required for all others | Purple 9-12; Sky 10-13; Ice & Snow 12-15; Sow: January-May; Finish: late May-July | Grow low RH and high light; let top soil dry in between waterings but do not allow medium to dry as high EC could cause root damage; Botrytis, root rot, leaf spot, aphids and mites; for shipping, keep soil moist and plant dry | 12-14 in. (30-36 cm) height; 10-12 in. (25-30 cm) spread | ✓ |  

| No | 4-5 in. quart (10-13 cm), 1 pp; Gallon, 1-3 pp | 60-72°F (16-22°C) Day; 60-65°F (16-18°C) Night | 5.8-6.5 / 1.1-1.2 to 1.4-1.5 | B-Nine 2000-3000; Sumagic 10-15 ppm | Long day required | 10-12 (needs potting late Spring); Sow: March-June; Finish: late April-May | Grow low RH and high light; let top soil dry in between waterings but do not allow medium to dry as high EC could cause root damage; Botrytis, root rot, leaf spot, aphids and mites; for shipping, keep soil moist and plant dry | 10-12 in. (25-30 cm) height; 10-12 in. (25-30 cm) spread | ✓ |  

| No | Pack, 4 in. (10 cm) | 70-75°F (21-24°C) Day; 65-70°F (18-21°C) Night | 5.8-6.5 / 1.1-1.2 to 1.4-1.5 | Pack: 14-15; 4-in. (10 cm): 18-20; Finish: late May-July | _ | _ | _ | 8-10 in. (20-25 cm) height; 10 in (25 cm) spread | ✓ |  

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*Crop time and scheduling info is based on Northern climate.

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<table>
<thead>
<tr>
<th>Grower Facts</th>
<th>Class</th>
<th>Series/ Variety</th>
<th>Hardiness Zone</th>
<th>First year Exposure</th>
<th>Seed info</th>
<th>Recommended plug size**</th>
<th>Seeds/ cell</th>
<th>Cover seed</th>
<th>Days to germination</th>
<th>Germination conditions</th>
<th>Stage 2-3 temp.</th>
<th>Plug PGs</th>
<th>Plug crop wks.</th>
<th>Plug tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAVENDER</td>
<td>Munstead</td>
<td>Lavandula angustifolia</td>
<td>5-8</td>
<td>✓</td>
<td>Yes</td>
<td>65°F-75°F (18-24°C); light not required but beneficial</td>
<td>4-5</td>
<td>65-68°F (18-20°C)</td>
<td>B-Nine</td>
<td>2500 ppm spray</td>
<td>4-5</td>
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<tr>
<td>NEPETA</td>
<td>Blue Moon &amp; Pink Cat</td>
<td>N. nervosa</td>
<td>4-7</td>
<td>✓</td>
<td>Yes</td>
<td>65-68°F (18-20°C); light not required but beneficial</td>
<td>4-5</td>
<td>60-65°F (16-18°C)</td>
<td>B-Nine</td>
<td>2000 ppm spray</td>
<td>4-5</td>
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<tr>
<td>LUPINE</td>
<td>Gallery Series</td>
<td>L. Polyphyllus</td>
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<td>Yes</td>
<td>60-65°F (16-18°C); light not required but beneficial</td>
<td>3-6</td>
<td>60-65°F (16-18°C)</td>
<td>B-Nine</td>
<td>1500 ppm (1.5g/liter)</td>
<td>6 wks for 288; 8 wks 84</td>
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<tr>
<td>MYOSOTIS</td>
<td>Mon Amie Blue</td>
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<td>No</td>
<td>68-74°F (20-23°C)</td>
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<td>PENSTEMON</td>
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<td>65-74°F (18-23°C); light not required but beneficial</td>
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<td>2500 ppm</td>
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<td>P. smallii</td>
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<td>65-68°F (18-20°C); light not required but beneficial</td>
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<td>PENSTEMON</td>
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<td>P. hartwegii</td>
<td>7-10</td>
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<td>No</td>
<td>65-68°F (18-20°C); light not required but beneficial</td>
<td>3-6</td>
<td>65-68°F (18-20°C)</td>
<td>B-Nine</td>
<td>2000 ppm (2g/liter)</td>
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<td>P. x mexicoll</td>
<td>5-7</td>
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<td>No</td>
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<td>3-6</td>
<td>65-68°F (18-20°C)</td>
<td>B-Nine</td>
<td>2000 ppm (2g/liter)</td>
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</tr>
<tr>
<td>PENSTEMON</td>
<td>Bambino Blue</td>
<td>P. caeruleum</td>
<td>4-8</td>
<td>✓</td>
<td>Yes</td>
<td>68-72°F (20-22°C); light not required</td>
<td>5-8</td>
<td>65-68°F (18-20°C)</td>
<td>B-Nine</td>
<td>2500 ppm</td>
<td>8-10</td>
<td></td>
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</tbody>
</table>

**Find online Grower Facts culture at panamseed.com  **Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm)  630 231-1400  kieft-pro-seeds.com
<table>
<thead>
<tr>
<th>Vernalization</th>
<th>Recommended containers (ppp/plug/pot)</th>
<th>Growing on temps.</th>
<th>Media pH/EC</th>
<th>PGR ppm</th>
<th>Photoperiod response</th>
<th>Annual crop weeks to flower from transplant with recommendations</th>
<th>Overwinter crop weeks to flower from transplant with recommendations</th>
<th>Tips, diseases &amp; recommendations</th>
<th>Mature height &amp; spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>Pack; 4 in. (10 cm)</td>
<td>70-75°F (23-24°C) Day; 65-70°F (18-21°C) Night</td>
<td>5.8-6.5 / start 1.1-1.2 to 1.4-1.5</td>
<td>B-Nine 2500</td>
<td>Long day beneficial</td>
<td>8-10; Sow: March-May; Finish: May-July</td>
<td>–</td>
<td>Grow relatively dry; prevent Mg and Fe deficiencies; Botrytis, downy mildew and aphids</td>
<td>12 in. (30 cm) heights; 12-18 in. (30-45 cm) spread</td>
<td>✅</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>5 in., 1 ppp; 1 Gallon, 1-3 ppp</td>
<td>60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night</td>
<td>5.8-6.5 / 1.2-1.4</td>
<td>B-Nine 2500</td>
<td>Long day beneficial</td>
<td>10-12 weeks</td>
<td>–</td>
<td>Requires well drained soil; medium fertilization; not heavy; allow leaves and top level soil to dry between waterings</td>
<td>30 in. x 20 in.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>5 in. (13 cm), 1 ppp; 1 Gallon, 1-3 ppp</td>
<td>60-72°F (16-22°C) Day; 50-59°F (10-15°C) Night</td>
<td>5.5-6.3 avoid 6.4 and up / 1.1-1.3</td>
<td>B-Nine 2500 ppm; or Tankmix Surnagic 4ppm and B-Nine 2000ppm</td>
<td>Long day beneficial</td>
<td>–</td>
<td>–</td>
<td>Maintain low pH. Myosotis suffer from chlorosis at high pH. Grow like Primula acaulis. See Grower Facts for details on how to mitigate chlorosis caused by high pH.</td>
<td>10-12 in. (25-30 cm) height; 6-9 in. (15-23 cm) spread</td>
<td>✅</td>
<td></td>
</tr>
<tr>
<td>No, but beneficial; cooled plants flower more uniformly and faster than non-cooled plants; duration of 10 weeks at 41°F (5°C)</td>
<td>4 in. (10 cm)</td>
<td>66-70°F (19-21°C) Day; 62-66°F (17-19°C) Night</td>
<td>5.8-6.5 / 1.0-1.5</td>
<td>None</td>
<td>Day neutral but needs high light intensity for complete, rapid and uniform flowering</td>
<td>12-13</td>
<td>–</td>
<td>Bulking prior to vernalization ensures pot-fill and improves flowering uniformity; white flies</td>
<td>18 in. (45 cm) height; 24 in. (60 cm) spread</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>6 in. (15 cm)</td>
<td>66-70°F (19-21°C) Day; 62-66°F (17-19°C) Night</td>
<td>5.8-6.5 / 1.0-1.5</td>
<td>B-Nine 5000 ppm</td>
<td>Facultative long day</td>
<td>12-15</td>
<td>–</td>
<td>Many more flowers under high light intensity</td>
<td>24 in. (60 cm) height; 18 in. (45 cm) spread</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Gallon, (1-3 ppp); 2 Gallon, 3 ppp</td>
<td>60-72°F (16-22°C) Day; 50-59°F (10-15°C) Night</td>
<td>5.5-6.5 / start 1.1-1.2 to 1.4-1.5</td>
<td>B-Nine 2500 ppm</td>
<td>Long day beneficial</td>
<td>13-16; Sow: January-May; Finish: May-July</td>
<td>–</td>
<td>Needs high light; low RH; grow relatively dry; prevent Mg and Fe deficiency; leafspot, powdery mildew, slugs, snails and leaf eelworm</td>
<td>14-16 in. (35-40 cm) height; 10-14 in. (25-36 cm) spread</td>
<td>✅</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4-5 in. (10-13 cm); Quart (10-13cm), 1 ppp</td>
<td>65-75°F (18-24°C) Day; 58-65°F (14-18°C) Night</td>
<td>5.8-6.8 / 1.1-1.2 to 1.4-1.5</td>
<td>B-Nine 2500 ppm</td>
<td>Day neutral</td>
<td>Purple 12-14; Rose 13-15; Sow: February-May; Finish: May-July</td>
<td>–</td>
<td>Needs high light; low RH; grow relatively dry; prevent Mg and Fe deficiency; leafspot, powdery mildew, slugs, snails and leaf eelworm; also suited for 1 plug and 3 plug gallons</td>
<td>8-10 in. (20-25 cm) height; 10-12 in. (25-30 cm) spread</td>
<td>✅</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>5 in. (13 cm), 1 ppp; 1 Gallon, 1-3 ppp</td>
<td>60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night</td>
<td>5.8-6.5 / 1.2-1.4</td>
<td>B-Nine 2500 ppm</td>
<td>Long day beneficial</td>
<td>10-14; Sow: March-May; Finish: May-July</td>
<td>–</td>
<td>Use well-drained medium; prevent Mg and Fe; grow relatively dry; keep top soil dry in between waterings; Botrytis, downy mildew and aphids</td>
<td>10-12 in. (25-30 cm) height; 6-8 in. (15-20 cm) spread</td>
<td>✅</td>
<td></td>
</tr>
</tbody>
</table>

*Crop time and scheduling info is based on Northern climate.*

630 231-1400  kieft-pro-seeds.com
### POPPY, Iceland Poppy

<table>
<thead>
<tr>
<th>Grower Class</th>
<th>Series/ Variety</th>
<th>Hardiness Zone</th>
<th>First Year Flower</th>
<th>Exposure</th>
<th>Seed Info</th>
<th>Recommended plug size**</th>
<th>Seeds/cell</th>
<th>Cover seed</th>
<th>Germination conditions</th>
<th>Days to germination</th>
<th>Stage 2-3 temp.</th>
<th>Plug crop wks.</th>
<th>Plug tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>POPPY P. miyabeumum</td>
<td>Moondance</td>
<td>4-7</td>
<td></td>
<td></td>
<td></td>
<td>288-cell</td>
<td>2-3</td>
<td>No</td>
<td>60-65°F (16-18°C); light optional</td>
<td>4-6</td>
<td>60-65°F (16-18°C)</td>
<td>6-8</td>
<td>Spray damp-off fungicide</td>
</tr>
<tr>
<td>POPPY, ICOLD</td>
<td>Champage Bubbles F1 Series</td>
<td>3-9</td>
<td></td>
<td></td>
<td></td>
<td>288-cell or larger</td>
<td>1</td>
<td>Cover lightly</td>
<td>64-68°F (18-20°C); light not required but beneficial</td>
<td>7-12</td>
<td>60-65°F (16-18°C)</td>
<td>4-5</td>
<td>Spray damp-off fungicide</td>
</tr>
</tbody>
</table>

### PRIMULA

<table>
<thead>
<tr>
<th>Grower Class</th>
<th>Series/ Variety</th>
<th>Hardiness Zone</th>
<th>First Year Flower</th>
<th>Exposure</th>
<th>Seed Info</th>
<th>Recommended plug size**</th>
<th>Seeds/cell</th>
<th>Cover seed</th>
<th>Germination conditions</th>
<th>Days to germination</th>
<th>Stage 2-3 temp.</th>
<th>Plug crop wks.</th>
<th>Plug tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRIMULA P. capiata</td>
<td>Noverna Deep Blue</td>
<td>4-7</td>
<td></td>
<td></td>
<td></td>
<td>288-cell</td>
<td>4</td>
<td>No</td>
<td>60-65°F (16-18°C); light not required</td>
<td>8-10</td>
<td>60-65°F (16-18°C)</td>
<td>None</td>
<td>8-10</td>
</tr>
</tbody>
</table>

### RUBBECKIA

<table>
<thead>
<tr>
<th>Grower Class</th>
<th>Series/ Variety</th>
<th>Hardiness Zone</th>
<th>First Year Flower</th>
<th>Exposure</th>
<th>Seed Info</th>
<th>Recommended plug size**</th>
<th>Seeds/cell</th>
<th>Cover seed</th>
<th>Germination conditions</th>
<th>Days to germination</th>
<th>Stage 2-3 temp.</th>
<th>Plug crop wks.</th>
<th>Plug tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>RUBBECKIA R. fuligida var. sullivani</td>
<td>Goldsturn</td>
<td>3-9</td>
<td></td>
<td></td>
<td></td>
<td>288-cell or larger</td>
<td>2</td>
<td>Yes</td>
<td>68-72°F (20-22°C); light required</td>
<td>5-7</td>
<td>65-68°F (18-20°C)</td>
<td>6-8</td>
<td></td>
</tr>
</tbody>
</table>

### SALVIA

<table>
<thead>
<tr>
<th>Grower Class</th>
<th>Series/ Variety</th>
<th>Hardiness Zone</th>
<th>First Year Flower</th>
<th>Exposure</th>
<th>Seed Info</th>
<th>Recommended plug size**</th>
<th>Seeds/cell</th>
<th>Cover seed</th>
<th>Germination conditions</th>
<th>Days to germination</th>
<th>Stage 2-3 temp.</th>
<th>Plug crop wks.</th>
<th>Plug tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>SALVIA S. lyrata</td>
<td>Purple Volcano</td>
<td>6-8</td>
<td></td>
<td></td>
<td></td>
<td>288-cell</td>
<td>3-4</td>
<td>Cover lightly</td>
<td>68-72°F (20-22°C); light required</td>
<td>5-7</td>
<td>65-68°F (18-20°C)</td>
<td>None</td>
<td>6-8</td>
</tr>
<tr>
<td>SALVIA S. nemorosa</td>
<td>New Dimension Series</td>
<td>4-8</td>
<td></td>
<td></td>
<td></td>
<td>288-cell</td>
<td>4</td>
<td>Cover lightly</td>
<td>68-72°F (20-22°C); light optional</td>
<td>3-4</td>
<td>65-68°F (18-20°C)</td>
<td>None</td>
<td>5-6</td>
</tr>
</tbody>
</table>

### SALVIA

<table>
<thead>
<tr>
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<th>First Year Flower</th>
<th>Exposure</th>
<th>Seed Info</th>
<th>Recommended plug size**</th>
<th>Seeds/cell</th>
<th>Cover seed</th>
<th>Germination conditions</th>
<th>Days to germination</th>
<th>Stage 2-3 temp.</th>
<th>Plug crop wks.</th>
<th>Plug tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>SALVIA S. patens</td>
<td>Patio Series</td>
<td>8-10</td>
<td></td>
<td></td>
<td></td>
<td>288-cell</td>
<td>1</td>
<td>No</td>
<td>65-68°F (18-20°C); light required</td>
<td>4-7</td>
<td>65-68°F (18-20°C)</td>
<td>B-Nine 1500 ppm (1.5g/liter)</td>
<td>5-6</td>
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</tbody>
</table>

### SALVIA

<table>
<thead>
<tr>
<th>Grower Class</th>
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<th>First Year Flower</th>
<th>Exposure</th>
<th>Seed Info</th>
<th>Recommended plug size**</th>
<th>Seeds/cell</th>
<th>Cover seed</th>
<th>Germination conditions</th>
<th>Days to germination</th>
<th>Stage 2-3 temp.</th>
<th>Plug crop wks.</th>
<th>Plug tips</th>
</tr>
</thead>
<tbody>
<tr>
<td>SALVIA S. roemeriana</td>
<td>Hot Trumpets</td>
<td>7-10</td>
<td></td>
<td></td>
<td></td>
<td>288-cell</td>
<td>3-4</td>
<td>Cover lightly</td>
<td>65-68°F (18-20°C); light required</td>
<td>5-7</td>
<td>65-68°F (18-20°C)</td>
<td>B-Nine 2000</td>
<td>6-8</td>
</tr>
</tbody>
</table>

*Find online Grower Facts culture at panamseed.com **Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm)

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<table>
<thead>
<tr>
<th>Vernalization</th>
<th>Recommended containers (ppp / plug/pot)</th>
<th>Growing on temps.</th>
<th>Medias pH/EC</th>
<th>PGR ppm</th>
<th>Photoperiod response</th>
<th>Annual crop weeks to flower from transplant with recommendations</th>
<th>Overwinter crop weeks to flower from transplant with recommendations</th>
<th>Tips, diseases &amp; recommendations</th>
<th>Mature height &amp; spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>5 in. (13 cm), 1 ppp</td>
<td>60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night</td>
<td>5.8-6.8 / 1.1-1.3</td>
<td>None</td>
<td>Long day beneficial</td>
<td>10-12; Sow: February-April; Finish: May-July</td>
<td>–</td>
<td>Well-drained soil; moderate fertilizer; high light and airy; Botrytis, downy mildew and aphids</td>
<td>6-8 in. (15-20 cm) height; 5-7 in. (13-18 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4 in. (10 cm), 6 in. (15 cm), 1-3 ppp</td>
<td>50-55°F (10-13°C) Day; 40-45°F (4-7°C) Night</td>
<td>Day neutral</td>
<td>4 in. (10 cm): 5-6; 6 in. (15 cm): 6-7; Sow: February-April; Finish: June-August</td>
<td>–</td>
<td>Use well-drained medium; prevent Mg and Fe deficiency; Botrytis, Pythium, Rhizoctonia and aphids</td>
<td>15 in. (38 cm) height; 6 in. (15 cm) spread</td>
<td>✓</td>
<td></td>
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</tr>
<tr>
<td>No</td>
<td>4-5 in. (10-13 cm)</td>
<td>65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night</td>
<td>5.5-6.0 / 1.1-1.3</td>
<td>None</td>
<td>Long day beneficial</td>
<td>10-12; Sow: March-May; Finish: June-August</td>
<td>–</td>
<td>High feeder; use long day or night interruption to finish early pottings; prevent Mg and Fe deficiency; Botrytis and downy mildew; high light and good ventilation</td>
<td>16-24 in. (40-60 cm) height; 14-18 in. (36-46 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Gallon, 1 ppp; 2 Gallon, 1-3 ppp</td>
<td>65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night</td>
<td>5.8-6.5 / 1.3-1.6</td>
<td>Sumagic 5-10 ppm spray; Bonzi 20-30 ppm spray</td>
<td>Long day required</td>
<td>20-24; Sow: January-May; Finish: July-September</td>
<td>–</td>
<td>Use well-drained medium; prevent Mg and Fe; Botrytis, downy mildew; aphids and spidermites</td>
<td>8-10 in. (20-25 cm) height; 6-8 in. (15-20 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>5 in. (13 cm), 1 ppp; 1 Gallon, 1-3 ppp</td>
<td>60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night</td>
<td>Day neutral</td>
<td>8-10; Sow: March-June; Finish: late April-July</td>
<td>32-38; Sow: August-September; Finish: March-May</td>
<td>Use well-drained medium; prevent Mg and Fe; Botrytis, downy mildew, aphids and spidermites</td>
<td>–</td>
<td>Avoid leaf yellow with high pH (Fe) and/or low N when generative; spray weekly Bittersalt MGS04 1g/liter; spidermites, Rhizoctonia, leafspot and root rot; wet after transplant with preventive spray Rhizoctonia</td>
<td>8-10 in. (20-25 cm) height; 6-8 in. (15-20 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4-5 in./quart (10-13 cm), 1 ppp; Gallon, 1-3 ppp</td>
<td>60-72°F (16-22°C) Day; 50-59°F (10-15°C) Night</td>
<td>5.5-6.2 / 1.2-1.4</td>
<td>Indoor prod B-Nine 2500</td>
<td>Long day required</td>
<td>Rose 8-10; Blue 9-11; Sow: March-May; Finish: May-July</td>
<td>32-38; Sow: August-September; Finish: April-May</td>
<td>Grow relatively dry. Use well-drained medium; prevent Mg and Fe deficiency; Botrytis, downy mildew, aphids and spidermites; high light and good ventilation</td>
<td>10-14 in. (25-36 cm) height; 12-14 in. (30-36 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>5 in., 1 ppp; Gallon, 1-3 ppp</td>
<td>60-65°F (16-18°C) Day; 57-60°F (14-16°C) Night</td>
<td>Day neutral</td>
<td>5.8-6.5 / 1.2-1.3</td>
<td>B-Nine 2000</td>
<td>Long day beneficial</td>
<td>7-11; Sow: April-May; Finish: May-July</td>
<td>–</td>
<td>Use well-drained medium; prevent Mg and Fe deficiency; Botrytis, downy mildew, aphids and spidermites; high light and good ventilation</td>
<td>8-10 in. (20-25 cm) height; 6-8 in. (15-20 cm) spread</td>
<td>✓</td>
</tr>
<tr>
<td>No</td>
<td>5 in., 1 ppp; Gallon, 1-3 ppp</td>
<td>65-68°F (16-20°C) Day; 54-60°F (12-16°C) Night</td>
<td>Day neutral</td>
<td>5.8-6.2 / 1.2-1.4</td>
<td>B-Nine 2000</td>
<td>Day neutral</td>
<td>8-12; Sow: April-May; Finish: June-August</td>
<td>–</td>
<td>Use well-drained medium; prevent Mg and Fe deficiency; Botrytis, downy mildew, aphids and spidermites; high light and good ventilation</td>
<td>8-10 in. (20-25 cm) height; 6-8 in. (15-20 cm) spread</td>
<td>✓</td>
</tr>
<tr>
<td>Grower Facts</td>
<td>Series/ Variety</td>
<td>Hardiness Zone</td>
<td>First year flower</td>
<td>Exposure</td>
<td>Seed info</td>
<td>Recommended plug size**</td>
<td>Seeds/ cell</td>
<td>Cover seed</td>
<td>Germination conditions</td>
<td>Days to germination</td>
<td>Stage 2-3 temp.</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------</td>
<td>----------------</td>
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</tr>
<tr>
<td><strong>SAXIFRAGA</strong></td>
<td><em>S. x arendsii</em></td>
<td>Purple Robe</td>
<td>4-7</td>
<td></td>
<td></td>
<td>543,000-600,000 S/oz. (19,000-21,000 S/g) SED</td>
<td>288-cell</td>
<td>4-6</td>
<td>Cover lightly</td>
<td>65-68°F (18-20°C); light not required</td>
<td>8-10</td>
</tr>
<tr>
<td><strong>SCABIOSA</strong></td>
<td><em>S. cot.</em></td>
<td>Blue Note</td>
<td>5-9</td>
<td>✓</td>
<td></td>
<td>11,000-20,000 S/oz. (400-700 S/g) SED</td>
<td>288-cell</td>
<td>2-3</td>
<td>Yes</td>
<td>65-68°F (18-20°C); light not required</td>
<td>8-10</td>
</tr>
<tr>
<td><strong>SCABIOSA</strong></td>
<td><em>S. japonica</em></td>
<td>Diamonds Series</td>
<td>5-9</td>
<td>✓</td>
<td></td>
<td>11,000-20,000 S/oz. (400-700 S/g) SED</td>
<td>288-cell</td>
<td>2-3</td>
<td>Yes</td>
<td>65-68°F (18-20°C); light not required</td>
<td>8-10</td>
</tr>
<tr>
<td><strong>SILENE</strong></td>
<td><em>S. alpestris</em></td>
<td>Starry Dreams</td>
<td>5-8</td>
<td>✓</td>
<td></td>
<td>171,000-200,000 S/oz. (6,000-7,000 S/g) SED</td>
<td>288-cell</td>
<td>3-4</td>
<td>No</td>
<td>68-72°F (20-22°C); light not required</td>
<td>5-7</td>
</tr>
<tr>
<td><strong>SILENE</strong></td>
<td><em>S. maritima</em></td>
<td>Icecups</td>
<td>4-7</td>
<td>✓</td>
<td></td>
<td>29,000-34,000 S/oz. (1,000-1,200 S/g) SED</td>
<td>288-cell</td>
<td>4</td>
<td>No</td>
<td>68-72°F (20-22°C); light not required</td>
<td>5-7</td>
</tr>
<tr>
<td><strong>TIARELLA</strong></td>
<td><em>T. wherryi</em></td>
<td>Silverado</td>
<td>4-8</td>
<td>✓</td>
<td></td>
<td>105,000-114,000 S/oz. (3,700-4,000 S/g) SED</td>
<td>288-cell</td>
<td>4</td>
<td>No</td>
<td>65-68°F (18-20°C); light not required</td>
<td>7-10</td>
</tr>
<tr>
<td><strong>VERBASCUM</strong></td>
<td><em>V. x hybridum</em></td>
<td>Southern Charm F1</td>
<td>5-8</td>
<td>✓</td>
<td></td>
<td>28,350 S/oz. (1,000 S/g) SED</td>
<td>200-cell or larger</td>
<td>1</td>
<td>Yes</td>
<td>65-68°F (18-20°C); light not required</td>
<td>3-7</td>
</tr>
<tr>
<td><strong>VERBASCUM</strong></td>
<td><em>V. phoeniceum</em></td>
<td>Temptress Series</td>
<td>5-7</td>
<td>✓</td>
<td></td>
<td>34,000-37,000 S/oz. (1,200-1,300 S/g) PEL</td>
<td>288 or 180-cell</td>
<td>3-4</td>
<td>No</td>
<td>68-72°F (20-22°C); light not required</td>
<td>2-4</td>
</tr>
</tbody>
</table>

*Find online Grower Facts culture at panamseed.com **Approximate plug cell diameter: 128-cell (3.25 cm), 288-cell (2 cm), 406-cell (1.75 cm)
<table>
<thead>
<tr>
<th>Vernalization</th>
<th>Recommended containers (ppp / plug/pot)</th>
<th>Growing on temps.</th>
<th>Media pH/EC</th>
<th>PGR ppm</th>
<th>Photoperiod response</th>
<th>Annual crop weeks to flower from transplant with recommendations</th>
<th>Overwinter crop weeks to flower from transplant with recommendations</th>
<th>Tips, diseases &amp; recommendations</th>
<th>Mature height &amp; spread</th>
<th>Heat tolerant</th>
<th>Cool crop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes; duration of 12 weeks at 41°F (5°C)</td>
<td>4-5 in. (10-13 cm), 1 ppp; Gallon, 1-3 ppp</td>
<td>58°F-65°F (10-12°C) Day; 44-50°F (7-10°C) Night</td>
<td>5.8-6.5 / 10-1.2</td>
<td>None</td>
<td>Day neutral</td>
<td>40-44; Sow: June-July; Finish: late April-June</td>
<td>Very well-drained medium; prevent Mg and Fe deficiency; Botrytis and spidermites</td>
<td>3-5 in. (8-13 cm) height; 4-6 in. (10-15 cm) spread</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4-5 in. (10-13 cm), 1 ppp; Gallon, 1-3 ppp</td>
<td>65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night</td>
<td>5.8-6.2 / 0.8-1.0 to 1.2-1.3</td>
<td>None</td>
<td>Day neutral</td>
<td>12-14; Sow: January-April; Finish: May-July</td>
<td>30-36; Sow: August-September; Finish: April-May</td>
<td>Needs high light; low RH; grow relatively dry; prevent Mg and Fe deficiency; Botrytis, downy mildew, root rot, aphids and mites; early spring forcing 6 wks 62-65, no long days</td>
<td>8-10 in. (20-25 cm) height; 8-10 in. (20-25 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4-5 in. (10-13 cm), 1 ppp; Gallon, 1-3 ppp</td>
<td>65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night</td>
<td>5.8-6.2 / start 0.8-1.0 to 1.2-1.3</td>
<td>None</td>
<td>Day neutral</td>
<td>13-15; Sow: January-April; Finish: May-July</td>
<td>30-36; Sow: August-September; Finish: April-May</td>
<td>Needs high light; low RH; grow relatively dry; prevent Mg and Fe deficiency; Botrytis, downy mildew, root rot, aphids and mites; early spring forcing 6 wks 62-65, no long days</td>
<td>8-10 in. (20-25 cm) height; 8-10 in. (20-25 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4-5 in. (10-13 cm)</td>
<td>65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night</td>
<td>5.8-6.5 / 10-1.2</td>
<td>B-Nine 2500</td>
<td>Long day required</td>
<td>10-12; Sow: February-April; Finish: May-July</td>
<td>Low-moderate fertilization; grow uniformly moist; prevent Mg and Fe deficiency; aphids, spidermites, slugs and snails</td>
<td>6-8 in. (15-20 cm) height; 6-8 in. (15-20 cm) spread</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4-5 in. (10-13 cm)</td>
<td>60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night</td>
<td>5.8-6.5 / 10-1.2</td>
<td>B-Nine 2500</td>
<td>Long day required</td>
<td>9-11 (LD); Sow: February-April; Finish: May-July</td>
<td>32-38; Sow: June-July; Finish: April-May</td>
<td>Low-moderate fertilization; grow uniformly moist; prevent Mg and Fe deficiency; aphids, spidermites, slugs and snails</td>
<td>5-7 in. (13-18 cm) height; 6-8 in. (15-20 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>4-5 in. (10-13 cm), 1 ppp; Gallon, 1-3 ppp</td>
<td>65-68°F (16-18°C) Day; 54-60°F (12-16°C) Night</td>
<td>5.5-6.5 / 1.2-1.4</td>
<td>B-Nine 2500</td>
<td>Long day required</td>
<td>10-12; Sow: February-April; Finish: late April-July</td>
<td>30-36; Sow: June-July; Finish: April-May</td>
<td>Moderate fertilization; keep dry top soil between waterings; avoid winter wet; Botrytis and slugs</td>
<td>10-12 in. (25-30 cm) height; 8-10 in. (20-25 cm) spread</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Gallon (15-18 cm), 1 ppp</td>
<td>64-67°F (18-19°C) Day; 62-65°F (17-18°C) Night</td>
<td>5.8-6.5 / 1.1-1.3</td>
<td>B-Nine 2500</td>
<td>Long day neutral</td>
<td>12-13; Sow: February-April; Finish: May-July</td>
<td>Flowering more uniform under high light conditions</td>
<td>24-30 in. (60-75 cm) height; 12-18 in. (30-45 cm) spread</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Gallon, 1 ppp</td>
<td>65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night</td>
<td>5.8-6.5 / 1.1-1.3</td>
<td>Long day beneficial</td>
<td>11-13; Sow: February-April; Finish: May-July</td>
<td>Moderate fertilization; grow relatively dry; powdery mildew and moth caterpillars</td>
<td>24-28 in. (60-71 cm) height; 12-16 in. (30-41 cm) spread</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grower Facts</td>
<td>Class</td>
<td>Series/Variety</td>
<td>Hardiness Zone</td>
<td>First year flower Exposure</td>
<td>Seed info</td>
<td>Recommended plug size**</td>
<td>Seeds/cell</td>
<td>Cover seed</td>
<td>Germination conditions</td>
<td>Days to germination</td>
<td>Stage 2-3 temp.</td>
</tr>
<tr>
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</tr>
<tr>
<td>VERBENA V. rigida</td>
<td>Santos</td>
<td>7-10</td>
<td>Yes</td>
<td>34,000 S/oz. (1,200 S/g) SED</td>
<td>288-cell</td>
<td>4</td>
<td>Yes</td>
<td>68-72°F (20-22°C); light not required</td>
<td>7-10</td>
<td>65-68°F (18-20°C)</td>
<td>6-7</td>
</tr>
<tr>
<td>VERBENA V. bonariensis</td>
<td>Buenos Aires</td>
<td>7-9</td>
<td>Yes</td>
<td>98,000 - 126,000 S/oz. (3,500-4,500 S/g) TUN</td>
<td>288-cell</td>
<td>4</td>
<td>Yes</td>
<td>68-72°F (20-22°C); light not required</td>
<td>7-10</td>
<td>65-68°F (18-20°C)</td>
<td>6-7</td>
</tr>
<tr>
<td>VERONICA V. x hybrida</td>
<td>Blue Bouquet F1</td>
<td>5-8</td>
<td>Yes</td>
<td>25,500 S/oz. (900 S/g) PEL</td>
<td>406-cell or larger</td>
<td>1</td>
<td>Yes</td>
<td>65-75°F (18-24°C); light not required</td>
<td>6-9</td>
<td>65-68°F (18-20°C)</td>
<td>5-6</td>
</tr>
<tr>
<td>VERONICA V. prostrata</td>
<td>Nestor</td>
<td>4-7</td>
<td>Yes</td>
<td>157,000-185,000 S/oz. (5,500-6,500 S/g) SED</td>
<td>288-cell</td>
<td>4</td>
<td>Cover lightly</td>
<td>65-68°F (18-20°C); light not required</td>
<td>3-6</td>
<td>60-65°F (16-18°C)</td>
<td>6-8</td>
</tr>
<tr>
<td>Variety</td>
<td>Recommended containers (ppp: plug/pot)</td>
<td>Growing on temps.</td>
<td>Media pH/EC</td>
<td>PGR ppm</td>
<td>Photoperiod response</td>
<td>Annual crop weeks to flower from transplant with recommendations</td>
<td>Overwinter crop weeks to flower from transplant with recommendations</td>
<td>Tips, diseases &amp; recommendations</td>
<td>Mature height &amp; spread</td>
<td>Heat tolerant</td>
<td>Cool crop</td>
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</tr>
<tr>
<td>V. rigida</td>
<td>No</td>
<td>5 in. (13 cm), 1 ppp; Gallon, 1-3 ppp</td>
<td>63-68°F (18-20°C) Day; 60-65°F (16-18°C) Night</td>
<td>5.5-6.2 / 1.3-1.5</td>
<td>Long day beneficial</td>
<td>11-13; Sow: February-April; Finish: May-August</td>
<td>–</td>
<td>Grow dry and light; relatively high fertilization; avoid high N; prevent Mg and Fe deficiency; powdery mildew, aphids and thrips</td>
<td>10-14 in. (25-36 cm) height; 12-14 in. (30-36 cm) spread</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>V. bonariensis</td>
<td>No</td>
<td>5 in. (13 cm), sold green</td>
<td>65-68°F (18-20°C) Day; 60-65°F (16-18°C) Night</td>
<td>5.5-6.2 / 1.3-1.5</td>
<td>Long day beneficial</td>
<td>16-18; Sow: February-April; Finish: May-August</td>
<td>–</td>
<td>Grow dry and light; relatively high fertilization; avoid high N; prevent Mg and Fe deficiency; powdery mildew, aphids and thrips</td>
<td>40-50 in. (1-1.5 m) x 12-16 in. (30-40 cm) spread</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>V. x hybrida</td>
<td>No</td>
<td>Gallon, 1 ppp</td>
<td>65°F (18°C) Day; 55-65°F (13-18°C) Night</td>
<td>5.5-6.2 / 1.3-1.5</td>
<td>14-18; Sow: February-April; Finish: May-August</td>
<td>–</td>
<td>See also Cut Flower section for more details (pg 50)</td>
<td>12 in. (30 cm) height; 12 in. (30 cm) spread</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>V. prostrata</td>
<td>No</td>
<td>5 in. (13 cm), 1 ppp; Gallon, 1-3 ppp</td>
<td>60-65°F (16-18°C) Day; 54-60°F (12-16°C) Night</td>
<td>5.8-6.8 / 1.1-1.3</td>
<td>B-Nine 2000</td>
<td>Long day beneficial</td>
<td>11-13; Sow: February-April; Finish: May-June</td>
<td>36-42; Sow: June-July; Finish: April-May</td>
<td>Finish relatively dry; prevent microelements deficiency; powdery and downy mildew, leaf spot and aphids</td>
<td>5-7 in. (13-18 cm) height; 8-12 in. (15-30 cm) spread</td>
<td>✔</td>
</tr>
</tbody>
</table>

*Crop time and scheduling info is based on Northern climate.*
PanAmerican Seed Grower Facts

NOTE: Growers should use the information presented here as a starting point. Crop times will vary depending on the climate, location, time of year and greenhouse environmental conditions. Chemical and PGR recommendations are only guidelines. It is the responsibility of the applicator to read and follow all the current label directions for the specific chemical being used in accordance with all regulations.

Sirocco Anemanthe
Plug Production

Media
Use a well-drained, disease-free soilless media with a pH of 5.8-6.2 and an EC of 0.75 mmhos/cm (2:1 extraction).

Sowing
Plug Tray Size: Can be produced in a 288, 128, 72 liner (European size: 264) or a similar size plug tray. Do not cover pellets.

Stage 1 – Germination takes approximately 5 to 6 days.

Germination temperature: 65 to 76°F (18 to 24°C)
Light: Light is optional.

Stage 2
Temperature: 65 to 70°F (18 to 21°C)
Light: Can be up to 2,500 f.c. (26,900 Lux) during Stages.

Stage 3
Temperature: 65 to 70°F (18 to 21°C)
Light: Can be up to 2,500 f.c. (26,900 Lux).

Stage 4
Temperature: 65 to 67°F (18 to 19°C)
Light: Can be up to 5,000 f.c. (53,800 Lux) at optimal temperature can be maintained.

Common Problems
Insect: No serious problems.
Disease: No serious problems.

Serena™ Series
Angelonia

Plug Production

Media
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.0 and a medium initial nutrient charge (EC 0.75 mmhos/cm with a 1:2 extraction).

Sowing
Plug tray size from 406 to 128. Do not cover or bury the seed.

Stage 1 – Germination takes 4 to 5 days.

Soil temperature: 71 to 76°F (22 to 24°C)
Light: 10 f.c. (100 Lux) or higher. Light is required for germination. Seeds will not germinate in the dark.

Growth Regulators
Not needed.

Fertilizer
Start at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) once a week from nitrate-form fertilizers with low phosphorus. Avoid using excessive ammonia nitrogen-form fertilizers and overfeeding, as these will result in less upright plants. Maintain the media EC at 1.50 to 2.00 ms/cm and pH at 5.5 to 6.2.

Growth Regulators
Not needed.

Pinching
Not needed.

Container Size
306 premium pack: 1 plug per cell
2.5-in. (6-cm) pot: 1 plug per pot
4-in. (10-cm) pot: 1 plug per pot
6-in. (15-cm) pot: 1 to 3 plugs per pot
1-gallon (18-cm) pot: 1 to 3 plugs per pot

Crop Scheduling
Sow to transplant (288/264-cell plug tray): 5 to 6 weeks
Add one more week when using 128 or 72 cell plug tray but reduce post-transplant crop times by one week.

Transplant to saleable size (from 288 cell):

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants per Pot</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>306 premium pack</td>
<td>1 plug per pot</td>
<td>6-8</td>
</tr>
<tr>
<td>4-in. (10-cm) pot</td>
<td>1 to 3 plugs per pot</td>
<td>6-8</td>
</tr>
<tr>
<td>1-gallon (18-cm) pot</td>
<td>1 to 3 plugs per pot</td>
<td>6-8</td>
</tr>
</tbody>
</table>

GROWER FACTS

PanAmerican Seed Grower Facts

GROWER FACTS

Note: Add 2 more weeks to the crop time when planting 1 plug per 6-in. (16-cm) and gallon (18-cm) container.

Common Problems
Insect: No serious problems.
Disease: No serious problems.

PanAmerican Seed Grower Facts

GROWER FACTS

Common Problems
Insect: No serious problems.
Disease: No serious problems.

PanAmerican Seed Grower Facts

GROWER FACTS

Common Problems
Insect: No serious problems.
Disease: No serious problems.
Serenita™ Series Angelonia

Plug Production Media
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.0 and a medium initial nutrient charge (EC 0.75 mmhos/cm with a 1:2 extraction).

Sowing
Plug tray size from 288 to 128. Do not cover or bury the seed.

Stage 1 – Germination takes 4 to 5 days.

Stage 2
Soil temperature: 68 to 73°F (20 to 23°C)
Light: Up to 2,500 f.c. (26,900 Lux).
Moisture: Start to slightly reduce soil moisture (level 3) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 ppm) from nitrate-form fertilizers with low phosphorous.

Stage 3
Soil temperature: 65 to 70°F (18 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow the media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture level at wet-dry cycle (moisture level 4 to 2). Do not allow the seedlings to wilt as they do not recover very well.
Fertilizer: Increase the fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 ppm) from nitrate-form fertilizers with low phosphorous.

Fertilizer
Feed plants weekly at rate 3 (175 to 225 ppm N/1.2 to 1.5 ppm) using predominantly nitrate-form fertilizer with low phosphorous. Maintain the media EC at 1.5 to 2.0 mS/cm and pH at 5.8 to 6.2.

Growth Regulators
A tank mix of B-Nine/Alar (daminozide) 2,500 ppm (3.0 g/l 85% formulation or 4.0 g/l of 64% formulation) mixed with Cycocel (chlormequat) 750 to 1,000 ppm (6.4 to 8.5 ml/l 11.8% formulation or 1.0 to 1.5 ml/l of 75% formulation) is the most effective growth regulator for angelonia. Cycocel rates can be adjusted depending on environmental conditions. Use lower rates under cooler and shorter daylength conditions, and higher rates under warmer and longer daylength conditions. Growth regulators can be started 2 weeks after transplanting. Repeat as needed.

For growers in warmer climates, a Bonzi (paclobutrazol) drench at 5-10 ppm (1.3 to 2.5 ml/l) at wet-dry cycle (moisture level 4 to 2). Do not allow the seedlings to wilt as they do not recover very well.
Fertilizer: Increase the fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 ppm) from nitrate-form fertilizers with low phosphorous.

Growth regulators are generally not needed in plug stage.

Common Problems
Insect: No serious problems
Disease: No serious problems

Growing On to Finish
Media
Use a well-drained, disease-free, soilless medium with a pH of 5.4 to 6.2 and a medium initial nutrient charge.

Temperature
Night: 65 to 67°F (18 to 19°C)
Day: 65 to 76°F (18 to 24°C)
Daily average temperatures below 65°F (18°C) will slow down the crop growth rate dramatically.

Light
Keep light as high as possible while maintaining recommended temperatures.

Irrigation
Avoid both excessive watering and drought.

Fertilizer
Feed plants weekly at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) using predominantly nitrate-form fertilizer with low phosphorus. Maintain the media EC at 1.5 to 2.0 mS/cm and pH at 5.8 to 6.2.

 Growth Regulators
A tank mix of B-Nine/Alar (daminozide) 2,500 ppm (3.0 g/l 85% formulation or 4.0 g/l of 64% formulation) mixed with Cycocel (chlormequat) 750 to 1,000 ppm (6.4 to 8.5 ml/l 11.8% formulation or 1.0 to 1.5 ml/l of 75% formulation) is the most effective growth regulator for angelonia. Cycocel rates can be adjusted depending on environmental conditions. Use lower rates under cooler and shorter daylength conditions, and higher rates under warmer and longer daylength conditions. Growth regulators can be started 2 weeks after transplanting. Repeat as needed.

For growers in warmer climates, a Bonzi (paclobutrazol) drench at 5-10 ppm (1.3 to 2.5 ml/l) at wet-dry cycle (moisture level 4 to 2). Do not allow the seedlings to wilt as they do not recover very well.
Fertilizer: Increase the fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 ppm) from nitrate-form fertilizers with low phosphorous.

Growth regulators are generally not needed in plug stage.

Common Problems
Insect: No serious problems
Disease: No serious problems

Serena™ Series Angelonia

Plug Production Media
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.0 and a medium initial nutrient charge (EC 0.75 mmhos/cm with a 1:2 extraction).

Sowing
Plug tray size from 288 to 128. Do not cover or bury the seed.

Stage 1 – Germination takes 4 to 5 days.

Stage 2
Soil temperature: 71 to 76°F (22 to 24°C)
Light: 10 f.c. (100 Lux) or higher. Light is required for germination. Seeds will not germinate in the dark.
Moisture: Keep soil moist but not saturated (level 4) during Stage 1 for optimal germination.
Humidity: Maintain 95% relative humidity (RH) until radicle emergence.

Stage 3
Soil temperature: 68 to 73°F (20 to 23°C)
Light: Up to 2,500 f.c. (26,900 Lux).
Moisture: Start to slightly reduce soil moisture (level 3) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 ppm) from nitrate-form fertilizers with low phosphorous.

Growth Regulators
Serenita requires less plant growth regulators than Serena varieties as it is more compact and naturally shorter than Serena. It may not need any growth regulators, especially under cooler conditions. However, if necessary, a tank mix of B-Nine/Alar (daminozide) 2,500 ppm (3.0 g/l 85% formulation or 4.0 g/l of 64% formulation) mixed with Cycocel (chlormequat) 500 to 750 ppm (4.2 to 6.4 ml/l 11.8% formulation or 0.7 to 1.0 g/l of 75% formulation) is good for Serenita. Cycocel rates can be adjusted depending on environmental conditions. Use lower rates under cooler and shorter daylength conditions, and higher rates under warmer and longer daylength conditions. Growth regulators can be started 2 weeks after transplanting. Repeat as needed.

For growers in warmer climates, a Bonzi (paclobutrazol) drench at 3 to 5 ppm (1.3 to 2.5 ml/l) at wet-dry cycle (moisture level 4 to 2). Can be used 2 weeks after transplant instead of the B-Nine/ Cycocel tank mix.

Pinching
Do not pinch the plants! Seed angelonia has excellent natural basal-branching. Pinching will only delay flowering and make the plant habit unattractive.

Crop Scheduling
Sow to transplant (406 to 128-cell plug tray): 5 to 6 weeks

Transplant from 406 to 288-tray to saleable finished container:

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants Per Pot</th>
<th>Weeks From Transplant</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>306 pack</td>
<td>1</td>
<td>8-9</td>
<td>13-15</td>
</tr>
<tr>
<td>4.45 in.</td>
<td>1</td>
<td>9-10</td>
<td>13-15</td>
</tr>
<tr>
<td>(10-11 cm) pot</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.65 in.</td>
<td>3</td>
<td>9-10</td>
<td>14-16</td>
</tr>
<tr>
<td>(15-16 cm) pot</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gallon</td>
<td>3</td>
<td>9-10</td>
<td>14-16</td>
</tr>
</tbody>
</table>

Note: When transplanted from a 128-tray, finish crop time for Serena can be reduced by 1 to 2 weeks.

Common Problems
Insect: No serious problems
Disease: No serious problems

Growing On to Finish
Media
Use a well-drained, disease-free, soilless medium with a pH of 5.4 to 6.2 and a medium initial nutrient charge.

Temperature
Night: 65 to 67°F (18 to 19°C)
Day: 65 to 76°F (18 to 24°C)
Daily average temperatures below 65°F (18°C) will slow down the crop growth rate dramatically.

Light
Keep light as high as possible while maintaining recommended temperatures.

Irrigation
Avoid both excessive watering and drought.

Fertilizer
Feed plants weekly at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) using predominantly nitrate-form fertilizer with low phosphorous and high potassium. Maintain the media EC at 1.5 to 2.0 mS/cm and pH at 5.8 to 6.2.

Growth Regulators
A tank mix of B-Nine/Alar (daminozide) 2,500 ppm (3.0 g/l 85% formulation or 4.0 g/l of 64% formulation) mixed with Cycocel (chlormequat) 750 to 1,000 ppm (6.4 to 8.5 ml/l 11.8% formulation or 1.0 to 1.5 ml/l of 75% formulation) is the most effective growth regulator for angelonia. Cycocel rates can be adjusted depending on environmental conditions. Use lower rates under cooler and shorter daylength conditions, and higher rates under warmer and longer daylength conditions. Growth regulators can be started 2 weeks after transplanting. Repeat as needed.

For growers in warmer climates, a Bonzi (paclobutrazol) drench at 3 to 5 ppm (1.3 to 2.5 ml/l) at wet-dry cycle (moisture level 4 to 2). Can be used 2 weeks after transplant instead of the B-Nine/ Cycocel tank mix.

Pinching
Do not pinch the plants! Seed angelonia has excellent natural basal-branching. Pinching will only delay flowering and make the plant habit unattractive.
**Serenita™ Series Angelonia continued**

**Crop Scheduling**
- **Sow to transplant (288 to 128-cell plug tray):** 5 to 6 weeks
- **Transplant from 288-tray to saleable finished container:**
  
<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants per Pot</th>
<th>Weeks From Transplant</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>306 pack</td>
<td>1</td>
<td>8-9</td>
<td>13-15</td>
</tr>
<tr>
<td>4 to 4.5-in. (10 to 11-cm) pot</td>
<td>1</td>
<td>9-10</td>
<td>13-15</td>
</tr>
<tr>
<td>6 to 6.5-in. (15 to 16-cm) pot</td>
<td>3</td>
<td>9-10</td>
<td>14-16</td>
</tr>
<tr>
<td>Gallon</td>
<td>3</td>
<td>9-10</td>
<td>14-16</td>
</tr>
</tbody>
</table>

**Note:** When transplanted from a 128-tray, finish crop time for Serenita can be reduced by 1 to 2 weeks.

**Common Problems**
- Insect: No serious problems.
- Disease: No serious problems.

**Blutopia™ & Snowtopia™ Bacopa**

**Plug Production**

**Media**
- Use a well-drained, disease-free plug media with a pH range of 5.5 to 6.0, and EC less than 0.75 ms/cm (2:1 extraction).

**Plug Tray Size**
- Can be produced in 288, 128 or similar cell size plug trays.

**Sowing**
- Do not cover the multi-seed pellets with vermiculite at sowing, and make sure to pass the plug trays through the misting/watering tunnel after sowing, as this will help in faster dissolution/breakdown of the pellet.

**Stage 1** – Germination takes approximately 4 days. (White may take a couple of days longer to germ.)

**Germination temperature:** 68 to 74°F (20 to 23°C).

**Light:** Required during germination (10 ft.c./100 Lux or more).

**Media moisture:** Keep the media medium wet (level 4) during germination.

**Relative humidity:** Maintain 95 to 97% relative humidity until cotyledons emerge.

**Stage 2**

**Temperature:** 65 to 75°F (18 to 24°C) days; 60 to 65°F (15 to 18°C) nights.

**Light:** Up to 2,500 ft.c. (26,900 Lux) during Stage 2 & 3.

**Media moisture:** Keep the media medium wet (level 3) to medium wet (level 4) during Stages 2 and 3.

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 ms/cm EC) with a nitrate-form fertilizer with low phosphorous. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 ms/cm (1:2 extraction).

**Stage 3**

**Temperature:** 65 to 75°F (18 to 24°C) days; 60 to 65°F (15 to 18°C) nights.

**Fertilizer:** Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 ms/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 ms/cm (1:2 extraction).

