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RHIZOCTONIA BLIGHT OF SYNGONIUM

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Abstract. **The fungus,** Rhizoctonia solani **Kuehn, was observed in foliage nurseries causing a serious disease of cuttings, leaves and seedlings in cultivars of** Syngonium podophyllum **Schott. In experiments with** S. podophyllum **'Green Gold',** R. solani, **produced both a severe cutting decay and a symptom on the first emerging leaf of many surviving cuttings which previously had been attributed to insect feeding. In several tests, the soil-applied fungicides benomyl and thiabendazole were found particularly effective for control.**

Cultivars of *Syngonium podophyllum* Schott (nephthytis), popular as ornamental foliage plants, are propagated by cuttings and seed. Several phytopathogens are reported to attack nephthytis (2,5,6,7) and one, *Rhizoctonia solani* Kuehn, was observed over a 4 year period, to cause considerable losses of cuttings and seedlings during propagation.

These investigations were undertaken to reproduce and describe the disease caused by *R. solani* and to evaluate fungicides for its control.

Rhizoctonia solani, under warm to hot, moist conditions, causes a serious decay and collapse of recently-planted cuttings. On young succulent cuttings, the grayish brown to black rot progresses from the cutting tip downward with a line of demarcation usually evident between healthy and diseased tissue. On more mature cuttings, infection usually occurs in the area of the leaf sheath and aerial roots. Both types of damage are shown in Fig. 1. The prominent reddish brown hyphae of the pathogen are generally visible on the propagative media and infected tissue. If a cutting survives infection and roots, the pathogen may attack the emerging shoot and leaf with disease development ceasing after the leaf emerges through the soil and unfurls. This type of infection appears as ragged holes within and along the leaf margin and/or within the leaf as small reddish brown spots with a chlorotic margin (Fig. 2).

Materials and Methods

The *R. solani* culture used in Tests 1-5 was isolated from *S. podophyllum*, and that used in

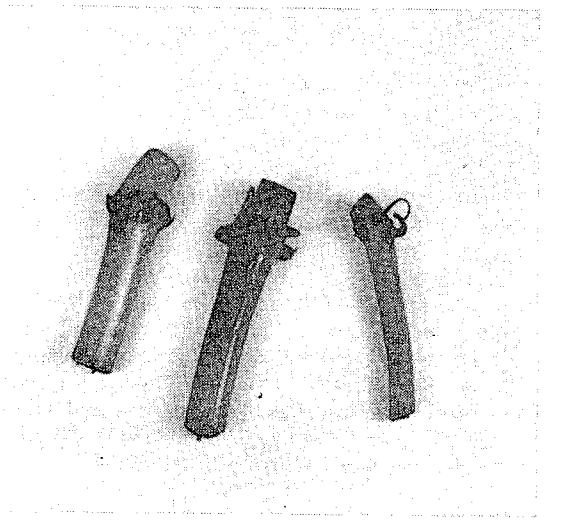

Fig. 1. Rhizoctonia solani infection of nephthytis cuttings —with rot initiated at top of cutting and in the nodal area.

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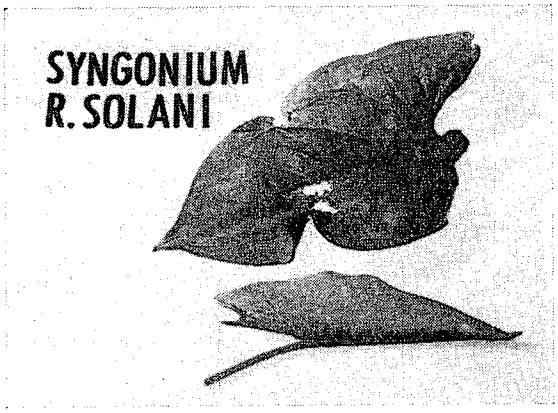

Fig. 2. Symptoms of R. solani infection on leaves of nephthytis, showing ragged hole appearance and small discrete spots with chlorotic halo.

