Influence of Host Plant and Isolate Source on Myrothecium Leaf Spot of Foliage Plants

A. R. CHASE, Assistant Professor of Plant Pathology, University of Florida, Agricultural Research Center, Apopka 32703

ABSTRACT

Chase, A. R. 1983. Influence of host plant and isolate source on Myrothecium leaf spot of foliage plants. Plant Disease 67:668-671.

Myrothecium roridum isolates were pathogenic on *Aeschynanthus pulcher, Aglaonema commutatum, Aphelandra squarrosa, Dieffenbachia maculata, Episcia cupreata, Fittonia verschaffeltii argyroneura, Hoya carnosa, Nematanthus* sp., *Peperomia* spp., *Pilea cadierei*, and *Spathiphyllum* sp. 'Clevelandii.' Seven isolates of the pathogen from different hosts were cross-inoculated to seven of the original hosts. In general, some plant genera were more susceptible to all isolates, and some isolates were more virulent than others; however, there was no evidence of host specificity.

Additional key words: crown rot

Myrothecium roridum Tode ex Fr. has been recognized as a seriously damaging leaf spot and crown rot pathogen of some ornamental plants, including gardenia (*Gardenia jasminoides* Ellis) (5), snapdragon (*Antirrhinum majus* L.) (9), and gloxinia (*Sinningia speciosa* (Lodd.) Hiern.) (6,7). Recently, a Myrothecium leaf spot of a foliage plant, *Aphelandra squarrosa* Nees (Zebra plant) (2), was described (Fig. 1).

Journal Series 4138 of the Florida Agricultural Experiment Stations.

Accepted for publication 29 November 1982.

The publication costs of this article were defrayed in part by page charge payment. This article must therefore be hereby marked "*advertisement*" in accordance with 18 U.S.C. § 1734 solely to indicate this fact.

Myrothecium spp. have been isolated from leaf spots of at least 23 genera of foliage plants many times during the past 20 yr (records of the Department of Agriculture and Consumer Services, Division of Plant Industry, Gainesville, FL 32602). The present study was conducted to characterize the host range of *M. roridum* on 15 genera of foliage plants and to investigate the importance of pathogen origin and host plant species on severity of disease development.

MATERIALS AND METHODS

M. roridum (4,8) was isolated from *Aglaonema commutatum* Schott 'Silver Queen,' *Aphelandra squarrosa* 'Dania,' *Dieffenbachia maculata* (Lodd.) G. Don 'Perfection,' *Nematanthus* sp. L. 'Tropicana,' and *Sinningia speciosa* (gloxinia). Leaf pieces were excised, surface-disinfested in 0.52% sodium hypochlorite for 3 min, rinsed in sterile deionized water (SDW), and plated on potato-dextrose agar (PDA) or PDA amended with 100 μg streptomycin sulfate per milliliter of medium (PDAS). Plates were incubated in approximately 2.2 klux of fluorescent light (12 hr/day) at 24–26 C for 7–10 days. Fungal isolates were transferred by single hyphal tips to PDA slants and maintained at 15 C throughout the study. Two additional isolates were obtained from *Peperomia obtusifolia* (L.) A. Dietr. (baby rubber tree) and *Kalanchoe blossfeldiana* Poelln. from Dr. A. W. Engelhard, Agricultural Research and Education Center, Bradenton, FL 33508.

Inocula were produced under the conditions described above on PDA plates and grown for 2 wk. Conidia were removed from plates using SDW and a sterile rubber spatula and diluted with SDW after being counted in a hemacytometer. Inocula for all experiments consisted of conidial suspensions of *M. roridum* adjusted to 1×10^6 conidia per milliliter. Three wounds produced with a sterile dissecting needle were made on each of five leaves of each plant. The plant was sprayed to runoff with a conidial suspension or SDW, bagged in polyethylene for 48 hr, and placed in a completely randomized or a randomized

complete block design on a greenhouse bench receiving approximately 21.6 klux of natural light at 20–30 C for the duration of the test.