**Stage 4**

**Temperature:** 60 to 70°F (15 to 21°C) days; 55 to 60°F (13 to 15°C) nights.

**Light:** Light levels can be up to 5,000 f.c. (53,800 Lux) if temperatures can be maintained.

**Media moisture:** Keep the media medium (level 3) wet. Do not let the seedlings wilt, as they will not recover favorably.

**Fertilizer:** Same as Stage 3.

**Plant growth regulators:** Generally PGRs are not required during plug production if plants are shipped/transplanted on time. Under Northern European conditions, foliar sprays of B-Nine/Alar (daminozide) at 640 to 950 ppm (1 to 1.5 g/l of 64% formulation or 0.75 to 1.15 g/l 85% formulation) worked well in toning the plugs.

**Growing On to Finish**

**Container Size**
- Can be produced in 4.5-in. (10.5-cm) or similar size containers with one multi-seeded plug per pot, or 5-6 plugs approximately for a 10-in. (25-cm) basket.

**Media**
- Use a well-drained, disease-free media with a pH of 5.8 to 6.2, and a medium initial nutrient charge.

**Temperature**
- **Nights:** 55 to 60°F (13 to 15°C)
- **Days:** 60 to 75°F (15 to 24°C)

**Light**
- Keep light levels as high as possible while maintaining appropriate temperatures.

**Fertilizer**
- Starting 1 week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 ms/cm) using predominantly nitrate-form fertilizer with low phosphorous. If needed, a balanced ammonium and nitrate form fertilizer may be used as needed to encourage growth and balance the media pH.
- Maintain the media EC at 1.50 to 2.00 ms/cm and pH at 5.8 to 6.2.

**Irrigation**
- Avoid both excessive watering and drought.

**Plant Growth Regulators**
- **In North American conditions:** Responds well to foliar sprays of B-Nine/Alar (daminozide) at 2,500 ppm (2.9 g/l 85% formulation or 3.9 g/l 64% formulation) applied once after transplant.
- In Northern European conditions: Can use foliar sprays of B-Nine/Alar (daminozide) at 2,500 ppm (2.9 g/l 85% formulation or 3.9 g/l 64% formulation), and if necessary can follow-up with Cycol (cholormequat) at 375 ppm (0.5 ml/l 75% or 3.1 ml/l 11.8% formulation).

**Crop Scheduling**
- **Sow to transplant:** 3 to 4 weeks
- **Transplant to flower:** 4 to 6 weeks

**Common Problems**
- Insect: White Flies

**BabyWing™ Series Begonia**

**Germination**
- Germination takes 7 to 10 days.

**Sowing**
- Do not cover seed. Water thoroughly at sowing to completely dissolve the pellet. Recommended plug sizes are 400 to 200-cell.

**Temperature**
- 72 to 80°F (22 to 27°C). Keep temperature as constant as possible.

**Humidity**
- Maintain relative humidity at 95%.

**Sowing**
- Do not cover seed. Germinating in a chamber is recommended.

**Light**
- Light is beneficial, but not required.

**Plug Production**

**Media**
- Use a very well-drained, disease-free soilless medium with a medium pH of 5.8 to 6.2 and an EC of about 0.5 mmhos/cm (1:2 extraction).

**Temperature**
- Maintain soil temperature at 70 to 75°F (21 to 24°C) after true leaves develop. Plugs can be held at 62 to 65°F (17 to 18°C) from maturity until transplant.

**Light**
- After germination, maintain light levels between 1,000 and 2,500 ft.c. (10,000 to 30,000 Lux). As seedlings mature, light levels can be increased up to 5,000 ft.c. (54,000 Lux).

**Moisture**
- BabyWing is very sensitive to drying out during early stages of germination. Keep soil moisture high until the first true leaf develops, then reduce moisture levels.
Fertilizer
The high soluble salts in fertilizers tend to affect BabyWing; however, it will also grow slowly if not fertilized. Frequent light fertilization is best. Use 20-10-20 about 50 ppm at Day 8 and 100 ppm at Day 11. Then use every other day until Stage 3. After true leaves emerge, alternate with 15-0-15 until transplant. Always rinse foliage after feeding.

Plant Growth Regulators
None are required during the plug stage.

Growing On To Finish

Container Size
4 to 4.5-in. (10 to 12-cm) pot: 1 plant per pot
6-in. (15-cm) pot: 1 to 2 plants per pot
6.5-in. (16-cm) and larger pots: 3 plants per pot
10 to 12-in. (25 to 30-cm) hanging baskets: 4 plants per pot

Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 6.0 to 6.5.

Temperature
Nights: 60 to 65°F (15 to 18°C)
Days: 65 to 70°F (18 to 21°C)

Light
Grow in a high light environment: 3,000 to 7,000 f.c. (30,000 to 70,000 lux). High light levels will result in earlier flowering and stronger stems.

Irrigation
Allow the media to dry slightly, then water liberally. Water early in the day to avoid leaf burn when temperatures are high.

Fertilization
Fertilize every other irrigation with 15-0-15, alternating with 20-10-20 at 150 ppm 

Plant Growth Regulators
A very light spray of tank mix containing B-Nine 2,500 and Cycocel 300 ppm can be used at 2 to 3 weeks after transplant. A light phytotoxicity may appear on the foliage after the PGR spray, but the plant will recover later.

Note: BabyWing is very responsive to Bonzi and Sumagic. Avoid overspray from neighboring plants.

Pinching
No pinching is required.

Crop Scheduling
Sow to transplant (406 or 288-cell plug tray): 7 to 8 weeks
Transplant to finish: 5 to 7 weeks
Note: Space the plants when the foliage starts touching each other.

Common Problems
Insect: Fungus Gnats, Shore Flies
Disease: No major problems when using good cultural and IPM practices.

Dragon Wing™ Series Begonia

Germination
Germination takes 7 to 10 days.

Plug Tray Size
Dragon Wing plants are best produced in 200-cell plug trays. This permits the plant enough growth at the plug stage so that the direction of the arching stem is clear for correct orientation at planting time. This orientation can be seen in smaller plugs, but is less readily apparent.

Media
Use a well-drained, disease-free sowing medium with a pH of 5.8 to 6.0 and electrical conductivity (EC) of 0.5 mmhos/cm. A very light covering of vermiculite may be needed when germinating pelleted seed on the bench.

Moisture
Keep media saturated through germination.

Temperature
72 to 75°F (22 to 24°C). Keep temperature as constant as possible.

Humidity
Maintain relative humidity at approximately 95% or higher.

Light
Light is beneficial but not required for germination.

Plug Production

Temperature
After radicle emergence, maintain a constant 70°F (21°C) soil temperature for two weeks. In Week 3, the temperature can be decreased to 65°F (18°C).

Moisture
Slightly reduce media moisture levels after radicle emergence. Maintain uniform media moisture until the true leaves appear; then allow media to dry out slightly before waterings. Do not stress plugs until Stage 4.

Light
Light will help to ensure a higher-quality seedling. After radicle emergence, keep light levels at 400 to 2,000 f.c. (4,000 to 20,000 Lux) for two weeks.

Fertilizer
Begin fertilization at 5 days out of the germination chamber, or 10 days after germination on the bench. Dragon Wing plugs require more feed than other fibrous begonias. Recommended application is 50 ppm N, 2 to 3 times per week. In Week 3, increase feed to 150 to 200 ppm N, 2 to 3 times per week.

Plant Growth Regulators
Growth regulators are not required to produce Dragon Wing begonia plugs.

Growing On to Finish

Temperature
Nights: 60 to 65°F (15 to 18°C)
Days: 65 to 70°F (18 to 21°C)

Container Size
Dragon Wing begonias can be transplanted into a wide range of container sizes. Follow these guidelines for the number of plants per pot or basket:

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Bench Spacing</th>
<th>Plants Per Pot/Basket</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-4.5-in. (10-11-cm) pot</td>
<td>Pot Tight</td>
<td>1</td>
</tr>
<tr>
<td>5.5-6-in. (14-15-cm) pot</td>
<td>8 in. (20 cm)</td>
<td>1-2</td>
</tr>
<tr>
<td>6.5-8-in. (16-20-cm) pots</td>
<td>8 to 10 in. (20-25 cm)</td>
<td>2-3</td>
</tr>
<tr>
<td>1-gal. container</td>
<td>10 in. (25 cm)</td>
<td>2</td>
</tr>
<tr>
<td>10-12-in. (25-30-cm) baskets</td>
<td>—</td>
<td>4</td>
</tr>
</tbody>
</table>

Transplanting
Due to directional stem arching, it is very important to position Dragon Wing plugs properly when placing more than one plug into baskets and containers for finishing. Plugs must be placed with the growing shoot facing outward, toward the outside of the container (see drawing). This is the side of the plant the flower is on. The directional growth remains consistent as the plant matures, ensuring flowers on the outside of the finish container.

Media
Use a well-drained, disease-free, soilless medium with a pH of 5.4 to 6.0 and electrical conductivity (EC) of 1.0 mmhos/cm.

Light
Grow on in a high-light environment – 3,000 to 7,000 f.c. (30,000 to 70,000 Lux). Daylength and light quality can have a dramatic effect on plant habit; daylength can also affect flowering time. Dragon Wing begonias will flower under natural daylength year-round, making them a good choice for year-round production in warmer climates. They flower 1 to 3 weeks faster under short days. Short days (8 to 10 hours) cause plants to grow nearly horizontal. Natural or HID long days give intermediate, arching growth. Long days provided by incandescent lighting cause more upright growth, which is beneficial for plant shipment (tighter spacing on shelves with less breakage).

Watering
Produce Dragon Wing begonias on the drier side to help prevent any fungal or water mold-type diseases. However, allowing...
**Dragon Wing™ Series Begonia continued**

plants to wilt even slightly between waterings will delay flowering, reduce branch number and result in paler foliage.

**Fertilizer**

A feed program of 200 ppm N once a week can begin as soon as the plugs have begun to root out.  
**Note:** Severe fertility and/or water stress will delay flowering 1 to 2 weeks.

**Plant Growth Regulators**

- **4-in. (10-cm) pots:** A spray of 3 ppm (0.75 ml/l) Bonzi can be applied weekly for 3 applications to keep plants compact. Start the first application 2 weeks after transplanting.
- **6-in. (15-cm) pots:** A spray of 5 ppm (1.25 ml/l) Bonzi 2 weeks after transplant has been found to be effective in trials in Elburn, IL. An additional 1 or 2 sprays of 5 ppm (1.25 ml/l) Bonzi every other week after the first application results in earlier flowering, shorter internodes, darker foliage and more uniform branches.

For larger containers, these additional applications may not be needed. In trials in Elburn, IL, Dragon Wing begonias grown in an 8-in. (20-cm) pot with 3 plants per pot evidenced more branches and more flowers than those grown in a 6-in. (15-cm) pot without using any plant growth regulators.  
**Note:** In-house trials are recommended to determine the best rates for your location. Always follow current manufacturer label instructions.

**Crop Scheduling**

- **Sow to transplant:** 7 to 8 weeks  
- **Transplant to finish:**  
  - **4-in. (10-cm) pots with 1 plant per pot:** 7 to 9 weeks
  - **6-in. (15-cm) pots with 2 to 3 plants per pot:** 7 to 9 weeks
  - **8-in. (20-cm) pots with 3 plants per pot:** 8 to 10 weeks
  - **10-12-in. (25-30-cm) pots with 4 plants per pot:** 9 to 11 weeks

**Common Problems**

Dragon Wing begonias are quite disease and pest-free. No major problems will occur if using good cultural and IPM practices. A wide range of insecticides has been tested on Dragon Wing plants with little or no phytotoxicity.

**Gryphon Begonia**

**Plug Production**

**Media**

Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.5 mmhos/cm with a 1:2 extraction).

**Sowing**

**Plug Tray Size:** Sow one pelleted seed per cell in 288 or larger plug tray. In Europe, 264-cell trays can be used. Water thoroughly at sowing to completely dissolve the pellet. Do not cover the pellet at sowing.

**Stage 1 – Germination** takes approximately 10 to 12 days.

**Germination temperature:** 72 to 78°F (22 to 26°C). Prefer warmer temperature but can also germinate well at 72°F (22°C).

**Light:** Light is required.

**Media moisture:** Keep the media moist (level 5) during germination. Gryphon is very sensitive to drying out during early stages of germination.

**Relative humidity:** Maintain 95 to 97% relative humidity until cotyledons emerge. A saturated media and high relative humidity is critical to germinate successfully.

**Stage 2**

**Temperature:** Optimum 71 to 76°F (21 to 24°C)

**Light:** Up to 2500 f.c. (26,900 Lux)

**Media moisture:** Keep the media very wet (level 5) to medium wet (level 4) during stage 2. Keep soil moisture high and maintain uniform moisture. Do not stress plugs.

**Fertilizer:** Begin fertilization at 5 days out of the germination chamber. Start with 50-75 ppm N from ammonia-form fertilizer, 2 to 3 times per week; increase slowly to 100 ppm. Maintain a media pH of 5.8 to 6.2.

**Stage 3**

**Temperature:** 68 to 73°F (20 to 22°C)

**Light:** Up to 5,000 f.c. (54,000 Lux)

**Media moisture:** Keep media medium wet to medium (level 4 to 3). Do not allow the seedlings to wilt. Maintain uniform media moisture until the true leaves appear; then allow media to dry out slightly between waterings. Do not stress plugs.

**Fertilizer:** Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 ms/cm EC), 2 to 3 times per week. Alternate fertilizers from ammonia-form to nitrate-form. Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 ms/cm (1:2 extraction).

**Stage 4**

**Temperature:** Can be decreased to 65 to 67°F (18 to 19°C)

**Light:** Up to 5,000 f.c. (54,000 Lux)

**Media moisture:** Moisture level can be reduced to medium dry (level 3). Avoid excess humidity later in the plug production, as this will create conditions favorable for disease incidence.

**Fertilizer:** Same as stage 3.

**Growing On To Finish**

**Media**

Use a well-drained, disease-free, soilless medium with a pH of 5.4 to 6.0 and electrical conductivity (EC) of 1.0 mmhos/cm.

**Temperature**

- **Nights:** 62 to 67°F (16 to 19°C)
- **Days:** 65 to 75°F (18 to 24°C)

**Light**

Light level from 3,000 to 7,000 f.c. (32,400 to 75,600 lux).

**Photoperiod**

- Gryphon is a foliage plant, but plant could flower when grown under a daylength of 11 hours or shorter. Under daylength longer than 11 hours, flowering will be significantly delayed or plants will never flower.

**Irrigation**

Avoid both excessive watering and drought.

**Fertilizer**

Apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 ms/cm) once a week as soon as the plugs have begun to root out. A balanced ammonium and nitrate-form fertilizer may be applied as needed to encourage growth and balance the media pH.

**Growth Regulators**

- Generally, PGRs are not needed. But if necessary, a tank mix of B-Nine/Alar (daminiozide) 2,500 ppm (3.0 g/l 85% formulation) or 4.0 g/l of 64% formulation) and Cycocecl (chloremquat) 300 ppm (2.5 ml/l 11.8% formulation) or 0.4 g/l of 75% formulation) or B-Nine/Alar alone (for cooler area) can be used at 2 weeks after transplanting. Avoid using CCC alone as it can cause phytotoxicity. Also use caution with Bonzi, Topflor, and Sumagic as they can stunt plants.

**In Northern European area:** No PGRs needed, but if necessary we’ve had the best results with a mix of B-Nine/Alar 3200 ppm (3.7 g/l 85% formulation or 5.0 g/l of 64% formulation) and CCC 375 ppm (3.1 ml/l 11.8% formulation or 0.5 g/l of 75% formulation)

**Note:** In-house trials are recommended to determine the best rates for your location. Always follow current manufacturer label instructions.

**Pinching**

No pinching is required.

**Crop Scheduling**

**Sow to transplant (288 cell plug tray):** 8 to 9 weeks

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants Per Pot/basket</th>
<th>Weeks From Transplant</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-5-in. (10-12-cm) pot</td>
<td>1</td>
<td>5-6</td>
</tr>
<tr>
<td>6-in. (15-cm) pot</td>
<td>2-3</td>
<td>5-6</td>
</tr>
<tr>
<td>8-in. (20-cm) pots</td>
<td>3</td>
<td>7-8</td>
</tr>
<tr>
<td>10-12-in. (25-30-cm) pot</td>
<td>3-4</td>
<td>9-11</td>
</tr>
</tbody>
</table>
Common Problems
Gryphon begonias are quite disease and pest-free. No major problems will occur if using good cultural and IPM practices. A wide range of insecticides has been tested on Gryphon plants with little or no phytotoxicity.

Amazon Mist Carex
Plug Production
Media
Use a well-drained, disease-free soilless media with a pH of 5.8-6.2 and an EC of 0.75 mmhos/cm (2:1 extraction).

Sowing
Plug Tray Size: Can be produced in a 288, 128, 72 liner but prefer 288 cell tray (European size: 264) or a similar size plug tray. Cover the seed with vermiculite.

Stage 1 – Germination takes approximately 7 to 10 days.

Germination temperature: 68 to 79°F (20 to 26°C); warmer temperature is preferred but will not make significant difference.

Light: Light is optional.

Relative humidity: Maintain 95 to 97% relative humidity until cotyledons emerge.

Stage 2
Temperature: 68 to 72°F (20 to 22°C)

Light: Can be up to 2,500 f.c. (26,900 Lux).

Media moisture: Reduce soil moisture slightly (level 3) to allow the roots to penetrate into the media.

Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorous. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mmhos/cm.

Growth Regulators
Not needed.

Pinching
Pinching is not needed.

Container Size
306 premium pack: 1 plug per cell
2.5-in. (6-cm) pot: 1 plug per pot
4-in. (10-cm) pot: 1 plug per pot
6-in. (15-cm) pot: 3 plugs per pot
1-gallon (18-cm) pot: 3 plugs per pot

Crop Scheduling
Sow to transplant (288/264-cell plug tray): 6 to 7 weeks
Add 2 to 3 more weeks when using 128 or 72 cell plug tray but reduce post-transplant crop time by 2 to 3 weeks.

Transplant to saleable size (from 288 cell):

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants per Pot/Basket</th>
<th>Weeks From Transplant</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>306 premium pack</td>
<td>1</td>
<td>9-10</td>
<td>15-17</td>
</tr>
<tr>
<td>2.5-in. (6-cm) pot</td>
<td>1</td>
<td>8-9</td>
<td>14-16</td>
</tr>
<tr>
<td>4 to 4.5-in. (10 to 11-cm) pot</td>
<td>1</td>
<td>9-10</td>
<td>15-17</td>
</tr>
<tr>
<td>6 to 6.5-in. (15 to 16-cm) pot</td>
<td>3</td>
<td>10-11</td>
<td>16-18</td>
</tr>
<tr>
<td>Gallon</td>
<td>3</td>
<td>10-11</td>
<td>16-18</td>
</tr>
</tbody>
</table>

Growing On to Finish
Media
Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm (2:1 extraction).

Temperature
Nights: 64 to 66°F (18 to 19°C)
Days: 66 to 74°F (19 to 23°C)

Fertilizer: Starting a week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) once a week from nitrate-form fertilizer with low phosphorus.

Growth Regulators
Not needed.

Common Problems
Insect: No serious problems.
Disease: Root rot when grown too wet.

Bronco Carex
Plug Production
Media
Use a well-drained, disease-free soilless media with a pH of 5.8-6.2 and an EC of 0.75 mmhos/cm (2:1 extraction).

Sowing
Plug Tray Size: Can be produced in a 288, 128, 72 liner but prefer 288 cell size (European size: 264) or a similar size plug tray. Do not cover the seed.

Stage 1 – Germination takes approximately 7 to 10 days.

Germination temperature: 74 to 79°F (24 to 26°C)

Light: Light is optional.

Media moisture: Keep the media medium wet (level 4) during germination.

Relative humidity: Maintain 95 to 97% relative humidity until cotyledons emerge.

Stage 2
Temperature: 68 to 72°F (20 to 22°C)

Light: Can be up to 2,500 f.c. (26,900 Lux).

Media moisture: Reduce soil moisture slightly (level 3) to allow the roots to penetrate into the media.

Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorous. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mmhos/cm.

Stage 3
Temperature: 68 to 72°F (20 to 22°C)

Light: Can be up to 2,500 f.c. (26,900 Lux).

Media moisture: Maintain wet/dry cycle.

Growth Regulators
Not needed.

Growing On to Finish
Media
Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

Temperature
Nights: 64 to 66°F (18 to 19°C)
Days: 66 to 74°F (19 to 23°C)

Fertilizer: If using good cultural and IPM practices. No major problems will occur if using good cultural and IPM practices. A wide range of insecticides has been tested on Gryphon plants with little or no phytotoxicity.

Light
As high as possible.

Irrigation
As high as possible.

Common Problems
Insect: No serious problems.
Disease: Root rot when grown too wet.
Bronco Carex continued

Fertilizer
Starting a week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) once a week from nitrate-form fertilizer with low phosphorus.

Growth Regulators
Not needed.

Pinching
Not needed.

Crop Scheduling
Sow to transplant (288/264-cell plug tray): 6 to 7 weeks.
Add 2 to 3 more weeks when using 128 or 72 cell plug tray but reduce post-transplant crop time by 2 to 3 weeks.

Transplant to saleable size (from 288 cell):

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants per Pot/Tray</th>
<th>Weeks From Transplant</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>306 premium pack</td>
<td>1</td>
<td>10-11</td>
<td>15-17</td>
</tr>
<tr>
<td>2.5-in. (6-cm) pot</td>
<td>1</td>
<td>9-10</td>
<td>14-16</td>
</tr>
<tr>
<td>4-in. (10-cm) pot</td>
<td>3</td>
<td>10-11</td>
<td>15-17</td>
</tr>
<tr>
<td>6-in. (15-cm) pot</td>
<td>1</td>
<td>10-11</td>
<td>15-17</td>
</tr>
<tr>
<td>1-gallon (18-cm) pot</td>
<td>1</td>
<td>10-11</td>
<td>15-17</td>
</tr>
</tbody>
</table>

Common Problems
Insect: No serious problems.
Disease: Root rot when grown too wet.

Cinnamon Carex

Plug Production

Media
Use a well-drained, disease-free soilless media with a pH of 5.8-6.2 and an EC of 0.75 mmhos/cm (2:1 extraction).

Sowing
Plug Tray Size: Can be produced in a 288, 128, 72 liner (European size: 264) or a similar size plug tray. Do not cover the seed.

Stage 1 – Germination takes approximately 8 to 10 days.

Germination temperature: 72 to 77°F (22 to 25°C)
Light: Light is required.
Media moisture: Keep the media medium wet (level 4) during germination.
Relative humidity: Maintain 95 to 97% relative humidity until cotyledons emerge.

Stage 2

Temperature: 68 to 72°F (20 to 22°C)
Light: Can be up to 2,500 f.c. (29,900 Lux).

Growing On to Finish

Media
Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

Temperature

Night: 64 to 66°F (18 to 20°C)
Day: 70 to 77°F (21 to 25°C)
Media moisture: Maintain a media pH of 5.8-6.2 and an EC of 0.75 mmhos/cm.

Coppertop Carex

Plug Production

Media
Use a well-drained, disease-free soilless media with a pH of 5.8-6.2 and an EC of 0.75 mmhos/cm.

Sowing
Plug Tray Size: Can be produced in a 288, 128, 72 liner but prefer 288 cell size (European size: 264) or a similar size plug tray. Do not cover the seed.

Stage 1 – Germination takes approximately 9 to 12 days.

Germination temperature: 65 to 69°F (18 to 20°C)
Light: Light is required.
Media moisture: Keep the media medium wet (level 4) during germination.
Relative humidity: Maintain 95 to 97% relative humidity until cotyledons emerge.

Stage 2

Temperature: 68 to 72°F (20 to 22°C)
Light: Can be up to 2,500 f.c. (29,900 Lux).

Media moisture: Reduce soil moisture slightly (level 3) to allow the roots to penetrate into the media.

Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorus. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1:2 extraction).

Stage 3

Temperature: 68 to 72°F (20 to 22°C)
Light: Can be up to 2,500 f.c. (29,900 Lux).
Media moisture: Moisture level can be reduced to medium to medium dry (level 3 to 2). Do not allow the seedlings to wilt.
**Fertilizer:** Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Stage 4**

**Temperature:** 65 to 67°F (18 to 19°C)

**Light:** Can be up to 5,000 f.c. (54,000 Lux).

**Media moisture:** Maintain wet/dry cycle. Do not allow the seedlings to wilt.

**Fertilizer:** Keep the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Growth Regulators**

Not needed.

**Growing On to Finish**

**Media**

Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

**Temperature**

**Nights:** 64 to 66°F (18 to 19°C)

**Days:** 66 to 74°F (19 to 23°C)

Plants can be grown under temperatures as low as 50°F (10°C) but the crop time will increase significantly. Foliage color is more reddish under cooler conditions with high light.

**Light**

As high as possible.

**Irrigation**

Grow plant on dry side. Do not keep media too wet.

**Fertilizer**

Starting a week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) once a week from nitrate-form fertilizer with low phosphorus.

**Growing Regulators**

Not needed.

**Pinching**

Not needed.

**Crop Scheduling**

**Sow to transplant:** (288/264-cell plug tray): 5 to 7 weeks
Add 2 to 3 more weeks when using 128 or 72 cell plug tray but reduce post-transplant crop time by 2 to 3 weeks.

**Transplant to saleable size (from 288 cell):**

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants per Pot/Basket</th>
<th>Weeks From Transplant</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>306 premium pack</td>
<td>1</td>
<td>10-12</td>
<td>16-18</td>
</tr>
<tr>
<td>2.5-in. (6-cm) pot</td>
<td>1</td>
<td>9-11</td>
<td>15-17</td>
</tr>
<tr>
<td>4 to 4.5-in. (10 to 11-cm) pot</td>
<td>1</td>
<td>10-12</td>
<td>16-18</td>
</tr>
<tr>
<td>6 to 6.5-in. (15 to 16-cm) pot</td>
<td>3</td>
<td>10-12</td>
<td>16-18</td>
</tr>
<tr>
<td>Gallon</td>
<td>3</td>
<td>10-12</td>
<td>16-18</td>
</tr>
</tbody>
</table>

**Note:** Add 2 more weeks to the crop time when planting 1 plug per 6-in. (16-cm) and gallon (18-cm) container.

**Common Problems**

**Insect:** Sciara in young plug stage.

**Disease:** No serious problems.

**Phoenix Green Carex**

**Plug Production**

**Media**

Use a well-drained, disease-free soilless media with a pH of 5.8-6.2 and an EC of 0.75 mmhos/cm (1:2 extraction).

**Sowing**

**Plug Tray Size:** Can be produced in a 288, 128, 72 liner but prefer 288 cell size (European size: 264) or a similar size plug tray. Do not cover the seed.

**Stage 1 – Germination**

**Temperature:** 74 to 79°F (24 to 26°C)

**Light:** Light is optional.

**Media moisture:** Keep the media medium wet (level 4) during germination.

**Relative humidity:** Maintain 95 to 97% relative humidity until cotyledons emerge.

**Stage 2**

**Temperature:** 68 to 72°F (20 to 22°C)

**Light:** Can be up to 2,500 f.c. (26,900 Lux).

**Media moisture:** Reduce soil moisture slightly (level 3) to allow the roots to penetrate into the media.

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorus. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1:2 extraction).

**Stage 3**

**Temperature:** 68 to 72°F (20 to 22°C)

**Light:** Can be up to 2,500 f.c. (26,900 Lux).

**Media moisture:** Moisture level can be reduced to medium to medium dry (level 3 to 2). Do not allow the seedlings to wilt.

**Fertilizer:** Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Stage 4**

**Temperature:** 65 to 67°F (18 to 19°C)

**Light:** Can be up to 5,000 f.c. (54,000 Lux).

**Media moisture:** Maintain wet/dry cycle. Do not allow the seedlings to wilt.

**Fertilizer:** Keep the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Growth Regulators**

Not needed.

**Growing On to Finish**

**Media**

Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

**Temperature**

**Nights:** 64 to 66°F (18 to 19°C)

**Days:** 66 to 74°F (19 to 23°C)

Plants can be grown under temperatures as low as 50°F (10°C) but the crop time will increase significantly.

**Light**

As high as possible.

**Irrigation**

Grow plants on the dry side. Do not keep media too wet.

**Fertilizer**

Starting a week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) once a week from nitrate-form fertilizer with low phosphorus.

**Growing Regulators**

Not needed.

**Pinching**

Not needed.

**Container Size**

**306 premium pack:** 1 plug per cell

**2.5-in. (6-cm) pot:** 1 plug per pot

**4-in. (10-cm) pot:** 1 plug per pot

**6-in. (15-cm) pot:** 1 to 3 plugs per pot

**1-gallon (18-cm) pot:** 1 to 3 plugs per pot

**Crop Scheduling**

**Sow to transplant (288/264-cell plug tray):** 5 to 7 weeks
Add 2 to 3 more weeks when using 128 or 72 cell plug tray but reduce post-transplant crop time by 2 to 3 weeks.

**Transplant to saleable size (from 288 cell):**

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants per Pot/Basket</th>
<th>Weeks From Transplant</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>306 premium pack</td>
<td>1</td>
<td>6-7</td>
<td>11-13</td>
</tr>
<tr>
<td>2.5-in. (6-cm) pot</td>
<td>1</td>
<td>5-6</td>
<td>10-11</td>
</tr>
<tr>
<td>4 to 4.5-in. (10 to 11-cm) pot</td>
<td>1</td>
<td>6-7</td>
<td>11-13</td>
</tr>
<tr>
<td>6 to 6.5-in. (15 to 16-cm) pot</td>
<td>3</td>
<td>7-8</td>
<td>12-14</td>
</tr>
<tr>
<td>Gallon</td>
<td>3</td>
<td>7-8</td>
<td>12-14</td>
</tr>
</tbody>
</table>
Phoenix Green Carex continued

Common Problems
Insect: No serious problems.
Disease: No serious problems.

Red Rooster Carex

Plug Production

Media
Use a well-drained, disease-free soilless media with a pH of 5.8-6.2 and an EC of 0.75 mmhos/cm (2:1 extraction).

Sowing

Plug Tray Size: Can be produced in a 288, 128, 72 liner or prefer 288 cell size (European size: 264) or a similar size plug tray. Do not cover the seed.

Stage 1 – Germination takes approximately 7 to 10 days.
Germination temperature: 74 to 79°F (24 to 26°C)
Light: Light is optional.
Media moisture: Keep the media medium wet (level 4) during germination.
Relative humidity: Maintain 95 to 97% relative humidity until cotyledons emerge.

Stage 2
Temperature: 68 to 72°F (20 to 22°C)
Light: Can be up to 2,500 f.c. (26,900 Lux)
Media moisture: Reduce soil moisture slightly (level 3) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/0.7 to 1.2 mS/cm EC) with a nitrate-form fertilizer with low phosphorus. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1:2 extraction).

Stage 3
Temperature: 68 to 72°F (20 to 22°C)
Light: Can be up to 2,500 f.c. (26,900 Lux)
Media moisture: Moisture level can be reduced to medium to medium dry (level 3 to 2). Do not allow the seedlings to wilt.
Fertilizer: Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Stage 4
Temperature: 65 to 67°F (18 to 19°C)
Light: Can be up to 5,000 f.c. (54,000 Lux)
Media moisture: Maintain wet/dry cycle. Do not allow the seedlings to wilt.
Fertilizer: Keep the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Growth Regulators
Not needed.

Growing On to Finish

Media
Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

Temperature
Nights: 64 to 66°F (18 to 19°C)
Days: 66 to 74°F (19 to 23°C)
Plants can be grown under temperatures as low as 50°F (10°C) but the crop time will increase significantly.

Light
As high as possible.

Irrigation
Grow plants on the dry side. Do not keep media too wet.

Fertilizer
Starting a week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) once a week from nitrate-form fertilizer with low phosphorus.

Growth Regulators
Not needed.

Pinching
Not needed.

Containers

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants per Pot</th>
<th>Weeks from Transplant</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>306 premium pack</td>
<td>1</td>
<td>8-9</td>
<td>14-16</td>
</tr>
<tr>
<td>2.5-in. (6-cm) pot</td>
<td>1</td>
<td>7-8</td>
<td>13-15</td>
</tr>
<tr>
<td>4 to 4.5-in. (10 to 11-cm) pot</td>
<td>1</td>
<td>8-9</td>
<td>14-16</td>
</tr>
<tr>
<td>8 to 6.5-in. (15 to 16-cm) pot</td>
<td>3</td>
<td>9-10</td>
<td>15-17</td>
</tr>
<tr>
<td>Gallon</td>
<td>3</td>
<td>9-10</td>
<td>15-17</td>
</tr>
</tbody>
</table>

Common Problems

Insect: No serious problems.
Disease: Root rot when grown too wet.

Icecream Series Celosia

Plug Production

Media
Use a well-drained, disease-free soilless media with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.7–1.2 mmhos/cm).

Sowing
Sow 1 seed per cell in a 288 or smaller plug tray. Cover seed lightly with vermiculite. Use a preventative treatment against soil-borne diseases.

Stage 1 – Germination takes 5 to 7 days.
Temperature
Nights: 70 to 72°F (21 to 22°C)
Light: Light is required.
Moisture: Keep soil moist (level 4) in Stage 1.
Humidity: Maintain 95 to 98% relative humidity (RH) until cotyledons emerge.

Stage 2
Temperature: 68 to 72°F (20 to 22°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Maintain soil moisture at the same level (level 4); don’t allow the media dry out.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC).

Stage 3
Temperature: 68 to 72°F (20 to 22°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Maintain the moisture level constantly medium moist to medium wet (level 3-4). Don’t allow the media dry out as water stress could cause premature flowering.
Fertilizer: Apply fertilizer at rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC).

Stage 4
Temperature: 65 to 67°F (18 to 19°C)
Light: Up to 5,000 f.c. (54,000 Lux)
Moisture: Keep plug tray uniform moisture.
Fertilizer: Same as Stage 3.

General Remark for Plug stage:
Celosia makes a taproot and is sensitive to root damage. Transplant on time and do not allow seedlings to get root bound.

Growing On to Finish

Media
Use a well-drained, disease-free soilless media with a pH of 5.8 to 6.2 and an EC of 0.75 mmhos/cm in a well-balanced fertilizer

Temperature
Nights: 59 to 61°F (15 to 16°C)
Days: 65 to 70°F (18 to 21°C)
Light
Maintain light levels as high as possible

Photoperiod
Celosia icecream is a quantitative short day plant and will flower uniformly under daylength 13 hours or shorter. When producing under natural daylength longer than 13 hours, daylength control can be applied. Start daylength control no earlier than one week after transplanting.

Irrigation
Maintain media constantly moist to prevent from premature flowering.

GRoWER FACTS

PanAmerican Seed.
Fertilizer
Celosia Icecream is a moderate feeder. Apply fertilizer at lower range of rate 3 (about 175 ppm N/1.2 mS/cm). Celosia is susceptible to high salt levels.

Growth Regulators
Generally, Celosia Icecream does not need PGRs. But if necessary, Celosia Icecream is responsive to B-Nine/Alar (daminozide) spray at 2000-3000 ppm (2.4-3.5 g/l, 85% formulation or 3.1-4.7 g/l 64% formulation) depending on weather. If necessary, repeat the treatment.

Pinching
Not needed.

Crop Scheduling
Sow to transplant (288 cell plug): 3 to 4 weeks
Transplant to flower:

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants per Pot Weeks From Transplant Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pack</td>
<td>1</td>
</tr>
<tr>
<td>4 to 5-in.</td>
<td>1</td>
</tr>
</tbody>
</table>

Production: Celosia Icecream can be produced year-round under the appropriate climate conditions.

Common Problems
Insect: Aphids, Thrips, Spider mites, Leafminers
Disease: Powdery Mildew, Botrytis

Kosmo Series Celosia

Plug Production
Media
Use a well-drained, disease-free, media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

Sowing
Sow 1 seed per cell in 288 or smaller plug tray. Cover seed lightly with vermiculite. Use a preventative treatment against soil-borne diseases.

Stage 1 – Germination begins at day 4-5 continuing through day 12-20.
Soil temperature: 70 to 72°F (21 to 22°C)
Light: Light is required.
Moisture: Keep soil moist (level 4) in Stage 1.
Humidity: Maintain 95%+ relative humidity (RH) until cotyledons emerge.

Stage 2
Soil temperature: 68 to 72°F (20 to 22°C)
Light: Up to 2,500 f.c. (26,900 Lux).
Moisture: Maintain soil moisture at the same level (level 4); don’t allow the media to dry out.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC).

Stage 3
Soil temperature: 68 to 72°F (20 to 22°C)
Light: Up to 2,500 f.c. (26,900 Lux).

Growing On to Finish
Media
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

Irrigation
Maintain media constantly moist to prevent from premature flowering.

Fertilizer
Celosia Kosmo is a moderate feeder. Apply fertilizer at lower range of rate 3 (about 175 ppm N/1.2 mS/cm). Celosia is susceptible to high salt levels.

Growth Regulators
Celosia Kosmo generally does not need PGR.

Note:
Coleus is very sensitive to high salts – particularly high ammonium – during germination. Keep ammonium levels less than 10 ppm.

Stage 1
Soil temperature: 72 to 75°F (22 to 24°C)
Light: Light is not necessary.
Moisture: Keep media evenly moist (level 4), but not saturated.
Humidity: Maintain 95%+ relative humidity (RH) until radicles emerge.

General Remark for Plug Stage:
Celosia makes a taproot and is sensitive to root damage.

Growing On to Finish
Media
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 5.8 and a medium initial nutrient charge (EC 0.75 mS/cm).

Sowing
Sow seed in 288 or larger plug tray. In Europe, 264-cell trays can be used. Cover with vermiculite lightly.

Stage 1 – Germination takes 4 to 5 days.
Soil temperature: 72 to 75°F (22 to 24°C)
Light: Light is not necessary.
Moisture: Keep media evenly moist (level 4), but not saturated.
Humidity: Maintain 95%+ relative humidity (RH) until radicles emerge.

Common Problems
Insect: Aphids, Thrips, Spider mites, Leafminers
Disease: Powdery Mildew, Botrytis

Chocolate Covered
Cherry, Chocolate Mint, Chocolate Splash & Dark Chocolate Coleus

Plug Production
Media
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 5.8 and a medium initial nutrient charge (EC 0.75 mS/cm).

Sowing
Sow seed in 288 or larger plug tray. In Europe, 264-cell trays can be used. Cover with vermiculite lightly.

Stage 1
Soil temperature: 72 to 75°F (22 to 24°C)
Light: Light is not necessary.
Moisture: Keep media evenly moist (level 4), but not saturated.
Humidity: Maintain 95%+ relative humidity (RH) until radicles emerge.

Note:
Coleus is very sensitive to high salts – particularly high ammonium – during germination. Keep ammonium levels less than 10 ppm.

Stage 2
Soil temperature: 72 to 75°F (21 to 24°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous. Alternate feed with clear water. Feed between 2 to 3 clear irrigations. Irrigate early in the day so foliage is dry by nightfall to prevent diseases. Keep soil pH at 5.5 to 6.2 and EC less than 1.0 mS/cm.

Stage 3
Soil temperature: 68 to 70°F (21 to 23°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to dry further until the surface becomes light brown (level 2) before watering but avoid excessive wilting to promote root growth and control shoot growth. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mS/cm (1:2 extraction).
Growth regulators: Generally not needed. If necessary, A-Rest, B-Nine and Bonzi are effective on coleus. Always follow label recommendations. Use temperature differential (DIF) whenever possible, especially the first 2 hours after sunrise, to control plant height.

Common Problems
Insect: Aphids, Thrips, Spider mites, Leafminers
Disease: Powdery Mildew, Botrytis
**Stage 4**

**Soil temperature:** 60 to 62°F (16 to 17°C).
**Light:** Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
**Moisture:** Same as Stage 3.
**Fertilizer:** Same as Stage 3.

**Growing On to Finish**

**Container Size**
- **306 pack:** 1 plant per cell
- **4 to 5-in. (11 to 13-cm) pots:** 1 plant per pot
- **6-in. (15-cm) or gallon pots:** 3 plants per pot

**Media**
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.0 and a medium initial nutrient charge (EC 0.75 mS/cm).

**Temperature**
- **Nights:** 57 to 65°F (14 to 18°C)
- **Days:** 65 to 75°F (18 to 24°C)

**Light**
Provide shade if over 5,000 f.c. (53,800 Lux).

**Irrigation**
Avoid both excessive watering and drought.

**Fertilizer**
Colesus are low to moderate feeders. Excessive feed can lead to dull coloration and decreased vigor. Apply fertilizer at rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm) using predominately nitrate-form fertilizer with low phosphorus and high potassium. Maintain medium electrical conductivity around 1.0 mS/cm (using 1:2 extraction).

**Growth Regulators**
Control plant growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid stem elongation. Coleus are responsive to day/night DIF and are shorter with a negative DIF.

**B-Nine/Alar (diaminoozide)** 2,500 to 5,000 ppm (3.0 to 6.0 g/l 185% formulation or 4.0 to 8.0 g/l of 64% formulation) and Bonzi 5 to 10 ppm spray are effective at controlling height on coleus. They can be applied at 2 to 3 weeks after transplanting. Repeat if necessary. Because Dark Chocolate is more vigorous than Chocolate Mint and Chocolate Splash, additional or heavier PGRs may be needed.

**Pinching**
Not necessary.

**Spacing**
Space plants when foliage is touching.

**Crop Scheduling**

**Sow to transplant (288 cell plug):**
- 5 to 6 weeks

**Transplant to flower:**
- 6 to 8 weeks

**Common Problems**

**Insect:** Aphids, Mealy Bugs, White Flies

**Disease:** Alternaria, Botrytis, Verticillium

**Other:** Excessive internode elongation under low light

**Kong™ Series Coleus**

**Plug Production**

**Stage 1 – Time of radicle emergence**
(4 to 5 days).
- Plug tray size 288 cell or larger.
- Soil temperature 72 to 75°F (22 to 24°C).
- Keep media evenly moist, but not saturated.
- Cover with vermiculite.
- Light is not necessary for germination until radicle emergence.
- Soil pH should be 5.5 to 5.8 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction).
- Coleus is very sensitive to high salts – particularly high ammonium – during germination.
- Keep ammonium levels less than 10 ppm.

**Stage 2 – Stem and cotyledon emergence**
(10 days).
- Soil temperature 72 to 75°F (22 to 24°C).
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Keep soil pH at 5.5 to 6.2 and an EC less than 1.0 mmhos/cm.
- Keep ammonium levels less than 10 ppm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water. Feed between 2 to 3 clear irrigations.
- Irrigate early in the day so foliage is dry by nightfall to prevent diseases.

**Stage 3 – Growth and development of true leaves**
(14 to 21 days).
- Soil temperature 68 to 70°F (20 to 21°C).
- Allow the soil to dry thoroughly between irrigations but avoid excessive wilting to promote root growth and control shoot growth.
- Maintain soil pH at 5.5 to 5.8 and an EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-10-20, alternating with 14-0-14 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Slower-growing colors may need more frequent feeding to get desired height.
- Use temperature differential (DIF) whenever possible, especially the first 2 hours after sunrise, to control plant height.
- A-Rest, B-Nine and Bonzi are effective on coleus, but PGRs are generally not needed. Always follow label recommendations.

**Stage 4 – Plants ready for transplanting or shipping**
(7 days).
- Soil temperature 60 to 62°F (16 to 17°C).
- Allow soil to dry thoroughly between irrigations.
- Maintain soil pH at 5.5 to 5.8 and an EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14 or calcium/potassium nitrate feed at 100 to 150 N as needed.

**Growing On to Finish**

**Temperature**
- **Nights:** 57 to 65°F (14 to 18°C)
- **Days:** 70 to 75°F (21 to 24°C)

**Light**
Provide shade if over 5,000 f.c. (53,800 Lux).

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.0.

**Fertilization**
Fertilize every other week with 15-0-15 alternating with 20-10-20 at 150 to 200 ppm nitrogen. Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction). Coleus are low to moderate feeders. Excessive feed can lead to dull coloration and decreased vigor.

**Pinching**
Pinching is not needed. It will result in smaller leaves and delay crop time.

**Controlling Height**
Kong coleus has very short internodes. Because of the large leaves, the plants tend to get too wide and need more space before they get too tall. Growth regulators are generally not needed.

**Post Production Care**

**Temperature**
- **Nights:** 62 to 65°F (17 to 18°C)
- **Days:** 70 to 75°F (21 to 24°C)

Optimal conditions may be difficult to maintain, especially if plants are displayed outside. Using a negative DIF will help keep the plants short and of high quality.

**Light**
Kong will tolerate shade to partial sun. Shady locations are recommended for retail display. Plants will get leaf burn under high light intensity.

**Crop Schedule & Uses**

**(Crop Schedule In Weeks)**

<table>
<thead>
<tr>
<th>Sow to transplant</th>
<th>(288 plugs)</th>
<th>5 to 6 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Transplant to Sale</strong></td>
<td>1801 premium pack</td>
<td>3 to 4 weeks</td>
</tr>
<tr>
<td></td>
<td>5 to 6 in. (13 to 15 cm) pot</td>
<td>5 to 6 weeks</td>
</tr>
<tr>
<td></td>
<td>Gallon pot</td>
<td>6 to 7 weeks</td>
</tr>
</tbody>
</table>
Versa™ Collection Coleus

Plug Production

Media
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.0 and a medium initial nutrient charge (EC 0.75 mS/cm).

Sowing
Sow seed in 288 or larger plug trays. In Europe, 264-cell trays can be used. Cover lightly with vermiculite.

Stage 1 – Germination takes approximately 3 to 6 days.

Germination temperature: 68 to 79°F (20 to 26°C)
Light: Light is not necessary.
Media moisture: Keep the media medium wet (level 4) during germination.
Relative humidity: Maintain 85 to 90% relative humidity until cotyledons emerge.

Stage 2

Temperature: 72 to 75°F (21 to 24°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorus. Alternate feed with clear water. Keep the media evenly moist (level 4), but not saturated.

Stage 3

Soil temperature: 68 to 70°F (20 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm) from nitrate-form fertilizers with low phosphorus. Alternate feed with clear water. Keep the media medium wet (level 4), but not saturated.

Spiky Blue Corynephorus

Plug Production

Media
Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

Growing On to Finish

Container Size
306 pack: 1 plant per cell
4 to 5-in. (10 to 13-cm) pots: 1 plant per pot
6-in. (15-cm) or gallon pots: 3 plants per pot

Media
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.0 and a medium initial nutrient charge (EC 0.75 mS/cm).

Temperature
Nights: 57 to 65°F (14 to 18°C)
Days: 65 to 75°F (18 to 24°C)
Light
Provide shade if over 5,000 f.c. (53,800 Lux).
Irrigation
Avoid both excessive watering and drought.
Fertilizer
Coleus are low to moderate feeders. Excessive feed can lead to dull coloration and decreased vigor. Apply fertilizer at rate 1 (100 to 175 ppm N/0.7 to 1.2 mS/cm) using predominate nitrate-form fertilizer with low phosphorus and high potassium. Maintain medium electrical conductivity around 1.0 mS/cm (using 1:2 extraction).

Growth Regulators
Control plant growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid stem elongation. Coleus are responsive to day/night DIF and are shorter with a negative DIF. B-Nine/Alar (daminozide) 2,500 to 5,000 ppm (3.0 to 6.0 g/l 85% formulation or 4.0 to 8.0 g/l of 64% formulation) can be applied at 2 to 3 weeks after transplanting. Repeat if necessary.

Pinching
Not necessary.

Spacing
Space plants when foliage is touching.

Crop Scheduling
Sow to transplant (288 cell plug): 5 to 6 weeks
Transplant to finish: 6 to 8 weeks

Common Problems
Insect: Aphids, Mealy Bugs, White Flies
Disease: Alternaria, Botrytis, Verticillium
Other: Excessive internode elongation under low light.

Sowing
Plug Tray Size: Can be produced in a 288 cell tray (European size: 264) or a similar size plug tray. Cover the seed lightly with vermiculite.

Stage 1 – Germination takes approximately 3 to 6 days.

Germination temperature: 68 to 79°F (20 to 26°C)
Light: Light is optional.
Media moisture: Keep the media medium wet (level 4) during germination.
Relative humidity: Maintain 85 to 90% relative humidity until cotyledons emerge.

Stage 2

Temperature: 68 to 72°F (20 to 22°C)
Light: Can be up to 2,500 f.c. (26,900 Lux)
Media moisture: Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorus. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1:2 extraction).

Stage 3

Temperature: 68 to 72°F (20 to 22°C)
Light: Can be up to 2,500 f.c. (26,900 Lux)
Media moisture: Moisture level can be reduced to medium to medium dry (level 3 to 2). Do not allow the seedlings to wilt.
Fertilizer: Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Stage 4

Temperature: 65 to 67°F (18 to 19°C)
Light: Can be up to 5,000 f.c. (54,000 Lux)
Media moisture: Maintain wet/dry cycle. Do not allow the seedlings to wilt.
Fertilizer: Keep the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Growing On to Finish

Media
Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

Temperature
Nights: 64 to 66°F (18 to 19°C)
Days: 66 to 74°F (19 to 23°C)

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Spiky Blue Corynephorus continued

**Irrigation**
Grow plants on the dry side. Do not keep media too wet as it may cause root rot or lean and lanky stems.

**Fertilizer**
Starting a week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) once a week from nitrate-form fertilizer with low phosphorus.

**Growth Regulators**
Not needed.

**Pinching**
Not needed.

**Container Size**
<table>
<thead>
<tr>
<th>306 premium pack</th>
<th>1 plug per cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-gallon (18-cm) pot</td>
<td>1 plug per pot</td>
</tr>
</tbody>
</table>

**Crop Scheduling**
Sow to transplant (288/264-cell plug tray): 6 to 7 weeks
Transplant to saleable size (from 288 cell):

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants per Pot/Basket</th>
<th>Weeks From Transplant</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>306 premium pack</td>
<td>1</td>
<td>6-7</td>
<td>12-14</td>
</tr>
<tr>
<td>2.5-in. (6-cm) pot</td>
<td>1</td>
<td>5-6</td>
<td>11-13</td>
</tr>
<tr>
<td>4 to 4.5-in. (10 to 11-cm) pot</td>
<td>1</td>
<td>6-7</td>
<td>12-14</td>
</tr>
<tr>
<td>6 to 6.5-in. (15 to 16-cm) pot</td>
<td>3</td>
<td>7-8</td>
<td>13-15</td>
</tr>
<tr>
<td>Gallon</td>
<td>3</td>
<td>7-8</td>
<td>13-15</td>
</tr>
</tbody>
</table>

**Common Problems**
Insects: Sciara in plug stage or young plant stage when pots are kept too wet.
Diseases: Root rot when grown too wet.

**Dash Dianthus**

**Plug Production**

**Media**
Use a well-drained, disease-free soilless media with a pH of 5.8 to 6.2 and an EC of 0.5 to 0.75 mmhos/cm (2:1 extraction).

**Sowing**

**Plug Tray Size:** Can be produced in a 288 or similar size plug tray. Cover the seed with a medium layer of coarse grade vermiculite at sowing.