Test 6 from *Philodendron oxycardium* Schott. Soil infestations with *R. solani* were accomplished in Tests 1,2,5 and 6 by pipetting 0.8 fl oz (25 ml) of inoculum onto the soil surface. Inoculum was prepared by blending for 1 min in a sterile Waring Blender, 3.5 fl oz (100 ml) sterile distilled water and a 7-day-old fungal mat grown at 86°F (30°C) in stationary culture on potato dextrose broth. Non-infested control pots received 0.8 fl oz (25 ml) sterile distilled water. In Test 3, a 2-week-old wheat culture of *R. solani* grown at 86°F (30°C) was thoroughly mixed with the potting medium in a cement mixer to give 0.28 oz (8 g) of inoculum/pot. In Test 4, 0.14 oz (4 g) of the wheat culture was placed in a hole in the center of the pot. Controls in Tests 3 and 4 were treated identically, except they received the same quantity of sterile wheat.

Cuttings of *S. podophyllum* 'Green Gold' were obtained from industry sources for Tests 1 and 2 and from a culture-indexed source maintained at our Research Center for Tests 3-6. The former cuttings were of unknown cultural origin and age, while the latter were selected to have the same type and age cuttings in each treatment.

Steam sterilized media used were: German peat (Tests 1,2); mixture of 1 German peat, 2 coarse sand (Tests 3,4); and a mixture of 2 German peat, 1 coarse sand plus 7 lb. dolomite, 1 lb. Perk and 4 oz 5% chlordane/yd^3 (Tests 5,6). Pots were hand watered 6 times/week and fertilization initiated (1 lb. 20-20-20/100 gal) 1 month after planting and weekly thereafter.

Five cuttings were used/pot with 5 pots/treatment. Pots were watered immediately after planting, and then infested. All pots were then covered with an individual plastic bag, placed under 12 hr-day mist (15 sec every 30 min) for 2 days whereupon the bags were removed and the pots drenched with their prospective fungicide treatment. Each pot received 5.3 fl oz (157 ml) (Tests 1-4) or 6.6 fl oz (200 ml) (Tests 5,6) of drench. Non-infested and infested control pots received the same quantity of tap water. After drenching, the bags were replaced and the pots placed under mist for 7 additional days. The bags were then removed and pots watered as stated previously. Treatments where fungicides were incorporated prior to planting were handled identically with the required amount of fungicide added by spraying into 1 ft^3 of the potting mix contained in a disinfested, rotating cement mixer.

The fungicides tested as a drench or soil incorporated, or both, were: azide (potassium azide); Banrot I (ethazole + thiabendazole, 15-15 WP); Banrot II (ethazol + thiophanate methyl, 15-25 WP); Benlate (benomyl 50 WP); Cleary's 3336 (thiophanate ethyl 50 WP); Daconil 2787 (chlorothalonil 75 WP); Demosan (chloroneb 65 WP); Fermate (ferbam 76 WP); Mertect 160 (thiabendazole 60 WP); Terraclor (pentachloronitrobenzene 75 WP); and Zyban (thiophanate methyl 25 WP).

In all tests but 5 and 6, data comprising the number of rooted cuttings and the fresh wt of their top was taken. Tests 5 and 6 were terminated before substantial rooting and growth had occurred and the data is presented as the number of unrotted cuttings remaining. Reduced fresh wt in comparison to the non-infested Control was taken as an indication of phytotoxicity for the fungicide treatments under experimentation.

Results and Discussion

Rhizoctonia solani was shown to cause disease of nephthytis cuttings and leaves. The pathogen was reisolated consistently from the diseased plant parts.

Several fungicides when used as a drench provided good control of the pathogen (Tables 1-4). Benlate provided effective pathogen control and was non-phytotoxic. Mertect, the Rhizoctonia-active portion of the fungicide combination Banrot I, also provided effective and safe control with the exception of phytotoxicity in Test 3 (Table 2). The activity of Benlate and Mertect correlates well with earlier work (3,4). Daconil and Fermate provided some control but proved to be phytotoxic (Tables 2,4), a tendency noted earlier for these

Table 1. Fungicide control of nephthytis cutting decay caused by Rhizoctonia solani.