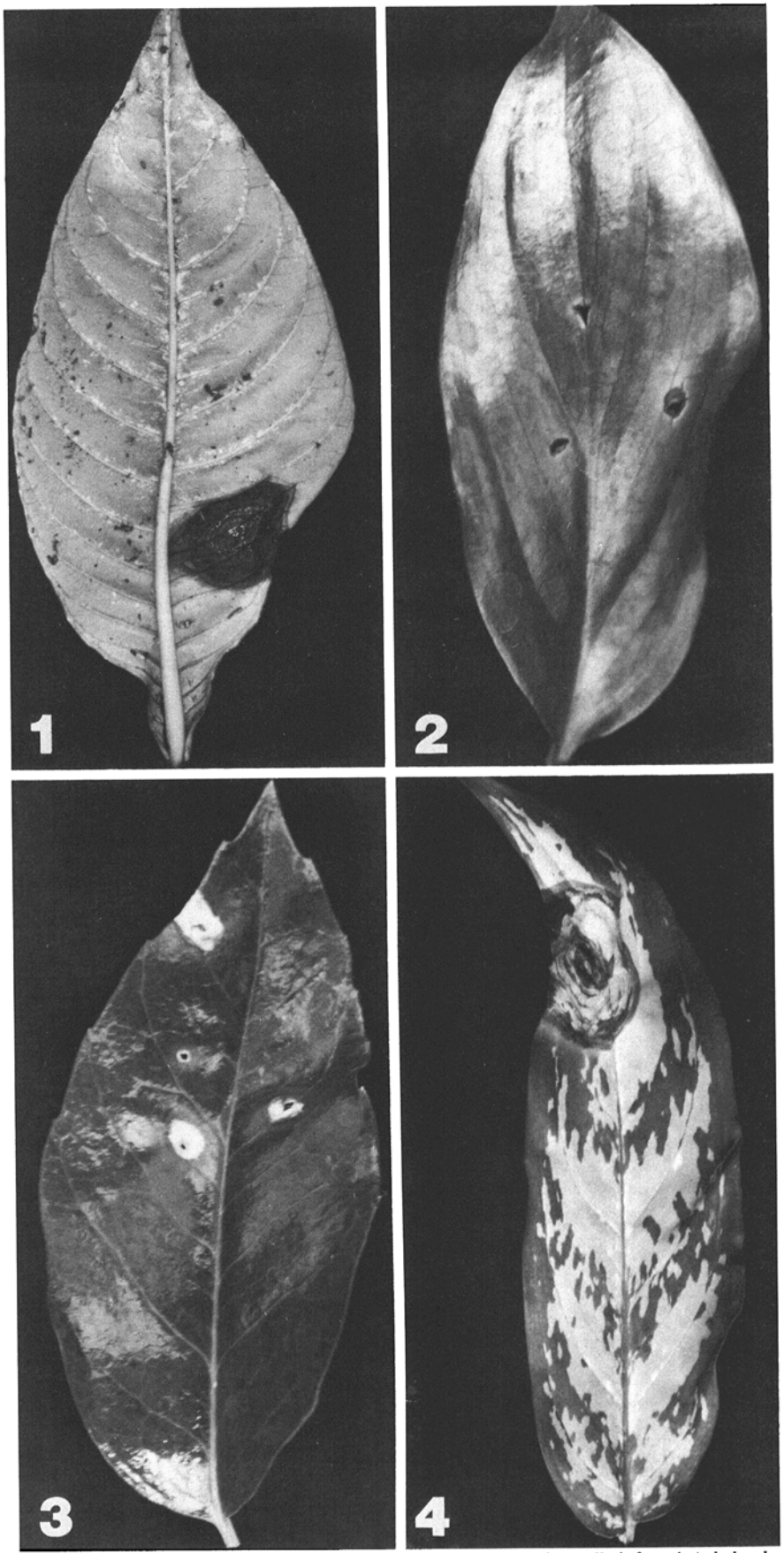
Plants were produced from shoot cuttings or obtained from growers. All plants were established in steam-sterilized potting medium consisting of Canadian peat, cypress shavings, and pine bark (2:1:1 by volume) and amended with 4.4 kg of Osmocote (19:6:12 slow-release, complete fertilizer, Sierra Chemical Co., Milpitas, CA), 4.2 kg of dolomite, and 0.9 kg of Micromax (micronutrients source, Sierra Chemical Co.) per cubic meter of medium. Plants, which were placed in plastic pots measuring 10, 12.5, or 15 cm according to their size, ranged in age from 4 to 12 wk at the time of inoculation.