**Stage 1 – Germination takes approximately 3 to 5 days.**

**Germination temperature:** 64 to 68°F (18 to 20°C)

**Light:** Not required, but can be beneficial.

**Media moisture:** Keep the media medium wet (level 4) during germination.

**Relative humidity:** Maintain 95 to 97% relative humidity until cotyledons emerge.

**Stage 2**

**Temperature:** 65 to 70°F (18 to 21°C)

**Light:** Can be up to 2,500 f.c. (26,900 Lux).

**Media moisture:** Reduce the media moisture slightly (level 3) to allow the roots to penetrate into the media.

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorus. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1:2 extraction).

**Stage 3**

**Temperature:** 60 to 65°F (15 to 18°C)

**Light:** Can be up to 2,500 f.c. (26,900 Lux).

**Media moisture:** Moisture level can be reduced to medium to medium dry (level 3 to 2). Do not allow the seedlings to wilt.

**Fertilizer:** Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Stage 4**

**Temperature:** 55 to 60°F (13 to 15°C)

**Light:** Can be up to 5,000 f.c. (54,000 Lux).

**Media moisture:** Maintain wet/dry cycle. Do not allow the seedlings to wilt.

**Fertilizer:** Keep the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Growing On to Finish**

**Media**
Use a well-drained, disease-free soilless media with a pH of 5.8 to 6.2 and an EC of 0.75 mmhos/cm.

**Temperature**
Provide 65 to 75°F (18 to 24°C) day temperatures and 60 to 65°F (15°C) night temperatures for the first 2 weeks of greenhouse production to establish the plants. Finish at 60 to 70°F (15 to 21°C) days, and nights in the low 50s (11 to 12°C). Lower temperatures can be tolerated in the mature plant stage.

**Light**
As high as possible while maintaining the optimal production temperatures

**Irrigation**
Maintain optimal media moisture, i.e. not too wet or too dry.

**Fertilizer**
Starting a week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) once a week from nitrate-form fertilizer with low phosphorus.

**Growth Regulators**
Dash dianthus has a naturally compact plant habit and good basal branching compared to other barbatus type dianthus, making it more suitable for container production. When producing Dash in containers, foliar spray of Bonzi (paclobutrazol) at 6 ppm (1.5 ml/l, 0.4% formulation) applied once at 2-3 weeks after transplant will help in toning the crop, if needed.

**Pinching**
Not needed.

**Container Size**
<table>
<thead>
<tr>
<th>Quart</th>
<th>1 plug per cell</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-gallon (18-cm) pot</td>
<td>1 to 3 plugs per pot</td>
</tr>
</tbody>
</table>

**Crop Scheduling**
Sow to transplant (288/264-cell plug tray): 4 to 5 weeks
Transplant to finish:
Late Spring/Early Summer: 9 to 10 weeks
Late Summer/Winter: 11 to 12 weeks

**Common Problems**
Insect: Thrips, Aphids, Mites
Disease: Powdery Mildew
Cultural Tip: Avoid using fungicides such as Heritage containing active ingredient Azoxystrobin as they can cause phytotoxic symptoms on Dash dianthus.

**Silver Falls Dichondra**

**Plug Production**

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.3 and a medium initial nutrient charge (EC 0.75 mmhos/cm with a 1:2 extraction).

**Sowing**
Cover the seed lightly with coarse vermiculite.

**Temperature**
Germination: 72 to 76°F (22 to 24°C)
Cotyledon stage: 65 to 72°F (18 to 22°C)
True leaves: 65 to 70°F (18 to 21°C)
Hold plugs: 62 to 65°F (16 to 18°C)

**Light**

**Stage one:** Not required.

**After germination:** 1,000 to 2,500 f.c. (10,000 to 30,000 Lux).

**Seeding maturity:** Up to 5,000 f.c. (54,000 Lux) if temperature can be controlled.

**Humidity**
Maintain 95% relative humidity until cotyledons emerge.

**Soil Moisture**
Keep soil moisture high until radicle emergence, then reduce moisture levels after the radicle penetrates the medium. Plug development is faster with drier plug culture. Do not allow the seedlings to wilt.
Fertilizer
At radicle emergence, apply 50 to 75 ppm N from 15-0-15. As cotyledons expand, increase to 100 to 150 ppm N.

Growth Regulators
Spray B-Nine at 2,500 ppm one week before transplant to promote branches.

Growing On to Finish
Media
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.5 and a medium initial nutrient charge.

Temperature
Nights: 62 to 65°F (16° to 18°C)
Days: 65 to 75°F (18° to 24°C)

Light
Higher light levels result in foliage that is more silver in color and shorter internodes.

Irrigation
Silver Falls dichondra benefits from warm, dry growing conditions. Let crop dry out well in between irrigations.

Fertilizer
Feed weekly with 200 ppm N in complete fertilizer.

Growth Regulators
For pot production, a tank mix of 5,000 ppm B-Nine and 1,000 ppm Cycocel one week after transplant can be used to increase branching, control stem length and prevent plants from becoming tangled. This treatment also makes the foliage more silver.

Pinching
Pinching is not needed.

Crop Scheduling
Sow to transplant (288-cell plug tray): 6-7 weeks
Transplant to saleable 4-in. (10-cm) pot: 7 to 8 weeks

Container Size
Plugs Per Pot/Basket
Weeks From Transplant
4-4.5-in. (10.5 cm) pot
1
6 to 7
6-in. (15-cm) pot or gallon
3
7 to 8
12-in. (30-cm) hanging basket
4
7 to 8
5
6 to 7

If producing liners (72-tray), allow 7 to 8 weeks from sow to transplant, and reduce post-transplant crop time by two weeks.

Common Problems
Insect: No serious problems.
Disease: Root rot when grown too wet.

Festina Festuca
Plug Production
Media
Use a well-drained, disease-free soilless media with a pH of 5.5-6.2 and an EC of 0.75 mmhos/cm (2:1 extraction).

Sowing
Plug Tray Size: Can be produced in a 288 cell tray (European size: 264) or a similar size plug tray. Cover the seed with vermiculite.

Stage 1 – Germination takes approximately 4 to 6 days.

Germination temperature: 64 to 72°F (18 to 22°C)
Light: Light is optional.
Media moisture: Keep the media medium wet (level 4) during germination.
Relative humidity: Maintain 85 to 90% relative humidity until cotyledons emerge.

Stage 2
Temperature: 68 to 72°F (20 to 22°C)
Light: Can be up to 2,500 f.c. (26,900 Lux)
Media moisture: Reduce soil moisture slightly (level 3) to allow the roots to penetrate into the media.

Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorus. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1:2 extraction).

Stage 3
Temperature: 68 to 72°F (20 to 22°C)
Light: Can be up to 2,500 f.c. (26,900 Lux)
Media moisture: Moisture level can be reduced to medium to medium dry (level 3 to 2). Do not allow the seedlings to wilt.

Fertilizer: Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC), Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Stage 4
Temperature: 65 to 67°F (18 to 19°C)
Light: Can be up to 5,000 f.c. (54,000 Lux)
Media moisture: Maintain wet/dry cycle. Do not allow the seedlings to wilt.

Fertilizer: Keep the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC), Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Growth Regulators
Not needed.

Growing On to Finish
Media
Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

Temperature
Nights: 64 to 66°F (18 to 19°C)
Days: 66 to 74°F (19 to 23°C)
Plants can be grown under temperatures as low as 50°F (10°C) but the crop time will increase significantly.

Light
As high as possible.

Irrigation
Grow plant on the dry side. Do not keep media too wet as it may cause root rot or lean and lankly stems.

Fertilizer
Starting a week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) once a week from nitrate-form fertilizer with low phosphorus.

Growth Regulators
Not needed.

Pinching
Not needed.

Container Size
306 premium pack: 1 plug per cell
2.5-in. (6-cm) pot: 1 plug per pot
4-in. (10-cm) pot: 1 plug per pot
6-in. (15-cm) pot: 3 plugs (space out) per pot
1-gallon (18-cm) pot: 3 plugs (space out) per pot

Crop Scheduling
Sow to transplant (288/264-cell plug tray): 6 to 7 weeks

Transplant to saleable size (from 288 cell):

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants per Pot/Basket</th>
<th>Weeks From Transplant</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>306 premium pack</td>
<td>1</td>
<td>6-7</td>
<td>12-14</td>
</tr>
<tr>
<td>2.5-in. (6-cm) pot</td>
<td>1</td>
<td>5-6</td>
<td>11-13</td>
</tr>
<tr>
<td>4 to 4.5-in. (10 to 11-cm) pot</td>
<td>1</td>
<td>6-7</td>
<td>12-14</td>
</tr>
<tr>
<td>6 to 6.5-in. (15 to 16-cm) pot</td>
<td>3</td>
<td>7-8</td>
<td>13-15</td>
</tr>
<tr>
<td>Gallon</td>
<td>3</td>
<td>7-8</td>
<td>13-15</td>
</tr>
</tbody>
</table>

Common Problems
Insect: No serious problems.
Disease: Root rot when grown too wet.

Fuseables™ Bacopa
Plug Production
Media
Use a well-drained, disease-free plug media with a pH range of 5.5 to 6.0, and EC less than 0.75 mS/cm (2:1 extraction).

Plug Tray Size
Can be produced in a 288, 105/128, 72 liner (European size: 128) or a similar size plug tray.

Sowing
Do not cover the multi-seed pellets with vermiculite at sowing, and make sure to pass the plug trays through the misting/watering tunnel after sowing, as this will help in faster dissolution/breakdown of the pellet.

Stage 1 – Germination takes approximately 4 days.

For PowWow Series
Echinacea, see pg 136
Fuseables™ Bacopa continued

Germination temperature: 68 to 73°F (20 to 23°C)
Light: Required during germination (10 f.c./100 Lux or more)
Media moisture: Keep the media medium wet (level 4) during germination.
Relative humidity: Maintain 95 to 97% relative humidity until cotyledons emerge.

Stage 2

Soil temperature: 68 to 70°F (20 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux) during Stage 2 & 3.
Media moisture: Keep the media medium (level 3) to medium wet (level 4) during Stages 2 and 3.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorus. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1x extraction).

Stage 3

Soil temperature: 65 to 70°F (18 to 21°C)
Fertilizer: Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1x extraction).
Plant growth regulators: Generally PGRs are not required during plug production if plants are shipped/transplanted on time. Under Northern European conditions, foliar sprays of B-Nine/Alar (diaminozide) at 640 to 950 ppm (1 to 1.5 g/l of 64% formulation or 0.75 to 1.15 g/l 85% formulation) worked well in toning the plugs.

Stage 4

Soil temperature: 59 to 65°F (15 to 18°C)
Light: Light levels can be up to 5,000 f.c. (53,800 Lux) if temperatures can be maintained.
Media moisture: Keep the media medium (level 3) wet. Do not let the seedlings wilt, as they will not recover favorably.
Fertilizer: Same as Stage 3.

Growing On to Finish

Container Size
10-in. (25-cm) to 12-in. (30-cm) color bowl or baskets: 3-4 plugs per color bowl or basket

Media
Use a well-drained, disease-free media with a pH of 5.8 to 6.2, and a medium initial nutrient charge.

Temperature

Nights: 55 to 60°F (13 to 16°C)
Days: 59 to 76°F (15 to 24°C)
Utopia can be grown as low as 50°F (10°C), but the crop time will be longer.

Light
Keep light levels as high as possible while maintaining appropriate temperatures.

Fertilizer
Starting 1 week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) using predominantly nitrate-form fertilizer with low phosphorus. If needed, a balanced ammonium and nitrate form fertilizer may be used as needed to encourage growth and balance the media pH. Maintain the media EC at 1.5 to 2.00 mS/cm and pH at 5.8 to 6.2.

Irrigation
Do not let the plants wilt as this will result in flower/bud drop.

Plant Growth Regulators

In North American conditions: It is not necessary when grown under cool temperatures with high light conditions. In warmer conditions, if needed, one application of B-Nine/Alar (diaminozide) at 1,000 -1500 ppm (1.2-1.8 g/l 85% formulation or 1.5-2.3 g/l 64% formulation) spray at 2 weeks after transplanted works well.

In Northern European conditions: Can use foliar sprays of B-Nine/Alar (diaminozide) at 2,500 ppm (2.9 g/l 85% formulation or 3.9 g/l 64% formulation), and if necessary can follow-up with CycoCell (chlormequat) at 375 ppm (0.5 ml/l 75% or 3.1 ml/l 11.8% formulation).

Crop Scheduling

Sow to transplant:
288 cells: 4 week
105/128 cells: 5 weeks
72 cells: 5 to 6 weeks

Transplant to flower:
6-7 weeks from 288 cells
5-6 weeks from 105/128 cells
4-5 weeks from 72 cells

Common Problems
Insect: White Flies
Disease: None

Fuseables™ Coleus

Plug Production

Media
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 5.8 and a medium initial nutrient charge (EC 0.75 mS/cm).

Sowing
Sow seed in 105/128 or larger plug trays. Dipple plug tray first. Sow seed to the center. Cover lightly with vermiculite. Water adequately after sowing to completely dissolve the pellet.

Stage 1 – Germination takes 4 to 5 days.

Soil temperature: 71 to 76°F (22 to 24°C)
Light: Light is not necessary.

Stage 2

Soil temperature: 71 to 73°F (22 to 23°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous. Alternate feed with clear water. Feed between 2 to 3 clear irrigations, irrigate early in the day so foliage is dry by nightfall to prevent diseases. Keep soil pH at 5.5 to 6.2 and EC less than 1.0 mS/cm.

Stage 3

Soil temperature: 68 to 70°F (20 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to dry further until the surface becomes light brown (level 2) before watering but avoid excessive wilting to promote root growth and control shoot growth. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain soil pH at 5.5 to 5.8 and EC less than 1.0 mS/cm (1x extraction).

Growth regulators: Generally not needed. The competition among the multiple seedlings in each plug cell will provide natural growth control. If necessary, A-Rest, B-Nine and Bonzi are effective on coleus. Always follow label recommendations. Use temperature differential (DIF) whenever possible, especially the first 2 hours after sunrise, to control plant height.

Stage 4

Soil temperature: 59 to 64°F (15 to 18°C)
Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

Growing On to Finish

Container Size
10-in. (25-cm) to 12-in. (30-cm) color bowl or baskets: 3-5 plugs per color bowl or basket

Media
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.0 and a medium initial nutrient charge (EC 0.75 mS/cm).

Temperature

Nights: 59 to 64°F (15 to 18°C)
Days: 65 to 76°F (18 to 24°C)

Light
Provide shade if over 5,000 f.c. (53,800 Lux).
**Irrigation**
Avoid both excessive watering and drought.

**Fertilizer**
Fuseables Coleus is a low to moderate feeder. Excessive feed can lead to dull coloration and lush growth. Apply fertilizer at rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm) using predominately nitrate-form fertilizer with low phosphorus and high potassium. Maintain medium electrical conductivity around 1.0 mS/cm (using 1:2 extraction).

**Growth Regulators**
Control plant growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid stem elongation. Fuseables Coleus is responsive to day/night DIF and is shorter with a negative DIF.

B-Nine/Alar (daminozide) 2,500 to 5,000 ppm (3.0 to 6.8 g/l 85% formulation or 4.0 to 8.0 g/l of 64% formulation) can be applied at 2 to 3 weeks after transplanting. Repeat if necessary.

**Pinching**
Not necessary.

**Spacing**
Space plants when foliage is touching.

**Crop Scheduling**
Sow to transplant (105/128 cell plug): 5 to 6 weeks
Transplant to finish: 6 to 8 weeks

**Fuseables™ Juncus**

**Plug Production**
**Media**
Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

**Sowing**
**Plug Tray Size:**
Can be produced in a 288, 128, 72 liner (European size: 264) or a similar size plug tray. Cover the seed lightly with coarse vermiculite.

**Stage 1 – Germination takes approximately 7 to 8 days.**
**Germination temperature:** 71 to 76°F (22 to 24°C)
**Light:** Light is optional.
**Media moisture:** Keep the media medium wet (level 4) during germination.
**Relative humidity:** Maintain 95 to 97% relative humidity until cotyledons emerge.

**Stage 2**
**Temperature:** 68 to 70°F (20 to 21°C).
**Light:** Can be up to 2,500 f.c. (26,900 Lux) during Stages.

**Growing On to Finish**
**Media**
Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

**Temperature**
**Nights:** 59 to 64°F (15 to 17°C).
**Days:** 62 to 73°F (16 to 22°C).
Plants can be grown under temperatures as low as 50°F (10°C) but the crop time will increase significantly.

**Light**
As high as possible while maintaining moderate temperature.

**Irrigation**
Keep media moist. Avoid growing dry as this will cause yellowing of Juncus effusus spiralis. Can be grown under saturated conditions.

**Fertilizer**
Starting a week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) once a week from nitrate-form fertilizer with low phosphorus. Avoid using excessive ammonia nitrogen-form fertilizers and overfeeding, as these will result in less upright plants. Maintain the media EC at 1.50 mS/cm (1:2 extraction).

**Common Problems**
**Insect:** Aphids, Mealy Bugs, White Flies
**Disease:** Alternaria, Botrytis, Verticillium

**Fuseables™ Lobelia**

**Plug Production**
**Media**
Use a well-drained, disease-free soilless media with a pH of 5.8 to 6.2 and an EC of 0.75 mmhos/cm (2:1 extraction).

**Sowing**
Fuseables Lobelia can be produced in a 288, 105/128, 72 liner (European size: 128) or similar size plug tray. Cover the seed lightly with coarse vermiculite.

**Stage 1 – Germination takes approximately 5 to 6 days.**
**Germination temperature:** 68 to 73°F (20 to 23°C).
**Light:** Light is optional.
**Media moisture:** Keep the media medium wet (level 4) during germination.
**Relative humidity:** Maintain 95 to 97% relative humidity until cotyledons emerge.

**Stage 2**
**Temperature:** 68 to 70°F (20 to 21°C).
**Light:** Can be up to 2,500 f.c. (26,900 Lux) during Stage 2.
**Media moisture:** Keep the media medium wet (level 3) to medium wet (level 4) during Stage 2.
**Fertilizer**
Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorus. Maintain a media pH of 5.8 to 6.2 and EC of 0.5 to 0.7 mS/cm (1:2 extraction).
Fuseables™ Lobelia continued

Stage 3
Temperature: 65 to 67°F (18 to 19°C).
Light: Can be up to 2,500 f.c. (26,900 Lux) while maintaining temperatures.
Media moisture: Moisture level can be reduced to medium to medium dry (level 3 to 2). Do not allow the seedlings to wilt.
Fertilizer: Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Avoid excess humidity later in the plug production, as this will create conditions favorable for disease incidence.

Stage 4
Temperature: 62 to 64°F (16 to 17°C).
Light: Can be up to 5,000 f.c. (54,000 Lux) while maintaining temperatures.
Media moisture: Moisture level can be reduced to medium to medium dry (level 3 to 2). Do not allow the seedlings to wilt.
Fertilizer: Keep the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Growth Regulators
Not needed.

Growing On to Finish
Media
Use a well-drained, disease-free sterile media with a pH of 5.8 to 6.2 and an EC of 0.75 mmhos/cm.

Temperature
Nights: 50 to 61°F (10 to 16°C).
Days: 65 to 70°F (18 to 21°C).
Fuseables Lobelia perform best in moderate climates. Growing under recommended temperature range will result in better-tuned products. Warmer temperatures could cause plants stretch.

Light
As high as possible, while maintaining moderate temperature. Provide shade to reduce temperature under warmer conditions.

Photoperiod
Lighting plants when days are shorter than 12 hours speeds flowering.

Irrigation
Avoid both excessive watering and drought.

Fertilizer
Lobelias are light to moderate feeders and perform best when a complete fertilizer is used at rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm). Reduce fertilizer rate at the end of the crop to keep the plants compact.

Growth Regulators
Generally, PGRs are not needed. If necessary, B-Nine/Alar (diaminodizide) at 2,500 to 5,000 ppm (3.0 to 6.0 g/l 18% formulation or 4.0 to 8.0 g/l of 64% formulation) with 1 application applied 2 weeks after transplant should be sufficient.

Pinching
Pinching is not needed.

Crop Scheduling
Sow to transplant (288-cell plug tray): 4 to 5 weeks
Sow to transplant (128/105-cell plug tray or 72 liner): 5 to 6 weeks

Fertilizer
Stage 1 – Germination takes approximately 4 days.
Germination temperature: 71 to 76°F (22 to 24°C).
Light: Lighting is beneficial.
Media moisture: Keep soil very wet (level 5) during Stage 1 for optimal germination.
Relative humidity: Maintain 100% relative humidity (RH) until radicles emerge.

Stage 2
Temperature: 68 to 76°F (20 to 24°C).
Light: Up to 2,500 f.c. (26,900 Lux).
Media moisture: Start to slightly reduce soil moisture (level 4) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorus.

Stage 3
Temperature: 65 to 70°F (18 to 21°C).

Common Problems
Insect: No serious problems.
Disease: No serious problems.

Fuseables™ Multi-Species (Petunia x Bacopa)

Plug Production
Media
Use a well-drained, disease-free seedling medium with a pH of 5.5 to 6.0 and an EC of 0.75 mS/cm (1:2 extraction).

Sowing
Can be produced in a 288, 105/128, 72 liner (European size: 128) or similar size plug tray, or 288-cell plug tray. Can be produced in a 288, 105/128, 72 liner.

Fertilizer
Stage 1: Fuseables Multi-Species Petunia x Bacopa plugs can be grown at temperatures as low as 35°F (2°C). Crop timing (time to flower) is related to daily average temperature when grown under proper daylength. Plants will take longer to flower when grown under cooler conditions.

Light
Keep light levels as high as possible while maintaining moderate temperatures.

Fertilizer
Apply nitrate-form with low phosphorus fertilizer at rate 3 (175 to 225 ppm N (1.2 to 1.5 mS/cm EC) every other irrigation. Apply a balanced ammonium and nitrate-form fertilizer with low phosphorus as needed to encourage growth and to balance media pH. Maintain media pH 5.8 to 6.2.

For constant fertilizer program, apply fertilizer at rate 2 (100 to 175 ppm N or

GRoWER FACTS

Container Size
Plug Production

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants Per Pot / Basket</th>
<th>Weeks From Sow to Transplant From 288</th>
<th>Weeks From Sow to Finish From 288</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5 in. (12 cm) pot</td>
<td>1</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>6-6.5 in. (15-16 cm) pot</td>
<td>1</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>12 in. (30 cm) hanging basket</td>
<td>3-5</td>
<td>6-8</td>
<td>11-13</td>
</tr>
</tbody>
</table>

Crop time can be reduced 1 to 2 weeks if transplanted from larger cells of 128/105 or 72 liner.

Sowing
Sow to transplant (128/105-cell plug tray or 72 liner): 5 to 6 weeks
Sow to transplant (288-cell plug tray): 4 to 5 weeks

Fertilizer
Stage 1: Increase the fertilizer level to 2 (100 to 175 ppm N or 0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain a media pH of 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).

Fertilizer
Stage 4: Increase the fertilizer level to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain a media pH of 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).

Fertilizer
Stage 5: No serious problems.
Disease: No serious problems.
0.7-1.2 mS/cm EC) while maintaining the above recommended EC and pH ranges.

Growth Regulators
Bonzi (paclolbutrazol) drench about 2-4 ppm (0.5 to 1.0 ml/l, 0.4% formulation) works well for Fuseables Multi-Species Petunia x Bacopa plant size control. Cotton Candy is more vigorous than Silk N’ Satin and can use the higher range of the rates. Drench can be done when foliage is close to reaching the edge of the container.

Do not use B-Nine/Alar (daminozide) at rates higher than 1000 ppm or Topflor (flurprimidol) as they will stunt bacopa. To determine the best rate for your conditions, we recommend that you run an in-house trial.

Photoperiod
Bacopa is not sensitive to daylength, but Easy Wave™ Petunias are slightly sensitive to daylength. All varieties of Easy Wave can flower successfully at 10 hours daylength with a 24-hour daylength. All varieties of Easy Wave can flower successfully at 10 hours daylength with a 24-hour daylength. Plants will take longer to flower when grown under cooler conditions.

Light
Keep light levels as high as possible while maintaining moderate temperatures.

Fertilizer
Apply nitrate-form with low phosphorus fertilizer at rate 1 (175 to 225 ppm N/1.2 to 1.5 mS/cm EC) every other irrigation. Apply a balanced ammonium and nitrate-form fertilizer with low phosphorus as needed to encourage growth and to balance media pH. Maintain media pH 5.8 to 6.2.

For constant fertilizer program, apply fertilizer at rate 2 (100 to 175 ppm N or 0.7-1.2 mS/cm EC) while maintaining the above recommended EC and pH ranges.

Growth Regulators
Use B-Nine/Alar (daminozide) at 5,000 ppm (5.9 g/l, 85% formulation or 7.8 g/l, 64% formulation) weekly application starting at 7 days after transplant or just use the same PGR regime as that for standard grandiflora petunias, such as Dreams or Supercascade.

Note: Pleasantly Blue does not respond to Bonzi spray or drench as well as B-Nine spray.

To determine the best rate for your conditions, we recommend that you run an in-house trial.

Photoperiod
Fuseables Petunias are slightly sensitive to daylength. All varieties can flower successfully at 10 hours daylength. Plants will take longer to flower when grown under proper daylength.

Crop Scheduling
Sow to transplant (288-cell plug tray): 4 weeks
Sow to transplant (105/128-cell plug tray): 5 weeks
Sow to transplant (72-cell plug tray): 5 to 6 weeks
Transplant to flower: 6-7 weeks from 288 cells
5-6 weeks from 105/128 cells
4-5 weeks from 72 cells

Total Crop Time:

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants Per Pot/Basket</th>
<th>Spring (weeks)</th>
<th>Summer (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 to 12-in. (25 to 30-cm) color bowl or basket</td>
<td>3-5</td>
<td>10-12</td>
<td>8-10</td>
</tr>
</tbody>
</table>

Common Problems
No major problems will occur if good cultural and IPM practices are used.

Fuseables™ Petunia
Plug Production
Media
Use a well-drained, disease-free media with a pH of 5.5 to 6.0 and an EC of 0.75 mS/cm (1:2 extraction).

Sowing
Can be produced in a 105/128, 72 liner (European size: 128) or similar size plug tray, but recommend 105/128 cells or larger. Do not cover the seed. Water adequately after sowing to completely dissolve the pellet.

Stage 1 – Germination takes approximately 4 days.

Germination temperature: 72 to 76°F (22 to 24°C).

Light: Lighting is beneficial.
Media moisture: Keep soil very wet (level 5) during Stage 1 for optimal germination.
Relative humidity: Maintain 100% relative humidity (RH) until radicles emerge.

Stage 2
Temperature: 68 to 75°F (20 to 24°C).
Light: Up to 2,500 E.c. (26,900 Lux).
Media moisture: Start to slightly reduce soil moisture (level 4) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous.

Stage 3
Temperature: 65 to 70°F (18 to 21°C).
Light: Can be up to 2,500 E.c. (26,900 Lux).
Media moisture: Allow media to dry further until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain a media pH of 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).

Growth regulators: If possible, try to grow Petunia Fuseables plugs without any PGRs. The competition amongst the multiple seedlings in each plug cell will provide natural growth control and also cooler temperatures during stage 4 will provide natural toning of the plugs.

In North American conditions: If PGRs are needed, apply B-Nine/Alar (daminozide) 1 to 2 applications at 5,000 ppm (6.0 g/l, 85% formulation or 7.8 g/l, 64% formulation) as a spray. The first application should be made when plugs have 2 to 3 true leaves. A second application can be made 7 days later. This treatment can improve basal branching of mature plants.

In Northern European conditions: 1 to 3 applications of B-Nine/Alar (daminozide) at 1,250 ppm (1.5 g/l, 85% formulation or 2.0 g/l, 64% formulation) spray has been tested in-house trial.

Stage 4
Temperature: 60 to 65°F (16 to 18°C).
Light: Up to 5,000 E.c. (53,800 Lux) if temperature can be controlled.
Media moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

Growing On to Finish
Container Size
10 to 12-in. (25 to 30-cm) color bowls or baskets: 3 plugs per color bowl or basket.

Media
Use a well-drained, disease-free soilless medium with a pH of 5.5 to 6.2 and a medium initial nutrient charge.

Temperature
Nights: 57 to 65°F (14 to 18°C).
Days: 61 to 75°F (16 to 24°C).

Fuseables Petunia can be grown at temperatures as low as 50°F (10°C). Crop timing (time to flower) is related to average temperature when grown under proper daylength. Plants will take longer to flower when grown under cooler conditions.

Light
Keep light levels as high as possible while maintaining moderate temperatures.

Fertilizer
Apply nitrate-form with low phosphorus fertilizer at rate 1 (175 to 225 ppm N/1.2 to 1.5 mS/cm EC) every other irrigation. Apply a balanced ammonium and nitrate-form fertilizer with low phosphorus as needed to encourage growth and to balance media pH. Maintain media pH 5.8 to 6.2.

For constant fertilizer program, apply fertilizer at rate 2 (100 to 175 ppm N or 0.7-1.2 mS/cm EC) while maintaining the above recommended EC and pH ranges.

Growth Regulators
Use B-Nine/Alar (daminozide) at 5,000 ppm (5.9 g/l, 85% formulation or 7.8 g/l, 64% formulation) weekly application starting at 7 days after transplant or just use the same PGR regime as that for standard grandiflora petunias, such as Dreams or Supercascade.

Note: Pleasantly Blue does not respond to Bonzi spray or drench as well as B-Nine spray.

To determine the best rate for your conditions, we recommend that you run an in-house trial.

Photoperiod
Fuseables Petunias are slightly sensitive to daylength. All varieties can flower successfully at 10 hours daylength with a 24-hour daylength. Plants will take longer to flower when grown under proper daylength.

Crop Scheduling
Sow to transplant (105/128-cell plug tray): 5 weeks
Sow to transplant (72-cell tray): 5 to 6 weeks
Transplant to flower: 6-7 weeks from 288 cells
5-6 weeks from 105/128 cells
4-5 weeks from 72 cells

Total Crop Time:

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants Per Pot/Basket</th>
<th>Spring (weeks)</th>
<th>Summer (weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 to 12-in. (25 to 30-cm) color bowl or basket</td>
<td>1</td>
<td>10-12</td>
<td>8-10</td>
</tr>
</tbody>
</table>

Common Problems
No major problems will occur if good cultural and IPM practices are used.
**For Mesa Series**

**Gaillardia, see pg 137**

**Fireworks Gomphrena**

**Plug Production**

**Media**
Use a well-drained, disease-free media with a pH range of 5.8 to 6.2, and EC less than 0.75 mS/cm (2:1 extraction).

**Sowing**
Can be produced in a 406, 288 (European size; 264) or a similar size plug tray with 1 seed per cell. Cover the seed with vermiculite.

**Stage 1** – Germination takes approximately 2 to 3 days.

- **Germination temperature:** 68 to 75°F (20 to 24°C).
- **Light:** Light is required for germination.
- **Relative humidity:** Maintain 95 to 97% relative humidity until cotyledons emerge. Avoid excess humidity later on in the plug production, as this will create conditions favorable for disease incidence.

**Stage 2**

- **Temperature:** 72°F (22°C) days; 68°F (20°C) nights.
- **Light:** Can be up to 2,500 f.c. (26,900 Lux) during Stages 2 and 3.
- **Media moisture:** Keep the media medium wet (level 4) during germination.

**Stage 3**

- **Temperature:** 72°F (22°C) days; 68°F (20°C) nights.
- **Light:** Can be up to 5,000 f.c. (54,000 Lux) while maintaining temperatures.

**Stage 4**

- **Temperature:** 68°F (20°C) days; 64°F (18°C) nights.
- **Light:** Can be up to 5,000 f.c. (54,000 Lux) while maintaining temperatures.

**Plant Growth Regulators**
Generally not required in young plant stage. If needed, young plants react well to B-Nine/Alar.

**Growing On to Finish**

**Media**
Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

**Temperature**

- **Nights:** 63° to 66°F (17° to 19°C)
- **Days:** 65 to 75°F (18 to 25°C)

**Light**
Light level should be as high as possible while maintaining proper temperature.

**Irrigation**
Avoid both excessive watering and drought.

**Fertilization**
Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate form fertilizer with low phosphorus.

**Media Moisture**
Keep the media medium wet (level 4 to 3) during this period. Do not allow the seedlings to wilt.

**Irrigation**
Maintain 95 to 97% relative humidity until cotyledons emerge. Avoid excess humidity later on in the plug production, as this will create conditions favorable for disease incidence.

**Stage 1** – Germination takes approximately 2 to 3 days.

- **Germination temperature:** 68 to 75°F (20 to 24°C).
- **Light:** Light is required for germination.
- **Relative humidity:** Maintain 95 to 97% relative humidity until cotyledons emerge. Avoid excess humidity later on in the plug production, as this will create conditions favorable for disease incidence.

**Stage 2**

- **Temperature:** 72°F (22°C) days; 68°F (20°C) nights.
- **Light:** Can be up to 2,500 f.c. (26,900 Lux) during Stages 2 and 3.
- **Media moisture:** Keep the media medium wet (level 4) during Stage 2.

**Stage 3**

- **Temperature:** 72°F (22°C) days; 68°F (20°C) nights.
- **Light:** Can be up to 5,000 f.c. (54,000 Lux) while maintaining temperatures.

**Stage 4**

- **Temperature:** 68°F (20°C) days; 64°F (18°C) nights.
- **Light:** Can be up to 5,000 f.c. (54,000 Lux) while maintaining temperatures.

**Fireworks Gomphrena plant response to PGRs is variable with container size and different environmental conditions. We recommend that you run an in-house trial to determine the best rate or method for your conditions.**

**Pinching**
Pinching is not required.

**Container Size**
Gomphrena can be produced in 5-in. (13-cm) pots with 1 plant per pot or in 1-gallon (18 to 19-cm) containers with 2 to 3 plants per pot.

**Crop Scheduling**

- **Sow to transplant (400 or 288/264-cell plug tray):** 5 to 6 weeks.
- **Transplant to finish:** 8 to 9 weeks at recommended temperatures/conditions. If grown under moderate conditions, crop time can be up to 10 to 12 weeks.

**Common Problems**
No major problems when using good culture and IPM practices.

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**Mahogany Splendor**

**Hibiscus**

**Plug Production**
Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm with a 1:2 extraction).

**Sowing**
Plug Tray Size: Sow one seed per cell in 200 or larger. EU: 128-84 cell plug tray. Cover heavily with plug media or vermiculite to prevent seedlings from tipping over.

**Stage 1** – Germination takes 2 to 3 days.

- **Germination temperature:** 71 to 76°F (21 to 24°C). Germination can also be done under cooler temperature like 65°F (18°C) with one day longer in germination chamber.
- **Light:** Light is not required for germination.
- **Media moisture:** Keep the media medium wet (level 4) during germination.
- **Relative humidity:** Maintain 95 to 97% relative humidity until cotyledons emerge.

**Stage 2**

- **Soil temperature:** 68 to 73°F (20 to 23°C)
- **Light:** Up to 2500 f.c. (26,900 Lux)
- **Media moisture:** Keep the media medium wet (level 4) to medium (level 3) during stage 2.
- **Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate form fertilizer with low phosphorus.

**North American conditions:** Apply Bonzi 4 to 10 ppm (1 to 2.5 ml/l) drench about 2 to 3 weeks after transplant. The exact rate depends on circumstances. In the PanAmerican Seed Santa Paula, California facility, a 4 to 6 ppm (1 to 1.5 ml/l) Bonzi drench was sufficient.

**Northwestern European conditions:**

- **Temperature:** 68 to 73°F (20 to 23°C)
- **Light:** Up to 5000 f.c. (54,000 Lux)
- **Media moisture:** Keep media medium wet to medium (level 4 to 3). Do not allow the seedlings to wilt.
- **Fertilizer:** Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC), with a nitrate form fertilizer with low phosphorus.

**GROWER FACTS**

**GRoWER FACTS**

**Treat plugs with tank mix of B-Nine/Alar 2500 ppm (3.9 g/l 64% formulation or 2.9 g/l 85% formulation) and**
CCC 300 ppm (0.4 ml/l 75% formulation or 0.7 ml/l 46% formulation) foliar spray. **Northwestern Europe:** Treat plugs with tank mix of Alar/B-Nine 1250 ppm (2.0 g/l 64% formulation or 1.7 g/l 85% formulation) and Cycoceol 300 ppm (0.4 ml/l 75% formulation or 0.7 ml/l 46% formulation) foliar spray.

**Stage 4**

**Soil temperature:** 65 to 70°F (18 to 21°C)
**Light:** 5,000 f.c. (54,000 Lux)
**Media moisture:** Moisture level can be reduced to medium dry (level 3).
**Fertilizer:** Same as stage 3.

**Growing On to Finish**

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2 and an EC of 0.75 mmhos/cm.

**Temperature**

- **Nights:** 62 to 67°F (17 to 19°C)
- **Days:** 65 to 70°F (18 to 21°C)

**Light**
Keep light levels as high as possible.

**Photoperiod**
It is a foliage plant. But plant could flower whenever possible to control plant height – especially the first 2 hours after sunrise.

**Irrigation**
Keep media uniform moisture. Plants can tolerate saturated moisture.

**Fertilizer**
Starting a week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 ms/cm) using predominantly nitrate-form fertilizer with low phosphorus and high potassium. Maintain the media EC at 1.50 to 2.00 mS/cm and pH at 5.8 to 6.2.

**Growth Regulators**

- **PGR plus pinch (see below)** will make a bushy, compact plant with dark purple foliage.
- A tank mix of B-Nine/Alar 2500 ppm (3.9 g/l 64% formulation, 2.9 g/l 85% formulation) and Cycoceol 750-1000 (1.0-1.3 ml/l 75% formulation, 6.4-8.5 ml/l 11.8% formulation) dependent on temperature can be applied every other week starting at 2 weeks after transplant.
- In **Northwest Europe**, the Cycoceol rate should start with 350 ppm (0.5 ml/l 75% formulation, 3.0 ml/l 11.8% formulation), and increase as plant mature but do not go higher than 750 ppm (1.0 ml/l 75% formulation, 6.4 ml/l 11.8% formulation). Bonzi spray can be used as a substitute for the tank mix B-Nine / Cycoceol. Start with 5-10 ppm (1.3-2.5 ml/l 0.4% formulation) dependent on temperature. Repeat as needed and the rate can go up to 10-15 ppm (2.5-3.8 ml/l 0.4% formulation).

**For growers in warmer climates**, a Bonzi drench at 1ppm (0.25 ml/l 0.4% formulation) also works very well.

**Pinching**
A soft pinch will promote development of branches. The pinch can be done when plants have developed 6-7 leaf stage to leave 5-6 leaves, which is about 2 weeks after transplant. Do not pinch too hard as it may result in open center habit.

**Crop Scheduling**

**Sow to transplant (200 cell plug tray):** 2 to 3 weeks

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants Per Pot / Basket</th>
<th>Weeks From Transplant</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.5 in. quart (10-12 cm) pot</td>
<td>1</td>
<td>5-6</td>
<td>9-10</td>
</tr>
<tr>
<td>6 in. (15) pot</td>
<td>1</td>
<td>6-7</td>
<td>9-11</td>
</tr>
<tr>
<td>Gallon or 8-in. (19-cm) pot</td>
<td>1</td>
<td>6-8</td>
<td>10-11</td>
</tr>
</tbody>
</table>

**Common Problems**
Watch for thrips.

**Impreza™ Series Impatiens**

**Plug Production**

**Stage 1** – Time of radicle emergence (3 to 5 days)
- Keep media very moist and near saturation.
- Do not cover or bury the seed.
- Germination temperature: 72 to 76°F (22 to 24°C).
- Light levels at 100 to 400 f.c. (1,000 to 4,000 Lux) will enhance germination.
- Keep soil pH at 6.0 to 6.2 and soluble salts (EC) less than 0.75 mmhos/cm (2:1 extraction). Keep ammonium levels less than 10 ppm.
- Impatiens are sensitive to high salts during germination.

**Stage 2** – Stem and cotyledon emergence (10 days)
- Reduce moisture levels once radicle emergence occurs. Allow the soil to dry out slightly before watering for best germination and rooting.
- Soil temperature should be 72 to 75°F (22 to 24°C).
- Light at 450 to 700 f.c. (4,500 to 7,000 Lux) using supplemental HID lights for two weeks after cotyledons have expanded (12 to 18 hours/day) to decrease plug crop time.
- Maintain ammonium levels at less than 10 ppm and soil pH at 6.0 to 6.2 with an EC of less than 1.0 mmhos/cm.
- Begin fertilizing with 50 to 75 ppm N from 14-0-14 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with 2 to 3 clear water irrigations.

**Stage 3** – Growth and development of true leaves (14 to 21 days)
- Allow the soil to dry out thoroughly between irrigations, but avoid severe wilting to promote root growth and control shoot growth.
- Soil temperature should be between 68 to 72°F (20 to 22°C).
- Maintain soil pH 6.0 to 6.2 and EC less than 1.0 mmhos/cm.
- Increase feed to 100 to 150 ppm N from 20-0-20 alternating with 14-0-14 or other calcium/potassium nitrate fertilizer.
- Fertilize every 2 to 3 irrigations.
- Use DIF (temperature differential) whenever possible to control plant height – especially the first 2 hours after sunrise.
- A-Rest, B-Nine, Bonzi or Sumagic can also be used.
- In plugs, Impreza impatiens should respond to PGRs like other *Impatiens walleriana*.

**Stage 4** – Plants ready for transplanting or shipping (7 days)
- Soil should still be allowed to dry thoroughly.
- Temperature should be maintained at 62 to 65°F (17 to 18°C).
- Keep soil pH at 6.0 to 6.2 and EC less than 0.75 mmhos/cm.
- Fertilize with 14-0-14 or calcium/potassium nitrate feed at 100 to 150 ppm N as needed.

**Note:** Impatiens require low to moderate feed levels. Excessive amounts will result in lush, vegetative stretched plugs.

**Growing On to Finish**

**Temperature**

- **Nights:** 62 to 65°F (17 to 18°C)
- **Days:** 65 to 75°F (18 to 24°C)

**Light**
Maintain light levels as high as possible while maintaining moderate temperatures.

**Media**
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 6.2 to 6.8.

**Fertilization**
Fertilize every other irrigation with 15-0-15, alternating with 20-0-20 at 150 ppm nitrogen. Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

**Controlling Height**
Once plants are rooted to the sides of the containers, they can be allowed to wilt prior to irrigation to provide some height control. Height can also be controlled by withholding fertilizer, especially phosphorus and ammonium-form nitrogen.

Impatiens are responsive to day/night DIF and are shorter with a negative DIF. B-Nine, Bonzi and Sumagic are effective for height control, but not labeled for use in all
Impreza™ Series Impatians continued

locations. Always follow label instructions. B-Nine and Bonzi can delay flowering. Impreza’s differentiated plant structure may enable growing with reduced PGR rates or frequency compared to other Impatians walleriana. Perform trials to determine the most effective rate and frequency for your conditions and growing style.

Light
Impatians are shade plants and should not be exposed to excessive amounts of sun. If properly hardened, impatians can handle up to 4 hours of morning sun.

Impatians Crop Schedule & Uses
(Crop Schedule in Weeks)

<table>
<thead>
<tr>
<th>Sow to Transplant (406 plugs)</th>
<th>4 to 5 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transplant to Flower (4-in./10-cm pot or 36 tray)</td>
<td>5 to 6 weeks</td>
</tr>
</tbody>
</table>

Common Problems
Insect: Aphids, Thrips
Disease: Pythium, Rhizoctonia, Botrytis, TSWV/INSV (Impatients Necrotic Spot Virus)
Other: Boron deficiency, high media pH

The most important disease and insect problem associated with impatians is Impatients Necrotic Spot Virus (INSV), which is transmitted by thrips. Control of thrips is necessary to avoid INSV.

Divine Series New Guinea Impatians

Plug Production
Media
Use a well-drained, disease-free seedling medium with a pH of 5.5 to 6.0 and EC about 0.75 ms/cm (1:2 extraction).

Sowing
The recommended plug sizes for Divine New Guinea impatians are 288 to 128-cell. Water adequately after sowing. Cover seed lightly with coarse vermiculite to maintain high moisture. Germination takes 6 to 8 days. Seed may be germinated either on the bench or in a germination chamber.

Temperature
Germination: 72 to 78°F (22 to 26°C).
After germination: Keep air temperature at 70 to 75°F (21 to 24°C) and soil temperature at 70°F (21°C) until transplant.

Light
Germination: Light appears to improve germination.
After germination: Up to 2,500 ft.c. (27,000 Lux)

Seedling maturity: Up to 5,000 ft.c. (54,000 Lux) if temperature can be controlled.
Supplement lighting is not required, but will decrease total crop time.

Humidity
Maintain 100% relative humidity (RH) until radicle emerge. RH can be reduced gradually to approximately 50% as plugs mature.

Soil Moisture
Keep plug trays in high moisture until late Stage 2. Do not allow plugs to get root bound.

Fertilizer
At radicle emergence: Apply 50 ppm N (0.4 ms/cm EC) from low phosphorus-nitrate form fertilizers, such as 13-2-13.
As cotyledons expand: Increase to 100 to 150 ppm N (0.9 to 1.3 ms/cm EC).
If growth is slow: Apply 20-10-20 with every other fertilization. Maintain medium EC between 1.0 and 1.5 ms/cm (1.2 extraction).

Plant Growth Regulators
PGRs are not needed in the plug stage for Divine New Guinea impatians.

Transplanting
Plugs are ready to transplant when “pullable” from the plug tray. Do not allow plugs to get root bound.

Growing On to Finish
Container Size
Divine New Guinea impatians are best suited to 306 premium packs, 1801 flats, 4-in. (10-cm) pots and hanging baskets.

Temperature
Maintain air temperature at 65 to 80°F (18 to 26°C) from transplant to sale. The warmer the temperature, the faster the plant will flower.

Lower temperature to 61 to 65°F (16 to 18°C) in the weeks during flower development will make larger flower size.

Light
Maintain light levels as high as possible while maintaining temperature. Plant flowering is also related to light levels.

Adapt the media. Don’t let the media dry out.

Fertilizer
Feed plants weekly for 3 to 4 weeks after transplant. Apply fertilizer once per week alternating between a predominantly nitrate-form fertilizer such as 15-5-15 and a balanced ammonium and nitrate form fertilizer such as 20-10-20. Apply fertilizer at 100 to 150 ppm N (0.6 to 1.0 ms/cm EC). Avoid high ammonium and high phosphorus fertilizer. Maintain salt levels below 1.5 ms/cm EC – make sure irrigations are thorough to prevent high salt levels.

Pinching
No pinching is required. Divine New Guinea impatians have a naturally superior branching habit and do not need pinching. Pinching will only increase the crop time.

Plant Growth Regulators
In North American conditions: Bonzi spray at a rate of about 5 ppm (0.125 ml/l). 0.4% formulation has been tested and shown effective in the PanAmerican Seed Co. research facility in Elburn, Illinois. Apply PGRs when plants begin to touch, especially when grown pot-tight.

Under Northern European conditions: 1 or 2 applications with 2 to 4 ppm (0.5 to 1.0 ml/l/0.4% formulation) Bonzi spray has been tested and shown effective.

For larger containers or hanging baskets, PGRs may not be needed. To determine the best rate for your conditions, we recommend that you run an in-house trial.
Note: It is the responsibility of the applicator to read and follow all current label directions for the specific chemical being used and to use the PGR in accordance with all laws and regulations.

Crop Scheduling
Germination: 6 to 8 days
Finish time for 288 or 128 plugs: 5 to 6 weeks
Transplant to flower: 7 to 8 weeks
Total crop time: 12 to 14 weeks

Common Problems
No major disease problems will arise if using good cultural and IPM practices. Thrips are the most common insect pest.

Gemini Series Isotoma

Plug Production
Media
Use a well-drained, disease-free media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

Sowing
Sow 2 to 4 seeds per cell in 288 or larger plug tray; no cover needed. Spray preventively with fungicide.

Stage 1 – Germination begins between day 8 to 12 continuing through day 14 to 21.

Soil temperature: 68 to 72°F (20 to 22°C)
Light: Not necessary but beneficial

Moisture: Keep soil moist (level 4) in Stage 1.

Humidity: Maintain 95 to 97% relative humidity (RH) until cotyledons emerge.

Stage 2
Soil temperature: 68 to 72°F (20 to 22°C)
Light: Can be up to 2,500 ft.c. (26,900 Lux).

Moisture: Maintain soil moisture moist (level 4), to allow the roots to penetrate into the media. Don’t let the media dry out.

Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm Nitrate/0.2 – 0.5 mmhos/cm EC) from nitrate-form fertilizers.

Stage 3
Soil temperature: 65 to 68°F (18 to 20°C)
Light: Can be up to 2,500 ft.c. (26,900 Lux). In low light area, supplemental light of 150 ft.c.
**Starhead Juncus**

### Plug Production

**Media**
Use a well-drained, disease-free media with a pH range of 5.8 to 6.2, and EC of 0.75 mS/cm.

**Transplanting**
- **Weeks From Transplant**: 6 to 7 weeks
- **Total Weeks**: 13-15

**Common Problems**
- **Insect**: Aphids, Thrips, Spider mites, Sciara
- **Disease**: Pythium, Botrytis

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(1620 lux) is beneficial for reducing seedling stretching and cutting plug crop time.

**Moisture**: Maintain the moisture level constantly medium moist to medium wet (level 3-4).

**Fertilizer**: Apply fertilizer at rate 1 (less than 100 ppm Nitrate/less than 0.7 mmhos/cm EC) from nitrate-form fertilizers.

**Growth regulators**: None

**Stage 4**
- **Soil temperature**: 65 to 68°F (18 to 20°C)
- **Light**: Can be up to 5,000 f.c. (53,800 Lux) if temperatures can be maintained.
- **Moisture**: Same as Stage 3.
- **Fertilizer**: Same as Stage 3.

**Growing On to Finish**

**Media**
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

**Temperature**
- **Nights**: 54 to 57°F (12 to 14°C)
- **Days**: 60 to 65°F (16 to 18°C)

**Light**
Maintain light levels as high as possible while maintaining moderate temperature

**Irrigation**
Maintain media constantly moisture (level 2-3). Avoid letting plants dry to wilt.

**Fertilizer**
Gemini Isotoma is a moderate feeder. Apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) once a week with nitrate-form fertilizer with low phosphorus. Avoid using excessive ammonia nitrogen-form fertilizers and overfeeding, as these will result in less upright plants. Maintain the media EC at 1.50 to 2.00 mS/cm and pH at 5.5 to 6.2.

**Growth Regulators**
Not needed.

**Crop Scheduling**
Sow to transplant 288-cell plug tray or larger: 6 to 7 weeks

**Transplant to saleable size (from 288 cell):**
- **4 to 4.5-in. (10-11 cm)**: 3 plants per pot, 8-9 weeks
- **6-6.5 in. (15-16 cm)**: 3 plants per pot, 8-9 weeks
- **Gallon (18cm)**: 3 plants per pot, 14-16 weeks

**Common Problems**
- **Insect**: No serious problems.
- **Disease**: No serious problems.

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**Jealousy Leycesteria**

### Plug Production

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm with a 1:2 extraction).