Fungicide	Conc (100 gal)	No. rooted/25 (59 days) Test 1 I[z]	Test 1 NI[z]	(55 days) Test 2 I	Test 2 NI	Top wt[y] Test 2 I	Test 2 NI
Benlate	1.0 lb	21	21	19	23	126.3	115.9
Daconil	1.5 lb	--	--	13	20	18.4	34.2
Demosan	1.5 lb	--	--	12	18	28.9	39.5
Fermate	3.0 lb	19	21	--	--	--	--
azide	1000 ppm	0	0	--	--	--	--
Mertect	1.0 lb	--	--	17	17	86.8	94.7
Terraclor	1.5 lb	20	22	16	15	68.4	71.0
Control	------	9	17	9	18	21.0	100.0

[z]I = infested; NI = non-infested
[y]Expressed as % of non-infested control

two compounds (1,4). Azide killed the cuttings at the conc tested soon after the drench was applied (Table 1). Demosan and Terraclor showed moderate to good activity against *R. solani* but reduced slightly the growth of the resulting plants (Tables 1,2). Zyban at the conc tested was highly phytotoxic.

Banrot II and Cleary's 3336 provided good control but their possible phytotoxicity was not determined since the tests were not prolonged to determine their effect on the continued growth of the resultant plants (Table 4).

Soil incorporation of fungicides prior to planting the cuttings appears to be an alternative to soil drenching (Table 4). The results obtained, however, are not sufficient to suggest this method without additional research.

Growers of nephthytis who consistently encounter this disease during propagation are advised to apply Benlate (8-16 oz/100 gal) at the rate of 1-2 pt/ft² of propagative bed area.

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Table 2. Fungicide control of nephthytis cutting decay caused by Rhizoctonia solani. Test 3, 63 days.

Fungicide	Conc (100 gal)	No. rooted/25 I[z]	NI[z]	No. pots (I) foliar Rhizoctonia	Top wt[y] I	NI
Demosan	1.5 lb	23	23	1	63.7	62.7
Mertect	1.5 lb	24	25	1	52.7	45.9
Terraclor	1.5 lb	24	25	0	69.5	71.2
Zyban	3.6 lb	25	25	0	16.4	21.2
Control	---	21	25	4	57.9	100.0

[z]I = infested; NI = non-infested
[y]Expressed as % of non-infested control

Table 3. Fungicide control of nephthytis cutting decay caused by Rhizoctonia solani. Test 4, 62 days.

Fungicide	Conc (100 gal)	No. rooted I[z]	No. rooted NI[z]	No. pots (I) foliar Rhizoctonia	Top wt[y] I	Top wt[y] NI
Banrot I	500 ppm	25	25	0	121.6	94.0
Benlate	1.5 lb	25	23	0	103.0	99.2
Demosan	1.5 lb	22	24	5	51.5	112.7
Mertect	1.5 lb	25	25	0	86.6	103.0
Terraclor	1.5 lb	24	25	2	71.6	88.8
Control	---	12	25	3	17.9	100.0

[z]I = infested; NI = non-infested
[y]Expressed as % of non-infested control

Table 4. Fungicide control of nephthytis cutting decay caused by Rhizoctonia solani. Test 5, 43 days; Test 6, 27 days.

Fungicide	Drench conc (100 gal)	Soil incorp conc (cu yd)	No. cutting remaining/25 Test 5 I[z]	Test 5 NI[z]	Test 6 I	Test 6 NI
Banrot II	12 oz	---	21	24	22	--
Banrot II	---	6 oz	16	24	22	--
Benlate	8 oz	---	24	23	22	--
Benlate	1 lb	---	25	24	23	--
Benlate	---	6 oz	24	23	24	--
Benlate	---	12 oz	22	24	22	--
Cleary's 3336	1 lb	---	24	22	24	--
Fermate	1½ lb	---	9[y]	16[y]	11[y]	--
Terraclor	12 oz	---	15	17	21	--
Control	---	---	15	22	11	22

[z]I = infested, NI = non-infested.
[y]Sprouting retarded when compared to other treatments.

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