The first test was performed to determine the host range of an isolate of *M. roridum* from *Aphelandra squarrosa* 'Dania' on the following foliage plants: *Aeschynanthus pulcher* (Blume) G. Don (lipstick plant), *Aglaonema commutatum* 'Silver Queen,' *Aphelandra squarrosa* 'Dania' (aphelandra), *Brassaia actinophylla* Endl. (schefflera), *Dieffenbachia maculata* 'Perfection,' *Epipremnum aureum* (Linden & Andre) Bunt (pothos), *Episcia cupreata* (Hook.) Hanst (flame violet), *Fittonia verschaffeltii argyroneura* (Coem.) Nichols. (silver nerve plant), *Hedera helix* L. (English ivy), *Hoya carnosa* (L.f.) R. Br. (wax plant), *Nematanthus* sp. 'Tropicana,' *Peperomia* spp., *Philodendron scandens oxycardium* (Schott) Bunt. (heartleaf philodendron), *Pilea cadierei* Gagnep. & Guillaum (aluminum plant), and *Spathiphyllum* Schott 'Clevelandii.' Ten plants of each species were used in each test and inoculated with either the conidial suspension or SDW. The number of developing lesions more than 2 mm in diameter and the presence or absence of *M. roridum* sporodochia were recorded twice at 2-wk intervals. Reisolation of the pathogen was performed using previously described methods and PDAS medium. This test was performed five times.

The host ranges of seven isolates of *M. roridum* were determined using the seven original host plants from which they were isolated. These included aglaonema, aphelandra, dieffenbachia, gloxinia, kalanchoe, nematanthus, and peperomia, produced as described earlier. Three plants of each species were inoculated with each isolate of the pathogen or SDW, in the manner described above. The number and size of resulting lesions were recorded after 2 wk, and evidence of sporodochia or reisolation of the pathogen was performed as described. This test was performed four times.

RESULTS

Most plants inoculated with *M. roridum* conidia were susceptible to the pathogen to some degree (Table 1). The



Figs. 1–4. Foliage plants infected with *Myrothecium roridum*: **(1)** Naturally infected *Aphelandra squarrosa* (Zebra plant) showing severe lesion reaction. Black and white sporodochia of the pathogen can be seen on the lower leaf surface in concentric rings within the lesion. **(2)** *Brassaia actinophylla* (schefflera) artificially inoculated with conidia of *M. roridum* showing a rarely seen moderate lesion reaction to the pathogen. **(3)** *Spathiphyllum* sp. artificially inoculated with conidia of *M. roridum* showing a typically small-lesion reaction to infection. **(4)** Naturally infected *Aglaonema commutatum* 'Silver Queen' showing a severe lesion reaction to infection.

most susceptible hosts were lipstick plant, aphelandra (Fig. 1), begonia, dieffenbachia, flame violet, nematanthus, and peperomia. Two species of *Peperomia* were inoculated, and *Peperomia* sp. 'Repi' was more susceptible than *P. obtusifolia*. Only silver nerve plant was immune, but schefflera (Fig. 2), spathiphyllum (Fig. 3), and philodendron were highly resistant to the pathogen. Dieffenbachia and aglaonema plants (Fig. 4) developed the largest lesions most rapidly (within 5 days of inoculation). There were no lesions on any plants that were not previously mechanically wounded. *Myrothecium* sporodochia were noted in lesions on many plants, and the pathogen was reisolated from each of the plants judged to be susceptible to the pathogen. Occasionally, lesions were noted at wound sites on uninoculated plants, presumably because of contamination during the inoculation process or inoculum present on the host prior to inoculation.