**Sowing**
- **Plug Tray Size**: Use 288-cell plug tray or larger cell. Do not cover the seeds.
- **Stage 1 – Germination takes approximately 7 to 10 days.**
- **Germination temperature**: 64 to 72°F (18 to 22°C).
- **Light**: Optional.
- **Media moisture**: Keep soil moist (level 4) for optimal germination.
- **Relative humidity**: Maintain 95 to 97% relative humidity until cotyledons emerge.

**Stage 2**
- **Temperature**: 64 to 79°F (18 to 26°C).
- **Light**: Up to 2,500 f.c. (26,900 Lux).
- **Moisture**: Once the plug trays come out of the germination chamber, reduce soil moisture slightly from level 4 to 3 to allow the roots to penetrate into the soil.
- **Fertilizer**: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorus. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1/2 extraction).

**Stage 3**
- **Temperature**: 64 to 72°F (18 to 22°C).
- **Light**: Can go up 2,500 f.c. (26,900 Lux).
- **Moisture**: Maintain the moisture level (level 4) during Stage 1 for optimal germination.
- **Relative humidity**: Maintain 95 to 97% relative humidity until cotyledons emerge.

**Stage 4**
- **Temperature**: 61 to 64°F (16 to 18°C)
- **Light**: Can be up to 5,000 f.c. (54,000 Lux) if temperatures can be maintained.
- **Moisture**: Maintain moisture condition level 3 to 2.
- **Fertilizer**: Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC), Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1/2 extraction).

**Growing On to Finish**

**Media**
Use a well-drained, disease-free soilless medium with a pH of 5.5 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

**Temperature**
- **Nights**: 64 to 66°F (18 to 19°C)
- **Days**: 66 to 74°F (19 to 23°C)

Can also be grown in cooler temperatures; however, plants will grow more slowly.

**Light**
Keep light levels as high as possible while maintaining moderate temperatures.

**Irrigation**
Keep media moisture medium wet to medium (level 4-3). Avoid growing in dry media as this will cause yellowing on the tip of shoots. Can be grown under saturated conditions.

**Fertilizer**
Starting 1 week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) once a week with nitrate-form fertilizer with low phosphorus. Avoid using excessive ammonia nitrogen-form fertilizers and overfeeding, as these will result in less upright plants. Maintain the media EC at 1.50 to 2.00 mS/cm and pH at 5.5 to 6.2.
Jealousy Leycesteria continued

Stage 2
Soil temperature: 68 to 73°F (20 to 23°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Start to slightly reduce soil moisture (level 4) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) before transplanting but it ends up slightly more uniform when pinch is done at two weeks after transplanting. When pinching manually, make sure to pinch all the main stems of each plant growing out of the multi-seeded pellets, so that the crop will be uniform at finish.

Crop Scheduling
Sow to transplant (288 plug tray): 7 to 8 weeks
Add one more week for larger plug/liner tray.
Transplant from 288-tray to saleable finished container:

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants Per Pot</th>
<th>Weeks From Transplant</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>306 pack</td>
<td>1</td>
<td>6-7</td>
<td>13-15</td>
</tr>
<tr>
<td>4-4.5 in. (10-11 cm) pot</td>
<td>1</td>
<td>6-7</td>
<td>13-15</td>
</tr>
<tr>
<td>6-6.5 in. (15-16 cm) pot</td>
<td>3</td>
<td>7-8</td>
<td>14-16</td>
</tr>
<tr>
<td>Gallon</td>
<td>3</td>
<td>7-8</td>
<td>14-16</td>
</tr>
</tbody>
</table>

Note: When transplanted from a 128-tray or 72-liner, finish crop time can be reduced by 1 week.

Common Problems
Insect: Watch for spider mites.
Disease: No serious problems.

Lucius & Starmaker Luzula
Plug Production
Media
Use a well-drained, disease-free soilless medium with a pH range of 5.8 to 6.2, and EC of 0.75 mmhos/cm (2:1 extraction).
Sowing
Plug tray size: Use 288-cell plug tray or larger cell. Cover seeds with a medium of coarse-grade vermiculite.

Growing On to Finish
Media
Use a well-drained, disease-free soilless medium with a pH of 5.6 to 6.2 and a medium initial nutrient charge.

Temperature
Nights: 65 to 67°F (18 to 19°C)
Days: 68 to 73°F (20 to 24°C)

Growth Regulators
None

Irrigation
Maintain uniform media moisture. Plants can tolerate saturated media moisture.

Fertilizer
Feed plants weekly at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) by alternating ammonium and nitrate-form fertilizers. Excessive nitrate-form fertilizer may cause the top foliage to turn bronze color.

Growth Regulators
Plant growth regulators are not recommended for height control as PGR applications will make the foliage more dark greenish or will make the crop less uniform.

Pinching
The best way to control plant growth with good uniform habit is to pinch or trim the plants down to 3 to 4 leaves in main stem. The pinch or trimming can be done at two weeks after transplanting or before transplanting but it ends up slightly more uniform when pinch is done at two weeks after transplanting.
Transplant to saleable size (from 288 cell):

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants Per Pot</th>
<th>Weeks From Sowing</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>306-cell pack</td>
<td>1 plant per cell</td>
<td>8-9</td>
<td>13-15</td>
</tr>
<tr>
<td>4 to 4.5-in. (10-11 cm)</td>
<td>1 plant per pot</td>
<td>8-9</td>
<td>13-15</td>
</tr>
<tr>
<td>6-6.5-in. (15-16 cm)</td>
<td>3 plants per pot</td>
<td>9-10</td>
<td>14-16</td>
</tr>
</tbody>
</table>

Note: Add one more week for Luzula Starmaker.

Common Problems
Insect: Mites, Thrips
Disease: Powdery mildew

Hot Cakes Series Bedding Matthiola

Plug Production

Media
Use a well-drained, disease-free media with a pH range of 5.5 to 6.0 and EC less than 0.75 mS/cm (2:1 extraction).

Sowing
Plug Tray Size
Can be produced in a 392, 288 or a similar size plug tray with 1 seed per cell. Any other tray used for cut flower Matthiola can also be used (e.g., 600-cell tray in Europe with dimensions 40 by 60 cm).

Stage 1 – Germination takes approximately 3 to 4 days.

Germination temperature: 68 to 72°F (20 to 22°C).

Light: Not required but beneficial during germination.

Media moisture: Keep the media medium wet (level 4) during germination.

Relative humidity: Maintain 95 to 97% relative humidity until cotyledons emerge. Avoid excess humidity later in the plug production, as this will create conditions favorable for disease incidence.

Stage 2
Temperature: 60 to 70°F (15 to 21°C) days; 55 to 60°F (13 to 15°C) nights.

Light: Up to 2,500 f.c. (26,900 Lux) during Stages 2 and 3.

Media moisture: Keep the media medium (level 3) to medium wet (level 4) during Stages 2 and 3.

Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorous. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1:2 extraction).

Stage 3
Beginning at late Stage 2 and Stage 3, they can be held/grown at the recommended cool temperatures for differentiating the seedlings of singles and doubles based on cotyledon leaf color.

Note: Refer to the Seedling Selection Guidelines for the recommended temperatures during this stage.

Fertilizer: Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Stage 4
Temperature: 60 to 70°F (15 to 21°C) days; 50 to 55°F (10 to 13°C) nights.

Light: Up to 5,000 f.c. (53,800 Lux) if temperatures can be maintained.

Media moisture: Keep the media medium (level 3) wet. Do not let the seedlings wilt as they will not recover favorably.

Fertilizer: Same as Stage 3.

Plant growth regulators: Not required.

Under North European conditions: Foliar sprays of B-Nine/Alar (diaminozide) at 600 to 1,200 ppm (0.7 to 1.4 g/l 85% formulation or 0.9 to 1.8 g/l 64% formulation) worked well in toning the plugs.

Guidelines for selecting seedlings of double flowering plants during plug production
Seedlings of double-flowering plants can be selected during plug production based on their cotyledon leaf color (lighter green/yellowish green) when grown under appropriate cool temperatures, compared to those of singles which have dark green cotyledons.

Option 1: Once the cotyledons have fully expanded (approximately 11 to 12 days from sowing), the seedlings can be moved into a cold chamber/storage set at 40 to 45°F (4 to 7°C) for a period of approximately 3 to 4 days. Make sure to moisten the trays well, before they go into the cool chambers. Lights are not required in chamber during this period. Monitor the plug trays for any color differentiation beginning at day 2 in the chamber, and bring them out accordingly. Hold them in the chamber for a maximum of 4 days, after which they can be grown at cool temperatures (50 to 60°F/10 to 15°C) in a greenhouse until selection. It is possible to differentiate the seedlings once they come out of the cold chamber. Avoid direct sun/high light levels during sorting, as this can make the cotyledon color differences less obvious. Typically early mornings are best for this procedure.

In European trials where the sorting is automated, the camera eye of the machine was also able to see/sort the cotyledon color differences for the singles and doubles. In these trials, the plugs were held for 5 days in the cold chamber set at 41°F (5°C), and the selection was done by the machine 3 days after they came out of the cold chamber and moved into the greenhouse.

Option 2: If cold chamber space/facility is not available to cool the plugs, then the seedling selection can also be done by growing the plugs at cool temperatures (50 to 60°F/10 to 15°C) under greenhouse/outside conditions, provided the conditions are cool enough. The timing and ease of the selection process will depend on the cool temperatures provided.

Growing On to Finish

Container Size
Can be produced in 4-in. (10-cm) or similar size containers.

Media
Use a well-drained, disease-free media with a pH of 5.8 to 6.2, and a medium initial nutrient charge.

Temperature
Hot Cakes matthiola can best be produced under cooler temperatures for uniformity/quality of flowering and plant habit. The optimal recommended production temperatures are:

Nights: 50 to 55°F (10 to 13°C)
Days: 60 to 70°F (15 to 21°C)

Note: Plants can also be produced under less optimal conditions, but the quality may not be the best.

Light
Keep light levels as high as possible while maintaining appropriate temperatures.

Fertilizer
Starting a week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) using predominantly nitrate-form fertilizer with low phosphorus. If needed, a balanced ammonium and nitrate-form fertilizer may be used as needed to encourage growth and balance the media pH.

Maintain the media EC at 1.50 to 2.00 mS/cm and pH at 5.8 to 6.2. Excessive fertilizer levels will result in large and lush leaves, while fertilizer stress will cause very small leaves, and yellow lower leaves.

Plant Growth Regulators
PGRs are generally not required.

Under Northern European conditions, 1 to 3 foliar applications of B-Nine/Alar (diaminozide) at 3,200 ppm (3.8 g/l 85% formulation or 5g/l 64% formulation), or Cycocel (chlorormequat) at 375 ppm (0.5 ml/l 75% formulation or 3.1ml/l 11.8% formulation) gave optimal growth control.

Crop Scheduling
Sow to transplant (392, 288 size tray): 4 weeks
Transplant to flower: 4 to 7 weeks
Total crop time (sow to flower): 8 to 11 weeks. Crop time is temperature dependent and can finish as early as 8 weeks from sowing if grown during periods of high temperatures/Summer.
**Flashing Milium**

**Plug Production**

**Media**
Use a well-drained, disease-free soilless media with a pH of 5.8-6.2 and an EC of 0.75 mmhos/cm (2:1 extraction).

**Sowing**

**Plug Tray Size:** Can be produced in a 288, 128, 72 liner (European size: 264) or a similar size plug tray. Do not cover seed.

**Stage 1 – Germination takes approximately 10 to 12 days.**

**Germination temperature:** 65 to 68°F (18 to 20°C)

**Light:** Light is optional.

**Media moisture:** Keep the media medium wet (level 4) during germination.

**Relative humidity:** Maintain 95 to 97% relative humidity until cotyledons emerge.

**Stage 2**

**Temperature:** 68 to 72°F (20 to 22°C)

**Light:** Can be up to 2,500 f.c. (26,900 Lux)

**Media moisture:** Reduce soil moisture slightly (level 3) to allow the roots to penetrate into the media.

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorous. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1:2 extraction).

**Stage 3**

**Temperature:** 68 to 72°F (20 to 22°C)

**Light:** Can be up to 2,500 f.c. (26,900 Lux)

**Media moisture:** Moisture level can be reduced to medium to medium dry (level 3 to 2). Do not allow the seedlings to wilt.

**Fertilizer:** Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Stage 4**

**Temperature:** 65 to 67°F (18 to 19°C)

**Light:** Can be up to 5,000 f.c. (54,000 Lux)

**Media moisture:** Maintain wet/dry cycle. Do not allow the seedlings to wilt.

**Fertilizer:** Keep the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Growth Regulators**

Not needed.

**Growing On to Finish**

**Media**
Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

**Jade Princess F1**

**Ornamental Millet**

**Plug Production**

**Note:** Plugs allowed to become rootbound or stressed by drought or nutrient deficiency will not perform well after transplant.

**Media**
Use a well-drained, disease-free media with a pH range of 5.5 to 6.3, and EC less than 0.75mS/cm (2:1 extraction).

**Sowing**

Recommended tray size is 128 or larger cell. Larger cells result in shorter overall crop times. Multiple sowing 2 to 3 seeds per plug is recommended.

**Direct Sowing**

Total crop time can be reduced by 2 weeks by direct sowing into the final container. Sowing 3 or more seeds in the center of the container is recommended. Using either method above, cover the seed with approximately 0.5 in. (1 cm) of media to prevent seedlings from tipping over.

**Stage 1 – Germination takes approximately 2 to 3 days.**

**Germination temperature:** 72 to 78°F (22 to 25°C). Temperatures below 68°F (20°C) will significantly delay germination.

**Light:** Light is not required for germination.

**Media moisture:** Keep the media medium wet to wet (level 4-5) during germination.

**Relative humidity:** As long as the soil is kept evenly moist, high air humidity is not required for germination. Therefore, seed can be germinated directly on the bench.

**Stage 2**

**Temperature:** 72°F (22°C) days; 68°F (20°C) nights.

**Light:** Can be up to 2,500 f.c. (26,900 Lux) during Stages 2 and 3.

**Media moisture:** Keep the media medium wet to wet (level 4-5) during Stages 2 and 3.

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorous. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1:2 extraction).

**Crop Scheduling**

**Sow to transplant (288/264-cell plug tray): 5 to 6 weeks**

Add one more week when use 128 or 72 cell plug tray but reduce post-transplant crop times by one week.

**Transplant to saleable size (from 288 cell):**

- **Per Pot / Transplant**
  - 1 plug per cell
  - 1 plug per pot
  - 1 to 3 plugs per pot
  - 1 to 3 plugs per pot
- **Total Weeks**
  - 11-12
  - 10-11
  - 11-12
  - 11-12

**Note:** Add 2 more weeks to the crop time when planting 1 plug per 6-in. (16-cm) and gallon (18-cm) container.

**Common Problems**

**Insect:** White fly, Aphids, Sciara (young plug stage).

**Disease:** Root rot when grown too wet.
**Fertilizer:** Keep the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Plant growth regulators:** Not required at plug stage. If needed, foliar sprays of B-Nine/Alar (daminozide) at 600 to 1,200 ppm (0.7 to 1.4g/1 85% formulation or 0.9 to 1.8g/1 64% formulation) work well in toning the plugs.

**Growing On to Finish**

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.5 and a medium initial nutrient charge.

**Temperature**
- **Nights:** 61 to 66°F (16 to 19°C)
- **Days:** 68 to 85°F (20 to 30°C)
This is a warm-season crop. Higher temperatures result in faster growth and taller plants. Average daily temperature below 64°F (18°C) will significantly delay crop time.

Do not grow Jade Princess with temperatures below 60°F (16°C), especially at times with low light intensity. It performs better at the upper end of the temperature range. Low temperatures can also cause Jade Princess foliage color to become more chlorotic or even cause necrosis and flower spike bending.

**Light**
Keep light levels as high as possible. Higher light results in stronger, thicker stems and better basal branching.

**Irrigation**
Maintain even moisture at level 2 to 3. Do not allow the substrate to dry up and the plants to wilt.

**Fertilizer**
Apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cmEC) once a week from a nitrate-form fertilizer with low phosphorus. A balanced ammonium and nitrate-form fertilizer may be applied as needed. Maintain the media EC at 1.5 to 2.0 mS/cm and pH at 5.8 to 6.2. For constant fertilizer program, can apply fertilizer at rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm) while maintaining the above recommended EC and pH ranges.

**Growth Regulators – Plants Grown For Landscape Use**
Jade Princess is naturally shorter and branches better than other ornamental millet varieties. It can do without any or with less PGRs. For example, no PGR to 1 application of Bonzi 3 to 5 ppm (0.75 to 1.25 ml/l) drench at about 1 week after transplanting or 4 weeks after sowing for directly sown.

**Northwestern European conditions:** Use the lower concentrations listed above.

This treatment results in a final height of 24 to 30 in. (60 to 75 cm) for Jade Princess.

**Note:** Based on the PanAmerican Seed research trial at Elburn, Illinois, transplanted plugs require less PGRs and make bushier plants after PGR applications, but crop timing is 1 to 2 weeks longer than direct-sown plants.

Millet plant response to PGRs is variable with container size and different environmental conditions. We recommend that you run an in-house trial to determine the best rate or method for your conditions.

**Pinching**
Do not pinch.

**Note**
Do not allow the plants to be stunted from water stress or inadequate fertilizer, or allow the plants to become rootbound. Plants which are stunted in a young stage may produce only a single, short stem and not reach their full potential.

**Crop Scheduling**

**Sow to transplant (288-cell plug tray):**
- 2 to 3 weeks

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants Per Pot/Basket</th>
<th>Weeks From Transplant</th>
</tr>
</thead>
<tbody>
<tr>
<td>1801s, 4 to 4.5-in. (10 to 11 cm) pots</td>
<td>1*</td>
<td>4-5 (green)</td>
</tr>
<tr>
<td>Gallon container</td>
<td>1-2*</td>
<td>4-5 (green) 12-14** (flowering)</td>
</tr>
</tbody>
</table>

This crop time is based on a 68°F (20°C) daily average temperature. When plants are grown in warm temperatures, crop time can be 2 or more weeks shorter.

*For multiple-sown plugs, only 1 plug is needed per pot. For single-sown plugs, plant the plugs close together in the center of the pot. Jade Princess does branch very well and therefore needs fewer seeds per cell/pot.

**Gallon container crop time is for plants with flower spikes emerging. See Growth Regulator recommendations for producing shorter plants with flower spikes.

When selling plants “green,” the crop time is for plants with roots established enough to hold the substrate together and with a height of 12 to 16 in. (30 to 40 cm). Allowing plants to become excessively rootbound or to flower prior to planting in the landscape results in shorter plants.

**Direct Sowing**
Crop time can be reduced by 2 weeks if seed is direct sown into the final container. If directly sown, the seed can be easily germinated in the finished area. See Plug Production for sowing, temperature and soil moisture recommendations.

**Note:** Jade Princess does not perform well in cooler temperatures.

**Common Problems**

**Insect:** Aphids

**Disease:** No serious problems

**Jester, Purple Majesty & Purple Baron F1 Ornamental Millet**

**Plug Production**

**Note:** Plugs allowed to become rootbound or stressed by drought or nutrient deficiency will not perform well after transplant.

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.3 and a medium initial nutrient charge (EC 0.75 mmhos/cm with a 1:2 extraction).

**Sowing**
Recommended tray size is 128 or larger cell. Larger cells result in shorter overall crop times. Multiple sowing 2 to 3 seeds per plug results in fuller, more attractive plants at retail.

**Direct Sowing**
Total crop time can be reduced by 2 weeks by direct sowing into the final container. Sowing 3 or more seeds in the center of the container is recommended.

Using either method, cover the seed with approximately 0.5 in. (1 cm) of media to prevent seedlings from tipping over.

**Temperature**
- **Germination:** 72 to 78°F (22 to 25°C)
- **Stage 2 to 3:** 68 to 72°F (20 to 22°C)
- **Hold plugs:** 62 to 65°F (16 to 18°C)

Seed germinates in 2 to 3 days at the recommended temperatures. Temperatures below 68°F (20°C) will significantly delay germination.

**Light**
Light is not required for germination.

**Humidity**
As long as the soil is kept evenly moist, high air humidity is not required for germination. Therefore, seed can be germinated directly on the bench.

**Soil Moisture**
Keep soil moisture high until radicle emergence, then reduce moisture levels after the radicle penetrates the medium. Do not allow the seedlings to wilt.

**Fertilizer**
At radicle emergence, apply 50 to 75 ppm N from 15-0-15. Increase to 100 to 150 ppm N as leaves develop.

**Growth Regulators**
See Growing On to Finish – Growth Regulators.
**Growing On to Finish**

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.5 and a medium initial nutrient charge.

**Temperature**

- **Days:** 68 to 85°F (20 to 30°C)
- **Nights:** 60 to 72°F (16 to 22°C)

This is a warm-season crop. Higher temperatures result in faster growth and taller plants. Average temperature below 64°F (18°C) will significantly delay crop time; below 60°F (16°C) will stop plant growth.

**Light**

Keep light levels as high as possible. Higher light results in stronger and thicker stems and better basal branching. Young plants are green. The stem and mid-rib of the foliage first turn purple after about eight leaves have developed. The foliage coloration occurs when the plants are moved from the greenhouse outside to full sun. *Note:* Because the plants will be mostly green when sold, a color picture label is recommended to help consumers understand what the plant looks like after it is planted in the garden.

**Irrigation**

Maintain even moisture. Do not allow plants to wilt.

**Fertilizer**

Feed plants weekly with 150 to 200 ppm N in a complete fertilizer.

**Growth Regulators**

**Plants Grown For Landscape Use**
Applying Bonzi at an early stage results in bushier plants with more side shoots without significantly affecting the final plant height. If seeds are sown directly into final containers, apply a 6 to 8 ppm Bonzi drench 4 weeks after sowing. If using plugs, a 3 to 5 ppm Bonzi drench can be applied one week after transplanting.

Optional PGR Treatment
Apply 2 applications of Florel 500 ppm spray. First application can be done 1 week after transplant or 4 weeks after sowing. Second application can be done 10 to 14 days later. Florel treatment can also result in bushier plants with more side shoots. However, Florel is not as strong as Bonzi in height control.

**Plants Grown For Mixed Container Use**
If seeds are sown directly into final containers, 2 applications of a 6 to 9 ppm Bonzi drench can be used to control plant height. First application can be done 4 weeks after sowing. Repeat 10 days later. If seeds are sown into plug trays, apply a 6 to 8 ppm Bonzi drench 1 week after transplanting into final container. Only one application is needed.

**These treatments result in plants with the first flower spike approximately 2 to 2.5 ft. (60 to 75 cm) above the top of the container for Purple Majesty and 1.8 to 2 ft. (55 to 65 cm) for Purple Baron and Jester.**

**Note:** Based on the PanAmerican Seed research trial at Elburn, Illinois, transplanted plugs require less PGRs and make bushier plants after PGR applications, but crop timing is 1 to 2 weeks longer than directly sown plants.

Millet plant response to PGRs is variable with container size and different environmental conditions. We recommend that you run an in-house trial to determine the best rate or method for your conditions.

**Pinching**

Do not pinch.

*Note:* Do not allow the plants to be stunted from water stress, inadequate fertilizer or allow the plants to become rootbound. Plants which are stunted in a young stage may produce only a single, short stem and not reach their full potential.

**Crop Scheduling**

**Sow to transplant (288-cell plug tray):**

<table>
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</thead>
<tbody>
<tr>
<td>1801s, 4 to 4.5-in. (10 to 11-cm) pots</td>
<td>1-2*</td>
<td>4-5 (green)</td>
</tr>
<tr>
<td>Gallon container (8-in./20-cm standard pot)</td>
<td>3*</td>
<td>5-6 (green)</td>
</tr>
</tbody>
</table>

This crop time is based on a 68°F (20°C) daily average temperature. When plants are grown in warm temperatures, crop time can be 2 or more weeks shorter.

*For multiple-sown plugs, only one plug is needed per pot. For single-sown plugs, plant the plugs close together in the center of the pot.

**Gallon container crop time is for plants with flower spikes emerging. See Growth Regulator recommendations for producing shorter plants with flower spikes.**

When selling plants “green,” the crop time is for plants with roots established enough to hold the soil ball together and with a height of 12 to 16 in. (30 to 40 cm). Allowing plants to become excessively rootbound or to flower prior to planting in the landscape results in shorter plants.

**Direct Sowing**
Crop time can be reduced by 2 weeks if seed is direct sown into the final container. If directly sown, the seed can be easily germinated in the finished area. See **Plug Production**
For sowing, temperature and soil moisture recommendations. Note: Jester does not perform as well in cooler temperatures.

**Common Problems**

*Insect:* Aphids
*Disease:* No serious problems

**Akila Series**

**Osteospermum**

**Plug Production**

**Media**

Use a well-drained, disease-free soilless plug media with a pH of 5.8 to 6.2, and an EC of 0.75 mmhos/cm (1:2 extraction).

**Sowing**

**Plug Tray Size**

Can be produced in a 105-cell size liner with one seed per cell. (A bigger cell size liner such as 105 will help in promoting branching early on and also will reduce the total crop time slightly when compared production from a smaller cell size plug.) Akila plugs can also be produced using a 288-cell size tray. A medium covering of coarse-grade vermiculite is recommended at sowing to help maintain humidity around the germinating seed for better germination performance.

**Stage 1 – Germination takes approximately 5 to 6 days.**

**Germination temperature:** 65 to 68°F (18 to 20°C)

**Light:** Light is not required for germination.

**Moisture:** Keep the media moisture at medium wet (level 4) during Stage 1.

**Relative humidity:** Maintain 95 to 97% relative humidity until cotyledons emerge.

**Stage 2**

**Soil temperature:** 68 to 72°F (20 to 22°C) days; 60 to 62°F (16 to 17°C) nights

**Light:** Can be up to 2,500 f.c. (26,900 Lux).

**Media moisture:** Keep the media moisture at medium (level 3) to medium wet (level 4).

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorous.

**Stage 3**

**Soil temperature:** 68 to 70°F (20 to 21°C) days; 60 to 62°F (16 to 17°C) nights

**Light:** Can be up to 2,500 f.c. (26,900 Lux).

**Media moisture:** Keep the media moisture medium dry (level 2) to medium (level 3) during Stages 3 and 4.

**Fertilizer:** Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Plant growth regulators:** Generally not required for plug production, but if necessary can apply a foliar spray of B-nine/
Alar (diaminozide) at 2,500 to 3,500 ppm (3.0 to 4.2 g/l of 85% formulation or 4.0 to 5.6 g/l of 64% formulation) once at about 3 weeks after sowing to tone the plugs.

**Stage 4**
- **Soil temperature:** 65 to 68°F (18 to 20°C) days; 60°F (16°C) nights
- **Light:** Light levels can be up to 5,000 f.c. (53,800 Lux) if temperatures can be maintained.
- **Media moisture:** Same as Stage 3
- **Fertilizer:** Same as Stage 3.

**Growing On to Finish**

**Container Size**
- 306-packs, 4-in. (10-cm) pots.

**Media**
Use a well-drained, disease-free soilless media with a pH of 5.8 to 6.2 and a medium initial nutrient charge.

**Temperature**
- **Nights:** 50 to 55°F (10 to 13°C)
- **Days:** 60 to 70°F (16 to 21°C)

Osteospermums in general perform best at 60 to 70°F (16 to 21°C) days; 65 to 70°F (18 to 21°C) nights.

**Light**
Keep light levels as high as possible while maintaining the optimal temperatures.

**Fertilizer**
Starting a week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 ms/cm) using predominately nitrate-form fertilizer with low phosphorus.

**Irrigation**
Maintain optimal media moisture, i.e. not too wet or not too dry.

**Plant Growth Regulators**
PGRs are generally not required, especially when grown under cool temperatures, as temperature can be the best natural growth-controlling factor. If needed when producing plants under warmer temperatures, apply a tank mix foliar application of B-Nine/Alar (diaminozide) at 2,500 ppm (3.0 g/l of 85% formulation or 4.0 g/l of 64% formulation) and Cycocel (chloromequat) at 500 ppm (4.3 ml/l of 11.8% formulation or 0.7 ml/l of 75% formulation) to control plant growth. One application at 2 weeks after transplant will be sufficient.

A medium covering of coarse-grade vermiculite is recommended at sowing to help maintain humidity around the germinating seed for better germination performance.

**Stage 1 – Germination**
- **Germination temperature:** 65 to 70°F (18 to 21°C)
- **Light:** Light is not required for germination.
- **Moisture:** Keep the soil wet (level 4) during Stage 1

**Relative humidity:** Maintain 95 to 97% relative humidity until cotyledons emerge.

**Stage 2**
- **Temperature:** 65 to 72°F (18 to 22°C) days; 60°F (16°C) nights
- **Light:** Can be up to 2,500 f.c. (26,900 Lux)
- **Media moisture:** Keep the media medium (level 3) to medium wet (level 4)
- **Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 ms/cm EC) with a nitrate-form fertilizer with low phosphorous.

**Transplant to finish in 306-packs and 4-in. (10-cm) pots:** Crop time is dependent on season and production temperatures; it takes about 10-12 weeks in spring/cool temperatures and 7-9 weeks in Autumn/warm temperatures.

Total crop time to finish can be a week longer when grown from a smaller size plug such as a 288-cell size.

**Common Problems**
- **Insect:** Check and monitor for thrips and aphids.
- **Note:** Avoid using insecticides containing active ingredient “Methiocarb”, as it affects the flower color.

**Cool Wave F1 Spreading Pansy**

**Plug Production**

**Media**
Use a well-drained, disease-free media. A pH range of 5.4 to 5.8 and EC less than 0.75 mmhos/cm (2:1 extraction) is recommended. Keep the phosphorus level as low as possible to avoid initial stretch.

**Sowing**

**Plug Tray Size**
Can be produced in a 128-cell tray with 1 seed per cell (a larger cell size such as 128 per cell (a larger cell size such as 128 to 128 potential seedlings) will promote branching early on and will also reduce the total crop time). Cool Wave pansies can also be produced in a 288-cell size tray; however the 128 size will promote stronger lateral growth and quicker finish with more flowers. Smaller plug sizes can restrict the plant growth and increase the crop time.

A medium covering of coarse-grade vermiculite is recommended at sowing to help maintain humidity around the germinating seed for better germination performance.

**Stage 1 – Germination**
- **Germination temperature:** 65 to 70°F (18 to 21°C)
- **Light:** Light is not required for germination.
- **Moisture:** Keep the soil wet (level 4) during Stage 1

**Relative humidity:** Maintain 95 to 97% relative humidity until cotyledons emerge.

**Stage 2**
- **Temperature:** 65 to 72°F (18 to 22°C) days; 60°F (16°C) nights
- **Light:** Can be up to 2,500 f.c. (26,900 Lux)
- **Media moisture:** Keep the media medium (level 3) to medium wet (level 4)
- **Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 ms/cm EC) with a nitrate-form fertilizer with low phosphorous.
**Cool Wave F1 Spreading Pansy continued**

**Light**
Keep light levels as high as possible while maintaining appropriate temperatures.

**Fertilizer**
Cool Wave pansies require more fertilizer than is usually recommended for standard pansies. For best results starting a week after transplant, apply nitrate-form with low phosphorus fertilizer at rate 4 (225 to 300 ppm N/1.5 to 2.0 mS/cm EC) every other irrigation.

For constant feed programs, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) using predominantly nitrate-form fertilizer with low phosphorus. If needed, alternate with a balanced ammonium and nitrate-form fertilizer to encourage growth and balance the media pH. Maintain the media EC at 1.50 to 2.00 mS/cm and pH at 5.4 to 5.8. If the media pH is greater than 6.2, take corrective measures.

**Irrigation**
Maintain optimal media moisture, i.e. not too wet or not too dry.

**Plant Growth Regulators**
Since this is a spreading type pansy and mostly grown in larger containers such as hanging baskets, minimal to no plant growth regulators are needed.

If needed for 4.5-in (10.5 cm) pot production, you can use tank mix foliar sprays of B-Nine/Alar (diaminazo) at 5,000 ppm (5.9 g/l of 85% formulation or 7.8 g/l of 64% formulation) and Cycocel (chloromequat) at 500 ppm (4.3 ml/l of 11.8% formulation or 0.7 ml/l of 75% formulation) to control plant growth.

**Northwestern Europe:** Temperature control is the best natural growth-controlling factor. Minimal to no plant growth regulators are needed when the crop is being produced at cooler temperatures especially during Spring production.

If needed, apply a tank mix foliar spray of B-Nine/Alar and CycoCell (chlormequat) once after transplant. Apply B-Nine/Alar (diaminazo) at 1,280 ppm (1.5 g/l of 85% formulation or 2 g/l of 64% formulation) and CycoCell at 750 ppm (6.4 ml/l of 11.8% formulation or 1 ml/l of 75% formulation) as a tank mix.

**Pinching**
Not recommended.
Light: Light levels can be up to 5,000 ft. c. (53,800 Lux) if temperatures can be maintained.

**Fertilizer:** Same as Stage 3.

**Plant Growth Regulators**
Can treat with a foliar spray of A-Rest (ancymidol) at 10 ppm (38 ml/l of 0.0264% formulation) once during the plug stage at about 3 weeks after sowing, when the first set of true leaves are fully open.

**Northwestern Europe:** Can use 1 to 2 applications of B-Nine/Alar (daminozide) at 1,280 ppm (1.5 g/l of 85% formulation or 2 g/l of 64% formulation).
Transplant the plugs “on time” to avoid initiation in the plug stage. Plugs that are initiated will not fill out the finish container well at the time of flowering.

**Growing On to Finish**

**Container Size**
606 jumbo cell packs, 1801 trays and 4-in. (10-cm) pots

**Media**
Use a well-drained, disease-free media with a pH of 5.6 to 5.8 and a medium initial nutrient charge.

**Temperature**

**Nights:** 50 to 55°F (10 to 13°C)
**Days:** 62 to 70°F (16 to 21°C)

**Light**
Keep light levels as high as possible while maintaining appropriate temperatures.

**Fertilizer**
Starting 1 week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mEq/cm²) using predominantly nitrate-form fertilizer with low phosphorus. If needed, alternate with a balanced ammonium and nitrate-form fertilizer to encourage growth and balance the media pH. Maintain the media EC at 1.50 to 2.00 mS/cm and pH at 5.6 to 5.8. If the media pH is greater than 6.2, then take corrective measures.

**Irrigation**
Maintain optimal media moisture, not too wet or too dry.

**Plant Growth Regulators**
The use of plant growth regulators on pansies is largely dependent on day/night temperatures, location and time of year. Can use tank mix foliar sprays of B-Nine/Alar (daminozide) at 5,000 ppm (5.9 g/l 85% formulation or 7.8 g/l of 64% formulation) and Cycoceol (chloromequat) at 500 to 1,000 ppm (4.3 to 8.5 ml/l of 11.8% formulation or 0.7 to 1.3 ml/l of 75% formulation). A tank mix foliar spray of B-Nine at 5,000 ppm (5.9 g/l 85% formulation or 7.8 g/l of 64% formulation) and A-Rest (ancymidol) at 5 to 10 ppm (19 to 38 ml/l of 0.0264% formulation) applied 2 to 3 times beginning 1 week after transplant with 7 to 10 days interval will also work. The rate and frequency is dependent on the production temperatures and time of the year.

**Northwestern Europe:** Temperature is the best natural growth-controlling factor. Minimal to no plant growth regulators are needed when the crop is produced at cooler temperatures during the Spring.
Can use a tank mix of B-Nine/Alar and Cycoceol. Apply B-Nine/Alar (daminozide) at 1,280 ppm (1.5 g/l of 85% formulation or 2 g/l of 64% formulation) and Cycoceol (chloromequat) at 750 ppm (6.4 ml/l of 11.8% formulation or 1 ml/l of 75% formulation) as a tank mix. Frequency is dependent on the production temperatures and time of the year.

**Crop Scheduling**
For finishing in 606, 1801 (9-cm), & 4-in. (10-cm) container sizes seasonally. Crop times are dependent on container size, season and local growing conditions.

**Common Problems**

**Insect:** Check/monitor for Fungus Gnats and Shore Flies during plug production and for Aphids during early stages after transplant.

**Disease:** Damping-off, Black Root Rot, Foliar Leaf Spots and Botrytis blight are common.

**Butterfly F1 Series Pentas**

**Plug Production**

**Plug Tray Size**
Butterfly pentas plugs are best produced in 392/406-cell or larger plug trays.

**Sowing**
Use a well-drained, disease-free seeding medium with a pH of 6.5 to 6.8 and EC about 0.75 mmhos/cm (1:2 extraction). Do not cover the seed.

**Temperature**

**Germination:** 74 to 80°F (23 to 26°C)
**Cotyledon emergence:** 68 to 72°F (20 to 22°C)
**True leaf expansion:** 65 to 68°F (18 to 20°C)
Plugs may be held at 60 to 65°F (15 to 18°C) from maturity until transplant.

**Light**
Light during germination (10 ft.c./100 Lux) will improve germination uniformity and seedling quality. Pentas have high light requirements. Seedlings must receive higher light levels immediately after germination to avoid elongation and promote rapid growth. After germination, maintain light levels between 1,000 and 2,500 ft.c. (10,000 to 30,000 Lux). As seedlings mature, light levels may be increased up to 5,000 ft.c. (54,000 Lux) if temperature is controlled.

**Humidity**
Maintain 100% relative humidity until cotyledons emerge. Avoid keeping the flats wet. Reduce the humidity to 50% as plugs mature to control foliar diseases.

**Fertilization**
Fertilize with 50 ppm nitrogen from 15-0-15 or 15-5-15 as soon as radicles emerge. When cotyledons expand, increase fertilization to 50 to 75 ppm nitrogen. Use 20-10-20 with every other fertilization only if growth slows. During Stage 3, increase fertilizer to 100 to 150 ppm to promote rapid plug growth. Maintain medium EC between 1.0 and 1.5 mmhos/cm (1:2 extraction). If the pH drops below 6.0 in the soil, plants will show severe iron toxicity and growth will slow or stop. Periodic feedings with CaNO3 will help avoid pH drop.

**Growth Regulators**
Control plug growth first by environment, nutrition management and irrigation management (keep plants on the dry side). Minimize phosphorus fertilizer to avoid elongation of seedlings. Temperature differential (DIF) can also be used to minimize height. If necessary, Cycoceol spray can be applied at 500 ppm about 5 to 6 weeks after sowing.

<table>
<thead>
<tr>
<th>Butterflies &amp; Fizzles Size</th>
<th>Fizzy &amp; Frizzle Size</th>
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<td>Transplant to Finish</td>
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<td>Transplant to Finish (Spring in frost-free Northern Europe)</td>
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**Matrix**

**Spring Matrix**

**Panola XP**

**Fizzy & Frizzle Size**

**Plug Tray Size**

**Butterfly F1 Series Pentas**

**Transplant to Finish**

**Plant Growth Regulators**
The use of plant growth regulators on pansies is largely dependent on day/night temperatures, location and time of year. Can use tank mix foliar sprays of B-Nine/Alar (daminozide) at 5,000 ppm (5.9 g/l 85% formulation or 7.8 g/l of 64% formulation) and Cycoceol (chloromequat) at 500 to 1,000 ppm (4.3 to 8.5 ml/l of 11.8% formulation or 0.7 to 1.3 ml/l of 75% formulation). A tank mix foliar spray of B-Nine at 5,000 ppm (5.9 g/l 85% formulation or 7.8 g/l of 64% formulation) and A-Rest (ancymidol) at 5 to 10 ppm (19 to 38 ml/l of 0.0264% formulation) applied 2 to 3 times beginning 1 week after transplant with 7 to 10 days interval will also work. The rate and frequency is dependent on the production temperatures and time of the year.

**Northwestern Europe:** Temperature is the best natural growth-controlling factor. Minimal to no plant growth regulators are needed when the crop is produced at cooler temperatures during the Spring.
Can use a tank mix of B-Nine/Alar and Cycoceol. Apply B-Nine/Alar (daminozide) at 1,280 ppm (1.5 g/l of 85% formulation or 2 g/l of 64% formulation) and Cycoceol (chloromequat) at 750 ppm (6.4 ml/l of 11.8% formulation or 1 ml/l of 75% formulation) as a tank mix. Frequency is dependent on the production temperatures and time of the year.

**Crop Scheduling**
For finishing in 606, 1801 (9-cm), & 4-in. (10-cm) container sizes seasonally. Crop times are dependent on container size, season and local growing conditions.

<table>
<thead>
<tr>
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</table>

**Matrix**

**Spring Matrix**

**Panola XP**

**Fizzy & Frizzle Size**

**Plug Tray Size**

**Butterfly F1 Series Pentas**

**Transplant to Finish**

**Fertilization**
Fertilize with 50 ppm nitrogen from 15-0-15 or 15-5-15 as soon as radicles emerge. When cotyledons expand, increase fertilization to 50 to 75 ppm nitrogen. Use 20-10-20 with every other fertilization only if growth slows. During Stage 3, increase fertilizer to 100 to 150 ppm to promote rapid plug growth. Maintain medium EC between 1.0 and 1.5 mmhos/cm (1:2 extraction). If the pH drops below 6.0 in the soil, plants will show severe iron toxicity and growth will slow or stop. Periodic feedings with CaNO3 will help avoid pH drop.

**Growth Regulators**
Control plug growth first by environment, nutrition management and irrigation management (keep plants on the dry side). Minimize phosphorus fertilizer to avoid elongation of seedlings. Temperature differential (DIF) can also be used to minimize height. If necessary, Cycoceol spray can be applied at 500 ppm about 5 to 6 weeks after sowing.
Butterfly F1 Series Pentas continued

Growing On to Finish

Container Size
Butterfly pentas are well-suited to 4-in. (10-cm) pots up to 2 gallons continent. Use 1 plug per 4-in. (10-cm) pot, 1 to 2 plugs per 6-in. (15-cm) pot, and 2 to 3 plugs per 1 to 2-gallon container.

Media
Use a well-drained, disease-free soilless medium with a medium initial nutrient charge and a pH of 6.5 to 6.8. If the pH drops below 6.0, severe marginal burn of leaves due to iron toxicity may occur and plants will stop growing.

Temperature
Butterfly pentas benefit from warm temperatures and high light conditions. Maintain minimum night temperatures of 62 to 65°F (17 to 18°C) and minimum day temperatures of 72 to 75°F (22 to 24°C).

Light
Keep light levels as high as possible to promote compact growth. Butterfly pentas will tolerate higher temperatures than other crops.

Humidity
Maintain low relative humidity during production to reduce foliar diseases.

Water
Avoid both excess watering and drought, which will stress the plants and cause severe yellowing and necrosis.

Fertilization
Fertilize every irrigation at 150 to 250 ppm with 15-0-15 or 15-5-15; apply 20-10-20 as needed to promote leaf expansion. Maintain medium EC around 1.0 mmhos/cm (using 1:2 extraction).

Growth Regulators
Effective height control of Butterfly pentas can be accomplished with environmental manipulation. Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen. Pentas are responsive to day/night temperature differential (DIF), and are shorter with a negative DIF. A Cycoceal spray of 1,000 to 1,500 ppm at visible bud can be used. Higher rates may cause phytotoxicity. Always follow current manufacturer label instructions. In-house trials are recommended to determine the best rate for your location.

Crop Scheduling
Sow to transplant: 8 to 10 weeks in a 392/406-cell plug tray.

Transplant to finish (flower first umbel) in 4-in. (10-cm) pots: 10 to 12 weeks in the North, 8 to 10 weeks in the South. Under high light, long days and warm temperatures (Summer production), Butterfly pentas can be produced in 12 to 13 weeks from seed.

Common Problems
Insect: Aphids, Thrips, White Flies
Disease:
Pythium Root Rot: Soft, brown, mushy roots. Drench with Subdue, Banrot, Truban or similar compound.
Rhizoctonia: Tan, brown or black lesions on the stem at the soil line in conjunction with good root development. Drench the soil with Chipco 26019, Cleary’s 3336, Banrot or Terraclor.
Botrytis Blight: Will usually show up in a wound to the plant on the stem or parts where the air is stagnant. If undetected, this blight will form a canker that will girdle the stem, thus wilting and killing that part of the plant. Treatments include increased air circulation and Daconil fungicide spray applications. Refer to the Daconil label for the specifics.
Iron toxicity: Excessive iron levels or pH below 6.2 will cause marginal burn on leaves in upper foliage. Raise pH by adding limestone.
Iron/Manganese toxicity: Extremely low pH can induce iron and manganese toxicity, indicated by brown or tan lesions on the foliage. Switch to a base-forming fertilizer, such as 15-0-15. If symptoms do not improve, or if the pH is below 6.0, irrigate the crop with a hydrated lime solution. Be sure to rinse foliage after application to avoid phytotoxicity.

Note: To increase soil pH, apply 12 oz. hydrated lime per 100 gal. water (90 g. per 100 l) as a soil drench. Follow up with 1 tablespoon of limestone (dolomite or calcium carbonate) per pot. Do not apply hydrated lime if the medium ammonium level is above 10 ppm (1:2 extraction).

Magnesium deficiency: If magnesium is not used in the fertilization program, magnesium deficiency (lower leaf interveinal chlorosis) can develop at the time of flowering. Use fertilizers that contain magnesium during early crop development.

Poor flower development: Low temperatures will prevent uniform flower development or slow flower opening.

Note: Chemical recommendations are only guidelines. Follow national and state regulations.

‘Cajun Belle’, ‘Cute Stuff Red’ & ‘Sweet Heat’ Peppers

Plug Production

Media
Use a well-drained, disease-free, soilless media with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

Sowing
Can be produced in 512 or larger plug tray. Cover the seed lightly with coarse vermiculite.

Stage 1 – Germination takes 5 to 7 days.

Soil temperature: 71 to 78°F (22 to 24°C)

Light: Optional

Moisture: Keep soil wet (level 4) during Stage 1.

Humidity: Maintain 95%+ relative humidity (RH) until radicles emerge.

Note: Peppers are very sensitive to high salts, particularly high ammonium, during germination.

Keep ammonium levels to less than 10 ppm.

Stage 2

Soil temperature: 68 to 73°F (20 to 23°C)

Light: Up to 2,500 f.c. (26,900 Lux)

Moisture: Reduce soil moisture slightly (level 3 to 4) to allow the soil to dry out slightly before watering for best germination and rooting.

Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous.

Stage 3

Soil temperature: 65 to 70°F (18 to 21°C)

Light: Up to 2,500 f.c. (26,900 Lux)

Moisture: Allow media to dry further until the surface becomes light brown (level 2) before watering to promote root growth and control shoot growth. Keep the moisture level to wet-dry cycle (moisture level 4 to 2). Avoid permanent wilting.

Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC) from 14-0-14 or other calcium/potassium nitrate fertilizer. Fertilize every 2 to 3 irrigations. Maintain medium pH of 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).

Growth regulators: If necessary, one application of Sumagic (uniconazole) at rate of 2.5 ppm (4.6 ml/l of 0.055% formulation) can be applied at 2 weeks after sowing for Cajun Belle and Cute Stuff Red. Sweet Heat is a naturally compact variety and does not need Sumagic.
Black Pearl, Calico & Purple Flash Ornamental Peppers

Plug Production

Plug Tray Size
Ornamental peppers are well suited to 288-cell or larger plugs.

Stage 1 (Radicle emergence/5 to 7 days)
- Maintain soil temperature at 72 to 76°F (22 to 24°C).
- Keep medium evenly moist but not saturated (level 4).
- Cover the seed lightly with coarse vermiculite.
- Light is not necessary for germination until radicle emergence.
- Maintain soil pH at 5.5 to 5.8 and soluble salts (EC) at less than 0.5 mmhos/cm (using 2:1 extraction).
- Keep ammonium levels less than 10 ppm.

Stage 2 (Stem and cotyledon emergence/7 to 10 days)
- Maintain soil temperature at 70 to 75°F (21 to 24°C).
- Allow the medium to dry out slightly (level 3) before watering for best germination and rooting.
- Provide light levels of up to 2,500 f.c. (26,900 Lux) for the remainder of plug production.
- Begin fertilizing at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from 14-0-14 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.

Stage 3 (Growth and development of true leaves/10 to 14 days)
- Maintain soil temperature at 70 to 75°F (21 to 24°C).
- Avoid wilt.
- Increase feed to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC) from 14-0-14 or other calcium/potassium nitrate feed. Fertilize every 2 to 3 irrigations.
- Chemical growth regulators cannot be used on peppers.

Stage 4 (Plants ready for transplanting or shipping/7 days)
- Maintain soil temperature at 68 to 70°F (20 to 21°C).
- Provide medium soil moisture and avoid wilt.
- Maintain soil pH at 5.5 to 5.8 and soluble salts (EC) at less than 0.75 mmhos/cm.
- Continue to fertilize with 100 to 175 ppm N from 14-0-14 or calcium/potassium nitrate feed as needed.

Growing On to Finish

Media
Use a well-drained, disease-free, soilless medium with a medium initial nutrient charge and a pH of 3.5 to 6.3.

Temperature
Nights: 65 to 70°F (18 to 21°C)
Days: 68 to 80°F (20 to 26°C)
Peppers will be damaged by temperatures below 45°F (7°C). Prefer temperatures as warm as possible.

Light
Provide light levels as high as possible. Peppers prefer high light with warm temperatures. Foliage colors will be more intense under higher light levels and high temperatures.

Fertilization
Fertilize at every other irrigation with 20-10-20 at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm EC). Maintain medium electrical conductivity around 1.0 mmhos/cm (using 1:2 extraction).

Controlling Height
High light levels and spacing will keep plants from stretching. We do not recommend the use of chemical plant growth regulators on ornamental peppers and in many parts of the world, use of these chemicals is prohibited on these plants.

Container Size
1801 pack: 1 plug per cell
4 to 4.5-in. (10 to 11-cm) pot: 1 plug per pot
6-in (15-cm) pot: 1 to 3 plugs per pot
1-gallon (18-cm) pot: 1 to 3 plugs per pot

Crop Schedule (Spring Production)
Plug stage: 4 to 5 weeks
Transplant to foliage only, no fruit: 9 to 10 weeks
Transplant to mature fruit: 16 to 20 weeks
Note: Crop time for mature fruit will be 4 to 5 weeks shorter during Summer production.
Chilly Chili, Medusa & Sangria Ornamental Peppers

Plug Production

Plug Tray Size
Ornamental peppers are well suited to 288-cell or larger plugs.

Stage 1 (Radicle emergence/5 to 7 days)
- Maintain soil temperature at 72 to 76°F (22 to 24°C).
- Keep medium evenly moist but not saturated (level 4).
- Cover the seed lightly with coarse vermiculite.
- Light is not necessary for germination until radicle emergence.
- Maintain soil pH at 5.5 to 5.8 and soluble salts (EC) at less than 0.5 mmhos/cm (using 2:1 extraction).
- Keep ammonium levels less than 10 ppm.

Stage 2 (Stem and cotyledon emergence/7 to 10 days)
- Maintain soil temperature at 70 to 75°F (21 to 24°C).
- Allow the medium to dry out slightly (level 3) before watering for best germination and rooting.
- Provide light levels up to 2,500 f.c. (26,900 Lux) for the remainder of plug production.
- Begin fertilizing at rate 1 (less than 100 ppm N/less than 0.7 ms/cm EC) from 14-0-14 or a calcium/potassium nitrate feed once cotyledons are fully expanded.
- Alternate feed with clear water.

