

Ornamental Pests of Hawai'i

Disease Management of Protea and Leucospermum spp.

At A Glance: Protea crops are susceptible to a wide array of root, stem and foliar fungal pathogens, and plant-parasitic nematodes, as outlined in Ornamental Pests of Hawai'i: Fungal and Nematode Associations and Symptoms on Protea and Leucospermum spp. There are several cultural and chemical management options available to reduce disease severity and improve plant health and vigor.



and dieback. Protea growing in their native range of South Africa prefer nutrient-poor, well-drained soils (Criley, 1998) and have specialized, proteiod roots consisting of dense clusters of rootlets (Crous et al, 2013) that help them scavenge nutrients and water (Lament, 1986).

Well-drained soils, such as loam or sandy-loam textured soils, are ideal for protea growth. In clay or poorly drained soils, consider reducing irrigation frequency and duration and adding compost to improve drainage and stimulate microbial activity.

During periods of prolonged drought,

Cultural Management Options

1. Remove Diseased Plant Tissue

Remove diseased plants/parts from the field to reduce the spread of fungal pathogens from symptomatic plants to healthy plants (Crous et al, 2013). Conduct sanitation pruning by cutting diseased foliage and stems back to healthy tissues as needed. Practice selective pruning by removing or cutting excessive branches, stems that cross, or stems that are growing in an undesirable direction to increase air flow within the plant. Manage and remove adjacent vegetation or weeds, which may serve as alternate disease hosts, to aid in reducing excess humidity.

Precautionary measures should be taken to prevent the transmission of microorganisms to new hosts or new locations via contaminated cutting implements, gloves, hands, etc., by spraying with disinfectants or chemicals. For a list of disinfectants, refer to Table 1. in Greenhouse and Nursery Sanitation Extension publication. Remove and destroy diseased plant material off-site to reduce inoculum levels.

2. Maintain Plant and Soil Health

Protea crops are relatively tolerant to occasional droughts as they generally have a mass of shallow, lateral roots and a deep taproot that takes advantage of deeper layers of soil moisture. Water-logged soil conditions, caused by excessive moisture and poor drainage, can lead to a condition known as 'wet feet,' often resulting in root rot irrigate plants via drip irrigation or apply supplemental water targeted at the root zone. Avoid overhead irrigation to reduce excessive leaf wetness, which may contribute to fungal germination and infection. For more information about irrigation frequency and timing, please contact your local CTAHR Extension agent as situations vary.

To aid in the management of plant-parasitic nematodes, increase the soil organic matter by adding compost or pathogen-free mulch, which encourages the development

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of beneficial free-living and predatory nematodes as well as bacterial and fungal parasites of nematodes. These beneficial microorganisms are sensitive to excessive soil disturbance, so minimizing tillage by planting protea with an o'o bar (digging bar) or other hand tool to manually dig planting holes is recommended to limit soil disruption. In areas with high levels of parasitic nematodes, consider removing the susceptible protea plants and establishing a cover crop such as Sunn Hemp (*Crotalaria juncea*) or marigolds (*Tagetes* spp.) with allelopathic properties that suppress plant-parasitic nematodes (Hooks et al, 2006 and Wang et al, 2007).

Overall, healthy plants are stronger and more capable of fending off plant disease. Optimize plant health as best as possible by maintaining ideal growing conditions and managing pests.



3) Sanitation

Sanitize pruning tools and equipment to prevent the spread of fungal pathogens. Disinfect pruning tools between plants to prevent disease spread. Disinfectants with the active ingredients of ammonium chloride, hydrogen peroxide peroxyacetic acid, or potassium peroxymonosulfate sodium chloride may be used to sanitize equipment (Galanti and Lutgen, 2021). For more information, refer to the Extension publication **Greenhouse and Nursery Sanitation**.

Chemical Management Options

Fungicides may be used in conjunction with the cultural methods outlined above to suppress pathogens or fungal associations with protea. Consider preventative fungicide applications after a pruning event, prior to the rainy season, or during the early onset of fungal disease symptoms. Fungicide resistance development can be a significant problem in crop production. Rotation of fungicides based on their fungicide resistance grouping (FRAC) will prolong the effectiveness.

Read and follow the pesticide label prior to use to ensure the product is labeled for the intended use. Refer to county and state regulations regarding pesticide use. See Table 1 for a suggested list of fungicides that can be used in ornamental and greenhouse situations. Using a rotation of four-six fungicides in different FRAC groups (i.e., 1,3, M5, 7)* may help to suppress fungal growth and disease severity of protea.

Disclaimer

Read and follow pesticide labels thoroughly. Prior to using pesticide, make sure the product is labeled for intended use or specific situation. Refer to county and state regulations regarding pesticide use. Mention of a trademark or proprietary name does not constitute an endorsement, guarantee, or warranty by the University of Hawai'i, Cooperative Extension, or its employees and does not imply recommendation to the exclusion of other suitable products.

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Fungicide Trade Name	Active Ingredient	FRAC group	Manufacturer
Triathlon BA	<i>Bacillus amyloliquefaciens</i> strain D747	44	OHP, Inc
			Morrisville, NC
Eagle 40 WP	Myclobutanil	3	Dow AgroSciences LLC
			Indianapolis, IN
Cleary's 3336 WP	Thiophanate-methyl	1	Cleary Chemicals LLC
			Dayton, NJ
Quali-Pro Tebuconazole 3.6F	Tebuconazole	3	Makhteshim Agan of North America, Inc
			Raleigh, NC
Spectro 90 WDG	Chlorothalonil; thiophanate-methyl	M5 & 1	Cleary Chemicals, LLC
			Alsip, IL
Orkestra	Fluxapyroxad; pyraclostrobin	7	BASF Corporation
			Research Triangle Park, NC
Pageant	Pyraclostrobin	7	BASF Corporation
			Research Triangle Park, NC

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Diseased protea leaf



Marigolds and Protea



Protea root disease



Diseased pincushion



Diseased protea



King Protea with diseased leaves

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