

Leucadendron Ebony

(*Leucodendron hybrid*)

Propagation

Not Applicable.

Growing On to Finish

Media

Practical experience has demonstrated that the following soil testing figures can be used as a working guide (based on MAF quick soil tests; QT values followed by ppm in soil):

pH: a maximum of 6.5, with ideal being 5 - 5.5. (In their natural habitats, some species such as *P. cynaroides* may occur in soils with a pH of 3.5.)

Calcium: a level of less than 10 (< 1250 ppm in soil) is desirable.

Potassium: Less critical, but under 20 (< 400 ppm in soil) is preferable.

Phosphorus: an upper limit of 30 (33 ppm in soil) may be permissible, but ideally should be under 20 (22 ppm).

Magnesium: Under 30 (<150 ppm in soil) is preferred.

Temperature

Highly tolerant of Coastal California weather.

Air Circulation

Proteaceous plants generally dislike sheltered humid environments. They prefer good air circulation around the bushes, as this assists the drying of the foliage and reduces the risk of fungal infection.

Only a few species will tolerate gale-force winds as most have comparatively shallow root systems, and if these are disturbed through wind movement, the resulting root damage may allow pathogens to enter the plant. This type of damage due to wind is more serious than foliage burning, which is not often a problem.

Light

Full sun for optimum growth and flowering

Irrigation

Allow the media to dry slightly between waterings. Because of the complex root system, irrigation should

is not necessary once plants are established, unless there is an extended period of drought. Irrigation could be needed in situations where the proteoid root system does not develop (e.g. high nutrients) or on light soils subject to summer drought (e.g. coastal sands).

Growth Regulators

No need for growth regulators. Selected for compact growth habit in a quart, #3 or #5 nursery container.

Pruning

A light pruning will be adequate for compact growth habit.

Spacing

Can be grown can tight. For larger nursery containers, it is recommended to space accordingly.

Container Size

3-gallon pot: 1 plant per pot.

Large pots are suitable as well. We don't recommend a pot smaller than 8 in. due to the length of the stems and the larger flowers.

Crop Scheduling

Liner to #3 nursery container

Fall/Winter potting: #3 nursery container will finish in 6 to 7 months (August/September potting saleable in March to May)

Spring: #3 nursery container will finish in 9 months (March/April potting)

Container Size

#1 (18 cm) pot: 1 liner per pot

#3 pot: 3 liners per pot; or shift #1 container

Common Problems

In their native habitat Proteaceae plants are subject to a wide range of pests and diseases.

Root diseases: Phytophthora root rot (Phytophthora cinnamoni): Phytophthora root rot (PRR) can infect most Proteaceae. The fungus occurs naturally in all soils, particularly those that are poorly drained. PRR is usually first observed as wilting and collapse of plants. Infected roots show browning and rotting. 'Wiriwiri wilt' of *Leucadendron* spp. is now thought to be due to

PRR infection. The best means of control is prevention. Ensure that any proposed sites are adequately drained and that surface ponding does not occur following heavy rain. Where the disease occurs, obviously infected plants should be removed and destroyed. Other plants in the vicinity should have a soil drench of metalaxyl ('Ridomil MZ'), 'Terrazole', or fosetyl-AI ('Aliette'), applied around the root zone. Ensure the soil is thoroughly soaked around each plant so the chemical reaches the roots. Alternatively, foliar sprays of a potassium phosphite-based compound (e.g. 'Foliasfos') can be used. Be aware that resistance can occur, so alternate the compounds used. While these chemicals can control PRR, no official recommendations on specific use have been made for Proteaceous crops, and you should check with your chemical supply representatives for latest advice. Other soil fungi of less significance occasionally found associated with root rots of proteaceous plants are *Cylindrocladium* and *Fusarium* species. These fungi are generally only a problem when induced by poor drainage.

Leaf and stem diseases:

Gray mould (*Botrytis cinerea*): stem lesions and infecting flowers of *Leucospermum* species. Usually identified by gray-colored fungus on the infected areas, infection can be reduced by ensuring good air circulation within the crop. Where the disease is a problem, regular sprays of vinclozolin ('Ronilan') should be applied.