Stage 3 (Growth and development of true leaves/10 to 14 days)
- Maintain soil temperature at 70 to 75°F (21 to 24°C).
- Avoid wilt.
- Increase feed to rate 2 (100 to 175 ppm N/0.7 to 1.2 ms/cm EC) from 14-0-14 or other calcium/potassium nitrate fertilizer. Fertilize every 2 to 3 irrigations.
- Chemical growth regulators cannot be used on peppers.

Stage 4 (Plants ready for transplanting or shipping/7 days)
- Maintain soil temperature at 68 to 70°F (20 to 21°C).
- Provide medium soil moisture and avoid wilt.
- Maintain soil pH at 5.5 to 5.8 and soluble salts (EC) at less than 0.75 mmhos/cm.
- Continue to fertilize with 100 to 175 ppm N from 14-0-14 or calcium/potassium nitrate feed as needed.

Growing On to Finish

Media
Use a well-drained, disease-free, soilless medium with a medium initial nutrient charge and a pH of 5.5 to 6.3.

Temperature
- Nights: 65 to 70°F (18 to 21°C)
- Days: 68 to 80°F (20 to 26°C)
Peppers will be damaged by temperatures below 45°F (7°C). They prefer the warmest growing temperatures possible.

Light
Provide light levels as high as possible. Peppers prefer high light with warm temperatures.

Fertilization
Fertilize at every other irrigation with 20-10-20 at rate 3 (175 to 225 ppm N/1.2 to 1.5 ms/cm EC). Maintain medium electrical conductivity around 1.0 mmhos/cm (using 2:1 extraction).

Controlling Height
Chilly Chili, Medusa and Sangria ornamental peppers produce a naturally dwarf, compact plant. We do not recommend the use of chemical plant growth regulators on ornamental peppers, and in many parts of the world, use of these chemicals is prohibited on these plants.

Container Size
1801 pack: 1 plug per cell
4 to 4.5-in (10 to 11-cm) pot: 1 plug per pot
6-in. (15-cm) pot: 1 to 3 plugs per pot
1 gallon (18-cm) pot: 1 to 3 plugs per pot

Crop Schedule (Spring Production)
Plug stage: 4 to 5 weeks
Transplant to flower: 8 to 12 weeks
Flower to fruit: 4 to 6 weeks
Total crop time: 16 to 22 weeks
Note: Crop time for mature fruit will be 4 to 5 weeks shorter during Summer production.

Post-Production Care
Once the peppers have formed, night temperatures of 60 to 65°F (15 to 18°C), and day temperatures of 65 to 75°F (18 to 24°C) are optimal.

Avoid shipping Chilly Chili, Medusa and Sangria plants in closed boxes. Due to the high fruit count, ethylene can build up in the boxes, causing the foliage to drop. If boxing is necessary, do not close boxes until just before loading onto trucks. Recommend that your customer unbox the plants immediately upon arrival.

Ornamental peppers prefer full sun; however, partial shade may be beneficial during retail display.

Debonair Collection F1
Multiflora Petunia

Plug Production

Media
Use a well-drained, disease-free seedling medium with a pH of 5.5 to 6.0 and EC about 0.75 ms/cm (1:2 extraction).

Sowing
Covering seed is not recommended. Water adequately after sowing to completely dissolve the pellet.

Stage 1 – Germination takes approximately 4 days.

Soil temperature: 72 to 76°F (22 to 24°C)
Light: Lighting is optional.
Moisture: Keep soil very wet (level 5) during Stage 1 for optimal germination.
Humidity: Maintain 100% relative humidity (RH) until radicles emerge.

Stage 2
Soil temperature: 68 to 75°F (20 to 24°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Start to slightly reduce soil moisture (level 4) to allow roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 ms/cm EC) from nitrate-form fertilizers with low phosphorous.

Stage 3
Soil temperature: 65 to 70°F (18 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 ms/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH 5.8 to 6.2 and EC between 1.0 and 1.5 ms/cm (1:2 extraction).

Growth regulators: Control plug growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid seedling elongation. Temperature differential (DIF) can also be used to minimize height. Test all chemical plant regulators first.

In North American conditions: Apply B-Nine/Alar (daminozide) 1 to 2 applications at 5,000 ppm (6.0 g/l, 85% formulation or 7.8 g/l, 64% formulation) as a spray. The first application should be made when plugs have 2 to 3 true leaves. A second application can be made 7 days later. This treatment can improve basal branching of mature plants.
In Northern European conditions: 1 to 3 applications of B-Nine/Alar (daminozide) at 1,250 ppm (1.5 g/l, 85% formulation or 2.0 g/l, 64% formulation) spray has been tested and shown effective if needed.

**Stage 4**

**Soil temperature:** 60 to 65°F (16 to 18°C)

**Light:** Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.

**Moisture:** Same as Stage 3.

**Fertilizer:** Same as Stage 3.

**Growing On to Finish**

**Container Size**

4 to 5-in. (10 to 13-cm) pots: 1 plant per pot

6-in. (15-cm) pots: 1 to 3 plants per pot

10-in. (25-cm) baskets: 3 to 4 plants per basket

**Media**

Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.2 and a medium initial nutrient charge.

**Temperature**

**Nights:** 57 to 65°F (14 to 18°C)

**Days:** 61 to 75°F (16 to 24°C)

Debonair can be grown as low as 50°F (10°C). Crop timing (time to flower) is related to average temperature when grown under proper daylength. Debainar plants will take longer to flower when grown in cooler conditions.

**Note:** Black Cherry may get some yellow color breaks under cold temperature at about 35°F (2°C).

**Light**

Keep light levels as high as possible while maintaining moderate temperatures.

**Fertilizer**

Apply nitrate-form with low phosphorous fertilizer at rate 1 (175 to 225 ppm N (1.2 to 1.5 ms/cm EC) every other irrigation. Apply a balanced ammonium and nitrate-form fertilizer with low phosphorous as needed to encourage growth and balance medium pH. Maintain medium pH 5.8 to 6.2.

For a constant fertilizer program, apply fertilizer at rate 2 (100 to 175 ppm N or 0.7 to 1.2 ms/cm EC) while maintaining the above recommended EC and pH ranges.

**Growth Regulators**

Use B-Nine/Alar (daminozide) at 5,000 ppm (5.9 g/l, 85% formulation or 7.8 g/l, 64% formulation) for weekly application starting at 7 days after transplant, or just use the same PGR as that for multiflora petunias, such as Carpet or Mirage.

Caution: Avoid using B-Nine, as B-Nine could cause Black Cherry some yellow color breaks or wash out black color a little bit to become more cherry tone. Instead of B-Nine, Bonzi 2 to 3 ppm drench or Topflor 1 to 2 ppm at 10 days after transplant can be used.

To determine the best rate for your conditions, we recommend that you run an in-house trial.

**Photoperiod**

All Debionair varieties can flower successfully at 10-hour daylengths. Debonair Dusty Rose will be slightly earlier than Debonair Lime Green in short-day conditions.

**Crop Scheduling**

Sow to transplant (400 to 288-cell plug): 4 to 6 weeks

Transplant to flower: 5 to 7 weeks

**Total Crop Time:**

<table>
<thead>
<tr>
<th>Container</th>
<th>Plants/Pot</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-in. (10-cm) pot</td>
<td>1 plant</td>
<td>10-12</td>
<td>8-10</td>
</tr>
<tr>
<td>6-in. (15-cm) pot</td>
<td>1-3 plants</td>
<td>10-12</td>
<td>8-10</td>
</tr>
<tr>
<td>10-in. (25-cm) basket</td>
<td>3-4 plants</td>
<td>10-13</td>
<td>8-11</td>
</tr>
</tbody>
</table>

**Common Problems**

No major problems will occur if good cultural and IPM practices are used.

**Ez Rider Grandiflora Series Petunia**

**Plug Production**

**Media**

Use a well-drained, disease-free seedling medium with a pH of 5.5 to 6.0 and EC about 0.75 ms/cm (1:2 extraction).

**Sowing**

Covering seed is not recommended. Water adequately after sowing to completely dissolve the pellet.

**Stage 1 – Germination takes approximately 4 days.**

**Soil temperature:** 72 to 76°F (22 to 24°C)

**Light:** Lighting is optional.

**Moisture:** Keep soil saturated (moisture level 5) during Stage 1 for optimal germination.

**Humidity:** Maintain 100% relative humidity (RH) until radicles emerge.

**Stage 2**

**Soil temperature:** 68 to 75°F (20 to 24°C)

**Light:** Up to 2,500 f.c. (26,900 Lux)

**Moisture:** Start to slightly reduce soil moisture (level 4) to allow roots to penetrate into the media.

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 ms/cm EC) from nitrate-form fertilizers with low phosphorous.

**Stage 3**

**Soil temperature:** 65 to 70°F (18 to 21°C)

**Light:** Up to 2,500 f.c. (26,900 Lux)

**Moisture:** Allow media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).

**Fertilizer:** Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 ms/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH 5.8 to 6.2 and EC between 1.0 and 1.5 ms/cm (1:2 extraction).

**Growth regulators:** Control plug growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid seedling elongation. Temperature differential (DIF) can also be used to minimize height. Test all chemical plant regulators first.

Ez Rider plugs can be treated with the same growth regulators as other standard petunias.

In North American conditions: Apply B-Nine/Alar (daminozide) 1 to 2 applications at 2500–5,000 ppm (3.0–6.0 g/l, 85% formulation or 3.9–7.8 g/l, 64% formulation) as a spray. The first application should be made when plugs have 2 to 3 true leaves. A second application can be made 7 days later. This treatment can improve basal branching of mature plants.

In Northern European conditions: 1 to 3 applications of B-Nine/Alar (daminozide) at 1,250 ppm (1.5 g/l, 85% formulation or 2.0 g/l, 64% formulation) spray have been tested and shown effective if needed.

**Stage 4**

**Soil temperature:** 60 to 65°F (16 to 18°C)

**Light:** Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.

**Moisture:** Same as Stage 3.

**Fertilizer:** Same as Stage 3.

**Growing On to Finish**

**Container Size**

804 pack: 1 plant per cell

10-in. (25-cm) baskets: 3 to 4 plants per basket

**Media**

Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.2 and a medium initial nutrient charge.
Ez Rider 

Temperature
Nights: 57 to 65°F (14 to 18°C)
Days: 61 to 75°F (16 to 24°C)
Ez Rider series petunias can tolerate temperatures as low as 35°F (2°C); however, keep in mind that crop timing (time to flower) is related to daily average temperature when grown under proper daylength. Ez Rider plants will take longer to flower when grown in cooler conditions.

Light
Keep light levels as high as possible while maintaining moderate temperatures.

Fertilizer
Apply nitrate-form with low phosphorus fertilizer at rate 3 (175 to 225 ppm N (1.2 to 1.5 mS/cm EC) every other irrigation. Apply a balanced ammonium and nitrate-form fertilizer with low phosphorus as needed to encourage growth and balance medium pH. Maintain medium pH 5.8 to 6.2.

For a constant fertilizer program, apply fertilizer at rate 2 (100 to 175 ppm N or 0.7 to 1.2 mS/cm EC) while maintaining the above recommended EC and pH ranges.

Growth Regulators
Ez Rider petunias is genetically compact and needs less to no PGR after transplanting. Based upon numerous trials, use B-Nine/Alar (daminozide) at 2,500 ppm (2.9 g/l, 85% formulation or 3.9 g/l, 64% formulation) 1 to 2 applications starting at 7 days after transplant, or just use the half PGR rate as that for standard petunias, such as Dreams. Under some growing regimes, production of plants may be possible.

To determine the best rate for your conditions, we recommend that you conduct an in-house trial.

Growth regulators: Control plug growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid seedling elongation. Temperature differential (DIF) can also be used to minimize height. Test all chemical plant regulators first.

Lo Rider plugs can be treated with the same growth regulators as other standard petunias.

In North American conditions: Apply B-Nine/Alar (daminozide) 1 to 2 applications at 2500-5,000 ppm (3.0-6.0 g/l, 85% formulation or 3.9-7.8 g/l, 64% formulation) as a spray. The first application should be made when plugs have 2 to 3 true leaves. A second application can be made 7 days later. This treatment can improve basal branching of mature plants.

In Northern European conditions: 1 to 3 applications of B-Nine/Alar (daminozide) at 1,250 ppm (1.5 g/l, 85% formulation or 2.0 g/l, 64% formulation) spray have been tested and shown effective if needed.

Stage 4
Soil temperature: 60 to 65°F (16 to 18°C)
Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

Growing On to Finish

Fertilizer:
Apply at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorus.

Stage 3
Soil temperature: 65 to 70°F (18 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2). Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).

Stage 2
Soil temperature: 68 to 75°F (20 to 24°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Start to slightly reduce soil moisture (level 4) to allow roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorus.

Stage 1
Soil temperature: 72 to 76°F (22 to 24°C)
Light: Lighting is optional.
Moisture: Keep soil saturated (moisture level 5) during Stage 1 for optimal germination.
Humidity: Maintain 100% relative humidity (RH) until radicles emerge.

Plug Production

Media
Use a well-drained, disease-free seedling medium with a pH of 5.5 to 6.0 and EC about 0.75 mS/cm (1:2 extraction).

Sowing
Covering seed is not recommended. Water adequately after sowing to completely dissolve the pellet.

Stage 1 – Germination takes approximately 4 days.

Moisture:
Keep soil saturated (moisture level 5) during Stage 1 for optimal germination.
Humidity: Maintain 100% relative humidity (RH) until radicles emerge.

Stage 3
Soil temperature: 65 to 70°F (18 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).

Stage 2
Soil temperature: 68 to 75°F (20 to 24°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Start to slightly reduce soil moisture (level 4) to allow roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorus.

Stage 1
Soil temperature: 72 to 76°F (22 to 24°C)
Light: Lighting is optional.
Moisture: Keep soil saturated (moisture level 5) during Stage 1 for optimal germination.
Humidity: Maintain 100% relative humidity (RH) until radicles emerge.

Plug Production

Media
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.2 and a medium initial nutrient charge.

Temperature
 Nights: 57 to 65°F (14 to 18°C)
Days: 61 to 75°F (16 to 24°C)
Lo Rider petunias can tolerate temperatures as low as 35°F (2°C); however, keep in mind that crop timing (time to flower) is related to daily average temperature when grown under proper daylength. Ez Rider plants will take longer to flower when grown in cooler conditions.

Light
Keep light levels as high as possible while maintaining moderate temperatures.
Fertilizer
Apply nitrate-form with low phosphorus fertilizer at rate 3 (175 to 225 ppm N (1.2 to 1.5 mS/cm EC) every other irrigation. Apply a balanced ammonium and nitrate-form fertilizer with low phosphorus as needed to encourage growth and balance medium pH. Maintain medium pH 5.8 to 6.2.

For a constant fertilizer program, apply fertilizer at rate 2 (100 to 175 ppm N or 0.7 to 1.2 mS/cm EC) while maintaining the above recommended EC and pH ranges.

Growth Regulators
Lo Rider petunia is genetically compact and needs less to no PGR after transplanting. Based upon numerous trials, use B-Nine/Alar (daminozide) at 2,500 ppm (2.9 g/l, 85% formulation or 3.9 g/l, 64% formulation) 1 to 3 applications starting at 7 days after transplant, or just use the half PGR rate as that for standard petunias, such as Dreams. Under some growing regimes, production with no plant growth regulators may be possible.

To determine the best rate for your conditions, we recommend that you conduct an in-house trial.

Photoperiod
Similar to Dreams petunia, all Lo Rider varieties can flower successfully at 10-hour daylengths with slightly delayed flower time compared with long day conditions.

Crop Scheduling
Sow to transplant (288-cell plug): 5 to 6 weeks
Transplant to flower: 5 to 7 weeks
Total Crop Time:

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Number of Plants</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>804 pack</td>
<td>1 plant per cell</td>
<td>9-11</td>
<td>8-10</td>
</tr>
<tr>
<td>10-in. (25-cm) basket</td>
<td>3-4 plants per basket</td>
<td>10-13</td>
<td>8-11</td>
</tr>
</tbody>
</table>

Common Problems
No major problems will occur if good cultural and IPM practices are used.

Pretty Flora Floribunda Series Petunia

Plug Production
Media
Use a well-drained, disease-free seedling medium with a pH of 5.5 to 6.0 and EC about 0.75 mS/cm (1:2 extraction).

Sowing
Covering seed is not recommended. Water adequately after sowing to completely dissolve the pellet.

Stage 1 – Germination takes approximately 4 days.

Soil temperature: 72 to 76°F (22 to 24°C)
Light: Lighting is optional.
Moisture: Keep soil saturated (moisture level 4) during Stage 1 for optimal germination.
Humidity: Maintain 100% relative humidity (RH) until radicles emerge.

Stage 2
Soil temperature: 68 to 75°F (20 to 24°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Start to slightly reduce soil moisture (level 4) to allow roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous.

Stage 3
Soil temperature: 65 to 70°F (18 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).

Growth regulators: Control plug growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid seedling elongation. Temperature differential (DIF) can also be used to minimize height. Test all chemical plant regulators first.

Pretty Flora plugs can be treated with the same growth regulators as other standard petunias.

In North American conditions: Apply B-Nine/Alar (daminozide) 1 to 2 applications at 2500-5,000 ppm (3.0-6.0 g/l, 85% formulation or 3.9-7.8 g/l, 64% formulation) as a spray. The first application should be made when plugs have 2 to 3 true leaves. A second application can be made 7 days later. This treatment can improve basal branching of mature plants.

In Northern European conditions: 1 to 3 applications of B-Nine/Alar (daminozide) at 1,250 ppm (1.5 g/l, 85% formulation or 2.0 g/l, 64% formulation) spray have been tested and shown effective if needed.

Stage 4
Soil temperature: 60 to 65°F (16 to 18°C)
Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

Growing On to Finish

Container Size
804 pack: 1 plant per cell
10-in. (25-cm) baskets: 3 to 4 plants per basket

Media
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.2 and a medium initial nutrient charge.

Temperature
Nights: 57 to 65°F (14 to 18°C)
Days: 61 to 75°F (16 to 24°C)

The Pretty Flora Floribunda series can tolerate temperatures as low as 35°F (2°C); however, keep in mind that crop timing (time to flower) is related to daily average temperature when grown under proper daylength. Pretty Flora Floribunda plants will take longer to flower when grown in cooler conditions.

Light
Keep light levels as high as possible while maintaining moderate temperatures.

Fertilizer
Apply nitrate-form with low phosphorus fertilizer at rate 3 (175 to 225 ppm N (1.2 to 1.5 mS/cm EC) every other irrigation. Apply a balanced ammonium and nitrate-form fertilizer with low phosphorus as needed to encourage growth and balance medium pH. Maintain medium pH 5.8 to 6.2.

For a constant fertilizer program, apply fertilizer at rate 2 (100 to 175 ppm N or 0.7 to 1.2 mS/cm EC) while maintaining the above recommended EC and pH ranges.
Pretty Flora Floribunda Series Petunia continued

Growth Regulators
Pretty Flora petunia is genetically compact and needs less to no PGR after transplanting. Based upon numerous trials, use B-Nine/Alar (daminozide) at 2,500 ppm (2.9 g/l, 85% formulation or 3.9 g/l, 64% formulation) 1 to 3 applications starting at 7 days after transplant, or just use the half PGR rate as that for standard petunias, such as Madness. Under some growing regimes, production with no plant growth regulators may be possible.

To determine the best rate for your conditions, we recommend that you conduct an in-house trial.

Photoperiod
Similar to Dreams petunia, all Pretty Flora varieties can flower successfully at 10-hour daylengths with slightly delayed flower time compared with long day conditions.

Crop Scheduling
Sow to transplant (288-cell plug): 5 to 6 weeks
Transplant to flower: 5 to 7 weeks
Total Crop Time: 5 to 7 weeks

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Number of Plants per Cell</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>804 pack</td>
<td>1 plant</td>
<td>9-11 weeks</td>
<td>8-10 weeks</td>
</tr>
<tr>
<td>10-in. (25-cm) basket</td>
<td>3-4 plants per basket</td>
<td>10-13 weeks</td>
<td>8-11 weeks</td>
</tr>
</tbody>
</table>

Common Problems
No major problems will occur if good cultural and IPM practices are used.

Pretty Grand Grandiflora Series Petunia

Plug Production

Media
Use a well-drained, disease-free seedling medium with a pH of 5.5 to 6.0 and EC about 0.75 mS/cm (1:2 extraction).

Sowing
Covering seed is not recommended. Water adequately after sowing to completely dissolve the pellet.

Stage 1 – Germination takes approximately 4 days.
Soil temperature: 72 to 76°F (22 to 24°C)
Light: Lighting is optional.
Moisture: Keep soil saturated (moisture level 5) during Stage 1 for optimal germination.
Humidity: Maintain 100% relative humidity (RH) until radicles emerge.

Stage 2
Soil temperature: 68 to 75°F (20 to 24°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Start to slightly reduce soil moisture (level 4) to allow roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous.

Stage 3
Soil temperature: 65 to 70°F (18 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).
Growth regulators: Control plug growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid seedling elongation. Temperature differential (DIF) can also be used to minimize height. Test all chemical plant regulators first.
Pretty Grand plugs can be treated with the same growth regulators as other standard petunia.

In North American conditions: Apply B-Nine/Alar (daminozide) 1 to 2 applications at 2500-5,000 ppm (3.0-6.0 g/l, 85% formulation or 3.9-7.8 g/l, 64% formulation) as a spray. The first application should be made when plugs have 2 to 3 true leaves. A second application can be made 7 days later. This treatment can improve basal branching of mature plants.

In Northern European conditions: 1 to 3 applications of B-Nine/Alar (daminozide) at 1,250 ppm (1.5 g/l, 85% formulation or 2.0 g/l, 64% formulation) spray have been tested and shown effective if needed.

Stage 4
Soil temperature: 60 to 65°F (16 to 18°C)
Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

Growing On to Finish
Container Size
804 pack: 1 plant per cell
10-in. (25-cm) baskets: 3 to 4 plants per basket

Media
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.2 and a medium initial nutrient charge.

Temperature
Nights: 57 to 65°F (14 to 18°C)
Days: 61 to 75°F (16 to 24°C)

Pretty Grand petunias can tolerate temperatures as low as 35°F (2°C); however, keep in mind that crop timing (time to flower) is related to daily average temperature when grown under proper daylength. Pretty Grand plants will take longer to flower when grown in cooler conditions.

Light
Keep light levels as high as possible while maintaining moderate temperatures.

Fertilizer
Apply nitrate-form with low phosphorus fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm EC) every other irrigation. Apply a balanced ammonium and nitrate-form fertilizer with low phosphorus as needed to encourage growth and balance medium pH. Maintain medium pH 5.8 to 6.2.

For a constant fertilizer program, apply fertilizer at rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC) while maintaining the above recommended EC and pH ranges.

Growth Regulators
Pretty Grand petunia is genetically compact and needs less to no PGR after transplanting. Based upon numerous trials, use B-Nine/Alar (daminozide) at 2,500 ppm (2.9 g/l, 85% formulation or 3.9 g/l, 64% formulation) 1 to 3 applications starting at 7 days after transplant, or just use the half PGR rate as that for standard petunias, such as Dreams. Under some growing regimes, production with no plant growth regulators may be possible.

To determine the best rate for your conditions, we recommend that you conduct an in-house trial.

Photoperiod
Similar to Dreams petunia, all Pretty Grand varieties can flower successfully at 10-hour daylengths with slightly delayed flower time compared with long day conditions.

Crop Scheduling
Sow to transplant (288-cell plug): 5 to 6 weeks
Transplant to flower: 5 to 7 weeks
Total Crop Time:

<table>
<thead>
<tr>
<th>Container Size</th>
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<tbody>
<tr>
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</tr>
</tbody>
</table>
Common Problems
No major problems will occur if good cultural and IPM practices are used.

**Sophistica™ Collection**

**F1 Grandiflora Petunia**

**Plug Production**

**Media**
Use a well-drained, disease-free seedling medium with a pH of 5.5 to 6.0 and EC about 0.75 mS/cm (1:2 extraction).

**Sowing**
Covering seed is not recommended. Water adequately after sowing to completely dissolve the pellet.

**Stage 1** – Germination takes approximately 4 days.

**Soil temperature:** 72 to 76°F (22 to 24°C)

**Light:** Lighting is optional for all varieties. Sophistica Lime Bicolor will benefit from light at Stage 1.

**Moisture:** Keep soil very wet (level 5) during Stage 1 for optimal germination.

**Humidity:** Maintain 100% relative humidity (RH) until radicles emerge.

**Stage 2**

**Soil temperature:** 68 to 75°F (20 to 24°C)

**Light:** Up to 2,500 f.c. (26,900 Lux)

**Moisture:** Start to slightly reduce soil moisture (level 4) to allow roots to penetrate into the media.

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorus.

**Stage 3**

**Soil temperature:** 65 to 70°F (18 to 21°C)

**Light:** Up to 2,500 f.c. (26,900 Lux)

**Moisture:** Allow media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).

**Fertilizer:** Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).

**Growth regulators:** Control plug growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid seedling elongation. Temperature differential (DIF) can also be used to minimize height. Test all chemical plant regulators first.

In North American conditions: Apply B-Nine/Alar (daminozide) 1 to 2 applications at 5,000 ppm (6.0 g/l, 85% formulation or 7.8 g/l, 64% formulation) as a spray. The first application should be made when plugs have 2 to 3 true leaves. A second application can be made 7 days later. This treatment can improve basal branching of mature plants.

In Northern European conditions: 1 to 3 applications of B-Nine/Alar (daminozide) at 1,250 ppm (1.5 g/l, 85% formulation or 2.0 g/l, 64% formulation) spray has been tested and shown effective if needed.

**Stage 4**

**Soil temperature:** 60 to 65°F (16 to 18°C)

**Light:** Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.

**Moisture:** Same as Stage 3.

**Fertilizer:** Same as Stage 3.

**Growing On to Finish**

**Container Size**
4 to 5-in. (10 to 13-cm) pots: 1 plant per pot
6-in. (15-cm) pots: 2 to 3 plants per pot
10-in. (25-cm) baskets: 3 to 4 plants per basket

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.2 and a medium initial nutrient charge.

**Temperature**

**Nights:** 57 to 65°F (14 to 18°C)

**Days:** 61 to 75°F (16 to 24°C)

Sophistica petunias can tolerate temperatures as low as 35°F (2°C); however, keep in mind that crop timing (time to flower) is related to daily average temperature when grown under proper daylength. Sophistica plants will take longer to flower when grown in cooler conditions.

**Note:** Blackberry may get some yellow color breaks under cold temperatures at about 35°F (2°C).

**Light**
Keep light levels as high as possible while maintaining moderate temperatures.

**Fertilizer**
Apply nitrate-form with low phosphorus fertilizer at rate 3 (175 to 225 ppm N (1.2 to 1.5 mS/cm EC)) every other irrigation. Apply a balanced ammonium and nitrate-form fertilizer with low phosphorus as needed to encourage growth and balance medium pH. Maintain medium pH 5.8 to 6.2. For a constant fertilizer program, apply fertilizer at rate 2 (100 to 175 ppm N or 0.7 to 1.2 mS/cm EC) while maintaining the above recommended EC and pH ranges.

**Growth Regulators**
Use B-Nine/Alar (daminozide) at 5,000 ppm (5.9 g/l, 85% formulation or 7.8 g/l, 64% formulation) for weekly application starting at 7 days after transplant, or just use the same PGR as that for grandiflora petunias such as Dreams or Supercascade.

**Caution:** Avoid using B-Nine for Lime Green and Blackberry as B-Nine could bleach out color for Lime Green and wash out black color a little bit to become more cherry tone as well as get some yellow color breaks for Blackberry. Instead of B-Nine, Bonzi 2 to 3 ppm drench or Topflor 1 to 2 ppm drench at 10 days after transplant can be used.

To determine the best rate for your conditions, we recommend that you run an in-house trial.

**Photoperiod**
Sophistica petunias can flower successfully at 10-hour daylengths. Crop time is 3 to 6 days faster under longer day conditions.

**Crop Scheduling**
Sow to transplant (288-cell plug):
5 to 6 weeks
Transplant to flower: 5 to 7 weeks

**Total Crop Time:**

<table>
<thead>
<tr>
<th>Container</th>
<th>Plants/Pot</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-in. (10-cm) pot</td>
<td>1 plant per pot</td>
<td>10-12 weeks</td>
<td>8-10 weeks</td>
</tr>
<tr>
<td>6-in. (15-cm) pot</td>
<td>1-3 plants per pot</td>
<td>10-12 weeks</td>
<td>8-10 weeks</td>
</tr>
<tr>
<td>10-in. (25-cm) basket</td>
<td>3-4 plants per basket</td>
<td>10-13 weeks</td>
<td>8-11 weeks</td>
</tr>
</tbody>
</table>

Common Problems
No major problems will occur if good cultural and IPM practices are used.

**Easy Wave™ Series**

**Petunia**

**Plug Production**

**Note:** Because their spreading habit begins after transplanting, Easy Wave plugs can be produced like other petunia plugs.

**Media**
Use a well-drained, disease-free seedling medium with a pH of 5.5 to 6.0 and EC about 0.75 mS/cm (1:2 extraction).

**Sowing**
Covering Easy Wave seed is not recommended. Water adequately after sowing to completely dissolve the pellet.
Easy Wave™ Series Petunia continued

Stage 1 – Germination takes approximately 4 days.

Soil temperature: 72 to 76°F (22 to 24°C)

Light: Lighting is optional. Burgundy Star, Pink and Plum Vein benefit from light during germination.

Moisture: Keep soil very wet (level 5) during Stage 1 for optimal germination.

Humidity: Maintain 100% relative humidity (RH) until radicles emerge.

Stage 2

Soil temperature: 68 to 75°F (20 to 24°C)

Light: Up to 2,500 f.c. (26,900 Lux)

Moisture: Start to slightly reduce soil moisture (level 4) to allow root to penetrate into the media.

Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous.

Stage 3

Soil temperature: 65 to 70°F (18 to 21°C)

Light: Up to 2,500 f.c. (26,900 Lux)

Moisture: Allow media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).

Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).

Growth regulators: Control plug growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid seedling elongation. Temperature differential (DIF) can also be used to minimize height. Test all chemical plant regulators first.

In North American conditions: Apply B-Nine/Alar (daminozide) 1 to 2 applications at 5,000 ppm (6.0 g/l, 85% formulation or 7.8 g/l, 64% formulation) as a spray. The first application should be made when plugs have 2 to 3 true leaves. A second application can be made 7 days later. This treatment can improve basal branching of mature plants.

In Northern European conditions: 1 to 3 applications of B-Nine/Alar (daminozide) at 1,250 ppm (1.5 g/l, 85% formulation or 2.0 g/l, 64% formulation) spray has been tested and shown effective if needed.

Stage 4

Soil temperature: 60 to 65°F (16 to 18°C)

Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.

Moisture: Same as Stage 3.

Fertilizer: Same as Stage 3.

Growing On to Finish

Container Size

1801 flats & Wave-Pink Packs: 1 plant per cell
4-in. (10-cm) pots: 1 plant per pot
6-in. (15-cm) pots: 1 to 3 plants per pot
10-in. (25-cm) baskets: 3 to 4 plants per basket

Media

Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.2 and a medium initial nutrient charge.

Temperature

Nights: 57 to 65°F (14 to 18°C)
Days: 61 to 75°F (16 to 24°C)

Easy Wave petunias can tolerate temperatures as low as 35°F (2°C); however, keep in mind that crop timing (time to flower) is related to daily average temperature when grown under proper daylength. Easy Wave plants will take longer to flower when grown in cooler conditions.

Light

Keep light levels as high as possible while maintaining moderate temperatures.

Fertilizer

Easy Wave petunias require more fertilizer than is usually recommended for petunias. For best results, apply nitrate-form with low phosphorus fertilizer at rate 4 (225 to 300 ppm N (1.5 to 2.0 mS/cm EC) every other irrigation. Apply a balanced ammonium and nitrate-form fertilizer with low phosphorus as needed to encourage growth and balance medium pH. Maintain medium pH 5.8 to 6.2.

For constant fertilizer program, can apply fertilizer at rate 3 (175 to 225 ppm N or 1.2 to 1.5 mS/cm EC) while maintaining the above recommended EC and pH ranges.

Growth Regulators

In North American conditions: Use B-Nine/Alar (daminozide) at 5,000 ppm (5.9 g/l, 85% formulation or 7.8 g/l, 64% formulation) at 7 days after transplant. Follow these with a Bonzi drench at 3 to 5 ppm (0.8 to 1.3 ml/l, 0.4% formulation) depending on environmental conditions. If additional PGR is needed, a Bonzi (paclobutrazol) spray at 30 ppm (7.5 ml/l, 0.4% formulation) will help hold the finished crop.

In Northern European conditions: Use B-Nine/Alar (daminozide) at 5,000 ppm (5.9 g/l, 85% formulation or 7.8 g/l, 64% formulation) at 7 days after transplant. Follow these with a Bonzi drench to 8 ppm (1.5 to 2.0 ml/l, 0.4% formulation) depending on environmental conditions. If additional PGR is needed, a Bonzi spray at 30 ppm (7.5 ml/l, 0.4% formulation) will help hold the finished crop.

In all conditions:
For hanging basket production, Plum Vein will benefit from one additional Bonzi 30 ppm spray.

Note: Topflor can be used in place of Bonzi at 2/3 the rate of Bonzi.

To determine the best rate for your conditions, we recommend that you conduct an in-house trial.

Photoperiod

Wave petunia lighting requirements vary by location, variety and production week. Refer to the Supplemental Lighting Chart on page 114. Easy Wave petunias are less sensitive to daylength than Wave petunias. Most Easy Wave varieties will flower successfully at 10.5 hours. Easy Wave Pink and Salmon flower best with 11-hour daylength. The crop time for Easy Wave varieties will be shorter with longer days, such as 12 hours.

When producing Easy Wave petunias early in the year when days are short, decrease crop times by using supplemental lighting after transplanting. Day extension or night break lighting is acceptable.

Crop Scheduling

Sow to transplant (400 to 288-cell plug): 4 to 6 weeks
Transplant to flower: 5 to 7 weeks

Total Crop Time:

<table>
<thead>
<tr>
<th>Container</th>
<th>Plants/Pot</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1801 flats, Wave-Pink Pack</td>
<td>1 plant per cell</td>
<td>10-12 weeks</td>
<td>8-10 weeks</td>
</tr>
<tr>
<td>4-in. (10-cm) pot</td>
<td>1 plant per pot</td>
<td>10-12 weeks</td>
<td>8-10 weeks</td>
</tr>
<tr>
<td>6-in. (15-cm) pot</td>
<td>2-3 plants per pot</td>
<td>10-12 weeks</td>
<td>8-10 weeks</td>
</tr>
<tr>
<td>10-in. (25-cm) basket</td>
<td>3-4 plants per basket</td>
<td>10-13 weeks</td>
<td>8-11 weeks</td>
</tr>
</tbody>
</table>

Common Problems

No major problems will occur if good cultural and IPM practices are used.

Shock Wave™ Series Petunia

Plug Production

Note: Because their spreading habit begins after transplanting, Shock Wave plugs can be produced like other petunia plugs.

Media

Use a well-drained, disease-free seedling medium with a pH of 5.5 to 6.0 and EC about 0.75 ms/cm (1:2 extraction).

Sowing

Covering Shock Wave seed is not recommended. Water adequately after sowing to completely dissolve the pellet.

Stage 1 – Germination takes approximately 4 days.

Soil temperature: 71 to 76°F (22 to 24°C)

Light: Lighting is optional. Denim and Red will benefit from lights in Stage 1.

Moisture: Keep soil very wet (level 5) during Stage 1 for optimal germination.
Humidity: Maintain 100% relative humidity (RH) until radicles emerge.

Stage 2

Soil temperature: 68 to 76°F (20 to 24°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Start to slightly reduce soil moisture (level 4) to allow root to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous.

Stage 3

Soil temperature: 65 to 70°F (18 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to dry until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH of 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).
Fertilizer rates:
- 5,000 ppm (6.0 g/l 85% formulation or 7.8 g/l 64% formulation) will help hold the finished crop.
- 2,500 ppm (1.5 g/l 85% formulation or 2.0 g/l 64% formulation) in Illinois environment.
- Wave petunias about 5 ppm (1.3 ml/l, 0.4% formulation) in Illinois environment,
- 1 to 2 applications at 5,000 ppm (6.0 g/l 85% formulation or 7.8 g/l 64% formulation) as a spray. The first application should be made when plugs have 2 to 3 true leaves. A second application can be made 7 days later. This treatment can be made 2 to 3 true leaves. A second application can be made 7 days later. This treatment can improve basal branching of mature plants.

In North American conditions: Apply B-Nine/Alar (daminozide) 1 to 2 applications at 5,000 ppm (6.0 g/l 85% formulation or 7.8 g/l 64% formulation) as a spray. The first application should be made when plugs have 2 to 3 true leaves. A second application can be made 7 days later. This treatment can improve basal branching of mature plants.

In Northern European conditions: 1 to 3 applications of B-Nine/Alar (daminozide) at 1,250 ppm (1.5 g/l 85% formulation or 2.0 g/l 64% formulation) spray has been tested and shown effective if needed.

Stage 4

Soil temperature: 59 to 64°F (15 to 18°C)
Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

Growing On to Finish

Container Size
- 1801 flats & Wave-Pink 9-Packs: 1 plant per cell
- 4 to 4.5-in. (10 to 11-cm) pots: 1 plant per pot
- 6-in. (15-cm) pots: 1 to 3 plants per pot
- 10-in. (25-cm) baskets: 3 to 4 plants per basket

Media
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.2 and a medium initial nutrient charge.

Temperature
- Nights: 56 to 64°F (13 to 18°C)
- Days: 62 to 73°F (17 to 23°C)
Shock Wave can tolerate temperatures as low as 35°F (2°C); however, keep in mind that crop timing (time to flower) is related to daily average temperature when grown under proper daylight. Shock Wave plants will take longer to flower when grown in cooler conditions.

Note: Shock Wave Deep Purple may get some leaf burn under cold temperature at about 35°F (2°C), but do not significantly suffer in plant development and will grow out of this when temperatures rise.

Light
Keep light levels as high as possible while maintaining temperature.

Fertilizer
Shock Wave petunias require more fertilizer than is usually recommended for petunias. For best results, apply nitrate-form with low phosphorus fertilizer at rate 4 (225 to 300 ppm N/1.5 to 1.7 mS/cm EC) after additional irrigation. Apply a balanced ammonium and nitrate-form fertilizer with low phosphorus as needed to encourage growth and maintain a balanced medium pH of 5.8 to 6.2. For constant fertilizer program, can apply fertilizer at rate 3 (175 to 225 ppm N or 1.2 to 1.5 mS/cm EC) while maintaining the above recommended EC and pH ranges. Prior to shipping the finished product – particularly baskets and large containers – it is recommended to add a slow-release fertilizer. Due to the dense canopy and the tremendous branching that result in a high amount of foliage and flowers and the overall strong plant growth, Shock Wave plants are heavy feeders. For best consumer success, we encourage incorporation of NutriCoat or Osmocote into the fertilizer program. Please check the label for application quantities based upon the container size.

Plant Growth Regulators
In North American conditions: Use B-Nine/Alar (daminozide) at 5,000 ppm (5.9 g/l, 85% formulation or 7.8 g/l 64% formulation) 7 days after transplant. Follow with a Bonzi drench about 3 ppm (0.8 ml/l, 0.4% formulation) in Illinois environment, similar to that recommended for Easy Wave varieties. Since Shock Wave Ivory and Pink Vein are genetically more vigorous than other varieties in the Shock Wave series, it is recommended to apply a heavier Bonzi drench rate similar to that recommended for Wave petunias about 5 ppm (1.3 ml/l, 0.4% formulation) in Illinois environment.

For 9-packs, it is recommended to follow the PGR regimes above and to ship product on time.

If additional PGRs are needed, a Bonzi (paclobutrazol) spray at 30 ppm (7.5 ml/l, 0.4% formulation) will help hold the finished crop.

In Northern European conditions: Use the same PGR regime but slightly heavier in Bonzi drench, i.e.; 3 to 4 ppm for Shock Wave Coconut, Coral Crush, Deep Purple, Denim, Pink Shades, Red and Rose, 6 to 8 ppm for Shock Wave Ivory and Pink Vein.

Note: Topflor can be used in place of Bonzi at 2/3 the rate of Bonzi.

To determine the best rate for your conditions, we recommend that you run an in-house trial.

Photoperiod
Shock Wave petunia lighting requirements vary by location, variety and production week. Refer to the Supplemental Lighting Chart on page 116. Shock Wave petunias are less sensitive to daylength than Wave petunias. Shock Wave varieties will flower successfully at 10 hours. The crop time at 10 hours will be about 10 to 14 days longer than at 12-hour daylength. When producing Shock Wave petunias early in the year when days are short, decrease crop times by using supplemental lighting after transplanting. Day extension or night break lighting is acceptable.

Crop Scheduling
Sow to transplant (288-cell plug): 5 to 6 weeks
Transplant to flower: 5 to 7 weeks
Total Crop Time:

<table>
<thead>
<tr>
<th>Container Type</th>
<th>Plants/Pot</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1801 flat, Wave-Pink 9-Pack</td>
<td>1 plant per cell</td>
<td>9-11 weeks</td>
<td>8-10 weeks</td>
</tr>
<tr>
<td>4 to 4.5-in. (10 to 11-cm) pot</td>
<td>1 plant per pot</td>
<td>9-11 weeks</td>
<td>8-10 weeks</td>
</tr>
<tr>
<td>6-in. (15-cm) pot</td>
<td>2-3 plants per pot</td>
<td>10-12 weeks</td>
<td>8-10 weeks</td>
</tr>
<tr>
<td>10-in. (25-cm) basket</td>
<td>3-4 plants per basket</td>
<td>10-13 weeks</td>
<td>8-11 weeks</td>
</tr>
</tbody>
</table>

Note: While Shock Wave can successfully flower under short-day conditions, it takes about 10 to 14 days longer to flower compared to long-day conditions at the same temperature. In addition to daylength, temperature also affects crop time. Therefore, when producing Shock Wave outdoors during early Spring, it should be considered that both daylength and cool temperature will delay flower time.
### Supplemental Lighting Chart

These tables will help you to decide when you need to light the different Wave Petunia family varieties and choose the right variety for you. For example, if you want to produce Wave petunia during week 6 to week 20 in Kalamazoo, MI (N42.5o), you need to light group 2 varieties for 6 weeks, but you don’t need to use supplemental light for group 1 varieties.

#### Daylength Requirements for Flowering Wave™ Petunia Varieties

<table>
<thead>
<tr>
<th>Group</th>
<th>Minimum Daylength Requirement*</th>
<th>Variety</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10.5 hours</td>
<td>Easy Wave™ Blue, Burgundy Star, Coral Reef, Mystic Pink Improved, Neon Rose, Red Improved, Rosy Dawn, Shell Pink, Violet and White; all Shock Wave™ colors</td>
</tr>
<tr>
<td>2</td>
<td>11 hours</td>
<td>Easy Wave™ Pink, Plum Vein and Salmon; Wave™ Blue</td>
</tr>
<tr>
<td>3</td>
<td>12 hours</td>
<td>Wave™ Lavender, Misty Lilac, Pink, Purple Classic, Purple Improved** and Rose; all Tidal Wave™ colors</td>
</tr>
</tbody>
</table>

*Speed of flowering increases at longer daylengths.  
**Wave Purple Improved requires 11.5 hours daylength or one week less of supplemental lighting compared to Purple Classic.

#### Production Weeks When Lighting is Required for Different Wave Petunias Based on Latitude

(N: Natural Daylength, L: Supplemental Lighting--daylength extension to 14 hours or night interruption from 10PM to 2AM by using HID or incandescent lights)

**Group Minimum Daylength Requirement***

<table>
<thead>
<tr>
<th>Variety</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 hours Wave™ Lavender, Misty Lilac, Pink, Purple Classic, Purple Improved** and Rose; all Tidal Wave™ colors</td>
<td></td>
</tr>
<tr>
<td>11.5 hours Wave™ Rose; all Tidal Wave™ colors</td>
<td></td>
</tr>
<tr>
<td>11 hours Easy Wave™ Pink, Plum Vein and Salmon; Wave™ Blue</td>
<td></td>
</tr>
<tr>
<td>10.5 hours Easy Wave™ Blue, Burgundy Star, Coral Reef, Mystic Pink Improved, Neon Rose, Red Improved, Rosy Dawn, Shell Pink, Violet and White; all Shock Wave™ colors</td>
<td></td>
</tr>
</tbody>
</table>

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**Latitude N25°, for cities such as: Miami, FL**

**Latitude N30°, for cities such as: Jacksonville, FL; New Orleans, LA; San Antonio and Houston, TX**

**Latitude N35°, for cities such as: Atlanta, GA; Charlotte, NC; Little Rock, AR; Los Angeles, CA; Oklahoma City, OK**

**Latitude N40°, for cities such as: Baltimore, MD; Cincinnati, OH; Columbus, OH; Denver, CO; Indianapolis, IN; Philadelphia, PA; Salt Lake City, UT**

**Latitude N42.5°, for cities such as: Boston, MA; Buffalo, NY; Chicago, IL; Cleveland, OH; Kalamazoo, MI; Grand Rapids, MI; Toledo, OH**

**Latitude N45°, for cities such as: Minneapolis, MN; Montreal, ON; Ottawa, ON; Portland, OR; Traverse City, MI; Toronto, ON**

**Latitude N50°, for cities such as: Seattle, WA; Vancouver, BC; Winnipeg, MB**
Wave™ Series Spreading Petunias: Plug & Liner Production

Plug Production

Note: Because their spreading habit begins after transplanting, Wave plugs can be produced like other petunia plugs.

Media

Use a well-drained, disease-free seedling medium with a pH of 5.5 to 6.0 and EC about 0.75 mS/cm (1:2 extraction).

Sowing

Water thoroughly after sowing to make sure the pellet cracks before the tray is moved to chamber or bench. Do not cover with vermiculite due to physical barriers caused by vermiculite.

Stage 1 – Germination takes approximately 4 days.

Soil temperature: 72 to 76°F (22 to 24°C)
Light: Lighting is beneficial. See below for detail.
Moisture: Keep soil very wet (level 5) during Stage 1 for optimal germination.
Humidity: Maintain 100% relative humidity (RH) until radicles emerge.
Note: Saturated moisture (level 5) and constant environmental conditions are the key issues for Wave germination. The best germination conditions are in a lighted chamber where the light level is about 10 f.c. (100 Lux) or higher, with 72 to 76°F (22 to 24°C).

If a light chamber is not available, either of the following conditions can be substituted for successful germination:

1) Dark chamber for the first 24 to 48 hours at 72 to 76°F (22 to 24°C). Once the trays are moved out of chamber, maintain saturated moisture (level 5) for the rest of Stage 1 at the same temperature.

2) If germinating on the bench, provide high media temperature from 72 to 76°F (22 to 24°C) and saturated moisture (level 5) by covering with Remay or plastic (Vermiculite is not recommended) until radicles emerge. If not covered, pay close attention to media moisture and maintain saturated condition (level 5) until the end of Stage 1.

Stage 2

Soil temperature: 68 to 75°F (20 to 24°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Start to slightly reduce soil moisture (level 4) to allow root to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous.

Stage 3

Soil temperature: 65 to 70°F (18 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to further dry until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH of 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).

Growth Regulators

Control Wave plug growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid seedling elongation. Temperature differential (DIF) can also be used to minimize height. Test all chemical plant regulators first.

In North American conditions: Apply B-Nine/Alar (daminozide) 1 to 2 applications at 5,000 ppm (6.0 g/l 85% formulation or 7.8 g/l 64% formulation) as a spray. The first application should be made when plugs have 2 to 3 true leaves. A second application can be made 7 days later. This treatment can improve basal branching of mature plants.

In Northern European conditions: 1 to 3 applications of B-Nine/Alar (daminozide) at 1,250 ppm (1.5 g/l 85% formulation or 2.0 g/l 64% formulation) spray has been tested and shown effective if needed.

Stage 4

Soil temperature: 60 to 65°F (16 to 18°C)
Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

Large Liner Production

For finished plant growers who do not have supplemental lighting and wish to finish Wave spreading petunias with the same PGRs as regular petunias, the best choice is to use larger, pre-lit liners. The following program produces Wave liners which have flower buds induced and all the heavy PGR applications already taken care of.

Liner Size

72-cell or larger. Wave Purple Classic and Wave Pink require 50-cell for uniform flowering.

Sowing

Direct sow into liner or transplant from 512 or 406-plug into liner. Note: If direct sowing, follow all germination requirements.

Photoperiod

Start long-day conditions (daylength extension to 14 hours or 4-hour night interruption) at 5-leaf count or earlier. Continue long-days until plant leaf number reaches 12 (about 6 to 7 weeks from sowing depending on soil temperature, or up to 9 weeks if transplanted from small plugs). Be aware that if plant material is moved from a 14-hour environment to less than 12 hours of light, there is a possibility of bud abortion occurring.

Growing Regulators

To achieve May flowering with a liner production time of 6 weeks, use the following schedule:

Week 3: B-Nine/Alar (daminozide) at 5,000 ppm (6.0 g/l 85% formulation or 7.8 g/l 64% formulation)
Week 4: Repeat B-Nine/Alar spray
Week 5: Bonzi (paclorobutrazol) spray at 15 ppm (3.8 ml/l, 0.4% formulation) to 60 ppm (15.0 ml/l, 0.4% formulation) spray
Week 6: Repeat Bonzi spray, if necessary.

If liner production is taking place during periods of cool temperatures and low light, the liner production period is about 1 week longer (about 7 weeks). Therefore, all PGR applications can be postponed 1 week (postpone 2 weeks if transplanted). All other environmental conditions follow normal plug production regimes.

Note: Do not overgrow Wave plugs. If plugs become rootbound, the plant slows/ stops growing. Rootbound plugs are more susceptible to disease. It takes about 1 to 2 weeks for plants to recover after transplanting from rootbound plugs. Make sure roots have optimum room for fastest crop timing.

Growing On to Finish

Refer to the separate Wave Spreading Petunias: Growing On to Finish Grower Facts for complete details.

Wave™ Series Spreading Petunias: Growing On to Finish

Growing On to Finish from Plugs

Container Size

Containers should be 4.5-SVD (11-cm) or larger.

4.5 to 6-in. (11 to 15-cm) pots: 1 plant per pot.
10-in. (25-cm) baskets: 3 plants of Wave Purple, Wave Pink or Wave Misty Lilac, or 4 plants of Wave Blue, Wave Rose or Wave Lavender per basket.

Media

Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.3 and a medium initial nutrient charge.
Wave™ and Tidal Wave™ Series Spreading Petunia Landscape Tips

Important Notes for Growing & Using Wave and Tidal Wave Petunias in the Landscape

Pick the right Wave petunia for your needs. Wave and Tidal Wave have distinct habits. Wave offers a thick, ground-hugging ocean of color. Tidal Wave grows outward, then up for a big, shrublike shape. Tidal Wave looks great growing alongside a fence—plants will grow up and over the fence!

