

## SUSCEPTIBILITY OF AZALEA VARIETIES TO *Calonectria theae* AND *Cylindrocladium scoparium*

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### ABSTRACT

Pathogenicity of the *Cylindrocladium* state of *Calonectria theae* was compared with that of *Cylindrocladium scoparium* to leaves and roots of 11 commercially grown azalea varieties. No mortality occurred among plants grown for 2 months in soil infested with either species. Plants of two varieties grown in soil infested with *Calonectria theae*, however, exhibited reduction and discoloration of the root system, five varieties had discolored roots only, two varieties had roots that appeared normal but from which the fungus was isolated, and two varieties had apparently healthy roots from which the pathogen could not be isolated. Three of 11 varieties grown in soil infested with *Cylindrocladium scoparium* exhibited reduced and discolored root systems, six varieties had discolored roots only, one variety appeared to have normal roots from which the fungus was isolated, and one variety had apparently healthy roots from which the pathogen could not be isolated. Leaves of all varieties exhibited some degree of susceptibility to both species. The isolate of *C. scoparium* was more virulent to leaves and roots than was the one of *Calonectria theae*.

### INTRODUCTION

*Calonectria theae* Loos [*Cylindrocladium theae* (Petch) Alf. & Sob.] was reported in the United States for the first time in 1971 (1). The fungus is known primarily as a pathogen of tea leaves in Ceylon and South India, but was isolated for the

first time from leaves of *Rhododendron obtusum* (Lindl.) Planch. 'Skylark' and 'Warbler', from roots of 'Gloria', 'Kingfisher' and 'Red Macaw', and from stems of 'Roadrunner' and 'Skylark' in three widely separated locations in the USA (2). Pathogenicity of the *Cylindrocladium* state of *Calonectria theae* to leaves of azalea varieties 'Duc de Rohan', 'Formosa', 'Mrs. G. B. Gerbering', 'Kingfisher', 'Redwing', and 'Roadrunner'; and to roots of 'Duc de Rohan', 'Formosa', 'Kingfisher', 'Redwing', and 'Roadrunner' has been established. Susceptibility of these varieties to *Cylindrocladium scoparium* Morgan was compared with that of *Calonectria theae* (1,2).

Because of extensive azalea production in the southeastern USA, it was felt that any additional information concerning the susceptibility of azaleas to *C. theae* would be of value to researchers and commercial growers.

### MATERIALS AND METHODS

Plants of the azalea varieties 'Dorothy Gish', 'Fireglow', 'Gloria', 'Meadowlark', 'Kiwi', 'Pluto', 'Skylark', 'Solitaire', 'Valentine', 'White Christmas', and 'White Water' were established in 6-inch pots containing soil fumigated with methyl bromide at a rate of 1 lb./54 ft.<sup>3</sup>. Three plants each of the 11 varieties were subjected to leaf and root pathogenicity tests using the *Cylindrocladium* state of an isolate of *Calonectria theae* and an isolate of *Cylindrocladium scoparium*. All plants were 6- to 7-months' old.

The culture of *Calonectria theae* was isolated in Florida from leaves of azalea variety 'Warbler' in 1970. The isolate of *Cylindrocladium scoparium* was obtained from leaves of an unknown variety of azalea collected at Ft. Myers, Florida in 1965.

Inocula for leaf pathogenicity tests were prepared by suspending conidia scraped from 10-day-old cultures grown on rehydrated Difco potato-dextrose agar (PDA, 39g/l of distilled water) in 10-ml portions of distilled water. The resulting suspensions were filtered through a single thickness of cheesecloth, adjusted to contain 20,000 conidia/ml, and blended for 30 sec. Triton B-1956 (active ingredient, 77% modified phthalic glyceryl alkylid resin) was added to the suspension at a rate of 0.05 ml/20 ml of suspension, blended for 30 sec, and sprayed on the leaves of test plants. Mixtures

containing 0.05 ml of Triton B-1956/20 ml of distilled water were blended for 30 sec and sprayed on leaves of control plants. All plants were maintained in a mist chamber for 24 hr. at 28 C and 95-100% RH after inoculation. Results were recorded 6 days after the plants were removed from the mist chamber.