Table 1. Host range of *Myrothecium roridum* isolate 81-178 on foliage plants

Host	Plants developing disease (%)[a]					Plants diseased (mean %)
	Test 1 24 July 1981	Test 2 9 Nov. 1981	Test 3 9 Oct. 1981	Test 4 25 Feb. 1982	Test 5 4 Mar. 1982	
Aeschynanthus	100	80	20	100	...	75
Aglaonema	...[b]	33	...	80	43	53
Aphelandra	80	20	100	80	...	70
Begonia	...	...	...	100	...	100
Brassaia	...	...	0	20	8	10
Dieffenbachia	...	100	20	100	100	80
Epipremnum	0	40	0	80	...	30
Episcia	...	...	80	60	80	75
Fittonia	0	...	...	0	0	0
Hedera	0	...	...	60	20	25
Hoya	20	60	40	...	...	35
Nematanthus	100	100	20	...	60	70
Peperomia	80	93	50	...	...	77
Philodendron	20	0	0	0	...	5
Pilia	60	20	0	100	...	45
Spathiphyllum	...	20	40	20	0	24
Plants diseased (mean%)	46	51	31	62	26	

[a] Five or more plants of each genus were used in each inoculation test under greenhouse conditions.
[b] Not tested.

Table 2. Influence of host plant on mean percentage of lesions developed on plants inoculated with conidia of *Myrothecium roridum* isolates from the original seven hosts

Host	Lesions developed for all isolates (mean %)[y]				Lesions developed for all tests (mean %)
	Test 1 18 Jan.	Test 2 9 March	Test 3 22 March	Test 4 20 April	
Aglaonema	0.4 ab[z]	0.8 b	14.8 f	8.8 b	6.2
Aphelandra	0.1 ab	0.0 a	3.6 b	26.1 d	7.4
Dieffenbachia	5.6 d	14.5 d	14.9 f	8.2 b	10.8
Kalanchoe	10.0 e	12.8 c	2.1 a	14.8 c	9.9
Nematanthus	3.5 c	0.8 b	12.6 de	32.0 e	12.2
Peperomia	0.0 a	0.0 a	6.6 c	0.8 a	0.9
Sinningia	0.9 b	0.0 a	11.9 d	9.0 b	5.4

[y] Tests conducted in a greenhouse in 1982.
[z] Numbers in the same column followed by the same letter were not statistically different at the 5% level using Duncan's new multiple range test.

Table 3. Influence of isolate source on mean percentage of lesions developed on the seven original host plants inoculated with conidia of *Myrothecium roridum*

Isolate no.	Original host	Lesions developed for all hosts (mean %)[y]				Lesions developed for all tests (mean %)
		Test 1 18 Jan.	Test 2 9 March	Test 3 22 March	Test 4 20 April	
81-131	*Aglaonema*	1.9 a[z]	3.6 b	9.0 b	13.4 b	7.0
81-178	*Aphelandra*	3.5 b	3.1 a	11.5 c	13.5 b	7.9
81-161	*Dieffenbachia*	1.6 a	3.1 a	8.0 ab	14.9 b	6.9
81-198	*Kalanchoe*	2.1 a	4.8 d	13.8 d	18.0 c	9.7
81-71	*Nematanthus*	5.8 c	4.1 c	8.8 ab	15.4 b	8.5
81-199	*Peperomia*	1.9 a	6.4 e	7.2 a	9.4 a	6.2
81-197	*Sinningia*	3.8 b	4.0 bc	7.4 a	15.1 b	7.6

[y] Tests conducted in a greenhouse in 1982.
[z] Numbers in the same column followed by the same letter were not statistically different at the 5% level using Duncan's new multiple range test.

Inoculations of seven host plants with seven isolates of *M. roridum* gave variable results (Tables 2 and 3). As seen in the previous set of experiments, each test gave different results. In most cases, the highest number of lesions did not occur on the original host, indicating that isolates of *M. roridum* are not host specific. The general hypothesis of host specificity was tested as follows. Data for each isolate were ranked for each test and the sum of the ranks for each isolate on its host species calculated. The normal distribution for the data was assumed, and a measure of the variation from this was determined by $Z = \text{sum} - 28/14$, where 28 is the sum if no specificity occurred and 14 is the variance. The value of Z needed to obtain a significant result at 5% level of probability is ± 1.645. The four tests had values of 1.470, −0.134, 0.134, and −1.203, respectively. These tests show that there is no host specificity for isolates of *M. roridum*.