Wave Lavender, Wave Blue, Wave Misty Lilac, Wave Rose and Wave Purple Improved flower up to one week earlier than Wave Purple Classic and Wave Pink.

Common Problems
No major problems will occur if using good cultural and IPM practices.

Growing On to Finish from Large Liners

Photoperiod
Natural day during Spring when daylength is longer than 11 hours.

Crop Scheduling

Sowing to transplant: 6 to 7 weeks for direct sowing; 7 to 9 weeks for transplant from small plug.

Transplant to flower: 5 to 6 weeks from 50-cell liner (add 1 more week for Wave Purple Classic and Wave Pink Improved); 5 to 7 weeks from 72-cell liner (add 1 more week for Wave Purple Classic and Wave Pink).

Hanging Basket Tips
At the end of production, maintain fertilization and utilize PGRs. Do not eliminate fertilization to control growth just prior to shipping. Apply fertilizer at half rate and, to hold plant habit, utilize PGRs. Provide good air circulation at the plant level. This reduces potential for disease and die-off. Do not allow plants to wilt. Maintain moderate moisture levels. This will provide better plant performance and color in the center of the basket.
Start with “fresh” plugs. Avoid starting from rootbound plugs. Plants grown from rootbound plugs may not be able to generate enough roots to adequately sustain themselves when planted outside. Wave and Tidal Wave plugs that have been scheduled and transplanted promptly will root out better in the container and perform better when planted in the landscape. Allowing the containers to dry out slightly between waterings encourages better root development. Do not let plants wilt.

Plant well-rooted plants. Avoid planting poorly rooted plants into the landscape. Poorly rooted plants may wilt quickly if the temperatures become very warm soon after planting.

Acclimate plants before planting. As a general rule, greenhouse or nursery-grown plants will adapt better in the landscape if they are hardened off prior to planting. Exposing plants to the outside temperatures and light allows the soil to dry between watering and helps reduce transplant shock.

Follow good soil preparation practices. Wave and Tidal Wave petunias tolerate a wide range of soil conditions. However, tilling the soil for good aeration, adding amendments, raising the beds to provide good drainage, maintaining the proper pH (6.5 to 7.0 is optimum), and using a broad spectrum fungicial drench all contribute to successful landscape plantings. Plants will take off more quickly if a liquid feed is used before planting. See “Provide Adequate Nutrition” for more details.

Petunias prefer sun. Wave and Tidal Wave petunias thrive in bright, sunny locations with at least 6 hours of direct sunlight. Sun is a MUST to keep these plants covered with blooms and looking terrific all season long.

Space adequately. For fast fill, space Wave petunias 12 to 18 in. (30 to 45 cm) apart in the landscape. Wave petunias spread 3 to 4 ft. (90 cm to 1.2 m), so they can be spaced as far as 24 in. (60 cm) apart. Spacing plants closer than 12 in. (30 cm) can lead to overcrowding and contribute to disease. Space Tidal Wave a minimum of 12 to 15 in. (30 to 38 cm) apart. At this spacing they will form dense mounds of 18 to 24 in. (45 to 60 cm) in height. When spaced at 18 to 24 in. (45 to 60 cm), Tidal Wave will spread more like a ground cover from 2.5 to 4 ft. (75 cm to 1.2 m).

Irrigation. Wave and Tidal Wave petunias are excellent landscape performers. However, like any other plant, they need adequate water after planting in order to get established in the landscape. During the season, do not overwater. Night watering is not recommended. Morning watering is preferred.

Water management. Do not let Wave or Tidal Wave petunias dry out to a wilt between waterings as too severe of wilt may lead to increased susceptibility and may limit nutrient uptake. Do not over-water or allow the plants to continually have wet roots. This can lead to disease. Mulching plants can help through conserving moisture.

Provide adequate nutrition. Wave and Tidal Wave petunias are vigorous growers and benefit from heavier feeding than standard petunias, therefore give plenty of feed throughout the life of the planting. Before Planting: A good way to get the plants off to a fast start is to water the plants with a liquid fertilizer, such as Daniels, prior to planting.

At Planting: A slow-release fertilizer (such as NutriCoat or Osmocote), which is released by temperature, is recommended. For best season-long growth we suggest the following: incorporate slow release at half rate at installation. Too much fertilizer too soon will cause plants to put on leaves, but not flowers. At approximately the halfway point in the life of the landscape, apply another half rate of the slow release formula. In regions where temperatures are elevated, utilize the 8 to 9 month release formulation as this will provide fertilizer longer into the season.

During the Growing Season: Because Wave and Tidal Wave are vigorous growers, using a liquid feed throughout the season, in addition to slow-release fertilizer, will give best plant performance. Fertilize with a liquid feed such as Daniels 10-4-3 (1 tablespoon per gallon, approximately 300 ppm) for approximately 6 waterings and 300 ppm) for approximately 6 waterings and water with plain water on the 7th watering. Later in the season, if the plants start to turn yellow, one or two liquid feeds with a higher nitrogen level such as 20-10-20, (15-2-20 or 10-10-10 at 250 ppm N High nitrate, low ammonium) can be applied. Always follow the rates recommended on the label.

Mulching. Use at least 2 in. (5 cm) of mulch. Mulch helps by keeping soil temperatures down through insulation and reflection of light, keeping weeds in check and conserving moisture for possible fewer irrigation cycles.

Rotate plantings. While it is tempting to use Wave and Tidal Wave petunias every year due to their exceptional garden performance, it is not recommended that any petunia be planted in the same beds every year so that the build-up of harmful disease pathogens specific to all petunias may be avoided. This can occur whenever the same types of plants are used in the same bed year after year. Here are some other high-impact, low-care plants to try in your sunny gardens in the alternating years when you aren’t using Wave™ family varieties. Try tall and stately Purple Majesty Ornamental Millet as a backdrop for bright Dakota Gold Helium or Bonanza Marigolds. Plant lush, ground-hugging Silver Falls Dichondra along with vibrant Vista Salvias. Other great varieties to try include Serena™ Angelonia, DragonWing™ Begonia, Pentas Butterfly, and Ornamental Pepper Black Pearl, which is particularly nice mixed with Tidal Wave Silver.

Additional Tips for Using Wave and Tidal Wave Petunias in Containers

- Wave and Tidal Wave petunias are multi-purpose! In addition to making a wonderful color impact in gardens, they’re spectacular in large containers, street planters and large window boxes. For fantastic showings in hanging baskets, choose Easy Wave™ petunias.

- Containers dry out more quickly than ground plantings. Since containers need to be watered more frequently, nutrients are likely to be leached from the containers more quickly. As a result they may also require more frequent feeding.

- Keep your Wave and Tidal Wave petunias well-fed and don’t let them dry out between waterings. Apply a liquid fertilizer once a week or use a combination of liquid and slow-release fertilizers, following the rates recommended on the labels.

For more information on all Wave Family spreading petunias, visit Wave-Rave.com or Balllandscape.com.

Tidal Wave™ Series

Hedge Petunia

Plug Production

Because their spreading habit begins after transplanting, you can produce Tidal Wave plugs like other petunia plugs.

Media

Use a well-drained, disease-free seeding medium with a pH of 5.5 to 6.0 and EC about 0.75 mmhos/cm (1:2 extraction).

Sowing

Covering Tidal Wave seed is not recommended. Water adequately to completely dissolve the pellet.

Temperature

Germination: 72 to 76°F (22 to 24°C)
Cotyledon stage: 68 to 75°F (20 to 24°C)
True leaves: 65 to 70°F (18 to 21°C)
Hold plugs: 60 to 65°F (16 to 18°C)

Light

Tidal Wave plugs require light during Stage 1. Stage 1: 10 f.c. (100 Lux) or more
After germination: 1,000 to 2,500 f.c. (10,000 to 30,000 Lux)

Seedling maturity: Up to 5,000 f.c. (54,000 Lux) if temperature can be controlled.

Humidity

Maintain 100% relative humidity (RH) until cotyledons emerge. RH can be reduced gradually to approximately 50% as plugs mature.
Tidal Wave™ Series Hedge Petunia continued

Soil Moisture
Apply above-average amounts of soil moisture during Stage 1 for optimal germination.

Fertilizing
At radicle emergence: 50 ppm N from low phosphorus-nitrate form fertilizer. As cotyledons expand; increase to 100 to 150 ppm N. Maintain medium EC between 1.0 and 1.5 mmhos/cm (1:2 extraction).

Growth Regulators
Control Tidal Wave plug growth first by environment, nutrition and irrigation management, then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid seedling elongation. Temperature differential (DIF) can also be used to minimize height. Test all chemical plant regulators first.

B-Nine: 1 to 2 applications at 5,000 ppm as a spray. The first application should be made when plugs have 2 to 3 true leaves. A second application can be made 7 days later.

Bonzi: 1 application at 6 ppm as a spray during late Stage 3.

Growing On to Finish
Container Size
Containers should be 4-in. (10-cm) or larger.

4-in. (10-cm) pots: 1 plant per pot.

6 to 8-in. (15 to 20-cm) pots: 2 to 3 plants per pot.

10-in. (25-cm) baskets: 3 to 4 plants per basket.

Media
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.3 and a medium initial nutrient charge.

Temperature
Nights: 57 to 65°F (14 to 16°C)
Days: 61 to 75°F (16 to 18°C)

Tidal Wave petunias can tolerate temperatures as low as 35°F (2°C); however, keep in mind that crop timing (time to flower) is related to daily average temperature when grown under proper daylength. Tidal Wave petunias will take longer to flower when grown in cooler conditions.

Light
Keep light levels as high as possible while maintaining moderate temperatures.

Fertilizer
Tidal Wave petunias require more fertilizer than is usually recommended for petunias. For best results, apply a balanced fertilizer with 200 to 300 ppm N with every other irrigation. At finish, feed to avoid lower yellow leaves. To assure consumer satisfaction, an optional top dressing with slow-release fertilizer can be applied 10 days before shipping.

Growth Regulators
The following growth regulator schedule is used for growing on Tidal Wave petunias at the PanAmerican Seed Co. Elburn, Illinois (Midwestern United States) research facility. This “recipe” results in 6 to 8-in. (15 to 20-cm) pots of heavily branched Tidal Wave petunias with a spread of approximately 8 to 10 in. (20 to 25 cm) when flowering begins – the plants will be covered with blooms and have the perfect look for point of sale.

6 to 8-Inch (15 to 20-Cm) Pots: Apply a B-Nine spray at 3,000 to 5,000 ppm 7 to 10 days after transplanting. Repeat 7 days later. Use a Bonzi drench one time at 5 ppm, 3 weeks after transplanting or when shoots have reached the edge of the pot. Follow with a Bonzi spray one time at 30 ppm after visible bud for additional control if needed.

Hanging Baskets: Apply a B-Nine spray at 3,000 to 5,000 ppm 7 to 10 days after transplanting. Repeat 7 days later. Use a Bonzi spray one time at 30 ppm, 3 weeks after transplanting. If needed, a second Bonzi spray can be done. B-Nine improves branching, but may delay flowering about 1 week. Bonzi does not appear to affect flower timing. Plants grow out of either plant growth regulator almost immediately after transplant to the landscape. Note: Be sure to check local regulations regarding the use of plant growth regulators. Always follow current manufacturer label instructions.

Photoperiod
Tidal Wave petunia lighting requirements vary by location, variety and production week. Refer to the Supplemental Lighting Chart on page 116. Flowering is fastest with daylengths greater than 13 hours. Tidal Wave petunias are responsive to daylength. When producing Tidal Wave petunias early in the year when days are short, decrease crop times by using supplemental lighting after transplanting. Day extension or night break lighting is acceptable.

Crop Scheduling
Sow to transplant (392-cell plug):
5 to 6 weeks
Transplant to flower:
Spring: 6 to 9 weeks under long days
Summer: 4 to 7 weeks under long days with high light and minimum night temperature of 65° F (18°C)

Total Crop Time:
Spring: 11 to 15 weeks

Summer: 9 to 13 weeks

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants/Pot</th>
<th>Total Crop Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-in. (10-cm) pot</td>
<td>1 plant per pot</td>
<td>11-13 weeks</td>
</tr>
<tr>
<td>6 to 8-in. (15 to 20-cm) pot</td>
<td>2-3 plants per pot</td>
<td>11-13 weeks</td>
</tr>
<tr>
<td>10-in. (25-cm) basket</td>
<td>3-4 plants per basket</td>
<td>13-15 weeks</td>
</tr>
</tbody>
</table>

Common Problems
No major problems will occur if using good cultural and IPM practices.

Wave Medleys Petunias
Plug Production
Note: Because their spreading habit begins after transplanting, Easy Wave and Shock Wave plugs can be produced like other petunia plugs.

Media
Use a well-drained, disease-free seedling medium with a pH of 5.5 to 6.0 and EC about 0.75 ms/cm (1:2 extraction).

Sowing
Covering Easy Wave seed is not recommended. Water adequately after sowing to completely dissolve the pellet.

Stage 1 – Germination takes approximately 4 days.

Soil temperature: 72 to 76°F (22 to 24°C)
Light: Lighting is optional. Burgundy Star, Pink and Plum Vein benefit from light during germination.
Humidity: Keep soil very wet (level 5) during Stage 1 for optimal germination.

Stage 2

Soil temperature: 68 to 75°F (20 to 24°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Slightly reduce soil moisture (level 4) to allow root to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 ms/cm EC) from nitrate-form fertilizers with low phosphorous.

Stage 3

Soil temperature: 65 to 70°F (18 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to further dry until the surface becomes light brown (level 2) before watering. Maintain wet-dry moisture cycles (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 ms/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH 5.8 to 6.2 and EC between 1.0 and 1.5 ms/cm (1:2 extraction).

Growth Regulators: Control plug growth first by environment, nutrition and...
irrigation management; then with chemical plant growth regulators if needed. Minimize ammonium-form nitrogen fertilizer to avoid seedling elongation. Temperature differential (DIF) can also be used to minimize height. Test all chemical plant growth regulators first.

**In North American conditions:** Apply B-Nine/Alar (daminozide) 1 to 2 applications at 5,000 ppm (6.0 g/l, 85% formulation or 7.8 g/l, 64% formulation) as a spray. The first application should be made when plugs have 2 to 3 true leaves. A second application can be made 7 days later; this can improve basal branching of the mature plant.

**In Northern European conditions:** 1 to 3 applications of B-Nine/Alar (daminozide) at 1,250 ppm (1.5 g/l, 85% formulation or 2.0 g/l, 64% formulation) spray have been effective.

### Stage 4
**Soil temperature:** 60 to 65°F (16 to 18°C)
**Light:** Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
**Moisture:** Same as Stage 3.
**Fertilizer:** Same as Stage 3.

#### Growing On to Finish
**Transplanting “Dibble 2 Method”**
A single dibble-hole should be made in the center of the pot. One plug of each desired variety should be transplanted in the same dibble-hole so the two, or three, plants grow together.

**Container Size**
- **6-in. (15-cm) pots:** 1 plant of each variety per pot (2 plants, not recommended for the 3 variety Medleys)
- **8-in. (20-cm) pots:** 1 plant of each variety per pot (2 or 3 plants)
- **10-in. (25-cm) baskets:** 1 or 2 plant of each variety per pot (2-4 plants)

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.2

**Temperature**
- **Nights:** 57 to 65°F (14 to 18°C)
- **Days:** 61 to 75°F (16 to 24°C)

Easy Wave and Shock Wave petunias can tolerate temperatures as low as 35°F (2°C); however, crop timing (time to flower) is related to daily average temperature when grown under proper day-length. Plants will take longer to flower when grown at cooler temperatures.

**Light**
Keep light levels as high as possible while maintaining moderate temperatures.

**Fertilizer**
Easy Wave and Shock Wave petunias require more fertilizer than is usually recommended for petunias. For best results, apply nitrate-form with low phosphorus fertilizer at rate 4 (225 to 300 ppm N/1.5 to 2.0 mS/cm EC) every other irrigation. Apply a balanced ammonium and nitrate-form fertilizer with low phosphorus as needed to encourage growth and balance medium pH.

Maintain medium pH 5.8 to 6.2. For constant fertilizer program, can apply fertilizer at rate 3 (175 to 225 ppm N or 1.2 to 1.5 mS/cm EC) while maintaining the above recommended EC and pH ranges.

**Growth Regulators**
Apply a Bonzi spray of 10 ppm 7 days after transplant. Repeat Bonzi spray 7 days later and 1 to 2 weeks later use a Bonzi drench of 2-4 ppm to control further stretch. 10 and 12-in. hanging baskets may need an additional Bonzi drench at 2-4 ppm to hold for finishing.

**Note:** Topflor can be used in place of Bonzi at approximately 2/3 the rate of Bonzi. To determine the best rate for your conditions, conducting in-house trials is highly recommended.

### Crop Time from Plug Transplant to Sale:

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Number of Plants</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>6-in. pot</td>
<td>2</td>
<td>4 to 5 weeks</td>
</tr>
<tr>
<td>8-in. pot</td>
<td>2 or 3</td>
<td>4 to 5 weeks</td>
</tr>
<tr>
<td>10-in. basket</td>
<td>2 to 4</td>
<td>6 to 7 weeks</td>
</tr>
<tr>
<td>12-in basket</td>
<td>2 to 4</td>
<td>6 to 7 weeks</td>
</tr>
</tbody>
</table>

**Common Problems**
Iron chelate may be applied to avoid iron deficiency in petunias. No major problems will occur if good cultural and IPM practices are used.

### Silver Crest & Silver Shield Plectranthus

**Silver Crest:**
- **Plug Production**
  - Media: Use a well-drained, disease-free medium with a pH range of 5.8 to 6.2, and EC less than 0.75 mS/cm (2:1 extraction).
  - **Sowing:**
    - **Plugs:** Can be produced in a 406, 288 (European size: 264) or a similar size plug tray with 1 seed per cell. Do not cover the seed.

**Stage 1 – Germination**
- **Temperature:** 64 to 72°F (18 to 22°C). Germinates slightly slower but more uniformly at lower range.
- **Light:** Light is required for germination. The seed will not germinate until it receives light.
- **Media moisture:** Keep the media medium wet (level 4) during germination.

### Silver Shield
- **Plug Production**
  - Media: Use a well-drained, disease-free medium with a pH of 5.5 to 6.2 and an EC of 0.75 mS/cm.
- **Sowing:**
  - **Plugs:** Can be produced in a 406, 288 (European size: 264) or a similar size plug tray with 1 seed per cell. Do not cover the seed.

**Stage 1 – Germination**
- **Temperature:** 64 to 72°F (18 to 22°C). Germinates slightly slower but more uniformly at lower range.
- **Light:** Light is required for germination. The seed will not germinate until it receives light.
- **Media moisture:** Keep the media medium wet (level 4) during germination.

**Relative humidity:** Maintain 95 to 97% relative humidity until cotyledons emerge. Avoid excess humidity later in the plug production, as this will create conditions favorable for disease incidence.

**Stage 2**
- **Temperature:** 68 to 72°F (20 to 22°C) days; 64 to 68°F (18 to 20°C) nights.
- **Light:** Can be up to 2,500 f.c. (26,900 Lux) during Stages 2 and 3.
- **Media moisture:** Keep the media medium (level 3) to medium wet (level 4) during stage 2.
- **Fertilizer:** Apply at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorous. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1:2 extraction).

**Stage 3**
- **Temperature:** 68 to 72°F (20 to 22°C) days; 64 to 68°F (18 to 20°C) nights.
- **Light:** Can be up to 5,000 f.c. (54,000 Lux) while maintaining temperatures.
- **Media moisture:** Moisture level can be reduced to medium to medium dry (level 3 to 2). Do not allow the seedlings to wilt.
- **Fertilizer:** Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC).
  - Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Stage 4**
- **Temperature:** 65 to 72°F (18 to 22°C) days; 57 to 65°F (16 to 18°C) nights.
- **Light:** Can be up to 5,000 f.c. (54,000 Lux) while maintaining temperatures.
- **Media moisture:** Moisture level can be reduced to medium to medium dry (level 3 to 2). Do not allow the seedlings to wilt.
- **Fertilizer:** Keep the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC).
  - Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Plant Growth Regulators**
- **Silver Crest:** PGRs are not required. If needed, foliar sprays of B-Nine/Alar (daminozide) at 600 to 1,200 ppm (0.7 to 1.4g/l 85% formulation or 0.9 to 1.4g/l 64% formulation) work well in toning the plugs.
- **Silver Shield:**
  - **In North American conditions:** Use 1 to 2 foliar sprays of B-Nine/Alar (daminozide) at 2,500 ppm (3g/l 85% formulation or 3.8g/l 64% formulation) to tone the plugs.
  - **In Northwestern European conditions:**
    - For Silver Shield, use 1 to 2 foliar sprays of B-Nine/Alar (daminozide) at 600 to 1,200 ppm (0.7 to 1.4g/l 85% formulation or 0.9 to 1.4g/l 64% formulation).

**Growing On To Finish**
- **Media**
  - Use a well-drained, disease-free soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mS/cm.
Silver Crest & Silver Shield Plectranthus continued

Temperature

Days: 64 to 80°F (18 to 27°C)

Plectranthus can be grown both under warm as well as under moderate conditions, however crop time increases under moderate conditions.

Light

Light level should be as high as possible while maintaining proper temperature.

Irrigation

Allow the media to dry slightly between watering. Dryer growing will result in more silver leaf color.

Fertilization

Apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm EC) to a week from a nitrate-form fertilizer with low phosphorus. A balanced ammonium and nitrate-form fertilizer may be applied as needed. Maintain the media EC at 1.5 to 2.0 mS/cm and pH at 5.8 to 6.2.

For constant fertilizer program, can apply fertilizer at rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm) while maintaining the above recommended EC and pH ranges.

Plant Growth Regulators

High light levels, spacing and drought stress will keep plants from stretching. Both Silver Shield and Silver Crest react very well to B-Nine/Alar.

North American conditions:

Silver Shield: Use 2 foliar sprays of B-Nine/Alar (diaminozide) at 2,500 ppm (3g/l 85% formulation or 3.8 g/l 64% formulation).

Silver Crest: use 1 to 2 foliar sprays of B-Nine/Alar (diaminozide) at 2,500 to 5,000 ppm (3 to 6g/l 85% formulation or 3.8 to 7.6 g/l 64% formulation).

Northwestern European conditions:

For both Silver Shield and Silver Crest, use 1 to 2 foliar sprays of B-Nine/Alar (diaminozide) at 1,600 to 3,200 ppm (2 to 4 g/l 85% formulation or 2.5-5 g/l 64% formulation). Use the higher concentration for small pot and pack sizes and at low light conditions.

Pinching

No pinching is required.

Container Size

Silver Crest can be produced in 4 to 4.5-in. (11-cm) pots or similar size containers and packs with 1 plant per pot. Use 3 plants per pot in a 10-in. (25 cm) basket.

Silver Shield can be produced in 4 to 4.5-in. (10 to 11-cm) pots to 1-gallon (18 to 19 cm) containers with 1 plant per pot.

Both Plectranthus species are very suitable to combine in mixed baskets. Use Silver Shield as a large centerpiece and Silver Crest as a spreading plant on the side. Due to directional stem arching, it is advisable to position Silver Crest plugs with the growing shoot facing outward, toward the outside of the container.

Crop Scheduling

Sow to transplant (288-cell plug tray): 5 to 6 weeks

Transplant to finish:

Silver Shield: 8 to 9 weeks for smaller pot sizes, 9 to 10 weeks for large pots and hanging baskets.

Silver Crest: 4 to 6 weeks for smaller pot sizes, 6 to 7 weeks for large pots and hanging baskets.

Common Problems

No major problems when using good culture and IPM practices.

Happy Hour & Happy Trails Series Portulaca

Plug Production

Media

Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2 and an EC less than 0.75 (mmhos/cm with a 1:2 extraction). Portulaca is very sensitive to high salts, particularly high ammonium, during germination.

Sowing

Happy Hour and Happy Trails portulaca is offered as multi-seededpellets and as raw seed. Each multi-seeded pellet will generally yield 2 to 4 plants. Suggested plug tray size is a 288-cell tray. Do not cover the seed.

Photoperiod

Portulaca is sensitive to short days, even during the plug stage. When daylength is shorter than critical, plants can rosette (stop growing without flowering). Once plants rosette, they will not recover even when given long day treatment.

To prevent plants from rosetting, sow seed when the natural daylength is longer than 10 hours, 30 minutes for Happy Hour (30 minutes less than Margarita, which means that Happy Hour can be sown two weeks earlier than Margarita), and 10 hours for Happy Trails (15 minutes less than Tequila). Therefore, Happy Trails can be sown one week earlier than Tequila.). If sowing earlier than suggested here, provide long day conditions (daylength extension to 12 to 13 hours) during all phases of production until critical natural daylength is achieved.

Media

Use a well-drained, disease-free soilless medium with a pH of 5.5 to 6.2 and a medium initial nutrient charge.

Temperature

Days: 65 to 67°F (18 to 19°C) to reduce stretching.

Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.

Moisture: Same as Stage 3.

Fertilizer: Same as Stage 3.

Growing On To Finish

Media

Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.2 and a medium initial nutrient charge.

Temperature

Days: 68 to 76°F (20 to 25°C)

Flower buds may not develop or open if temperatures are too low.

Light

Maintain light levels as high as possible while maintaining recommended temperatures. Flower buds may not open if light levels are too low.

Photoperiod

If transplanting plugs when the daylength is shorter than 10 hours, 30 minutes for Happy Hour and 10 hours for Happy Trails, provide long day conditions after transplanting. Daylength extension to 12 to 13 hours can be used. Make sure that the plugs/plants have been produced with
the proper daylength as noted under Plug Production – Photoperiod.

Irrigation
Do not overwater. Allow the media to dry thoroughly between waterings. Plants can be allowed to wilt slightly after the roots reach the side of the container.

Fertilizer
Fertilize every other irrigation with 15-0-15 alternating with 20-10-20 at 150 to 200 ppm N.

Growth Regulators
PGRs are generally not needed unless grown under very warm conditions. Height can be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.

Crop Scheduling
Sow to transplant (288-cell plug tray): 4 to 5 weeks.

Height can also be controlled by withholding fertilizer, especially phosphorous and ammonium-form nitrogen.

Common Problems
Insect: Spider Mites, Thrips
Disease: Rhizoctonia, Pythium

Primula™ Series
Primula acaulis

Plug Production

**Stage 1**
- Germination: 7 to 10 days at 64°F (17°C)
- Recommended plug sizes are 512 to 72
- Cover seed lightly with coarse vermiculite to maintain moisture levels
- 10 f.c. (100 Lux) of light benefits germination, but is not required
- Provide high moisture but do not saturate (4+)

**Stage 2**
- Maintain light levels below 1,500 f.c. (15,000 Lux)
- Begin fertilizing with 14-0-14 at 100 ppm
- Maintain medium moisture (3 to 4)
- Maintain temperatures at 64 to 68°F (17 to 20°C)

**Stage 3**
- Increase light to 2,000 to 2,500 f.c. (20,000 to 25,000 Lux)
- Increase fertilizer to 200 ppm, alternating 14-0-14 and 20-10-20
- Allow moisture levels to alternate between 1 (dry, not wilted) and 4 (moist)
- Keep media pH below 6.0
- Maintain temperatures at 64 to 68°F (17 to 20°C)

**Stage 4**
- Increase light to 2,500 f.c. (25,000 Lux), maintaining cool temperatures
- Maintain dry to medium moisture levels
- If pH is above 6.0, apply Iron Sulfate at 1 pound per 100 gallons as a soil drench
- Maintain temperatures at 64 to 68°F (17 to 20°C)

**Plug Crop Times**
- 512/406-cell sizes: 5 to 6 weeks
- 288-cell size: 6 to 7 weeks

**Important Plug Production Tips**
- Maintain high light levels, but shade if necessary to avoid high temperatures.
- Severe wilting can cause leaf tip burn.
- Primula have a high pH sensitivity. Fe deficiency causes interveinal chlorosis on new growth and stunting. Maintain pH below 6.0.
- Watch for fungus gnats, especially if staying wet due to cool temperatures or shading.
- Apply preventative fungicide for Pythium and Theleleipsis during late Stage 3 and early Stage 4.

**Growing On to Finish**

**Media**
Use a peat-lite mix with good drainage; peat to maintain moisture levels. Plants grown under these conditions are likely to have longer crop times than noted below.

<table>
<thead>
<tr>
<th>Container</th>
<th>plugs* Per Flat/Pot</th>
<th>Weeks From Transplant</th>
</tr>
</thead>
<tbody>
<tr>
<td>606 flat</td>
<td>36</td>
<td>5</td>
</tr>
<tr>
<td>4 in. (10 cm) pot</td>
<td>1</td>
<td>5-6</td>
</tr>
</tbody>
</table>

*Plugs are grown from multi-seeded pellets. Each multi-seeded pellet will generally yield 2 to 4 plants.

**Humidity**
Relative humidity between 60 and 70% prevents stress on the plant and reduces the water requirement. Provide good air circulation in the area to prevent condensation and Botrytis.

**Water**
Water quality should be good with alkalinity below 140 ppm. Maintain EC below 0.5 mmhos.

**Fertilization**
Primula is a cool crop and does not have a high fertilizer requirement. Start the plants with 20-10-20 at 200 ppm. When ready for cold treatment, change fertilizer to 15-0-15 at 50 ppm. Maintain media EC under 1.2 mmhos.

**Crop Scheduling**
**Plug timing (based on 288-plug size):**
- 6 to 7 weeks

**Plant establishment:** 4 weeks

**Bud initiation and cooling:** 6 weeks

**Flower development and forcing:** 5 to 6 weeks

**Total crop time from sow to flower:** 22 weeks

**Note:** Growing-on time in weeks depends on how large a plant is required. A large plant requires a longer time at 60 to 65°F (15.5 to 18°C) nights. From bud visibility to first opening of flower is approximately 4 to 5 weeks, depending on temperature.

**Common Problems**
Insect: Aphids, whitefly, fungus gnats
Disease: Botrytis on flowers, Pythium, Rhizoctonia

**Common Problem Causes**

<table>
<thead>
<tr>
<th>Common Problem</th>
<th>Causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Botrytis</td>
<td>Plants have wet foliage and flowers at night</td>
</tr>
<tr>
<td></td>
<td>Lack of circulating air which can prevent condensation</td>
</tr>
<tr>
<td></td>
<td>No fungicide control for Botrytis</td>
</tr>
<tr>
<td></td>
<td>Be sure to water early in morning and avoid high humidity</td>
</tr>
<tr>
<td>Premature bud set and small plants</td>
<td>Temperature too cold during growing-on period</td>
</tr>
<tr>
<td></td>
<td>Low fertility</td>
</tr>
<tr>
<td></td>
<td>Not enough weeks of warm growing-on temperatures</td>
</tr>
<tr>
<td>Flower stems too short</td>
<td>Cold temperature below 40°F (4.5°C) for too long</td>
</tr>
<tr>
<td></td>
<td>Forcing at high temperatures above 65°F (18°C) nights</td>
</tr>
<tr>
<td>Flower stems long and weak</td>
<td>Light levels too high</td>
</tr>
<tr>
<td></td>
<td>High day/night temperature above 70°F (21°C)</td>
</tr>
<tr>
<td>Chlorotic plants</td>
<td>Media too wet – poor drainage</td>
</tr>
<tr>
<td></td>
<td>High pH causing iron and nitrogen deficiency</td>
</tr>
<tr>
<td></td>
<td>Ammonium toxicity</td>
</tr>
<tr>
<td></td>
<td>Magnesium deficiency</td>
</tr>
</tbody>
</table>
**Toucan Series Purslane**

**Plug Production**

**Media**
Use a well-drained, disease-free, soilless media with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

**Sowing**
Sow seed in 288-cell trays. In Europe, 264-cell trays can be used. It is recommended to sow 4 seeds per cell for the most uniform result. Do not cover seed.

**Stage 1** – Germination takes 3 to 4 days.
**Soil temperature:** 68 to 74°F (20 to 23°C)
**Light:** Not required.
**Moisture:** Keep soil wet (level 4) during Stage 1.
**Humidity:** Maintain 95%+ relative humidity (RH) until radicles emerge.

**Stage 2**
**Soil temperature:** 72 to 75°F (22 to 24°C)
**Light:** Up to 2,500 f.c. (26,900 Lux)
**Moisture:** Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.
**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous.

**Stage 3**
**Soil temperature:** 64 to 68°F (18 to 20°C)
**Light:** Up to 2,500 f.c. (26,900 Lux)
**Moisture:** Allow media to dry further until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
**Fertilizer:** Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH of 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).
**Growth regulators:** Not needed.

**Stage 4**
**Soil temperature:** 65 to 68°F (18 to 20°C)
**Light:** Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
**Moisture:** Same as Stage 3.
**Fertilizer:** Same as Stage 3.

**Growing On to Finish**

**Media**
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

**Temperature**
**Nights:** 65 to 68°F (18 to 20°C)
**Days:** 68 to 75°F (20 to 24°C)

**Light**
Maintain light levels as high as possible. Light intensity will significantly affect the number of flowers.

---

**Southern Star Series**

**Ruellia**

**Plug Production**

**Media**
Use a well-drained, disease-free, soilless media with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

**Sowing**
Sow seed in 406 to 288-cell trays. In Europe, 264-cell trays can be used. Cover seed with vermiculite.

**Stage 1** – Germination takes 5 to 6 days.
**Soil temperature:** 72 to 76°F (22 to 25°C)
**Light:** Not required.
**Moisture:** Keep soil wet (level 4) during Stage 1.
**Humidity:** Maintain 95%+ relative humidity (RH) until radicles emerge.

**Stage 2**
**Soil temperature:** 72 to 75°F (22 to 24°C)
**Light:** Up to 2,500 f.c. (26,900 Lux)
**Moisture:** Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.
**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous.

**Stage 3**
**Soil temperature:** 68 to 72°F (20 to 22°C)
**Light:** Up to 2,500 f.c. (26,900 Lux)
**Moisture:** Allow media to dry further until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
**Fertilizer:** Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH of 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).
**Growth regulators:** Not needed.

**Stage 4**
**Soil temperature:** 65 to 68°F (18 to 20°C)
**Light:** Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
**Moisture:** Same as Stage 3.
**Fertilizer:** Same as Stage 3.

**Growing On to Finish**

**Media**
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

**Temperature**
**Nights:** 65 to 68°F (18 to 20°C)
**Days:** 68 to 75°F (20 to 24°C)
**Light**
Maintain light levels as high as possible. Light intensity will significantly affect the number of flowers.
**Photoperiod**
Southern Star Ruellia can flower under any daylength but will flower about 5 to 7 days faster under shorter days.

**Irrigation**
Maintain even moisture and do not allow plants to wilt.

**Fertilizer**
Starting 1 week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) using predominately nitrate-form fertilizer with low phosphorus and high potassium. Maintain the media EC at 1.5 to 2.0 mS/cm and pH at 6.0 to 6.5.

**Growth Regulators**
Not needed.

**Pinching**
Not needed.

**Spacing**
Not needed.

**Container Size**

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Number of Plants</th>
<th>Spring</th>
<th>Summer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1801 pack</td>
<td>1 plug per cell</td>
<td>15-16 weeks</td>
<td>13-14 weeks</td>
</tr>
<tr>
<td>4 to 4.5-in. (10 to 11-cm) pot</td>
<td>1 plug per pot</td>
<td>15-16 weeks</td>
<td>13-14 weeks</td>
</tr>
<tr>
<td>6-in. (15-cm) pot</td>
<td>3 plugs per pot</td>
<td>15-16 weeks</td>
<td>13-14 weeks</td>
</tr>
</tbody>
</table>

**Crop Scheduling**

<table>
<thead>
<tr>
<th>Sow to transplant (288-cell plug):</th>
<th>5 to 6 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transplant to flower:</td>
<td>8 to 10 weeks</td>
</tr>
</tbody>
</table>

**Total Crop Time:**

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Plants Per Pot/Basket</th>
<th>Weeks from Transplant to Finish</th>
<th>Weeks from Sow to Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-in. (11-cm) pot</td>
<td>1</td>
<td>2-4</td>
<td>4-7</td>
</tr>
<tr>
<td>8-in. Color Bowl</td>
<td>3-4</td>
<td>2-4</td>
<td>4-7</td>
</tr>
<tr>
<td>10-in. Color Bowl</td>
<td>4-5</td>
<td>4-6</td>
<td>6-9</td>
</tr>
<tr>
<td>12-in. Color Bowl</td>
<td>5-6</td>
<td>4-6</td>
<td>6-9</td>
</tr>
</tbody>
</table>

**SimplySalad™**

**Plug Production**

**Media**
Use a well-drained, disease-free soilless media with a pH of 5.8-6.2 and an EC of 0.75 mmhos/cm (2:1 extraction).

**Sowing**
SimplySalad can be sown into 105/128 cell size plug tray or directly sown into finish containers. A light cover of coarse vermiculite helps maintain moisture levels while letting light pass through to the seeds for improved germination.

**Growing On to Finish**

**Media**
Use a well-drained, disease-free soilless media with a pH of 5.8 to 6.2 and an EC of 0.75 mmhos/cm.

**Temperature**

**Nights:** 56 to 61°F (13 to 16°C).

**Days:** 62 to 70°F (16 to 21°C).

Cooler temperatures with high light will enhance foliage colors, but if average daily temperatures (ADT) are below 50°F (10°C), crop time could be significantly delayed. To achieve faster production with good foliage color, SimplySalad can be grown at moderate to warm temperatures (55 to 70°F/13 to 21°C), and then finished at 45 to 55°F (7 to 13°C) for 3 to 5 days. Colored varieties develop pigment very quickly at cooler temperatures.

**Light**
As high as possible, while maintaining moderate temperatures. Provide shade to reduce temperatures under warmer conditions.

**Irrigation**
Maintain media moisture.

**Fertilizer**
Apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) once a week. A balanced ammonium and nitrate-form fertilizer may be applied as needed to encourage growth and balance the media pH.

**Growth Regulators**
None

**Pinching**
Pinching is not needed.

**Crop Scheduling**

| Sow to transplant (105/128-cell plug tray): | 2-3 weeks |

**Transplant to finish and total crop time:**

**Common Problems**

**Insect:** None

**Disease:** None

**SimplySalad™**

**Plug Production**

**Media**
Use a well-drained, disease-free soilless media with a pH of 5.8-6.2 and an EC of 0.75 mmhos/cm (2:1 extraction).

**Sowing**
SimplySalad can be sown into 105/128 cell size plug tray or directly sown into finish containers. A light cover of coarse vermiculite helps maintain moisture levels while letting light pass through to the seeds for improved germination.

Total crop time can be reduced by 1 week by directly sowing into the final container.

**Stage 1** — Germination takes approximately 2 to 3 days.

**Germination temperature:** 65 to 73°F (18 to 22°C)

**Light:** Light is optional.

**Media moisture:** Keep the media medium wet (level 4) during germination.

**Relative humidity:** SimplySalad can be germinated on bench. As long as the soil is kept evenly moist, high air humidity is not required for germination.

**Stage 2**

**Temperature:** 68 to 70°F (20 to 21°C)

**Light:** Can be up to 2,500 f.c. (26,900 Lux) during Stages.

**Media moisture:** Keep the media medium wet (level 4) during stage 2.

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorous. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1:2 extraction).

**Stage 3**

**Temperature:** 65 to 67°F (18 to 19°C)

**Light:** Can be up to 2,500 f.c. (26,900 Lux) during Stages.

**Media moisture:** Keep the media medium wet (level 3) to medium dry (level 4) during stage 2.

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorous. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1:2 extraction).

**Stage 4**

**Temperature:** 62 to 64°F (16 to 17°C)

**Light:** Can be up to 5,000 f.c. (54,000 Lux)

**Media moisture:** Moisture level can be reduced to medium to medium dry (level 3 to 2). Do not allow the seedlings to wilt.

**Fertilizer:** Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Growth Regulators**
None

**Common Problems**

**Insect:** Watch for Aphids.

**Disease:** No serious problems.
Mayan Gold Tecoma

Plug Production

Media
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

Sowing
Sow coated seed in 288, 200 or larger liners. In Europe, 264-cell trays can be used. Cover moderately to heavily with vermiculite to maintain media moisture. Note: While the seed coat sometimes remains on the young seedlings, it will eventually fall off and will not affect the growth rate of the seedlings.

Stage 1 – Germination takes 3 to 5 days
Soil temperature: 68 to 74°F (20 to 23°C)
Light: Light is optional.
Moisture: Keep soil wet (level 4) during Stage 1.
Humidity: Maintain 95% relative humidity (RH) until radicles emerge.

Stage 2
Soil temperature: 72 to 75°F (21 to 24°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media. Do not allow the medium to dry out.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm) EC from nitrate-form fertilizers with low phosphorous.

Stage 3
Soil temperature: 68 to 72°F (20 to 22°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to dry further until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH of 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).
Growth regulators: Not needed.

Stage 4
Soil temperature: 65 to 68°F (18 to 20°C)
Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

Growing On to Finish

Container Size
4.5-in. (11-cm) square pots: 1 plant per pot
6-in. (15-cm) or gallon pots: 3 plants per pot

Media
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

Temperature
Night: 65 to 68°F (18 to 20°C)
Day: 68 to 75°F (20 to 24°C)

Light
Maintain light levels as high as possible. Under low-light and short-day conditions, the flower cluster may develop slowly or abort.

Photoperiod
Mayan Gold is a facultative long-day plant that flowers faster and more uniformly at daylengths of 14 hours or longer. Flowering will be delayed about 3 weeks when grown at daylengths of 12 hours or shorter. Light levels can interactively affect Tecoma daylength sensitivity. Under high light conditions, plant flowering may require shorter daylength.

Irrigation
Avoid both excessive watering and drought.

Fertilizer
Starting 1 week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) using predominately nitrate-form fertilizer with low phosphorus and high potassium. Maintain the media EC at 1.5 to 2.0 mS/cm and pH at 6.0 to 6.5. For constant fertilizer program, can apply fertilizer at rate 2 (100 to 175 ppm N or 0.7 to 1.2 mS/cm) while maintaining the above recommended EC and pH ranges.

Growth Regulators
Plants respond well to a tank mix of B-Nine and Cycoceal. Apply B-Nine/Alar (daminozide) 2,500 ppm (3.0 g/l 85% formulation or 4.0 g/l of 64% formulation) mixed with Cycoceal (chlormequat) 1,000 ppm (8.5 ml/l 11.8% formulation or 1.3 g/l of 75% formulation). Spray every other week starting 2 to 3 weeks after transplanting. Do not use Bonzi as drench or spray because it will make the plant softer and floppy.

In Northern European conditions: Use 3,200 ppm Alar (3.8 g/l 85% formulation or 5.0 g/l of 64% formulation) mixed with Cycoceal (3.2 ml/l 11.8% formulation or 0.5 g/l of 75% formulation).

Kauai Series Torenia

Plug Production

Media
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.0 and a medium initial nutrient charge (EC 0.75 mmhos/cm with a 1:2 extraction).

Sowing
Plug tray size 288 cells. Do not cover or bury the seed.

Stage 1 – Germination takes 4 to 6 days.
Soil temperature: 71 to 76°F (22 to 24°C)
Light: Light is required.
Moisture: Keep soil moist but not saturated (level 4) during Stage 1 for optimal germination.
Humidity: Maintain 95% relative humidity (RH) until radicle emergence.

Stage 2
Soil temperature: 68 to 73°F (20 to 23°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Start to slightly reduce soil moisture (level 4) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous.

Stage 3
Soil temperature: 68 to 70°F (20 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow the media to further dry until the surface becomes brown to dark
brown (level 3) before watering. Keep the moisture level at wet-dry cycle (moisture level 4 to 3). Do not allow the seedlings to wilt as they do not recover very well.

**Fertilizer:** Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC).

**Growth regulators:** Growth regulators are not needed.

**Stage 4**

**Soil temperature:** 65 to 67°F (18 to 19°C)

**Light:** Up to 5,000 f.c. (53,800 Lux) if optimal temperature can be maintained.

**Moisture:** Same as Stage 3.

**Fertilizer:** Same as Stage 3.

**Growing On to Finish**

**Media**

Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.2 and a medium initial nutrient charge.

**Temperature**

- **Nights:** 62 to 64°F (17 to 18°C)
- **Days:** 65 to 70°F (18 to 21°C)

**Light**

Keep light as high as possible while maintaining recommended temperatures.

**Irrigation**

Avoid both excessive watering and drought.

**Fertilizer**

Starting a week after transplant, apply fertilizer weekly at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) using predominantly nitrate-form fertilizer with low phosphorus and high potassium. Maintain the media EC at 1.5 to 2.0 mS/cm and pH at 5.8 to 6.2.

**Growth Regulators**

Cycocel (chlorimuron) can be used at rate of 500-750 ppm (4.2 to 6.4 ml/l 11.8% formulation or 0.7 to 1.0 g/l of 75% formulation) at two weeks after transplant, repeat as necessary.

Bonzi (paclobutrazol) 20 to 30 ppm (5.0 to 7.5 ml/l 0.4% formulation) spray also works but slightly less effective than Cyocel.

Avoid using B-Nine/Alar or tank mix of B-Nine/Cycocel as B-Nine will bleach flower color to become less intense. B-Nine will also delay flower timing.

**Pinching**

No need.

**Crop Scheduling**

Sow to transplant (288-cell plug tray): 5 to 6 weeks.

Transplant from 288-tray to saleable finished container:

<table>
<thead>
<tr>
<th>Container Size</th>
<th>Number of Plants</th>
<th>Weeks From Transplant</th>
<th>Total Weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>804 pack</td>
<td>1</td>
<td>5-6</td>
<td>10-12</td>
</tr>
<tr>
<td>4-in. (10-cm) pot</td>
<td>1</td>
<td>6-7</td>
<td>11-13</td>
</tr>
</tbody>
</table>

**Common Problems**

**Insect:** No serious problems

**Disease:** No serious problems

**Quartz Series Verbena XP and Original Colors**

**Plug Production**

**Plug Tray Size**

392-cell or similar size.

**Sowing**

- Top-dress the plug trays with a medium covering of coarse-grade vermiculite at sowing.
- Moisture management is the key to successful verbena germination.
- Verbena germinates best under medium-dry (level 2) to medium (level 3) plug media moisture levels; medium-wet (level 4) and wet (level 5) conditions will tend to decrease germination performance.
- Moisture levels in the plug media at sowing can be controlled by adjusting the water pressure, number of misting nozzles and the speed of the misting tunnel in the sowing line.

**Stage 1** (Sow to radicle emergence; 4 to 6 days)

**Germination temperature:** 72 to 75°F (22 to 24°C)

**Light:** Not required for germination.

**Relative humidity:** 95 to 97%.

**Stage 2** (Radicle emergence to cotyledon expansion; 10 to 14 days)

**Temperature:** The day air temperatures can be set at 70 to 72°F (21 to 22°C) and the night temperature at approximately 60°F (15°C).

**Light:** Up to 2,500 f.c. (26,900 Lux) during Stages 2 and 3.

**Moisture:** Once the plug trays come out of the germination chamber, grow them under medium-wet (level 4) moisture conditions. Avoid wet (level 5) moisture conditions until the seedlings establish.

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorous. Maintain a media pH of 5.8 to 6.2 and EC at 0.5 to 0.7 mS/cm (1:2 extraction).

**Stage 3** (Cotyledon expansion to growth of all set of true leaves; 10 to 14 days)

**Temperature:** The day air temperatures can be set at 68 to 70°F (20 to 21°C) and the night temperature at approximately 60°F (15°C).

**Fertilizer:** Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

**Stage 4** (Development of all true leaves to shipping/transplant; 7 days)

Maintain the recommended growing temperatures and fertilizer regime as in Stage 3. Light levels can be up to 5,000 f.c. (53,800 Lux) if temperatures can be maintained. Check for powdery mildew from this stage onwards.

**Growth Regulators**

**In North American conditions:** If plant growth regulator treatments are necessary for holding/toning the plugs, apply A-Rest (ancymidol) at 10 ppm (37.6ml/l, 0.0264% formulation) as a foliar spray.

**In Northern European conditions:** If needed, 1 to 3 applications of B-Nine/Alar (daminozide) at 1,250 ppm (1.5 g/l 85% formulation or 2 g/l 64% formulation) spray has been tested and shown to be effective.

**Growing On to Finish**

**Container Size**

606-cell packs.

**Media**

Use a well-drained, disease-free soilless medium with a pH of 5.5 to 6.2 and a medium initial nutrient charge.

**Temperature**

Maintain day temperatures at 65 to 70°F (18 to 21°C) and night temperatures at about 60°F (15°C) until finish. Verbena can be grown as low as 55°F (13°C), but the crop time will be longer.

**In Northern European conditions:** For the first 2 weeks following transplant, maintain night temperatures at 61 to 66°F (16 to 19°C). After this, night temperatures may be dropped to 57 to 63°F (14 to 17°C).

**Light**

Keep light levels as high as possible while maintaining appropriate temperatures.

**Humidity**

Avoid high humidity in the growing environment as this can induce powdery mildew.

**Fertilizer**

Starting 1 week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) using predominantly nitrate-form fertilizer with low phosphorous. If needed, a balanced ammonium and nitrate-form fertilizer may be used as needed to encourage growth and balance the media pH.

**Growth Regulators**

**In North American conditions:** Use 2 applications of A-Rest (ancymidol) at 20 ppm (75ml/l, 0.0264% formulation) as a foliar spray. One application can be done 1 week after transplant, and the second application can be done 10 to 14 days later.
PanAmerican Seed.

Titan Series F1 Vinca

Plug Production

Media
Use a well-drained, disease-free, soilless medium with a pH of 5.8 to 6.0 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

Sowing
Can be produced in 392, 288, or similar cell size plug trays. Cover the seed with vermiculite. Allow 3 to 5 days for germination.

Stage 1 – Germination takes 3 to 5 days.
Soil Temperature: 75 to 78°F (24 to 25°C)
Light: Not required
Moisture: Keep soil wet (level 4) during Stage 1.
Humidity: Maintain 95% relative humidity (RH) until the cotyledons emerge.

Stage 2
Soil temperature: 70 to 72°F (21 to 22°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.

Fertilizer:
Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous.

Stage 3
Soil temperature: 70 to 72°F (21 to 22°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to dry further until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain medium pH of 5.8 to 6.0 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).

Stage 4
Soil temperature: 70 to 72°F (21 to 22°C)
Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.
Growth regulators: Not needed.

Growing On to Finish

Media
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.0 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

Temperature
Nights: 65 to 68°F (18 to 20°C)
Days: 75°F (24°C) or above
Light
As high as possible while maintaining optimal production temperatures.

Irrigation
Maintain even moisture. Avoid excessive media and foliage wetness as these conditions are favorable for disease incidence.

Growth Regulators
Not required.

Crop Scheduling
Sow to transplant (392, 288, or similar cell plug size): 5 weeks
Transplant to finish in 306-packs or 4-in. (10-cm) pot: 3 to 5 weeks
Total crop time from sow to finish: 8 to 10 weeks. The timing is dependent on temperature and light levels.

Common Problems

Insect: Mites, Thrips
Disease: Powdery Mildew

Sorbet™ Series Viola

Plug Production

Plug Tray Size
Use 406-cell plug trays. Finish time is about 4 weeks.

Media
Use a well-drained, disease-free seedling medium with a pH of 5.4 to 5.8. Avoid plug media mixes with a high initial nutrient charge. Keep phosphorus levels as low as possible to avoid initial stretch.