Inocula for root pathogenicity tests were prepared by blending 14-day-old cultures growing on PDA in 30-ml portions of distilled water. These mixtures were adjusted to contain 70,000-75,000 propagules/ml of suspension. Sixty-five ml of inoculum was mixed into the top 3 cm of soil in each pot. Soil in pots containing control plants was treated in the same manner with a like amount of autoclaved inoculum. Plants were maintained in a greenhouse where temperatures varied from 19-36 C during the experiment. Results were recorded 2 months after infesting the soil with the test organisms.

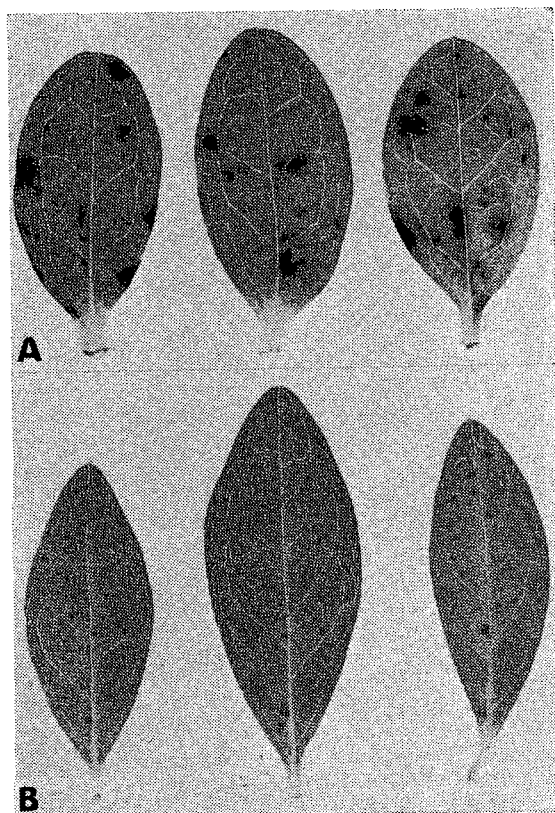


Figure 1.—Lesions on azalea leaves caused by *Calonectria theae*, A) variety 'Roadrunner', B) variety 'White Water'.

## RESULTS

Lesions were apparent in varying size and number on leaves of all varieties 3-4 days after inoculation with both species. By the 7th day slightly susceptible varieties exhibited only a few circular to irregularly circular, purplish black lesions 1-2 mm in diam. Susceptible varieties had lesions of similar shape and color, frequently with dark brown centers surrounded by a purplish black margin, up to 12 mm in diam, and with some leaf abscission apparent (Fig. 1). The most susceptible varieties were moderately to severely defoliated, exhibiting lesions that occasionally involved over half the leaf (Table 1). Although the results clearly suggested that *C. scoparium* was more virulent than *Calonectria theae*, it was impossible to distinguish between the two species by the type of lesion each produced.

No mortality was observed among plants grown for 2 months in soil infested with either species. However, significant discoloration and reduction of the root systems was found among plants of two varieties grown in soil infested with *C. theae*, five varieties had discolored roots only, and four varieties had apparently healthy roots, but only two

Table 1. The effect of *Calonectria theae* and *Cylindrocladium scoparium* on leaves and roots of 11 varieties of azalea.