Further analysis of these data indicated that there were significant differences ($P = 0.05$) between isolates and hosts in each test. Influence of the host plant (Table 2) was not consistent among tests. In some cases, plants that were least susceptible in three previous tests were the most susceptible to *M. roridum* in the fourth. In general, however, peperomia plants were least susceptible and dieffenbachia, kalanchoe, and nematanthus most susceptible to this pathogen. The influence of isolate source on disease severity was also variable (Table 3). Peperomia isolate 81-199 caused the least disease on the hosts tested, whereas kalanchoe isolate 81-198 caused the most disease. Overall, the more virulent isolates originated from the more susceptible hosts with the obvious exception of dieffenbachia. In test four, nematanthus plants inoculated with *M. roridum* isolates died within 7 days (Table 2). Severe lesions developed at wound sites as well as all other parts of the plants. This was the first time that severe disease occurred in the absence of mechanical wounding on this host. In another test (Table 3), gloxinias that were held to maturity developed characteristic symptoms of crown rot and girdling (6,7).

DISCUSSION

This paper describes a serious leaf spot disease of many foliage plants caused by *M. roridum*. Although plants showed varying degrees of susceptibility to the pathogen, there was no evidence of host specificity in seven isolates from different hosts. As past research has demonstrated (1,8), isolates showed a range of virulence that, in general, was related to the susceptibility of their original host to the pathogen. The variation between tests may result from environmental differences

occurring at test times and differences in host conditions. The optimum temperature and humidity for disease development was not determined. Because these two factors change drastically during the course of a year, the variability between experiments may be caused at least partially by their influences. Preliminary results indicate that air temperature is an important factor influencing the development of Myrothecium leaf spot of aphelandra, peperomia, and dieffenbachia. Changes as small as 3 C alter development of the disease. In addition, host plant nutrition is important in host susceptibility. Further testing by the author is underway regarding these factors.

This disease has been very damaging in many nurseries where a large variety of foliage plants are grown and may be partially or completely dependent upon the wide host range of single isolates of the pathogen. Myrothecium leaf spot is primarily dependent upon mechanical wounding for infection to occur, and careful handling of all plants is very important. Disease control in several plants (nematanthus, gloxinia, and spathiphyllum seedlings) must include use of pathogen-free plants, sterile soil and pots, and pesticide applications, if needed, because infection occurs in these plants without apparent wounding. Both chlorothalonil and maneb-zinc ion complex provided good control of this disease on *Begonia* × *rex-cultorum* Bailey (Rex begonia) (3). However, because neither pesticide has a broad registration for use on ornamentals, labels must be consulted prior to use for control of Myrothecium leaf spot on foliage plants.

ACKNOWLEDGMENTS

Appreciation is extended to Central Florida growers for their generous donations of plant materials. W. A. McLees and M. K. Salt provided excellent technical assistance. Special thanks to D. D. Brunk for identification of the isolates and assistance in their collection and to F. G. Martin and R. Randles for aid in statistical analysis of data.

LITERATURE CITED

1. Brooks, F. T. 1944. Notes on the pathogenicity of *Myrothecium roridum* Tode ex Fr. Trans. Br. Mycol. Soc. 27:155-157.
2. Chase, A. R. 1981. Comparison of *Myrothecium* sp. and *Corynespora cassicola* leaf spots on two cultivars of *Aphelandra squarrosa* Nees. Proc. Fla. State Hortic. Soc. 94:115-116.
3. Chase, A. R. 1982. Chemical control of Myrothecium crown rot and leaf spot of Rex Begonia. Fla. Agric. Res. Cent., Inst. Food Agric. Sci., Res. Rep. RH-1982-10.
4. Ellis, M. B. 1976. Dematiaceous Hyphomycetes. Commonw. Mycol. Inst., Kew, Surrey, England. 608 pp.
5. Fergus, C. L. 1957. *Myrothecium roridum* on Gardenia. Mycologia 49:124-127.
6. Littrell, R. H. 1965. A Myrothecium rot of gloxinias. Plant Dis. Rep. 49:78-80.
7. Ploetz, R. C., and Englehard, A. W. 1980. Chemical control of Myrothecium disease of gloxinia. Proc. Fla. State Hortic. Soc. 93:181-183.
8. Preston, N. C. 1947. Observations on the genus *Myrothecium* Tode. I: The three classic species. Mycologia 39:548-555.
9. Taubenhaus, J. J. 1935. On black crown rot of greenhouse snapdragons caused by *Myrothecium roridum* Tode. (Abstr.) Phytopathology 25:969-970.