Sowing
A medium covering of coarse grade vermiculite is recommended to help maintain high humidity around the germinating seed for better germination performance. Bench germination takes 3 to 4 days. Chamber germination will yield better results.

For optimal germination performance, maintain the plug media at “wet” moisture levels, i.e., the media is glistening, but water will not ooze out from the bottom of the tray and will penetrate only slightly from the top around the fingertip. Avoid germination temperatures above 70°F (21°C) to prevent seedling stretch.

Stage 2 timing: 10 days
Stage 3 timing: 14 days
Stage 4 timing: 7 days

Temperature
Germination: 68°F (20°C)
Stage 2: 65 to 70°F (18 to 21°C) days; 60°F (15°C) nights
Stage 3: 65°F (18°C) days; 60°F (15°C) nights
Stage 4: 60°F (15°C) days; 55°F (13°C) nights

Water
Beginning at Stage 3, reduce the moisture level in the media once the seedlings are established. Stage 4 plugs can be grown under wet/dry cycles to tone the seedlings and avoid soft growth.

Light
Light is not required for germination. Quality seedlings can be produced with light levels up to 3,000 f.c. (30,000 Lux).

Humidity
Maintain 95 to 97% relative humidity.

Fertilizer
Beginning at Stage 3, start fertilizing the seedlings twice a week with 50 ppm N from 14-0-14, alternating with a 20-10-20 type fertilizer for pH balance and supplying the required calcium. Increase the nitrogen

Common Problems

Disease: Incorporate a preventative fungicide program for Rhizoctonia, Botrytis and Phytophthora.

GROWER FACTS
concentration to 100 ppm after a week, and
maintain an EC of 0.5 to 0.75 mmhos/cm and
a pH of 5.4 to 5.8 at Stage 2; at Stage 3 and
4, EC and pH values can be at 1.0 and 5.6 to
5.8, respectively. A high pH (greater than
6.0) can induce boron deficiency and also
courages fungal black root rot, caused by
Thielaviopsis sp.

Growing Regulators
Viola seedlings are naturally compact and
stretch-free. Plant growth regulators may
therefore not be required in the plug stage
if transplanted on time. Otherwise, a foliar
spray of A-10 at 1 ppm is recommended
for plug production. One application is
sufficient, applied when the first set of true
leaves is fully developed (when plugs are
approximately 3 weeks old). If necessary, the
foliar spray can be applied a few days earlier
than week 3.

Note: Transplant the plugs “on time” to
avoid initiation in the plug stage. Plugs that
are initiated will not fill out the finished
container well at the time of flowering.

Growing On to Finish

Container Size
606 jumbo cell packs

Media
The level of starter nutrient charge
incorporated into the growing mix
influences crop quality. A starter charge
that is too low can result in a viola crop
that will flower before enough foliage
has grown to fill the packs/container.
Incorporate a medium level of supplemental
nutrient charge in the growing media mix
to encourage good foliar growth before the
crop flowers.

Temperature
Provide day temperatures of 60°F (15°C)
and night temperatures of 50 to 55°F (10 to 13°C)
for greenhouse production.

Light
No supplemental lighting is required.

Fertilizer
A week after transplant, begin fertilizing
with 150 ppm N once a week when grown
in the greenhouse. Additional fertilization
may be needed if grown outside. Maintain
an EC of 1.5 and a pH of 5.6 to 5.8 after
transplant until finish. Alternate between
an acidic fertilizer, such as 20-10-20, and
a basic fertilizer, such as 15-5-15 calcium/magnesium,
for pH balance. If the media
pH is greater than 6.0, then take corrective
measures to lower the pH to the desired
level.

Growth Regulators
The use of plant growth regulators on
violas is largely dependent on day/night
temperatures, location and time of year. If
the day/night temperatures are optimal,
i.e., not too high for viola production (days
in 60°F (16 to 20°C) and nights in 50°F
(11 to 15°C), then foliar sprays of A-10 at
10 to 20 ppm, applied 2 to 3 times beginning
a week after transplant with 7 to 10 days
interval, will work. When grown under
warmer day/night temperatures, B-Nine
at 5,000 ppm and A-Rest at 5 to 10 ppm
applied 2 to 3 times beginning a week after
transplant with 7 to 10 days interval will
work. Temperature is the best natural
growth-controlling factor. Minimal to no
plant growth regulators are needed when
the crop is produced at lower temperatures
during the Spring.

To produce the best-quality violas, grow
them outside beginning a week after
transplant under cold frame-type conditions.
Optimal outside growing temperatures are
60 to 70°F (15 to 21°C) days, and nights in
the low 50s°F (11 to 15°C) for the first few
weeks. Violas can also tolerate lower night
temperatures – in the 40s°F (5 to 9°C).

Crop Scheduling
Sow to transplant: 4 weeks in a
406-cell plug tray
Transplant to finish in 606 jumbo cell
pack: 3 to 5 weeks seasonally
Total crop time to flower:
7 to 9 weeks seasonally

Common Problems
Insect: Fungus Gnats and Shore Flies can
be problem pests during plug production.
Aphids, Thrips, Mites and White Flies can be
a problem during finishing stages.
Disease: Damping-off, Black Root Rot, Foliar
Leaf Spots and Botrytis blight are common.

Zahara™ Series Zinnia

Plug Production

Media
Use a well-drained, disease-free media with
a pH range of 5.5 to 6.0, and EC less than
0.75 mmhos/cm (2:1 extraction).

Sowing
Plug Tray Size: Can be produced in 200,
288 or similar cell size plug trays. Cover the
seed with a medium layer of vermiculite at
sowing.

Stage 1 – Germination takes approximately
2 to 3 days.

Germination temperature: 68 to 72°F (20
to 22°C)
Zahara™ Series Zinnia continued
Zahara™ Series Zinnias continued

ammonium and nitrate-form fertilizer to encourage growth and balance the media pH. Maintain the media EC at 1.50 to 2.00 mS/cm and pH at 5.8 to 6.2.

Irrigation
Maintain optimal media moisture (not too wet or too dry). Avoid overhead irrigation. Irrigation should take place during times when foliage will dry quickly, to prevent any disease incidence.

Plant Growth Regulators
B-Nine/Alar (daminozide) at 3,500 ppm (4.1 g/l 85% formulation or 5.5 g/l of 64% formulation) applied twice as a foliar spray will control the plant growth. First application can be done 1 week after transplant, followed by a second application 7 to 10 days later.

In Northwestern Europe: Zahara will require less PGRs under northwestern European conditions. Can use 2 applications of B-Nine/Alar (daminozide) at 1,600 ppm (1.9 g/l 85% formulation or 2.5 g/l of 64% formulation).

Crop Scheduling
Sow to transplant: Approximately 3 weeks

Transplant to flower: 8 to 9 weeks in Spring, 5 to 6 weeks in Summer

Total crop time (sow to flower): 11 to 12 weeks in Spring, 8 to 9 weeks in Summer. Crop time will be shorter under long days than under short days.

Common Problems
Insect: Monitor for Aphids early in production, and Thrips during flowering.
Disease: Avoid high humidity and condensation in the greenhouse, as these conditions are favorable for Berytis and Powdery Mildew incidence.

Double Zahara™ Series Zinnia

Plug Production
Media
Use a well-drained, disease-free media with a pH range of 5.8 to 6.2, and EC less than 0.75 mS/cm (1:2 extraction).

Sowing
Plug Tray Size: Can be produced in 288, 200 or similar cell size plug trays. Cover the seed with a medium layer of vermiculite at sowing.

Stage 1 – Germination takes approximately 2 to 3 days.

Germination temperature: 68 to 73°F (20 to 22°C)

Light: Light is not required for germination.

Moisture: Keep the soil wet (level 4) during germination.

Stage 1

Relative humidity: Maintain 95 to 97% relative humidity (RH) until cotyledons emerge.

Stage 2

Temperature: 68 to 76°F (20 to 24°C) days; 59 to 64°F (15 to 17°C) nights

Light: Can be up to 2,500 f.c. (26,900 Lux) during Stages 2 and 3.

Media Moisture: Keep the media medium (level 3) to medium wet (level 4).

Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N per less than 0.7 mS/cm EC) with a nitrate-form fertilizer with low phosphorous.

Stage 3

Temperature: 68 to 76°F (20 to 24°C) days; 59 to 64°F (15 to 17°C) nights.

Media Moisture: Keep the media medium wet (level 3) during Stages 3 and 4.

Fertilizer: Increase the fertilizer rate to 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). Maintain a media pH of 5.8 to 6.2 and EC at 0.7 to 1.0 mS/cm (1:2 extraction).

Stage 4

Temperature: 65 to 70°F (18 to 21°C) days; 59 to 64°F (15 to 17°C) nights

Light: Light levels can be up to 5,000 f.c. (53,800 Lux) if optimal temperatures can be maintained.

Fertilizer: Same as Stage 3.

Plant Growth Regulators
PGRs are generally not required during plug production. If needed, plants can be treated once during the plug stage at about 10 to 14 days after sowing with a foliar spray of B-Nine/Alar (daminozide) at 1,250 to 2,500 ppm (1.5 to 3.0 g/l 85% formulation or 2.0 to 3.9 g/l of 64% formulation).

Growing On to Finish

Container Size
Double Zahara can be produced in 4-in. (10-cm), quarts, gallon (18-cm) pots or similar size containers.

Media
Use a well-drained, disease-free media with a pH of 5.8 to 6.2 and a medium initial nutrient charge.

Temperature
Nights: 59 to 64°F (15 to 17°C)

Days: 65 to 70°F (18 to 21°C)

Light
Keep light levels as high as possible while maintaining appropriate temperatures. Flowers will be more double with intense color under high light levels.

Fertilizer
Starting 1 week after transplant, apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) using predominantly nitrate-form fertilizer with low phosphorus.

If needed, alternate with a balanced ammonium and nitrate-form fertilizer to encourage growth and balance the media pH. Maintain the media EC at 1.50 to 2.00 mS/cm and pH at 5.8 to 6.2. Avoid fertilizer/nutritional stress during production as this can cause the flowers to be less double.

Irrigation
Maintain optimal media moisture (not too wet or too dry). Avoid overhead irrigation. Irrigation should take place during times when foliage will dry quickly, to prevent any disease incidence.

Plant Growth Regulators
B-Nine/Alar (daminozide) at 3,500 to 5,000 ppm (4.1 to 6.0 g/l of 85% formulation or 5.5 to 7.8 g/l of 64% formulation) applied twice as a foliar spray will help in controlling the plant growth. First application can be done 1 week after transplant, followed by a second application 7 to 10 days later.

In Northwestern Europe: Zahara will require less PGRs under northwestern European conditions. Can use 2 applications of B-Nine/Alar (daminozide) at 1,600 ppm (1.9 g/l 85% formulation or 2.5 g/l of 64% formulation).

Crop Scheduling
Sow to transplant: Approximately 3 weeks

Transplant to flower: 8 to 9 weeks in Spring, 5 to 6 weeks in Summer

Total crop time (sow to flower): 11 to 12 weeks in Spring, 8 to 9 weeks in Summer. It may take 1 additional week to finish in gallon size containers.

Common Problems
Insect: Monitor for Aphids early in production, and Thrips during flowering.
Disease: Avoid high humidity and condensation in the greenhouse, as these conditions are favorable for Berytis and Powdery Mildew incidence.
Kieft-Pro-Seeds Grower Facts

NOTE: Growers should use the information presented here as a starting point. Crop times will vary depending on the climate, location, time of year and greenhouse environmental conditions. Chemical and PGR recommendations are only guidelines. It is the responsibility of the applicator to read and follow all the current label directions for the specific chemical being used in accordance with all regulations.

Winky Series Aquilegia
Plug Production

Media
Use a well-drained, disease-free, soilless media with a pH of 5.8 to 6.2 and an EC of 0.75 mmhos/cm).

Sowing
Sow 2 to 3 seeds per cell in 288 plug tray (depending on series single or double). Cover seed lightly with vermiculite. Spray after sowing preventively against fungi.

Stage 1 – Germination takes 7-12 days.
Soil temperature: 68 to 72°F (20 to 22°C)
Light: Requires light to germinate.
Moisture: Keep soil medium moist (level 3) in Stage 1.
Humidity: Maintain 95 to 97% relative humidity (RH) until radicles emerge.

Stage 2
Soil temperature: 68 to 72°F (20 to 22°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Reduce media moisture slightly (level 2–3) to allow the roots to penetrate into the media. Don’t let the media dry out.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N; less than 0.7 mmhos/cm EC) from nitrate-form fertilizers.

Stage 3
Soil temperature: 65 to 68°F (18 to 20°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to dry further until the surface becomes light brown (level 2) before watering.
Fertilizer: Apply fertilizer at rate 2 (100 to 175 ppm N/0.7 – 1.2 mmhos/cm EC) from nitrate-form fertilizers.
Growth regulators: Not necessary.

Stage 4
Soil temperature: 65 to 68°F (18 to 20°C)
Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

Growing On to Finish

Container Size
5 in. (13 cm) or square/quart pots:
1 plug per pot
1 gallon (18 cm):
1-3 plugs per pot
1½ gallon (23 cm):
3 plugs per pot

Media
Use a well-drained, disease-free, soilless media with a pH of 5.8 to 6.4 and an EC of 1.2-1.5 mmhos/cm).

Vernalization
Required; minimum 8 to 10 weeks at 41°F (5°C). Plants should have at least 10 to 12 true leaves before vernalization starts.

Temperature
Cool growing towards the winter period to get a full and bushy plant development and a good settled root-system is important. Don’t allow the plants to become stretched and leggy before winter.

After winter period/vernalization
Night: 50 to 59°F (10 to 15°C)
Days: 60 to 72°F (16 to 22°C)

Light
No additional light is required, but could be beneficial for flower induction after vernalization period.

Photoperiod
Aquilegia is a day-neutral plant after vernalization. Long day of 14 hours or longer could stimulate stem elongation and slightly hasten flowering after the vernalization period.

Irrigation
Keep media medium moist (level 3). Avoid both excessive watering and drought. During overwinter/vernalization period, maintain plants dry to medium dry as overwatering could result in plant loss from root rot.

Fertilizer
Apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mmhos/cm EC) from Nitrate form fertilizer.
Add some extra Nitrate fertilizer early spring form fertilizer.

Growth Regulators
In general no PGR is needed (especially when grown under cool conditions), but if necessary B-Nine/Alar (daminozide) at 2,500-5,000 ppm (3.0-6.0 gr/l 85% formulation or 4.0-8.0 gr/l 64% formulation) can be applied as needed.

Pinching
Pinching is not needed.

Spacing
Space plants when foliage is touching.

Crop Scheduling
Sow to transplant (288 cell plug): 7 to 8 weeks
Transplant to flower: 30 to 40 weeks
Total crop time: 38 to 46 weeks

Production: Sow in late March to early April for natural flowering late April to early May of the following year.

Common Problems
Insect: Aphids, Spider Mites, Leaf Miners, White Flies
Disease: Sclerotinia, Downy Mildew

Ballerina Series Armeria
Plug Production

Media
Use a well-drained, disease-free, soilless media with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

Sowing
Sow 2 to 4 seeds per cell in 288 or larger plug trays. Do not cover the seeds.

Stage 1 – Germination takes 3 to 6 days.
Soil temperature: 60 to 65°F (16 to 18°C)
Light: Needs light to germinate.
Moisture: Keep soil wet (level 4) during Stage 1.
Humidity: Maintain 95 to 97%+ relative humidity (RH) until radicles emerge.

Stage 2
Soil temperature: 60 to 65°F (16 to 18°C)
Light: Can be up to 2,500 f.c. (26,900 Lux).
Moisture: Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N; less than 0.7 mmhos/cm EC) from nitrate-form fertilizers with low phosphorus.

Stage 3
Soil temperature: 60 to 65°F (16 to 18°C)
Light: Can be up to 2,500 f.c. (26,900 Lux).
Moisture: Allow the soil moisture to dry to level 3.
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N; 0.7 to 1.2 mmhos/cm EC).
Growth regulators: Generally not needed.

Stage 4
Soil temperature: 60 to 65°F (16 to 18°C)
Light: Can be up to 5,000 f.c. (54,000 Lux).
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

Growing On to Finish

Container Size
4 to 5-in. (10 to 13-cm) square/quart pots:
1 plug per pot
Gallon (7 in./18 cm): 1-3 plugs per pot

Media
Use a well-drained, disease-free, soilless media with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm).
**Kieft-Pro-Seed**

**Ballerina Series Armeria continued**

**Temperature (optimum)**
- **Nights:** 50 to 58°F (10 to 14°C)
- **Days:** 60 to 65°F (16 to 18°C)

**Note:** For early Spring sales, grow in a frost-free greenhouse/tunnel.

**Light**
No additional light is required.

**Photoperiod**
Ballerina is a day-neutral plant.

**Irrigation**
Keep media moisture dry (level 2; substrate color is light brown) to medium moist (level 3; substrate color is brown to dark brown). Ballerina is relatively drought tolerant. For overwinter production, grow plants on the dry side during cold period as overwatering could result in plant loss from root rot.

**Fertilizer**
Ballerina generally needs low to medium fertilization. Apply fertilizer at rate 1 to 2 (70 to 175 ppm N; 0.5 to 1.2 mmhos/cm).

After overwintering, apply an extra fertilizer application (150 to 175 ppm Nitrate fertilizer; 1.0 to 1.2 mmhos/cm) when plants start to grow in early Spring.

**Growth Regulators**
Not needed.

**Pinching**
Not needed.

**Crop Scheduling**
**Sow to transplant (288 cell plug):** 5 to 6 weeks

**Annual**
- **Transplant to flower:** 12 to 15 weeks
- **Total crop time:** 16 to 21 weeks

**Overwintered frost-free**
- **Transplant to flower:** 28 to 36 weeks
- **Total crop time:** 32 to 40 weeks

**Spring production:**
- **Sow January to mid-March for natural flowering from mid-May to July.**

**Overwinter production:**
- **Sow late July to late August for natural flowering late May to early June of the following year.**

**Note:** Plants from overwinter production will have a better plant habit with many more flowering stems per plant (approximately 20 to 30 stems per plant).

**Common Problems**
**Insect:** Sciara in plug stage
**Disease:** Colletotrichum
**Physiological:** When grown too cold during growing season, leaves may turn red-purplish and could twist.

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**Campana Series Campanula**

**Plug Production**

**Media**
Use a well-drained, disease-free media with a pH of 5.8 to 6.5 and an EC of 0.8 mmhos/cm.

**Sowing**
Sow 1 seed or pellet per cell in a 288 or larger plug tray. Larger plug size can increase plug time by a week. Do not cover the seed. Use a fungicide after sowing to prevent damping-off.

**Photoperiod**
Campanula is a qualitative long-day plant. To ensure sufficient vegetative growth and stem length, it is recommended to provide 6 weeks of short-day conditions (11 hours) from approximately 2 weeks after sowing.

**Stage 1 – Germination**
- **Soil temperature:** 68 to 72°F (20 to 22°C)
- **Light:** Campana is a light germinator.
- **Moisture:** Keep soil moist (level 4) in Stage 1.
- **Humidity:** Maintain approximately 98% relative humidity (RH) until radicles emerge.

**Stage 2**
- **Soil temperature:** 68 to 72°F (20 to 22°C)
- **Light:** 370 f.c. (4,000 Lux) to 2,500 f.c. (26,900 Lux)
- **Moisture:** Keep soil moisture at level 3 to 4 to allow the roots to penetrate into the media. Don’t let the media dry out.
- **Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N; less than 0.7 mmhos/cm EC).

**Stage 3**
- **Soil temperature:** 60 to 65°F (16 to 18°C)
- **Light:** 370 f.c. (4,000 Lux) to 2,500 f.c. (26,900 Lux)
- **Moisture:** Keep soil moisture at level 3 to 4.
- **Fertilizer:** Apply fertilizer at rate 2 (100 to 175 ppm N; 0.7 to 1.2 mmhos/cm EC).

**Growth regulators:** Do not use growth regulators at this stage so that sufficient stem length is reached.

**Stage 4**
- **Soil temperature:** 60 to 65°F (16 to 18°C)
- **Light:** 370 f.c. (4,000 Lux) to 5,000 f.c. (54,000 Lux)
- **Moisture:** Same as Stage 3.
- **Fertilizer:** Same as Stage 3.

**Growing On to Finish**

**Planting Density**
64-80 plants/m². Use netting for support (5x5 in./12.5x12.5 cm).

**Media**
Plant in beds with a well-drained, disease-free media with a pH of 5.5 to 6.0 and an EC of 0.75 mmhos/cm.

**Temperature**
- **Nights:** 54 to 59°F (12 to 15°C)
- **Days:** 60 to 70°F (16 to 21°C)

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**Light**
Maintain light levels as high as possible while keeping the temperature moderate. To assure enough stem length and good plant quality, a minimum of 370 f.c. (4,000 Lux) light is required in the plug stage.

**Photoperiod**
Campanula is a qualitative long-day plant. To ensure sufficient vegetative growth and stem length, it is recommended to provide 6 weeks of short-day conditions (11 hours) from approximately 2 weeks after sowing. When producing for Winter flowering, providing long days starting at 6 weeks after transplanting is required. “Mum lighting” from 10:00 p.m. to 2:00 a.m. can be used.

**Irrigation**
Maintain a medium moisture level. In order to reach sufficient stem length, Campanula medium needs adequate moisture and fertilization. Dry growing conditions will cause early flowering and reduced stem length.

Do not overwater as this will cause weaker stems and weaker root systems, which will lead to plants falling over.

**Fertilizer**
Campana needs adequate nutrition to reach the desired length. Apply standard mix with micro-elements included fertilizer at level 3 (175 to 225 ppm, EC 1.2 to 1.5 mmhos/cm) constantly with irrigation water at the first 4 weeks after transplant. Then, reduce EC in irrigation water to 1.0 to 1.2 mmhos/cm (145 to 175 ppm).

**Growth Regulators**
Do not use growth regulators.

**Pinching**
Pinching is not required. Pinching will lead to a delay in flowering of about 2 weeks. It will result in multiple stems of shorter length and lesser stem quality.

**Crop Scheduling**
**Sow to transplant (288 cell plug):** 7 to 8 weeks with minimum 5 to 6 weeks short days (11 hours) on plugs under cooler conditions (60 to 65°F/16 to 18°C)

**Transplant to flower:** 10 to 14 weeks

Under proper day length and temperature range

**Total crop time:** 17 to 22 weeks
Under proper day length and temperature range

**Production**
Campana can be produced year-round under the appropriate light levels, temperature and day lengths.

**Common Problems**
**Insect:** Aphids, Thrips, Leaf Miners
**Disease:** Fusarium, Rhizoctonia, Ramularia, Rust, Downy Mildew

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**GRoWER FACTS**

**Ballerina Series Armeria continued**

**Temperature (optimum)**
- **Nights:** 50 to 58°F (10 to 14°C)
- **Days:** 60 to 65°F (16 to 18°C)

**Note:** For early Spring sales, grow in a frost-free greenhouse/tunnel.

**Light**
No additional light is required.

**Photoperiod**
Ballerina is a day-neutral plant.

**Irrigation**
Keep media moisture dry (level 2; substrate color is light brown) to medium moist (level 3; substrate color is brown to dark brown). Ballerina is relatively drought tolerant. For overwinter production, grow plants on the dry side during cold period as overwatering could result in plant loss from root rot.

**Fertilizer**
Ballerina generally needs low to medium fertilization. Apply fertilizer at rate 1 to 2 (70 to 175 ppm N; 0.5 to 1.2 mmhos/cm).

After overwintering, apply an extra fertilizer application (150 to 175 ppm Nitrate fertilizer; 1.0 to 1.2 mmhos/cm) when plants start to grow in early Spring.

**Growth Regulators**
Not needed.

**Pinching**
Not needed.

**Crop Scheduling**
**Sow to transplant (288 cell plug):** 5 to 6 weeks

**Annual**
- **Transplant to flower:** 12 to 15 weeks
- **Total crop time:** 16 to 21 weeks

**Overwintered frost-free**
- **Transplant to flower:** 28 to 36 weeks
- **Total crop time:** 32 to 40 weeks

**Spring production:**
- **Sow January to mid-March for natural flowering from mid-May to July.**

**Overwinter production:**
- **Sow late July to late August for natural flowering late May to early June of the following year.**

**Note:** Plants from overwinter production will have a better plant habit with many more flowering stems per plant (approximately 20 to 30 stems per plant).

**Common Problems**
**Insect:** Sciara in plug stage
**Disease:** Colletotrichum
**Physiological:** When grown too cold during growing season, leaves may turn red-purplish and could twist.
Bombay™ Series Celosia

Plug Production

Media
Use a well-drained, disease-free media with a pH of 5.8 to 6.2 and an EC of 0.75 mmhos/cm.

Sowing
Sow 1 seed (or 1 pellet) per cell in a 288 or larger plug tray. Cover seed lightly with vermiculite. It is also possible to sow directly into the beds in the greenhouse. Press seeds lightly into the soil. Keep soil evenly moist. Treat preventively against fungi.

Stage 1 – Germination takes 3 to 4 days.

Soil temperature: 68 to 72°F (20 to 22°C)
Light: Required for germination.
Moisture: Keep soil moist (level 4) in Stage 1.
Humidity: Maintain 97 to 98% relative humidity (RH) until radicles emerge.

Stage 2

Soil temperature: 68 to 72°F (20 to 22°C)
Light: Can be up to 2,500 f.c. (26,900 Lux).
Moisture: Maintain soil media moist (level 4). Don’t let the media dry out.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC).

Stage 3

Soil temperature: 68 to 72°F (20 to 22°C)
Light: Can be up to 2,500 f.c. (26,900 Lux).
Moisture: Soil moisture can be reduced slightly (level 3 to 4), but do not allow media to dry out as it will result in premature flowering.
Fertilizer: Apply fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC).
Growth regulators: None needed. Do not use PGRs in this stage as cutflower Celosia will not reach sufficient length otherwise.

Stage 4

Soil temperature: 68 to 72°F (20 to 22°C)
Light: Can be up to 5,000 f.c. (54,000 Lux).
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

General Remark for Plug Stage:
Celosia makes a taproot and is sensitive for root damage, which will result in early bud formation, deformed flowers and less uniformity. Therefore, planting should be done before the plugs get rootbound. Depending on season and plug size, this will generally take between 10 to 18 days after sowing. In this stage, mostly the first pair of true leaves unfolds.

Growing On to Finish

Planting Density
6 to 8 plants/sq. ft. (64 to 80 plants/sq. m).

Media
Use a well-drained, disease-free media with a pH of 5.8 to 6.5 and an EC of 0.75 mmhos/cm.

Temperature
From planting until start of flower development (6 to 8 weeks):
Nights: 63 to 65°F (17 to 18°C)
Days: 65 to 75°F (18 to 24°C)

From start of flower development onwards:
Nights: 59°F (15°C)
Days: 60 to 61°F (16°C)

Light
Maintain light levels as high as possible. Shading is only required when light intensity is very high. Low light intensity, short days and low temperatures may cause growth disturbances (for example, flat stems and combs shattering). Therefore, it is recommended not to sow later than the end of June in Northwest Europe.

Photoperiod
Celosia is a quantitative short-day plant. Flowers will initiate under short days. The optimum daylength for Celosia Bombay to reach the appropriate stem length lies between 12 to 13 hours. Under short-day conditions, provide daylength extension up to 13 hours to allow plants to elongate and to prevent early flowering. When daylength is over 13 hours, short-day treatments can be applied. Provide a dark period for a minimum of 12 hours for 5 to 6 weeks. Do not start short days until 1 week after planting. Prevent high relative humidity when using short-day treatments.

Irrigation
From transplanting to flower initiation, it is important to maintain constantly moist media, especially for the first 2 weeks. We recommend irrigating the first 10 to 14 days after transplanting each morning for approximately half an hour, as this is an important step in establishment and growing-on of the crop. If Celosia suffers from water stress during this stage, root development gets blocked and plants start flowering without reaching sufficient length. Overhead irrigation can be used, preferably in the morning.

After flower initiation, refrain from overhead irrigation in order to prevent disease incidence and to keep the soil drier; only irrigate when extremely sunny or when foliage wilts. Over-irrigating may cause flowers to become top-heavy and fall over.

Fertilizer
Celosia Bombay is a moderate feeder (level 2). Maintain 100 to 175 ppm N; 0.7 to 1.2 mmhos/cm EC with completely balanced fertilizer. Celosia is susceptible to salt and high EC.

Growth Regulators
PGRs are generally not recommended as this is for cut flower production. If needed to control the excessive stem length, PGRs can be used. Celosia is responsive to B-Nine/

Alar (diaminezide) 2,000 ppm (2.5 g/l 85% formulation or 3.0 g/l of 64% formulation) when excessive stem length is expected, starting at 12 to 20-in. (30 to 50-cm) height; depending on the weather, a weekly spray is advised. At final desired length, a spray with B-Nine/Alar (diaminezide) 3,250 ppm (3.8 g/l 85% formulation or 5.0 g/l of 64% formulation) could be given to stop the plant growing further.

Pinching
Do not pinch.

Crop Scheduling
Sow to transplant (288 cell plug): 2 to 3 weeks
Transplant to flower: 10 to 14 weeks (under proper daylength and temperature range)
Total crop time: 12 to 16 weeks (under proper daylength and temperature range)
The classic Bombay series varieties flower approximately 1 week earlier than Bombay Fire types, which are all varieties starting with “Fi”.

Production: Bombay can be produced year-round under the appropriate light levels, temperature and daylengths.

Common Problems

Insect: Aphids, Thrips, Spider Mites, Leaf Miners
Disease: Powdery Mildew, Botrytis
It is recommended to treat preventively against Botrytis 1 week after transplanting.

Sunday™ Series Celosia

Plug Production

Media
Use a well-drained, disease-free media with a pH of 5.8 to 6.5 and an EC of 0.75 mmhos/cm.

Sowing
Sow 1 seed (or 1 pellet) per cell in a 288 or larger plug tray. Cover seed lightly with vermiculite. It is also possible to sow directly into the beds in the greenhouse. Press seeds lightly into the soil. Keep soil evenly moist. Treat preventively against fungi.

Stage 1 – Germination takes 3 to 4 days.

Soil temperature: 68 to 72°F (20 to 22°C)
Light: Required for germination.
Moisture: Keep soil moist (level 4) in Stage 1.

Soil temperature: 60 to 61°F (16°C)

Pinching
Do not pinch.

Crop Scheduling
Sow to transplant (288 cell plug): 2 to 3 weeks
Transplant to flower: 10 to 14 weeks (under proper daylength and temperature range)
Total crop time: 12 to 16 weeks (under proper daylength and temperature range)
The classic Bombay series varieties flower approximately 1 week earlier than Bombay Fire types, which are all varieties starting with “Fi”.

Production: Bombay can be produced year-round under the appropriate light levels, temperature and daylengths.

Common Problems

Insect: Aphids, Thrips, Spider Mites, Leaf Miners
Disease: Powdery Mildew, Botrytis
It is recommended to treat preventively against Botrytis 1 week after transplanting.
Sunday™ Series Celosia continued

**Fertilizer:** Apply fertilizer at rate 2 (100 to 175 ppm N 0.7 to 1.2 mmhos/cm EC).

**Growth regulators:** None needed. Do not use PGRs in this stage as cutflower Celosia will not reach sufficient length otherwise.

**Stage 4**
- **Soil temperature:** 68 to 72°F (20 to 22°C)
- **Light:** Can be up to 5,000 f.c. (54,000 Lux).
- **Moisture:** Same as Stage 3.
- **Fertilizer:** Same as Stage 3.

**General Remark for Plug Stage:** Celosia makes a taproot and is sensitive for root damage, which will result in early bud formation, deformed flowers and less uniformity. Therefore, planting should be done before the plugs get rootbound. Depending on season and plug size, this will generally take between 12 to 20 days after sowing. In this stage, mostly the first pair of true leaves unfolds.

**Growing On to Finish**

**Planting Density**
6 to 8 plants/sq. ft. (64 to 80 plants/sq. m).
Use netting for support.

**Media**
Use a well-drained, disease-free media with a pH of 5.8 to 6.5 and an EC of 0.75 mmhos/cm.

**Temperature**
- **From planting until start of flower development:** 6 to 8 weeks:
  - **Nights:** 63 to 65°F (17 to 18°C)
  - **Days:** 65 to 75°F (18 to 24°C)
- **From start of flower development onwards:**
  - **Nights:** 59°F (15°C)
  - **Days:** 60 to 61°F (16°C)

**Light**
Maintain light levels as high as possible. Shading is only required when light intensity is very high. Low light intensity, short days and low temperatures may cause growth disturbances (for example, flat stems and plumes shattering). Therefore, it is recommended not to sow later than end of June in Northwest Europe.

**Photoperiod**
Celosia is a quantitative short-day plant. Flowers will initiate under short days. The optimum daylength for Celosia Sunday to reach the appropriate stem length lies between 12 to 13 hours. Under short-day conditions, provide daylength extension up to 13 hours to allow plants to elongate and to prevent early flowering. When daylength is over 13 hours, short-day treatments can be applied. Provide a dark period for a minimum of 12 hours for 5 to 6 weeks. Do not start short days until one week after planting. Prevent high relative humidity when using short-day treatments.

**Irrigation**
From transplanting to flower initiation, it is important to maintain constantly moist media, especially for the first 2 weeks. We recommend irrigating the first 10 to 14 days after transplanting each morning approximately half an hour, as this is an important step in establishment and growing-on of the crop. If Celosia suffers from water stress during this stage, root development gets blocked and plants start flowering without reaching sufficient length. Overhead irrigation can be used, preferably in the morning.

After flower initiation, refrain from overhead irrigation in order to prevent disease incidence and to keep soil drier; only irrigate when extremely sunny or when foliage wilts. Over-irrigating may cause flowers to become top-heavy and fall over.

**Fertilizer**
Celosia Sunday is a moderate feeder (level 2). Maintain 100 to 175 ppm N 0.7 to 1.2 mmhos/cm EC with completely balanced fertilizer. Celosia is susceptible to salt and high EC.

**Growth Regulators**
PGRs are generally not recommended as this is for cut flower production. If needed to control the excessive stem length, PGRs can be used. Celosia is responsive to B-Nine/Alar (daminzide) 2,000 ppm (2.5 g/l 18% formulation) when excessive stem length is expected, starting at 12 to 20-cm (30 to 50-cm) height; depending on the weather, a weekly spray is advised. At final desired length, a spray with B-Nine/Alar (daminzide) 3,250 ppm (3.8g/l 18% formulation or 5.0 g/l of 64% formulation) could be given to stop the plant growing further.

**Pinching**
Do not pinch.

**Crop Scheduling**

**Sow to transplant (288 cell plug):** 2 to 3 weeks

**Transplant to flower:** 12 to 16 weeks (under proper daylength and temperature range)

**Total crop time:** 14 to 18 weeks (under proper daylength and temperature range)

The Sunday series flowers approximately 2 weeks later than the Bombay types.

**Production:** Sunday can be produced year-round under the appropriate light elongate, temperature and daylengths.

**Common Problems**
- **Insect:** Aphids, Thrips, Spider Mites, Leaf Miners
- **Disease:** Powdery Mildew, Botrytis

It is recommended to treat preventively against Botrytis 1 week after transplanting.

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**Dalmatian Series Digitalis**

**Plug Production**

**Media**
Use a well-drained, disease-free, media with a pH of 5.5 to 6.5 and a medium initial nutrient charge (EC 0.7–1.0 mmhos/cm).

**Sowing**

<table>
<thead>
<tr>
<th>Tray Size</th>
<th>Seeds Per Plug</th>
</tr>
</thead>
<tbody>
<tr>
<td>288 cell tray</td>
<td>1 seed / cell</td>
</tr>
<tr>
<td>180 cell tray</td>
<td>1 seed / cell</td>
</tr>
<tr>
<td>84 cell tray</td>
<td>4 seeds / cell</td>
</tr>
</tbody>
</table>

Do not cover the seed.
Spray preventively with fungicide against damping off.

**Stage 1 – Germination takes approximately 5-6 days.**

**Soil temperature:** 65 to 68°F (18 to 20°C)

**Light:** Light is necessary for improving germination and reducing early stretch.

**Moisture:** Maintain soil constantly moist (level 4) in Stage 1.

**Humidity:** Maintain 95 to 97% relative humidity (RH) until radicles emerge.

**Stage 2**

**Soil temperature:** 65 to 68°F (18 to 20°C)

**Light:** Up to 2,500 f.c. (26,900 Lux)

**Moisture:** Soil moisture can be slightly reduced (level 3-4) to allow the roots to penetrate into the media. Don’t let the media dry out.

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mmhos/cm EC) from nitrate-form fertilizers.

**Stage 3**

**Soil temperature:** 65 to 68°F (18 to 20°C)

**Light:** Up to 2,500 f.c. (26,900 Lux)

**Moisture:** Allow media to dry further until the surface becomes brown to dark brown (level 3) before watering. Keep the moisture level to medium moist (moisture level 3).

**Fertilizer:** Maintain fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mmhos/cm EC) from nitrate-form fertilizers, and keep media with a medium pH of 5.5 to 6.2.

**Growth regulators:** Digitalis is responsive to B-Nine/Alar (daminzide), and Bonzi. B-Nine/Alar (daminzide) at 2000 ppm (3.0 g/l of 64% formulation or 2.5 g/l of 85% formulation) can be applied at 2-3 weeks after sowing. Repeat a week later if necessary. In warmer conditions, Bonzi (paclbutrazol) spray at about 5 ppm (1.25 ml/l 10.4% formulation) or Sunmagic (uniconazole) spray at 3ppm (5.5 ml/l 0.05% formulation) can be used. In Northwest Europe, Tilt (propiconazole) is also effective for Digitalis height control. A weekly spray with 0.3 ml/l is advised.
Stage 4

**Soil temperature:** 57 to 65°F (14 to 18°C)
**Light:** Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
**Moisture:** Same as Stage 3.
**Fertilizer:** Apply fertilizer to rate 1-2 (up to 150 ppm N/ up to 0.5 mmhos/cm EC) from nitrate-form fertilizers.

### Growing On to Finish

<table>
<thead>
<tr>
<th>Container Size</th>
<th>1 plug / pot from 288</th>
<th>1-3 plugs / pot from 288 or 1 plug / pot from 84</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 in. (15 cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Gallon (18 cm)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Gallon (30 cm)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Media**
Use a well-drained, disease-free, soilless media with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 1.0 mmhos/cm).

**EC schedule from start to finish**

<table>
<thead>
<tr>
<th>Start production stage</th>
<th>EC= 1.0 – 1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final production stage</td>
<td>EC= 1.3 – 1.5</td>
</tr>
</tbody>
</table>

**Temperature**

| Nights: 50 to 65°F (10 to 18°C) | Days: 60 to 68°F (16 to 20°C) | Avoid temperatures below freezing. |

**Light**
No additional light is required. High light will enhance flowering.

**Photoperiod**
Digitalis is a facultative long-day plant and has a critical day length of approximately 14 hours.

**Irrigation**
Maintain media constantly moist. Avoid both excessive watering and drought.

**Fertilizer**
Apply constant fertilizer at rate 1-2 (75 to 100 ppm N/0.5 to 0.7 mmhos/cm EC). Maintain the pH at 5.8 to 6.2. A pH of 7 or higher may cause younger leaf yellowing, short plants and stress flowering.

**Growth Regulators**
Digitalis is responsive to multiple applications of B-Nine/Alar (daminozide) 2,500 ppm (3.0 g/l 85% formulation or 4.0 g/l of 64% formulation). If necessary, the first application can be done at 2 weeks after transplanting. In warmer conditions, Bonzi (paclobutrazol) spray at 5 to 10 ppm (1.25 to 2.50 ml/l 1.04% formulation) or Sumagic (uniconazole) spray at 5 ppm (9.1 ml/l of 0.055% formulation) can be used before flower spike begins to elongate. In Northwestern Europe, Tilt (propiconazole) 0.3 ml/l weekly spray is also effective.

**Note:** Use Topflor with caution as it is very strong for Digitalis and could stunt plant and significantly delay flowering.

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**Pinching**
Pinching is not needed.

**Spacing**
Space plants when foliage is touching.

**Crop Scheduling**

- **Sow to transplant (288 cell plug):** 5 to 6 weeks
- **Sow to transplant (180 cell plug):** 6 to 7 weeks
- **Sow to transplant (84 cell plug):** 6 to 7 weeks

**Transplant to flower:** 11 to 12 weeks Under proper day length and temperature range from 60°F (16°C) to 68°F (20°C)

**Total crop time:** 15 to 18 weeks Under proper day length and temperature range from 60°F (16°C) to 68°F (20°C)

**Note:** Dalmatian Purple will flower about a week earlier than other varieties.

**Spring Production:** Sow middle to late February for natural flowering in middle to late June.

### Common Problems

- **Insect:** Aphids, White Flies
- **Disease:** Botrytis, Downy Mildew, Leafspot

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### ‘Cheyenne Spirit’ Echinacea

#### Plug Production

**Media**
Use a well-drained, disease-free, soilless media with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

**Fertilizer:** Generally not needed.

#### Stage 4

- **Soil temperature:** 65 to 67°F (18 to 19°C)
- **Light:** Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
- **Moisture:** Same as Stage 3.
- **Fertilizer:** Same as Stage 3.

### Growing On to Finish

<table>
<thead>
<tr>
<th>Container Size</th>
<th>4.5-in. (11-cm) square/quart pots: 1 plug per pot</th>
<th>6-in. (15-cm) or gallon (18-cm) pots: 1 plug per pot</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stage 3.</td>
<td>Same as Stage 3.</td>
</tr>
<tr>
<td></td>
<td>Stage 4.</td>
<td>Same as Stage 3.</td>
</tr>
</tbody>
</table>

**Media**
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

**Fertilizer:** Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH of 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1.2 extraction).

**Growth regulators:** Generally not needed.

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**Stage 4**

**Soil temperature:** 65 to 67°F (18 to 19°C)
**Light:** Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
**Moisture:** Same as Stage 3.
**Fertilizer:** Same as Stage 3.

### Growing On to Finish

<table>
<thead>
<tr>
<th>Container Size</th>
<th>4.5-in. (11-cm) square/quart pots: 1 plug per pot</th>
<th>6-in. (15-cm) or gallon (18-cm) pots: 1 plug per pot</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stage 3.</td>
<td>Same as Stage 3.</td>
</tr>
<tr>
<td></td>
<td>Stage 4.</td>
<td>Same as Stage 3.</td>
</tr>
</tbody>
</table>

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**Temperature**

| Nights: 50 to 60°F (10 to 15°C) | Days: 60 to 75°F (15 to 24°C) | Note: To keep plants growing, keep daily average temperature above 55°F (13°C). Otherwise, plants will stop growing. |

**Light**
Maintain light levels as high as possible while maintain moderate temperature.

**Photoperiod**
It is an intermediate-day plant and flowers most rapidly and uniformly at 13-14 hours daylength. Under daylength 12 hours or shorter, flower can be initiated but will not elongate and will develop more slowly. Daylength 16 hours or longer including night interruption causes flowering sporadically or unpredictably. When forcing crop, use up to 16 hours instead of 16 days when night interruption to promote flowering. Once plant has begun to flower, it will keep blooming regardless of the daylength.

**Irrigation**
Maintain media moisture. Avoid both excessive watering and drought.

For overwinter production, keep plants on the dry side during cold period as overwatering could result in plant loss from root rot.
Cheyenne Spirit Echinacea continued

Fertilizer
Apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) using predominately nitrate-form fertilizer with low phosphorus and high potassium. Maintain the media EC at 1.5 to 2.0 mS/cm and pH at 6.0 to 6.5.

For constant fertilizer program, can apply fertilizer at rate 2 (100 to 175 ppm N or 0.7 to 1.2 mS/cm) while maintaining the above recommended EC and pH ranges.

Growth Regulators
For height control: Echinacea is responsive to tank mix of B-Nine/Alar (daminozide) 2,500 ppm (3.0 g/l 85% formulation or 4.0 g/l 64% formulation) mixed with Cycoel (chlormequat) 500-750 ppm (4.2-6.4 ml/l 11.8% formulation or 0.67-1.0 g/l of 75% formulation). PGR application can be applied at the point when stem starts elongation, about 4 weeks after transplant. If necessary, repeat the application 2 weeks later.

Optional PGR treatments: 1-2 applications of B-Nine at 3500 to 5000 ppm (4.1-5.9 g/l 85% formulation or 5.8-7.8 g/l of 64% formulation) or Sumagic (uniconazole) at 20 ppm (36.4 ml/l 0.055% formulation) spray also work well.

Note: Higher PGR rates may cause plant height to be less uniform. It is recommended using lower rate with multiple applications.

For branching: Configure (active ingredient N-phenylmethyl-1H-purine-t-amine, commonly called benzyladenine or 6-BA) 5.0 g/l of 64% formulation) works well.

For overwinter production, will flower slightly earlier than spring production with better branching and shorter flower stems.

Common Problems
Insect: Aphids, Fungus gnats, etc.
Disease: Powdery Mildew

PowWow™ Series Echinacea

Plug Production
Media
Use a well-drained, disease-free, soilless media with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

Sowing
Sow 1 seed per cell in 288 or larger plug tray. In Europe, 264-cell trays can be used. Covering seed with vermiculite is recommended.

Stage 1 – Germination begins at day 4-5 continuing through day 14.

Soil temperature: 71 to 76°F (21 to 24°C)
Light: Optional.
Moisture: Keep soil wet (level 4) during Stage 1.
Humidity: Maintain 95%+ relative humidity (RH) until radicles emerge.

Stage 2
Soil temperature: 71 to 73°F (21 to 22°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorus.

Stage 3
Soil temperature: 68 to 70°F (20 to 21°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Allow media to dry further until the surface becomes light brown (level 2) before watering. Keep the moisture level to wet-dry cycle (moisture level 4 to 2).
Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilization. Maintain medium pH of 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).

Growth regulators: Generally not needed.

Stage 4
Soil temperature: 65 to 67°F (18 to 19°C)
Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
Moisture: Same as Stage 3.
Fertilizer: Same as Stage 3.

Growing On to Finish

Container Size
4.5-in. (11-cm) square/quart pots: 1 plug per pot
6-in. (15-cm) or gallon (18-cm) pots: 1 plug per pot

Media
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm). For overwinter production, bark media is recommended for better drainage to protect plants from root rot.

Temperature
Nights: 50 to 60°F (10 to 15°C)
Days: 60 to 75°F (15 to 24°C)

Note: To keep plant growing, keep daily average temperature above 55°F (13°C). Otherwise, plants will stop growing.

Light
Maintain light levels as high as possible while maintaining moderate temperature.

Photosynthesis
It is an intermediate-day plant and flowers most rapidly and uniformly at 13-14 hours daylength. Under daylength 12 hours or shorter, flower can be initiated but will not elongate and develop more slowly. Daylength 16 hours or longer including night interruption causes flowering sporadically or unpredictably. When forcing crop, use 14 hours instead of 16 hours daylength or night interruption to promote flowering.

Irrigation
Maintain media moisture. Avoid both excessive watering and drought. For overwinter production, keep plants on the dry side during cold period as overwatering could result in plant loss from root rots.

Fertilizer
Apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) using predominately nitrate-form fertilizer with low phosphorus and high potassium. Maintain the media EC at 1.5 to 2.0 mS/cm and pH at 6.0 to 6.5.

For constant fertilizer program, can apply fertilizer at rate 2 (100 to 175 ppm N or 0.7 to 1.2 mS/cm) while maintaining the above recommended EC and pH ranges.
Growth Regulators

For height control: Echinacea is responsive to tank mix of B-Nine/Alar (daminozide) 2,500 ppm (3.0 g/l 85% formulation or 4.0 g/l of 64% formulation) mixed with Cyocel (chloromequat) 500-750 ppm (4.2-6.4 ml/l 11.8% formulation or 0.67-1.0 g/l of 75% formulation). PGR application can be applied at the point when stem starts elongation, about 4 weeks after transplant. If necessary, repeat the application two weeks later.

Optional PGR treatments: 1-2 applications of B-Nine at 3500 to 5000 ppm (4.1-5.9 g/l 85% formulation or 5.8-7.8 g/l of 64% formulation) or Sunmagic (uniconazole) at 20 ppm (36.4 ml/l 0.055% formulation) spray also work well.

Note: Higher PGR rates may cause plant height to be less uniform. It is recommended using lower rate with multiple applications.

For branching: Configure (active ingredient N-phenylmethyl-1H-purine-2-amine, commonly called benzyladenine or 6-BA) commonly called benzyladenine or 6-BA) will promote echinacea branching. Configure can be applied at 300 ppm two weeks after transplanting and repeated two weeks later.

In Northern European conditions: 2,500 ppm Alar (daminozide) 5,000 ppm (6.0 g/l 85% formulation or 8.0 g/l of 64% formulation) is good for plant size control.

Overwinter production: Sow in July to early September for natural flowering later May to early June of the following year. Note: Plants from overwinter production will flower slightly earlier than spring production, with better branching and shorter flower stems.

Common Problems

Insect: Aphids, Fungus Gnats, etc.
Disease: Powdery Mildew

Mesa Series Gaillardia

Plug Production

Media

Use a well-drained, disease-free, soilless media with a pH of 5.8 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

Sowing

Sow seed in 288 or larger plug tray. In Europe, 264-cell trays can be used. Covering seed with vermiculite is recommended.

Stage 1 – Germination takes 4 to 5 days.

Soil temperature: 68 to 73°F (20 to 23°C)

Light: Optional.

Moisture: Keep soil wet (level 4) during Stage 1.

Humidity: Maintain 95%+ relative humidity (RH) until radicles emerge.

Stage 2

Soil temperature: 68 to 73°F (20 to 23°C)

Light: Up to 2,500 ft. c. (26,000 Lux)

Moisture: Reduce soil moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.

Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mS/cm EC) from nitrate-form fertilizers with low phosphorous.

Stage 3

Soil temperature: 65 to 67°F (15 to 19°C)

Light: Up to 2,500 ft. c. (26,000 Lux)

Moisture: Allow media to dry further until the surface becomes light brown (level 2) before watering. Keep the moisture to wet-dry cycle (moisture level 4 to 2).

Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mS/cm EC). If growth is slow, apply a balanced ammonium and nitrate-form fertilizer with every other fertilizer. Maintain middle pH of 5.8 to 6.2 and EC between 1.0 and 1.5 mS/cm (1:2 extraction).

Stage 4

Soil temperature: 59 to 64°F (15 to 18°C)

Light: Up to 5,000 ft. c. (53,800 Lux) if temperature can be controlled.

Moisture: Same as Stage 3.

Fertilizer: Same as Stage 3.

Growing On to Finish

Container Size

4.5-in. (11-cm) square or quart pots: 1 plant per pot

6-in. (15-cm) or gallon (18-cm) pots: 1 plant per pot

Media

Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.2 and a medium initial nutrient charge (EC 0.75 mmhos/cm).

Temperature

Nights: 50 to 61°F (10 to 16°C)

Days: 59 to 70°F (15 to 21°C)

Mesa Gaillardia can be grown at lower temperatures (frost-free cold frame/poly house in Spring); however crop times will increase.

