

applying a full cover of the recommended chemicals is advisable when the pest is observed.

SOFT SCALES

This flattened, motionless insect has an elliptical body shape and is found on the underside of leaves. It sucks the sap from the leaves and stems, causing stunted growth. There are also recommended chemical control measures for these scales.

SNOUTBEETLES

They differ with species and can be either brown or black. They chew foliage, stems and bracts of the flower heads. Applying a full cover of recommended chemicals is advisable.

Proteas are attacked by a variety of diseases. The most important ones are the following:

DAMPING OFF

This is the fungal diseases which attacks seedlings. The disease is caused by seeding too dense, poor ventilation and too damp weather. Seedling beds should receive direct sunlight to avoid this disease; overirrigation should also be avoided.

PHYTOPHTHORA ROOT ROT

This is a soilborne disease which is caused by the *Phytophthora cinnamomi* fungus. It infests the feeder root system and leads to stunted growth, wilting and ultimately to the collapse of the plant. To avoid infestation it is important that soil preparation be done efficiently to facilitate good drainage and overirrigation should be avoided. Infested plants should be removed and destroyed.

STEM AND SHOOT CANKER, DIEBACK AND SHOOT BLIGHT

Lesions on stems, shoots and leaves which are caused by *Colletotrichum* and *Drechslera* fungus. This fungus is very difficult to control because it has a wide range of hosts. Control should best be based on preventative measures such as: sterilising seeds, growing resistant cultivars and, lastly, keeping plants in a healthy condition. Infected plants should be removed and burned. Chemical control of these diseases is not effective; the following fungicides can be sprayed on infected plants:

SCAB

These defined lesions on leaves, shoots and flowering branches are caused by the *Elsinoe* fungus. Overhead irrigation and wet weather when the plant is actively growing favours scab infestation. Fungicide application should be used before the symptoms are noticed. For young plants the best time for such application is when they are in a growth flush, while mature trees should be sprayed when new flush is expected. Fungicides for controlling canker and blight can also be used for scab.

Uses

Proteas are grown chiefly for their beautiful cut-flowers, which are sold either fresh or dried. Cuts are also sold locally and receive a good price in international markets. Home gardeners and landscapers grow proteas to beautify their gardens.

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Classification

Kingdom: Plantae

Family: Proteaceae

Genus: Protea

Origin and distribution

The majority of the protea family originates from South Africa and Australia; however this family is widely distributed throughout the Southern Hemisphere with few species found in tropical Africa, tropical America, New Zealand, Pacific Islands and Malaya.

A huge number of proteas grow principally in the mountains which curve around the coastline of South Africa, spreading in a rough crescent from the Clanwilliam district to the area around Port Elizabeth, with the densest distribution in the Tulbagh area, Peninsula, Caledon and Knysna.

Relatively few proteas also grow in the eastern mountain ranges, extending northwards into Natal and Mpumalanga while certain species are also found in Australia and Central Africa.

Climatic and soil requirements

Proteas, which are native in South Africa, grow exceptionally well in local climates. Mild climates with low humidity are preferred and it should not be more than 80 % for more than a week.

Temperature

The generally recommended temperature is a mean minimum temperature of 7,2 °C to a mean maximum temperature of 27,6 °C. The average daily temperature should vary from 7 °C to 24 °C and the average daily temperature for the coldest months should be 12 °C while for the hottest months it should be 31°C. The absolute minimum should be -6 °C and the maximum 44,6 °C.

Moisture

Most protea species require abundant quantities of water throughout the year. The minimum water requirement for the proteas is equivalent to 700 mm of rain per year. Some proteas can still survive in areas which receive as little as 300 mm annually, however, where there is a good drainage proteas can benefit greatly from annual rainfall of up to 2 000 mm. To produce high cut-flower yields, additional water application through irrigation is highly recommended.

Good-quality irrigation water will also assist in keeping the pH low and washing away the salts which accumulate in the

upper soil profile. The water should have a high a electric resistance with low pH (except for alkaline loving species such as *P. neriifolia*) with an electric conductivity at a range of 0,65 to 1,3Ms/cm.

Soil

Most species and cultivars require deep well-drained sand, acidic soils with a pH of 5.0 to 6.0 for optimum growth. Most acid loving species will also grow well at a pH of less than 3. Soil with high clay percentage is not ideal but sandy loam with 6% clay is suitable. Humus containing soils have proven to be very beneficial although excessive humus impedes drainage, which will result in root growth suppression. It is recommended to do soil tests to assess exactly what is in the soil.

Cultural practices

Propagation

Usually proteas are propagated from seeds while in some members of the protease family it is not always easy to obtain sufficient seeds. Hence proteas are now cultivated from cuttings. Propagation by cuttings would ensure that proteas become an important commercial crop and that the flowers would be uniform in type.

Planting

The best time to sow seeds is from late summer to late autumn. Seeds are best sown in a seedbed than in plastic bag and containers. The seeds should not be broadcasted on a seedbed but rather be sown sparsely to a spacing of at least 4 cm apart. Sowing depth depends on a particular species being sown.

Like in growing seeds, the best time to grow cuttings is from late summer to late autumn. Soft cuttings of about 15 to 20 cm should be taken from current flush. Only the leaves from the upper end of cuttings should remain and the rest should be removed. Under normal conditions cuttings should be ready for transplanting after 2 to 3 months when they are about 100 to 200 mm high.

Fertilisation

The recommended fertilisers for the proteas are nitrogen and potassium. Nitrogen should be applied in the form of

ammonium and about 50 kg of ammonium sulphate per hectare should be applied in three different applications. First application should be made before the start of active growth and the other two applications should be made every second month (8-weeks interval).

Most South African soils contain sufficient potassium which meets protea needs. It should be applied in the form of potassium nitrate. The application of about 5 g/m² per year with three split applications is recommended. It is also recommended to conduct soil tests.

Weed control

The best time to control weeds is when doing soil preparation, during the first time the most troubling weeds such as kikuyu can be controlled effectively. Post-emergence herbicides can be used for weeds that appear after the crop has been planted but great care should be taken to avoid contamination when using the herbicides.

Pests and disease control

WITCHES BROOM MITE

These are very tiny mites with two pairs of legs. They feed on the stem bud, leading to abnormal bud development. For these pests there are no registered chemicals. Malformed growth should be removed and destroyed.

FLOWER HEAD BORER/SCARLET PROTEA BUTTERFLY

These are butterflies with dark-brown or black lines on their forewings. They make holes in both flowers and florets. They also damage the flower bud, causing flower malformation. There are also no registered chemicals for these pests but closing buds with a nylon stockings or hand removal of eggs on the flower buds could be of assistance.

BLACK MOTH

They are black in colour with a 20 mm wingspan. They tunnel into the inflorescence and damage developing seeds. The use of chemicals is recommended for the control of black moth.

BLOTCH LEAF MINER

These tiny moths of about 5mm long feed on the leaves, making dead blotches and later small holes. For control,