Wilt (*Verticillium dahliae*): This soil-borne fungus has been recorded in NZ on *Protea compacta*. *Verticillium* infects the vascular system of plants, causing wilting and dieback. The recommended method of control is to remove the infected plants.

Silverleaf (*Chondrostereum purpureum*): Recorded on *Protea* species and on *Leucodendron* in NZ, causing silvering and, in severe cases, yellowing of foliage on affected stems. Entire plants may eventually become infected. The silverleaf fungus enters through pruning wounds or injury sites. To help prevent infection, pruning should be carried out during dry weather and a fungicidal spray such as captafol ('Difolatan') applied to pruning cuts. Only major pruning cuts or injury are considered to be at risk, not normal cuts associated with the removal of flower stems.

Bacterial leaf spot (*Pseudomonas syringae*): Recently identified as causing a leaf spot on *Protea cynaroides*, where it is usually observed as small (up to 5 mm diameter), occasionally sunken, dark brown or black well-defined spots.

Bacteriocides used for control of *P. syringae* in fruit trees could be tried where the incidence of the disease is of concern.

Other diseases: The causes of the following diseases are unknown.

'Waitara wilt': The symptoms of 'Waitara wilt' occur on *Leucodendron* species in a number of areas. It is usually first seen as a watersoaked area on a leaf

which rapidly enlarges and dries out to form a pale tan necrotic area, often encompassing the entire leaf. In severe cases, some stems of plants or even entire plants may be affected, with little or no live leaf tissue remaining. Some plants affected in this manner may apparently recover for a period, but then succumb to the problem again at a later stage. Bract discoloration: *Leucodendron laurifolium* and *L. microcephalum* show a rusty discoloration of the terminal leaf bracts.

Pests:

Leaf roller caterpillars (*Ctenopseutis obliquana*; *Epiphyas postvittana*): Regarded as the most significant insect pests of Proteaceous plants. The typical symptoms are holes in the leaves or bracts, or chewing damage around the margins. The formation of webbing on leaves or leaves webbed together is also indicative of these pests. Applications of insecticides such as acephate ('Orthene') are recommended at regular intervals to prevent attack.

Scale insects (*Phenacaspis eugeniae* - 'waratah scale'; *Parlatoria pittospori*; *Coccus longulus*): These are white or brown limpet-like insects, usually found on the underside of leaves.

Severe infestations result in yellowing or browning of the upper leaf surface - corresponding to the point of attachment of the insect on the underside, and stunting of plant growth can result. A regular spray program of insecticide such as maldison ('Malathion'), plus an all-seasons oil, is normally recommended for control. Orthene is also quite useful.

Mites (*Tetranychus urticae* - two-spotted mite; *Panonychus ulmi* - European red mite): Mites cause silvering and mottling of host leaves or flowers, rendering them unsuitable for export.

A regular spray program using a miticide such as cyhexatin ('Plictran') is recommended, particularly during hot dry periods of the year. Other pests of less significance recorded on Proteaceous plants include aphids, cicadas, leaf miners, mealy bugs and psyllids, all of which should be controlled by regular preventative insecticide application.

Spray Program

As a general guide, the following spray program for disease and pest control is suggested: benomyl ('Benlate'), plus permethrin and pirimiphos-methyl ('Attack'), plus cyhexatin ('Plictran'). Take care with the use of benomyl as there is a tendency for resistance to develop.

Alternate with chlorothalonil ('Bravo'), plus acephate ('Orthene'). A protective type of fungicide such as 'Mancozeb' and a variety of potent fungicides can be used whenever fungal problems occur. This practice can be more economic as some of the potent fungicides are too costly to be used on a regular basis. Applications can be made at monthly intervals after harvesting has been completed, reducing to 10-14 day intervals during periods of active growth, and to 7-10 day intervals approaching harvest. These are not the



only chemicals that may be used and alternatives are available. Frequent inspections should be made to check for the presence of pests and diseases. With experience, the interval between sprays and the types of sprays used may be varied to suit individual situations. However, once damage occurs it cannot be reversed and can adversely affect the profitability of the crop.

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.