Light

Maintain light levels as high as possible while maintaining moderate temperature.

Photoperiod

Mesa Gaillardia is a facultative long-day plant and requires 14 hours or longer daylength for uniform and faster flowering.

Irrigation

Maintain media moisture. Plants can dry out quickly when they are large. Water thoroughly when irrigation is needed.

Fertilizer

Apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) using predominately nitrate-form fertilizer with low phosphorous and high potassium. Maintain the media EC at 1.5 to 2.0 mS/cm and pH at 6.0 to 6.5.

For constant fertilizer program, can apply fertilizer at rate 2 (100 to 175 ppm N or 0.7 to 1.2 mS/cm) while maintaining the above recommended EC and pH ranges.

Growth Regulators

PGRs are not necessary if grown under cooler temperatures. If necessary, B-Nine/Alar (daminozide) 5,000 ppm (6.0 g/l 85% formulation or 8.0 g/l of 64% formulation) is good for plant size control.

In Northern European conditions: 3,200 ppm Alar (3.8 g/l 85% formulation or 5.0 g/l of 64% formulation) works well.

Pinching

Pinching is not needed.

Spacing

Space plants when foliage is touching.

Crop Scheduling

Sow to transplant (288 cell plug): 5 to 6 weeks

Transplant to flower: 13 to 17 weeks

Under proper daylength and temperature range from 60°F (15°C) to 68°F (20°C)

Total crop time: 18 to 23 weeks

Under proper daylength and temperature range from 60°F (15°C) to 68°F (20°C)

Spring production: Sow in January for natural flowering in middle to later June.

Note: Since daylength of 16 hours or longer will cause non-uniform flowering (see photoperiod section), please refer to the following sowing schedule for different regions to ensure uniform flowering:

Recommended Sow Dates:

Latitude lower than N35°: no limits
N36° – N40°: no later than week 9
N41° – N45°: no later than week 7
N51° – N55°: no later than week 6

When sowing later than the latest sowing date above, treat the plants with short day (10 hours) for about 6 weeks after transplanting for flower uniformity.

Days:

50 to 61°F (10 to 16°C)

Temperature

Mesa Gaillardia can be grown at lower temperatures (frost-free cold frame/poly house in Spring); however crop times will increase.

Light

Maintain light levels as high as possible while maintaining moderate temperature.

Photoperiod

Mesa Gaillardia is a facultative long-day plant and requires 14 hours or longer daylength for uniform and faster flowering.

Irrigation

Maintain media moisture. Plants can dry out quickly when they are large. Water thoroughly when irrigation is needed.

Fertilizer

Apply fertilizer at rate 3 (175 to 225 ppm N/1.2 to 1.5 mS/cm) using predominately nitrate-form fertilizer with low phosphorous and high potassium. Maintain the media EC at 1.5 to 2.0 mS/cm and pH at 6.0 to 6.5.

For constant fertilizer program, can apply fertilizer at rate 2 (100 to 175 ppm N or 0.7 to 1.2 mS/cm) while maintaining the above recommended EC and pH ranges.

Growth Regulators

PGRs are not necessary if grown under cooler temperatures. If necessary, B-Nine/Alar (daminozide) 5,000 ppm (6.0 g/l 85% formulation or 8.0 g/l of 64% formulation) is good for plant size control.

In Northern European conditions: 3,200 ppm Alar (3.8 g/l 85% formulation or 5.0 g/l of 64% formulation) works well.

Pinching

Pinching is not needed.

Spacing

Space plants when foliage is touching.

Crop Scheduling

Sow to transplant (288 cell plug): 5 to 6 weeks

Transplant to flower: 11 to 13 weeks

Total crop time: 16 to 18 weeks.

Generally, Mesa Bright Bicolour flowers about 1 to 2 weeks faster than Mesa Yellow dependent on daylength conditions. The longer daylength (longer than 14 hours) they are grown under,
Mesa Series Gaillardia continued

the bigger the difference in flower timing.

Note: The total crop time of about 16 to 18 weeks is based on Spring production under night temperatures of about 50 to 61°F (10 to 16°C) and day temperatures of about 59 to 70°F (15 to 21°C) with natural daylength. Crop time will be shorter under warmer temperature and long day conditions, or longer under cooler and short day conditions.

Spring Production: Sow in January for natural flowering in later May to early June.

Overwinter Production: Sow in July to early September for natural flowering late April of the following year.

Common Problems

Insect: Watch for fungus gnats larva and thrips.

Disease: INSV, White Smut, Powdery Mildew.

Germination: Occasionally there are albino seedlings which will not develop into viable plants. Frequency can vary up to 9%.

Revolution™ F1 Series Gerbera

Plug Production

Media

Use a well-drained, disease-free, soilless medium with a pH of 5.0 to 5.5 and a medium initial nutrient charge (EC 0.4 to 0.8 mmhos/cm with a 1:2 extraction).

Sowing

Sow 1 seed per plug in a dibble. Plug tray size from 144 to 128. Make sure seed is lying on its side in a dibble at sowing so radicle isn’t upside down at emergence. Cover the seeds lightly with vermiculite (course to extra coarse) to prevent drying out. Cover is important at sowing but too much isn’t good either. Some of the top of the plug tray should be visible after covering but the seed should be covered completely. Use a preventative treatment, e.g. Rovral (iprodion) half concentration against damping-off diseases directly after sowing.

Stage 1 – Germination takes 4 to 7 days.

Soil temperature: 64-68°F (18-20°C)

Light: Light is optional.

Moisture: Keep soil saturated (level 5) during Stage 1 for optimal germination.

Humidity: Maintain 95% relative humidity (RH) in chamber or germ tent on bench until radicle emergence.

Stage 2

Soil temperature: 68 to 70°F (20 to 21°C)

Light: Up to 2,500 f.c. (26,900 Lux)

Moisture: Start to slightly reduce soil moisture (level 4) to allow the roots to penetrate into the media.

Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mmhos/cm EC) from nitrate-form fertilizers (17-5-17 or 14-0-14).

Stage 3

Soil temperature: 68 to 70°F (20 to 21°C)

Light: Up to 5,000 f.c. (53,800 Lux)

Moisture: It is critical to allow the media to dry until moisture (level 4) to allow the roots to penetrate into the media. Keep the moisture level at wet-dry cycle (moisture level 4 to 2).

Fertilizer: Increase fertilizer to rate 2 (100 to 175 ppm N/0.7 to 1.2 mmhos/cm EC) from nitrate-form fertilizers (17-5-17 or 14-0-14).

Growth regulators: None

Stage 4

Soil temperature: 68 to 70°F (21 to 21°C)

Light: Up to 5,000 f.c. (53,800 Lux) if optimal temperature can be maintained.

Moisture: Same as Stage 3.

Fertilizer: Same as Stage 3.

Note: During plug production, fine dry or mist is best, using a water temperature similar to or around air temperature. Irrigation with too cold water will cause foliage to cup up hard and brittle. Once this happens, keep media dry for a few days and water later with warmer water.

Growing On to Finish

Media

Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.0 and a medium initial nutrient charge.

Potting

Uniformity at all levels in production will greatly increase uniformity of overall crop. Uniform soil level in pots; fill pots 100%!

Pinching

Generally, growth regulators are not used in normal production. To reduce stretching when growing pot tight, B-Nine/Alar (diaminozide) can be applied at 1000 to 1500 ppm (1.2 to 1.8 g/l of 85% formulation or 1.6 to 2.3 g/l of 64% formulation) 2 to 3 times with an interval of 5 to 7 days. Do not apply when flower buds are the size of a pea or bigger to prevent decrease of flower size.

Spacing

Space plants when the leaves of the plants are touching each other, generally 5 to 6 weeks after transplanting.

Crop Scheduling

Sow to transplant (144 to 128-cell plug tray): 6-7 weeks

Bulking after transplant: 4-6 weeks

Finishing the crop: 4-6 weeks

Note: Crop Schedule is dependent on the sowing date, the available light and the required pot/plant ratio. Total crop time is approx. 14-15 weeks from sowing to 50%
flowing. 100% color will appear 10–14 days later.

Common Problems
Insect: White Flies, Thrips
Disease: Downy Mildew, Crown Rot, Botrytis, Fusarium

Pixie Splash Gypsophila
Plug Production
Media
Use a well-drained, disease-free, soilless media with a pH of 5.8 to 6.5 and an EC of 0.6 mmhos/cm.

Sowing
Sow 4 seeds (Tuned seeds preferred) per cell in a 288 tray. Do not cover the seeds. Spray preventively against fungi after sowing.

Stage 1 – Germination takes 3 to 4 days.

Soil temperature: 60 to 65°F (16 to 18°C)
Light: Light is required for germination.
Moisture: Keep soil moist (level 4) in Stage 1.
Humidity: Maintain 95 to 97% relative humidity (RH) until radicles emerge.

Stage 2
Soil temperature: 60 to 65°F (16 to 18°C)
Light: Can be up to 2,500 f.c. (26,900 Lux).
Moisture: Reduce media moisture slightly (level 3 to 4) to allow the roots to penetrate into the media.
Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm N; less than 0.7 mmhos/cm EC).

Stage 3
Soil temperature: 60 to 65°F (16 to 18°C)
Light: Can be up to 2,500 f.c. (26,900 Lux).
Moisture: Allow media to dry further until the surface becomes light brown (level 2) before watering. Do not allow seedlings to wilt.
Fertilizer: Apply fertilizer at rate 2 to 3 (150 to 200 ppm N/1.0 to 1.3 mmhos/cm EC).

Stage 4
Soil temperature: 60 to 65°F (16 to 18°C)
Light: Can be up to 5,000 f.c. (54,000 Lux).
Moisture: Same as Stage 3.
Fertilizer: Apply fertilizer at rate 3 (175 to 225 ppm N; 1.2 to 1.5 mmhos/cm EC).

Growing On to Finish
Container Size
4 to 5 in. (10.5 to 13 cm) or square/quart pots: 1 plug per pot
Gallon (18 cm): 1-3 plugs per pot

Media
Use a well-drained, disease-free, soilless media with a pH of 5.8 to 6.2 and a medium initial nutrient charge of EC 0.8 mmhos/cm.

Vernalization
Not needed.

Optimum Temperature
Nights: 58 to 60°F (14 to 16°C)
Days: 60 to 68°F (16 to 20°C)

Light
No additional light is required.

Photoperiod
No direct influence as Heuchera’s attractiveness is leaf color and texture of the foliage and therefore sold for its ornamental foliage.

Irrigation
Keep media constantly medium dry to medium moist (level 2 to 3). Avoid both excessive watering and drought.

Melting Fire & Malachite Heuchera
Plug Production
Media
Use a well-drained, disease-free, soilless media with a pH of 5.6 to 6.2 and an EC of 0.75 mmhos/cm.

Sowing
Sow 8 seeds for Melting Fire and 6 to 8 seeds for Malachite per cell in 288 or larger plug tray. Do not cover the seed. Spray after sowing to prevent fungi.

Stage 1 – Germination takes 10 to 14 days for Melting Fire and 8 to 10 days for Malachite.

Temperature (optimum)
Nights: 50 to 58°F (10 to 14°C)
Days: 60 to 65°F (16 to 18°C)
Leaves may become purplish when grown at temperatures below 46°F (8°C).

Light
Keep light as high as possible while maintaining moderate temperatures.

Photoperiod
Melting Fire Gypsophila is a day-neutral plant.

Irrigation
Keep media dry (level 2; substrate color is light brown) to medium moist (level 3; substrate color is brown to dark brown).

Fertilizer
Moderate feeder at fertilizer rate 2 (100 to 175 ppm N; 0.7 to 1.2 mmhos/cm EC). When plants start regrowing after Winter, it is advised to add 1 or 2 extra applications of Nitrate fertilizer in a well-balanced mix including micro-elements.

Growth Regulators
Not needed.

Pinching
Not needed.

Spacing
Space plants when foliage is touching (10 in./25 cm).

Common Problems
Insect: Aphids, Spider Mites, White Flies
Disease: Botrytis

Melting Fire & Malachite Heuchera
Plug Production
Media
Use a well-drained, disease-free, soilless media with a pH of 5.6 to 6.2 and an EC of 0.75 mmhos/cm.

Sowing
Sow 8 seeds for Melting Fire and 6 to 8 seeds for Malachite per cell in 288 or larger plug tray. Do not cover the seed. Spray after sowing to prevent fungi.

Stage 1 – Germination takes 10 to 14 days for Melting Fire and 8 to 10 days for Malachite.

Soil temperature: 68 to 72°F (20 to 22°C)
Light: Requires light to germinate.
Moisture: Keep soil medium moist to medium wet (level 3-4) in Stage 1.
Humidity: Maintain 95 to 97% relative humidity (RH) until radicles emerge.

Stage 2
Soil temperature: 65 to 68°F (18 to 20°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Reduce media moisture slightly to medium moist (level 3) to allow the roots to penetrate into the media. Don’t let the media dry out.
Humidity: Maintain 75 to 80% relative humidity (RH).
Fertilizer: None.

Stage 3
Soil temperature: 65 to 69°F (17 to 18°C)
Light: Up to 2,500 f.c. (26,900 Lux)
Moisture: Reduce media moisture slightly to medium dry to medium moist (level 2-3). Avoid both excessive watering and drought.
Fertilizer: Apply fertilizer at rate 1 (between 40 to 60 ppm N with an EC of 0.3 to 0.4 mmhos/cm) from nitrate-form fertilizers. Keep a low soluble salt level in plug stage.
Growth Regulators: Not needed.

Stage 4
Soil temperature: 60 to 65°F (16 to 18°C)
Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.
Moisture: Same as Stage 3.
Fertilizer: Maintain fertilizer at rate 1 but increase slightly (75 to 100 ppm Nitrate fertilizer/0.5 – 0.7 mmhos/cm EC) from nitrate-form fertilizers.
### Luna Series Hibiscus

#### Germination

**Media**
Use a well-drained, disease-free, soilless medium with a pH of 5.5 to 6.3 and a medium initial nutrient charge (EC 0.75 mmhos/cm with a 1:2 extraction).

**Plug Tray Size**
The recommended size is 200-cell or larger plug.

**Sowing**
Cover the seed with plug media. Seed can be germinated in a germination chamber or directly on the bench. When germinated in a chamber, the plug trays should be moved out as soon as radicle emergence occurs, to prevent seedling stretch.

**Temperature**
Germinate at 68 to 75°F (20 to 24°C). Germination is slower but more uniform at the lower temperature range.

**Humidity**
As long as the soil is kept evenly moist, high air humidity is not required for germination.

**Light**
Light is not required for Stage 1.

#### Plug Production

**Temperature**
Keep air temperature at 68 to 75°F (20 to 24°C) and soil temperature at 68 to 70°F (20 to 21°C) from germination to transplant.

**Light**
Supplemental lighting is not required, but will decrease total crop time.

**Fertilizer**
At radicle emergence, apply 50 to 75 ppm N. Increase to 100 to 150 ppm N as leaves develop.

**Moisture**
Keep soil media evenly moist. Do not allow the seedlings to wilt.

#### Plant Growth Regulators

A Cycocel spray at 300 ppm has been tested in different climates in the U.S. and shown effective. Apply PGRs 2 weeks after transplant. Repeat application 2 weeks later if necessary.

**Optional treatment:**
Bonzi drench at a very low rate of 0.25 to 0.5 ppm with multiple applications (2 to 3 times) is also effective. Be careful when using Bonzi drench as it is very easy to stunt plants, especially for northern growers.

If you are growing in a nursery mix that includes soil, less PGRs may be needed. One application 3 to 4 weeks after transplanting may be sufficient.

**PGRs for Northern Europe:**
A weekly spray of a low concentration Cycocel (0.5ml/1, 75% a.i.) has been tested and shown effective in Risjenhout, Netherlands. If there is additional clay in the soil, it may turn out to be an alternative for the use of PGRs.

To determine the best rate for your conditions, we recommend that you run an in-house trial.

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### Transplant to Finished Product:

<table>
<thead>
<tr>
<th>Variety</th>
<th>4 in./10.5 cm pot</th>
<th>5 in./13 cm pot</th>
<th>Gallon/17 cm pot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malachite</td>
<td>11 to 13 weeks</td>
<td>13 to 15 weeks</td>
<td>12 to 15 weeks</td>
</tr>
<tr>
<td>Melting Fire</td>
<td>12 to 14 weeks</td>
<td>14 to 16 weeks</td>
<td>14 to 16 weeks</td>
</tr>
<tr>
<td>Malachite</td>
<td>30 to 34 weeks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melting Fire</td>
<td>32 to 36 weeks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### Crop Scheduling

#### Sow to transplant (288 cell plug):

<table>
<thead>
<tr>
<th>Variety</th>
<th>4 in./10.5 cm pot</th>
<th>5 in./13 cm pot</th>
<th>Gallon/17 cm pot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malachite</td>
<td>11 to 13 weeks</td>
<td>13 to 15 weeks</td>
<td>12 to 15 weeks</td>
</tr>
<tr>
<td>Melting Fire</td>
<td>12 to 14 weeks</td>
<td>14 to 16 weeks</td>
<td>14 to 16 weeks</td>
</tr>
<tr>
<td>Malachite</td>
<td>30 to 34 weeks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melting Fire</td>
<td>32 to 36 weeks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### Total Crop Time:

<table>
<thead>
<tr>
<th>Variety</th>
<th>4 in./10.5 cm pot</th>
<th>5 in./13 cm pot</th>
<th>Gallon/17 cm pot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malachite</td>
<td>18 to 22 weeks</td>
<td>20 to 24 weeks</td>
<td>19 to 24 weeks</td>
</tr>
<tr>
<td>Melting Fire</td>
<td>22 to 26 weeks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malachite</td>
<td>36 to 40 weeks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Melting Fire</td>
<td>38 to 42 weeks</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### Production

Sow beginning to middle of January for a finished product middle of May to end of June under Northwestern European conditions.

### Common Problems

**Insect:** Leaf Nematodes

**Disease:** Powdery Mildew, Botrytis, Leafspot, Rust, Root Rot

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### Fertilizer

Apply fertilizer at rate 1 to 2 (75 to 100 ppm Nitrate form fertilizer/0.7 to 0.9 mmhos/cm EC) or 150 ppm as needed. Maintain media pH 5.8 to 6.2 and EC 1.2 to 1.4 mmhos/cm.

### Growth Regulators

Not needed.

### Pinching

Not needed.

### Spacing

Space plants when foliage is touching.

### Watering

Keep media moist to wet. Consistent soil moisture is important and plants should not be allowed to wilt. Growing plants too dry will result in flower bud abortion.

### Light

Keep light levels as high as possible. Plants grow best under full sun. Space plants to allow light to reach basal area, as this promotes better branching.

### Photoperiod

Luna Hibiscus requires a minimum of 12 hours of daylength to flower. Flowering is faster when daylength is 14 hours or longer. Supplemental lighting should be used under shorter days.

### Cascadia Pro-Seeds

630 231-1400 kief-pro-seeds.com
Crop Scheduling

|Germination: 3 to 5 days |Finish time for 200 plugs: 3 to 4 weeks (add 1 week for 72 liners) |
|Transplant to flower: 10 to 13 weeks |Total crop time (quarts & gallons): 14 to 16 weeks |

The shorter crop times occur under warmer growing temperatures and longer daylength. If using a nursery mix, add one week to total crop time.

Common Problems

Insect: Thrips, Aphids, Spider Mites, Fungus Gnats. Note: Use caution when using Adept, an insect growth regulator, as it could cause phytotoxicity on Hibiscus. To control fungus gnats, it is recommended to use Gnatrol or Distance as a drench for the larvae, and Decathlon or Talstar as a foliar spray for adults.

Disease: No serious problems.

Ellagance Series, Lavance Purple & Mini Blue Lavandula

Plug Production

Media

Use a well-drained, disease-free, media with a pH of 5.5 to 6.5 and a medium initial nutrient charge (EC 0.7–1.2 mmhos/cm).

Sowing

Sow 4 seeds per cell in a 288 cell tray, 6 seeds per cell in a 180 cell tray or 8 seeds per cell in an 84 cell tray. Cover seed lightly with vermiculite. Spray with fungicide against Alternaria/Phoma.

Stage 1 – Germination takes 4-5 days.

Soil temperature: 65 to 68°F (18 to 20°C)

Light: Not required but beneficial.

Moisture: Keep soil medium moist to moist (level 3-4) in Stage 1.

Humidity: Maintain 95-98% relative humidity (RH) until radicles emerge.

Stage 2

Soil temperature: 65 to 68°F (18 to 20°C)

Light: Up to 2,500 f.c. (26,900 Lux)

Moisture: Maintain the moisture level constantly medium moist to medium wet (level 3-4), to allow the roots to penetrate into the media.

Fertilizer: Apply fertilizer at rate 1 (less than 100 ppm Nitrate/0.2 – 0.5 mmhos/cm EC) from nitrate-form fertilizers.

Stage 3

Soil temperature: 59 to 63°F (15 to 17°C)

Light: Up to 2,500 f.c. (26,900 Lux)

Moisture: Reduce media moisture slightly towards medium dry to medium moist (level 2-3). Avoid both excessive watering and drought.

Fertilizer: Apply fertilizer to rate 2-3 (140 to 225 ppm N/1.0 to 1.5 mmhos/cm EC). Maintain medium pH of 5.8 to 6.5

Growth regulators: Lavandula is responsive to B-Nine/Alar (daminozide) 2,000 ppm (2.5 g/l 85% formulation or 3.0 g/l of 64% formulation). Depending on weather, a weekly spray is advised starting approximately 2 to 2½ weeks after sowing with a maximum of 3 to 4 times.

Note: Ellagance Purple is for cool/early season productions and Lavance Purple is scheduled for middle to late season (warmer) productions. Plant development will vary between Ellagance and Lavance and therefore PGR treatments need to be watched carefully before applied.

Stage 4

Soil temperature: 59 to 63°F (15 to 17°C)

Light: Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.

Moisture: Same as Stage 3.

Fertilizer: Same as Stage 3.

Growing On to Finish

Container Size

4 to 5-in. (10.5-13-cm) square/quart pots: 1 plug per pot
1 to ½ gallon (17 to 23-cm pots): 1-3 plugs per pot

Media

Use a well-drained, disease-free media (with coarse or bark parts) with a pH of 5.8 to 6.5 and a medium initial nutrient charge (EC 1.0 mmhos/cm).

Nitrate schedule from start to finish:

- Start production stage: N = 1.0 – 1.2
- Final production stage: N = 1.4 – 1.5

Temperature

Ellagance series

- Nights: 54 to 60°F (12 to 16°C)
- Days: 60 to 72°F (16 to 22°C)

Lavance

- Nights: 57 to 60°F (14 to 16°C)
- Days: 60 to 72°F (16 to 22°C)

Note: Ellagance Purple is for cool/early season productions and Lavance Purple is scheduled for middle to late season (warmer) productions. Lavance requires higher minimum temperature (58-61°F/14-16°C) to start growth.

Light

As high as possible while maintaining controlled moderate temperatures.

Photoperiod

- Ellagance Pink and Purple are facultative long day plants (Long Day Beneficial) which will flower under all day length conditions but will flower faster under long day conditions.
- Ellagance Sky, Snow and Ice; Lavance and Mini Blue are obligated long day plants which have a critical day length of 13 to 14 hours.

Irrigation

Maintain medium moisture (level 3). Avoid both excessive watering and drought.

For overwinter production, keep plants on the dry side during winter period as overwatering could result in plant loss from root rot.

Fertilizer

Apply constant fertilizer at rate 1-2 (100 to 125 ppm N/0.7 to 1.2 mmhos/cm EC or 150 ppm as needed). Maintain the pH at 5.8 to 6.5 and EC 1.2 to 1.5 mmhos/cm.

For overwintering outside, add some extra Nitrate form fertilizer early spring (EC 1.5 – 1.6 mmhos/cm) when plants start to re-grow.

Growth Regulators

Lavandula is responsive to B-Nine/Alar (daminozide) 2,500 ppm (3.0 gr/l) but can also be mixed with Cycoceal (chloromequat) 500-750 ppm (4.2 to 6.4 ml/l of 11.8% formulation or 0.7 to 1.0 ml/l of 75% formulation) for more compact plants. Lavandula is also responsive to Sumagic (uniconazole) 10 to 15 ppm (18 to 27 ml/l of 0.055% formulation) spray. PGR can be applied about 1 to 2 weeks after transplant. If necessary, repeat the applications as needed.

In Northwestern Europe, Tilt (propiconazole) 0.3ml/l weekly spray is also effective.

Note: Ellagance Pink and Purple are faster development varieties than others. They may require more frequent PGR applications.

Pinching

Annual:

Pinching is not needed.

Overwintered:

To control shape, pinching or trimming is possible when plants have started to flower or stretch too much before winter, or after re-growth.

Note: It is not necessary to pinch or trim Mini Blue Lavandula.

IMPORTANT: Don’t pinch too low (minimum 10 cm from heart of the plant/soil level) or too late if pinch is done before winter to protect plants from disease infection.

Spacing

Space plants before foliage is touching.
**Carillo Series Penstemon**

**Plug Production**

**Media**
Use a well-drained, disease-free, soilless media with a pH of 5.8 to 6.5 and an EC of 0.75 mmhos/cm.

**Sowing**
Sow 4 seeds per cell in 288 or larger plug tray. Do not cover the seed. Spray after sowing preventively against fungi.

**Stage 1 – Germination**
- **Soil temperature**: 65 to 68°F (18 to 20°C)
- **Light**: Requires light to germinate
- **Moisture**: Keep soil medium moist to medium wet (level 3-4).

**Humidity**: Maintain 95 to 97% relative humidity (RH) until radicles emerge.

**Stage 2**
- **Soil temperature**: 65 to 68°F (18 to 20°C)
- **Light**: Up to 2,500 f.c. (26,900 Lux)
- **Moisture**: Reduce media moisture slightly to medium moist (level 3) to allow the roots to penetrate into the media. Don’t let the media dry out.

**Fertilizer**
- Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mmhos/cm EC) from nitrate-form fertilizers with low phosphorous.

**Stage 3**
- **Soil temperature**: 60 to 65°F (16 to 18°C)
- **Light**: Up to 2,500 f.c. (26,900 Lux)
- **Moisture**: Maintain the moisture level constantly medium moist (level 3). Avoid both excessive watering and drought.

**Fertilizer**
- Maintain fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mmhos/cm EC) from nitrate-form fertilizers.

**Growth regulators**
- Not needed for height control, however plant quality seems improved in a later stage when using 2 applications of B-Nine/Alar (daminozide) of 2,000 ppm (2.5 gr/l 85% formulation or 3.0 gr/l 64% formulation) applied about 2 to 2½ weeks after sowing.

**Growing On to Finish**
- **Container Size**: 4 to 5 in. (10.5 to 13cm) or square/quart pots: 1 plug per pot
- **Media**
  - Use a well-drained, disease-free, soilless media with a pH of 5.8 to 6.8 and an EC of 1.2 mmhos/cm.

**Vernalization**
- Not required; Penstemon mexicali doesn’t need vernalization for flower induction.

**Temperature**
- **Nights**: 58 to 65°F (14 to 18°C)
- **Days**: 65 to 75°F (18 to 24°C)
- **Light**: No additional light is required.

**Photoperiod**
- Carillo Purple is a day-neutral plant.

**Irrigation**
- Keep media constantly medium dry to medium moist (level 2 to 3). Root-system of Carillo is sensitive to both excessive watering and drought.

**Tubular Bells Series Penstemon**

**Plug Production**

**Media**
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.5 and an EC of 0.75 mmhos/cm.

**Sowing**
Sow 4 seeds per cell in 288 or 6 seeds per cell in 180 or larger plug tray. Do not cover the seed. Spray after sowing preventively against fungi.

**Stage 1 – Germination**
- **Soil temperature**: 65 to 68°F (18 to 20°C)
- **Light**: Requires light to germinate.

**Fertilizer**
Apply fertilizer at rate 2 to 3 (150 to 225 ppm N/1.1 to 1.5 mmhos/cm EC) from Nitrate form fertilizer. Avoid high ammonium levels.

**Growth Regulators**
- In general, PGR is not needed for height control when grown cool, however Penstemon mexicali is responsive to B-Nine/Alar (daminozide) in an early stage after transplant. An application of 2,500 ppm (3.0 gr/l 85% formulation or 4.0 gr/l 64% formulation) can be applied about 10 days to 2 weeks after transplant. If necessary, repeat the application after approximately 1 week depending on growth, temperature and light level. Best reaction to PGR treatments may be expected the first month after transplant.

**Pinching**
- Not needed; however for pot-culture, pinching approximately 1 week after transplant could be done to get more flower stems; this enlarges crop time by approximately 3 to 5 weeks.

**Spacing**
Space plants when foliage is touching.

**Crop Scheduling**
**Sow to transplant (288 cell plug):**
- 6 to 8 weeks

**Transplant to flower:**
- Purple: 12 to 14 weeks
- Rose: 13 to 15 weeks

**Total crop time:**
- Purple: 18 to 22 weeks
- Rose: 19 to 23 weeks

**Production**
Sow early to middle of January for natural flowering in May to June under Northwest European circumstances.

**Common Problems**
- Insect: Aphids, Spider Mites, White Flies
- Disease: Downy Mildew
Moisture: Keep soil medium moist to medium wet (level 3-4).

Humidity: Maintain 95 to 97% relative humidity (RH) until radicles emerge.

**Stage 2**

**Soil temperature:** 65 to 68°F (18 to 20°C)

**Light:** Up to 2,500 f.c. (26,900 Lux)

**Moisture:** Reduce media moisture slightly to medium moist (level 3) to allow the roots to penetrate into the media. Don’t let the media dry out.

**Fertilizer:** Apply fertilizer at rate 1 (less than 100 ppm N/less than 0.7 mmhos/cm EC) from nitrate-form fertilizers with low phosphorous.

**Stage 3**

**Soil temperature:** 60 to 65°F (16 to 18°C)

**Light:** Up to 2,500 f.c. (26,900 Lux)

**Moisture:** Maintain the moisture level constantly to medium moist (level 3). Avoid both excessive watering and drought.

**Fertilizer:** Apply fertilizer at rate 2 (100 to 175 ppm Nitrate fertilizer/0.7-1.2 mmhos/cm EC) from nitrate-form fertilizers.

**Growth regulators:** *Penstemon hartwegii* is responsive to B-Nine/Alar (diaminodzine) 2,000 ppm (2.5 g/l 85% formulation or 3.0 g/l of 64% formulation) in early stage. Depending on weather, a weekly spray is advised starting approximately 2 to 2½ weeks after sowing.

**Note:** PGR in plug stage is beneficial for uniformity but could delay crop time by 1 to 2 weeks.

**Stage 4**

**Soil temperature:** 60 to 65°F (16 to 18°C)

**Light:** Up to 5,000 f.c. (53,800 Lux) if temperature can be controlled.

**Moisture:** Same as Stage 3.

**Fertilizer:** Same as Stage 3.

**Growing On to Finish**

**Container Size**

1 gallon (17 cm): 3 plugs per pot
2 gallon (30 cm): 5 plugs per pot

**Media**

Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.5 and an EC of 1.2 – 1.3 mmhos/cm.

**Vernalization**

Not required; *Penstemon hartwegii* doesn’t tolerate frost and is a tender perennial.

**Optimum Temperature**

**Nights:** 50 to 59°F (10 to 15°C)

**Days:** 60 to 72°F (16 to 22°C)

**Note:** Growing Tubular Bells outdoors when frost free or in tunnels with cooler temperatures will give the best plant quality but could increase crop time by 2 to 4 weeks depending on season, temperature and light level.

**Light**

As high as possible. Low light intensity will make plants more stretching and soft, so additional light during winter or early spring will be beneficial.

**Photoperiod**

It is a facultative long-day plant (long day beneficial) and flowers most rapidly and uniformly at 14 hours or longer day length.

**Irrigation**

Keep media constantly medium moist (level 3). Root-system of Tubular Bells is very sensitive to too wet or too dry conditions. Avoid both excessive watering and drought.

**Fertilizer**

Constantly fertilize at rate 1 to 2 (75 to 125 ppm/1.1 to 1.5 mmhos / cm EC) or apply 150 ppm N as needed.

Use a well-balanced Nitrate form fertilizer including micro nutrients. Avoid high ammonium and high nitrogen levels and also prevent for magnesium and Iron deficiency.

**Nitrate schedule from start to finish:**

<table>
<thead>
<tr>
<th>Stage</th>
<th>Final production stage</th>
<th>Start production stage</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = 1.1 – 1.2</td>
<td>N = 1.4 – 1.5</td>
<td></td>
</tr>
</tbody>
</table>

**Growth Regulators**

*Penstemon hartwegii* is responsive to B-Nine/Alar (diaminodzine) in an early stage. An application of 2,500 ppm (3.0 gr/l 85% formulation or 4.0 gr/l 64% formulation) can be applied about 1 week to 10 days after transplant. If necessary, repeat the application after approximately 5 to 7 days depending on growth, temperature and light level. Low light and low temperatures may influence the reaction of the plant on the growth regulator.

**Note:** *Penstemon hartwegii* reacts best to plant growth regulator treatments in early stages (plug or just after transplant). The reaction will reduce to minimum approximately 4 to 6 weeks after transplant.

**Pinching**

For pot-culture, pinching after 4 pairs of leaves could be done to get more flower stems; however, this will delay crop time approximately 3 weeks.

**Spacing**

Space plants when foliage is touching.

**Crop Scheduling**

Sow to transplant (288 cell plug):
6 to 8 weeks

Sow to transplant (180 cell plug):
7 to 9 weeks

**Transplant to flower:** 13 to 16 weeks
Under proper day length and temperature range using a 288 plug tray

**Total crop time:** 19 to 24 weeks
Under proper day length and temperature range using a 288 plug tray

**Note:** Larger plug size or bigger pot size may cause a slightly longer crop time of approximately one week.

**Production**

Sow early to middle of January for natural flowering in June under Northwest European conditions.

**Common Problems**

**Insect:** Aphids, Spider Mites, White Flies, Thrips

**Disease:** Powdery Mildew, Leafspot

**New Dimension Series Salvia**

**Plug Production**

**Media**

Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.2 and an EC of 0.5 mmhos/cm.

**Sowing**

Sow 4 seeds per cell in 288 or larger plug tray. In Europe 180-cell trays can be used with 4 to 6 seeds per cell for overwintering production or for early sowing spring production. Cover seed lightly with vermiculite.

Spray with fungicide to prevent damping off and against Alternaria/Phoma.

**Stage 1 – Germination**

**Soil temperature:** 68 to 72°F (20 to 22°C)

**Light:** Light is optional.

**Moisture:** Keep soil medium moist (level 3) in Stage 1.

**Humidity:** Maintain 95 to 97% relative humidity (RH) until radicles emerge.

**Stage 2**

**Soil temperature:** 65 to 68°F (18 to 20°C)

**Light:** Up to 2,500 f.c. (26,900 Lux)

**Moisture:** Keep soil moisture at the same level (level 3), to allow the roots to penetrate into the media, don’t let the media dry out.

**Fertilizer:** None. Salvia is sensitive to high salt level during early plug stage. Do not fertilize until true leaves develop (maximum 0.5 EC).

**Stage 3**

**Soil temperature:** 65 to 68°F (18 to 20°C)

**Light:** Up to 2,500 f.c. (26,900 Lux)

**Moisture:** Allow media to dry further until the surface becomes light brown (level 2) before watering. Keep the moisture level to wet-dry cycle (moisture level 3 to 2).

**Fertilizer:** Apply fertilizer to rate 2 (100 to 175 ppm Nitrate/0.7-1.0 mmhos/cm EC) from nitrate-form fertilizers.

**Growth regulators:** Not necessary.

**Stage 4**

**Soil temperature:** 65 to 68°F (18 to 20°C)

**Light:** Up to 5,000 f.c. (53,800 Lux)

**Moisture:** Allow media to dry further until the surface becomes light brown (level 2) before watering. Keep the moisture level to wet-dry cycle (moisture level 3 to 2).

**Fertilizer:** Apply fertilizer to rate 2 (100 to 175 ppm Nitrate/0.7-1.0 mmhos/cm EC) from nitrate-form fertilizers.

**Growth regulators:** Not necessary.

**Growing On to Finish**

**Container Size**

4 to 5–in. (10 to 13 cm) or square/quart pots: 1 plug per pot
1 to 1½ gallon (17 to 23 cm): 1 to 3 plugs per pot
New Dimension Series Salvia continued

Media
Use a well-drained, disease-free, soilless media with a pH of 5.5 to 6.2 and an EC of 0.75 mmhos/cm.

Nitrate schedule from start to finish:

<table>
<thead>
<tr>
<th>Stage</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start production</td>
<td>0.8 – 1.0</td>
</tr>
<tr>
<td>Final production</td>
<td>1.2 – 1.3</td>
</tr>
</tbody>
</table>

Temperature
Nights: 50 to 59°F (10 to 15°C)
Days: 60 to 72°F (16 to 22°C)
During overwinter period, plants will do best under minimum 36-38°F/2-3°C protected circumstances.

Light
Natural daylight during season, preferably as high as possible; no additional light is required.

Photoperiod
It is a long-day plant and flowers most rapidly and uniformly at 14 or longer day length with critical day length about 14 hours.

Irrigation
Keep media medium dry to medium moist (level 2 – 3). Avoid both excessive watering and drought but allow pots to dry in between waterings.

For overwinter production, keep plants on the dry side during winter period as overwatering could result in plant loss from root rot.

Fertilizer
Apply fertilizer at rate 1-2 (100 to 125 ppm N/1.2 to 1.5 mmhos/cm EC) or 150 ppm as needed. Maintain the pH at 5.5 to 6.2.

The ratio of N : K should be 1:1 at start production stage and increase to 1:2 at later stage.

Growth Regulators
In general, no PGR is needed, especially when grown under cool conditions, but if necessary New Dimension is responsive to B-Nine/Alar (daminozide) 2,500 ppm (3.0 gr/l 85% formulation or 4.0 gr/l 64% formulation) applied about 10 days to 2 weeks after transplant. If necessary, repeat the application 2 weeks later depending on growth, temperature and light level.

Pinching
Annual:
Pinching is not needed.

Overwintered:
Pinch only those plants which flower before winter.
IMPORTANT: Don’t pinch too low (minimum 8 to 10 cm from heart of the plant/soil level) or too late if pinch is done before winter to prevent plants from disease or infection.

Spacing
Space plants when foliage is touching.

Crop Scheduling

Sow to transplant (288 cell plug):
5 to 6 weeks

Sow to transplant (180 cell plug):
6 to 7 weeks

Annual:
Transplant to flower from 288 cell:
• Blue: 9 to 11 weeks
• Rose: 8 to 10 weeks
Total crop time: 13 to 15 weeks
Under proper day length and temperature range

Overwintering:
Transplant to flower: 32 to 38 weeks
Total crop time: 38 to 44 weeks

Spring Production: Sown in mid-March for natural flowering in middle to late June.

Overwinter Production: Sown in middle to late of July for natural flowering late May to early June of the following year.
Do not sow too early for preventing flowering before winter.

Common Problems
Insect: Spider Mites, Aphids, Thrips, White Flies
Disease: Rhizoctonia, Crown and Root Rot (under wet conditions), Leafspot, Pythium, Phytophthora, Botrytis, Powdery Mildew, Phoma
Physiological: To enhance foliage color and quality add 1 g/l Bittersalt (MgSO4) on a weekly basis starting from two weeks after transplant.
Kieft-Pro-Seeds Award Winners

All-America Selections
Coreopsis Early Sunrise
Digitalis Foxy
Echinacea PowWow Wild Berry
Gaillardia Mesa Yellow
Lavender Lavender Lady

Fleuroselect Gold Medal
Armeria Ballerina Red
Armeria Ballerina White
Celosia Bombay Purple
Celosia Bombay Yellow Gold
Coreopsis Early Sunrise
Coreopsis Rising Sun
NEW Echinacea ‘Cheyenne Spirit’
Gaillardia Mesa Yellow
Lavandula Ellagance Purple
Lavandula Ellagance Sky
Lavatera Twins Hot Pink
Monarda Bergamo

Fleuroselect Quality Award
Alyssum Luna
Ammi Graceland
Aquilegia Clementine Formula Mix
Aquilegia Tower Light Blue
Aquilegia Winky Single Red-White
Aquilegia Winky Rose-Rose
Armeria Joystick Lilac Shades
Armeria Joystick Red
Armeria Joystick White
Asclepias Silky Gold
Bellis Bellissima Rose
Bellis Bellissima Rose Bicolour
Bellis Bellissima White
Celosia Punky Red
Celosia Spiky Pink
Celosia Star trek Rose Pink
Coreopsis Sunfire
Gomphrena QIS Carmine
Lavandula Ellagance Ice
Lavatera Twins Cool White
Nepeta Pink Cat
Penstemon Tubular Bells Rose
Penstemon Navigator
Salvia Patio Deep Blue
Salvia Patio Pink
Salvia Patio Sky Blue
Sanvitalia Orange Sprite

Fleuroselect Novelty
Ageratum Red Sea
Aquilegia Clementine Blue
Aquilegia Clementine Dark Purple
Aquilegia Clementine Rose
Aquilegia Clementine Salmon Rose
Aquilegia Tower Dark Blue
Aquilegia Tower Light Pink
Aquilegia Tower White
Aquilegia Winky Single Early Sky Blue
Aquilegia Winky Double Red-White
Aquilegia Winky Double White-White
Armeria Ballerina Lilac
Celosia Madras Scarlet
Digitalis Dalmatian Purple
Heuchera Malachite
Heuchera Melting Fire
Lavandula Ellagance Snow
Penstemon Tubular Bells Red
Penstemon Tubular Bells Wine Red With White Throat
Penstemon Carillo Purple
Penstemon Carillo Rose
Rudbeckia Moreno
Salvia New Dimension Blue
Salvia New Dimension Rose
Salvia Patio Lilac
Sanvitalia Vanilla Sprite
Silene Starry Dreams

Royal Horticultural Society Award of Garden Merit
Aquilegia Songbird Bunting
Aquilegia Songbird Dove
Aquilegia Swan Burgundy and White
Aquilegia Swan Yellow
## PanAmerican Seed Award Winners

### All-America Selections
- Basil Purple Ruffles
- Basil Sweet Dani
- Dianthus Ideal Select Violet
- (All-America Classic)
- Diascia Diamante Coral Rose
- Dill Fernleaf
- Lisianthus Forever Blue
- Marigold Golden Gate
- Marigold First Lady
- Nicotiana Nicki Red
- Ornamental Millet Purple Majesty
- (Gold Medal Winner)
- Ornamental Pepper Black Pearl
- Ornamental Pepper Chilly Chili
- Pepper Cajun Belle
- Petunia Orchid Daddy
- Petunia Purple Pirouette
- Petunia Tidal Wave Silver
- Petunia Wave Blue
- Petunia Wave Lavender
- Petunia Wave Purple Classic
- (All-America Classic)
- Snapdragon Rocket Bronze
- Snapdragon Rocket Golden
- Snapdragon Rocket Orchid
- Snapdragon Rocket Red
- Snapdragon Rocket Rose Shades
- Snapdragon Rocket White
- NEW Vinca Jams 'N Jellies Blackberry
- Vinca Pacifica Burgundy Halo XP
- Viola Shangri-La Marina *
- Viola Skippy XL Plum-Gold
- Viola Skippy XL Red-Gold
- Viola Sorbet XP Delft Blue
- Viola sp. Rain Blue & Purple *
- Zinnia Double Zahara Cherry
- Zinnia Double Zahara Fire
- Zinnia Zahara Starlight Rose

* Bred by Tokita Seed Co., Ltd..

### Fleuroselect Gold Medal
- Alyssum Snow Crystals
- Cosmos Sonata White
- Dianthus Noverna Clown
- Dianthus Noverna Purple
- Gazania Daybreak Red Stripe
- Marigold Honeycomb
- Marigold Orange Boy
- Marigold Orange Jacket
- Nemesis Sundrops Mixture
- Petunia Wave Blue
- Petunia Wave Lavender
- Viola Sorbet Delft Blue XP
- Viola Sorbet Orange Duet XP
- Zinnia Double Zahara Fire

### Fleuroselect Novelty
- Aster Meteor Carmine Red
- Aster Meteor Yellow
- Dahlia Figaro White
- Dahlia Figaro Original Field Grown Mixture
- Lobelia Regatta Marine Blue
- Lobelia Regatta Sapphire
- Lobelia Regatta Sky Blue
- Lobelia Riviera Blue Splash
- Lobelia Riviera White
- New Marigold Bonanza Deep Orange
- Ornamental Pepper Peppa Blanca/Rosé
- Verbena Quartz Purple XP
- Zinnia Double Zahara Cherry
- Zinnia Zahara Starlight Rose

### Fleuroselect Quality Award
- Alyssum Easter Bonnet Violet
- Aster Meteor Violet Blue
- Cosmos Sonata Carmine
- Cosmos Sonata Pink
- Cosmos Sonata Pink Blush
- Cosmos Sonata Mixture
- Dahlia Figaro Orange Shades
- Dahlia Figaro Red Shades
- Dahlia Figaro Violet Shades
- Dahlia Figaro Yellow Shades
- Dianthus Ideal Carmine
- Dianthus Ideal Select Rose
- Helianthus Prado Gold
- Helichrysum Chico Red
- Helichrysum Chico Yellow
- Lobelia Regatta Blue Splash
- Lobelia Regatta Rose
- Lobelia Riviera Midnight Blue
- Lobelia Riviera Rose
- Lobelia Riviera Sky Blue
- Marigold Orange Gate
- Marigold Yellow Gate
- Ornamental Pepper Black Pearl
- Pansy Rally Lilac Cap
- Petunia Tidal Wave Silver
- Trachelium Devotion Burgundy
- Vinca Pacifica Burgundy Halo XP

### Royal Horticultural Society Award of Garden Merit
- Alyssum Easter Bonnet Lavender
- Alyssum Easter Bonnet Violet
- Dianthus Amazon Neon Purple
- Dianthus Amazon Rose Magic
- Dianthus Dynasty Orchid
- Dianthus Ideal Select Rose
- Dianthus Ideal Select WhiteFire
- Dianthus Sweet Coral
- Dianthus Sweet Scarlet
- Dianthus Sweet White
- Viola Sorbet Blueberry Cream
- Viola Sorbet Yellow Frost
Patent Information

PanAmerican Seed

European Community Plant Variety Rights
Begonia Dragon Wing Pink (EU 10351)
Begonia Dragon Wing Red (EU 9611)

European Utility Patent Applied For
Alyssum Clear Crystal Lavender Shades
Alyssum Clear Crystal Purple Shades
Petunia Debonair Dusty Rose
Petunia Debonair Lime Green
Petunia Sophistica Antique Shades
Petunia Sophistica Lime Bicolour

Alyssum Clear Crystal Lavender Shades & Clear Crystal Purple Shades – USPVP 7,915,504

U.S. Patents
Impatiens Super Elfin™ Red Starburst XP, Rose Starburst XP, Salmon Starburst XP and Violet Starburst XP – Plants grown from this seed are protected by U.S. Utility Patent 5,986,188.

Ornamental Pepper Chilly Chili and Medusa – Plants grown from this seed are protected by U.S. Utility Patents 7,087,819 and 7,393,995.

Ornamental Pepper Sangria – Plants grown from this seed are protected by U.S. Utility Patents 7,393,995 and 7,696,416.

Petunia Debonair Dusty Rose, Debonair Lime Green, Sophistica Antique Shades and Sophistica Lime Bicolour — Plants grown from this seed are protected by U.S. Utility Patent 7,642,436.

The purchaser or user of seed for the varieties listed here is granted a license to use such plants once and only once for the purpose of producing an ornamental plant. No other license, express or implied, is granted to the purchaser or user of this product. Propagation from or breeding with such plants is prohibited.

U.S. Plant Variety Protections
Basil Sweet Dani – USPVP 9500027
Coleus Kong Green* – USPVP 200600019
Coleus Kong Red* – USPVP 20050015
Coleus Kong Rose* – USPVP 20050017
Coleus Kong Salmon Pink* – USPVP 200900035
Coleus Kong Scarlet* – USPVP 200900016
Helenium Dakota Gold – USPVP 20060009
Lobelia Regatta Lilac Splash – USPVP 200600188
Lobelia Riviera Blue Splash – USPVP 9400206
Lobelia Riviera Lilac – USPVP 9300313
Marigold Janie Deep Orange – USPVP 9200025
Marigold Janie Primrose – USPVP 9200027
Ornamental Pepper Black Pearl – USPVP 200500020
Ornamental Pepper Medusa – USPVP 20000140
Vinca Grape Cooler – USPVP 9000113
Vinca Jams ‘N Jellies Blackberry – USPVP 201100526
Vinca Mediterranean Dark Red XP – USPVP 200000043
Vinca Mediterranean Hot Rose XP – USPVP 200000084
Vinca Mediterranean Lilac – USPVP 9800182
Vinca Mediterranean Peach XP – USPVP 200000080
Vinca Mediterranean Red XP – USPVP 200900081
Vinca Mediterranean Rose XP – USPVP 200900082
Vinca Mediterranean Strawberry XP – USPVP 200900083
Vinca Mediterranean White XP – USPVP 200900053
Vinca Pacifica Apricot XP – USPVP 9800181
Vinca Pacifica Burgundy Halo XP – USPVP 200700072
Vinca Pacifica Dark Red XP – USPVP 200600189
Vinca Pacifica Magenta Halo XP – USPVP 200500016
Vinca Pacifica Orchid Halo – USPVP 20050217
Vinca Pacifica Pink – USPVP 9700087
Vinca Pacifica Punch XP – USPVP 9400248
Vinca Pacifica Really Red XP – USPVP 200600190
Vinca Pacifica Rose Halo XP – USPVP 20050218
Zinnia Double Zahara Cherry – USPVP 200700335
Zinnia Double Zahara Fire – USPVP 200700336
Zinnia Zahara Coral Rose – USPVP 200700357
Zinnia Zahara Fire – USPVP 201000090
Zinnia Zahara Scarlet – USPVP 200700356
Zinnia Zahara White – USPVP 200700334
Zinnia Zahara Yellow – USPVP 200700355

U.S. Plant Variety Protections Applied For
Vinca Jams ‘N Jellies Blackberry
Vinca Mediterranean Cherry Red Halo XP
Vinca Mediterranean Rose Halo XP

* Bred by Sakata Seed Corporation.

Kieft-Pro-Seeds

European Community Plant Variety Rights
Celosia Bombay Fidor (EU17179)
Celosia Bombay Figo (EU16690)
Celosia Bombay Firosa (EU16689)
Celosia Bombay Purple (EU1458)
Erysimum Citrona Orange (EU 21394)
Erysimum Citrona Yellow (EU 21395)
Heuchera Melting Fire (EU 20557)
Lavandula Lavance (EU 17706)
Scabiosa Blue Note (EU 27547)

European Community Plant Variety Rights Applied For
Echinacea PowWow Wild Berry

U.S. Utility Patent
Echinacea PowWow™ Wild Berry – Plants grown from this seed are protected by U.S. Utility Patent 7,982,110

U.S. Plant Variety Protections
Erysimum Citrona Orange – USPVP 200600167
Erysimum Citrona Yellow – USPVP 20060168
Myosotis Mon Amie Blue – USPVP 20080070

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