	<i>C. scoparium</i>		<i>C. theae</i>	
	Leaves	Roots	Leaves	Roots
Dorothy Gish	S	RD	SS	N
Fireglow	S	N	SS	RD
Gloria	S	RD	S	RD,RR
Meadowlark	S	NI	SS	N
Kiwi	S	RD,RR	S	RD
Pluto	S	RD	S	RD
Skylark	S	RD	S	NI
Solitaire	S	RD	S	RD
Valentine	VS	RD,RR	VS	RD,RR
White Christmas	VS	RD	S	RD
White Water	S	RD,RR	SS	NI

VS=Very susceptible, plants with leaf lesions and more than 5% leaf abscission; S=Susceptible, plants with leaf lesions and less than 5% leaf abscission; SS=Slightly susceptible, few leaf lesions and no leaf abscission; RD=Root system discolored; RR=Root system reduced in size; NI=Roots apparently normal but the fungus was isolated; N=Roots apparently normal but the fungus was not isolated.

of these varieties yielded the fungus on reisolation (Table 1). Three of 11 varieties grown in soil infested with *Cylindrocladium scoparium* exhibited reduced and discolored root systems, six varieties had discolored roots only, one variety appeared to have healthy roots from which the fungus was isolated, and one variety had apparently healthy roots from which the fungus could not be isolated (Table 1). As in leaf pathogenicity tests, the isolate of *C. scoparium* was the most virulent.

## LITERATURE CITED

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## EVALUATIONS OF EASTER LILY AND HYBRID LILY CULTIVARS FOR COMMERCIAL FLOWER PRODUCTION IN FLORIDA

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## ABSTRACT

Two plantings of seven cultivars of diploid and tetraploid Easter lilies and three plantings of ten hybrid lily cultivars were evaluated in field (saran-house) culture at Bradenton. The diploid 'Georgia' averaged 10.0 flowers on 71 cm stems and flowered in 168 days from the October planting and in 154 days from the November planting. Flowering of the tetraploids ranged from 160 to 222 days and between 3.6 and 5.4 flowers were produced on 57 to 93 cm stems.

'Enchantment' and 'Harmony' were the most promising hybrid lily cultivars for potential cut flower use. Flower shape and placement, fragrance, bud count and disease tolerance were major problems which would limit use of most of the remaining 8 cultivars. Only 'Enchantment', 'Lime-light', 'Helios', and 'Black Dragon' returned as many bulbs at digging as were planted. Disease losses were high with 'Cinnabar', 'Harmony', and 'Sonata'.

## INTRODUCTION

The Florida cut-flower industry, with annual sales greater than 32 million dollars, is heavily concentrated on two floral crops, chrysanthemums

and gladiolus. These comprise over 80 per cent of total flower sales in the state (4, 5). Many flower firms are beginning to diversify, growing crops which a few years ago were considered of less value and importance. Some of these "minor" crops grown for cut-flower production are: statice (*Limonium*), Baby's Breath (*Gypsophila elegans*), asters (*Callistephus chinensis*), carnation (*Dianthus caroyophyllus*), snapdragon (*Antirrhinum majus*), and delphinium (*Delphinium elatum*). In addition to these, over 25 acres of Easter lilies (*Lilium longiflorum*) and a small acreage of hybrid lilies are grown for cut-flower sales. 'Georgia' is the principal Easter lily cultivar grown but numerous hybrid lily cultivars are grown.

Within the past 20 years major advances have been made in the development of tetraploid Easter lilies, with the release of 9 tetraploid cultivars by the United States Department of Agriculture. Eight were hybrid selections and the last was an autotetraploid of 'Georgia', called 'Georgia Tetra'. These tetraploids had larger but fewer flowers than the diploids. Interspecific crosses of lily species have produced some spectacular hybrids with many different flower shapes and colors.

Some evaluation of hybrid lilies for plant culture has been conducted (2) but little use of the hybrids has been made in the U.S. commercial cut-flower industry. Potential for commercial use exists as evidenced by success elsewhere, such as in Japan where lilies are grown year round and constitute one of the three most important cut flower crops. The potential is also indicated by the fact that several million bulbs of American hybrid lilies are shipped to Europe each year and are rapidly