



Fig. 4. Profuse conidial masses of *Colletotrichum gloeosporioides* produced on necrotic phyllodes of *Acacia cyanophylla* under conditions of high temperatures and relative humidity.

pathogen sporulates profusely (Fig. 4), and entire seedling crops have been lost to the disease.

Colletotrichum gloeosporioides is reported to overwinter in plant debris (11) as well as infected acacia seed (5, 14). In fact, infected seed has been considered the most important source of primary anthracnose infections in nursery crops (14). Limited isolations (authors-unpublished) have failed to confirm a seed-borne aspect in Florida. Indeed, the cosmopolitan distribution of *C. gloeosporioides* (10) suggests that the pathogen would hardly be dependent upon seed transmission.

Anthracnose of acacia represents a noteworthy potential threat to acacia production in Florida. Greater problems with this disease are likely to be experienced in nurseries and greenhouses as opposed to landscape settings due to the pathogen's propensity to build up under conditions of warm temperatures and high humidities (10) often enhanced by "closed quarters". Clearly, however, anthracnose of acacia is not the "internationally dangerous" disease it has been considered previously (14). Good cultural practices including 1) the use of clean soil (12), 2) various seed treatments if necessary (5, 12), 3) sanitation, 4) minimal overhead

irrigation (10), and 5) the use of fungicides (5, 12 and Table 2) in certain cases (in accordance with label restrictions and local regulations) provide the grower with an effective battery of control strategies for minimizing losses to anthracnose infections.

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Literature Cited

1. De Urries, M. J. 1952. Notas micologicas. Ann. Inst. Bot. A. J. Cavanilles 2:193-228.
2. Fischer, N. L., L. W. Burgess, T. A. Toussoun, and P. E. Nelson. 1982. Carnation leaves as a substrate and for preserving cultures of *Fusarium* species. Phytopathology 72:151-153.
3. Gibson, I. A. S. 1975. Diseases of forest trees widely planted as exotics in the tropics and southern hemisphere. Part I. Important members of the Myrtaceae, Leguminosae, Verbenaceae and Meliaceae. Commonwealth Mycol. Inst. Kew, Surrey.
4. Hartung, J. S., C. L. Burton, and D. C. Ramsdell. 1981. Epidemiological studies of blueberry anthracnose disease caused by *Colletotrichum gloeosporioides*. Phytopathology 71:449-453.
5. Hashimoto, H. 1968. Studies on the control of anthracnose of *Acacia dealbata* caused by *Glomerella cingulata* Stonem. Bul. Fukuoka-Ken For. Exp. Sta. 20.
6. Hawksworth, D. L., Sutton, B. C., and Ainsworth, G. C. 1983. Ainsworth and Bisby's Dictionary of the fungi. Commonwealth Mycol. Inst. Kew, Surrey.
7. Ito, K. and K. Shibukawa. 1956. Studies on some anthracnoses of woody plants. IV. A new anthracnose of *Acacia* with special reference to the life history of the causal fungus. Bul. Govt. Forest Exp. Sta. Meguro 92:51-64.
8. Liberty Hyde Bailey Hortorium Staff. 1978. Hortus Third. MacMillan Publishing Co., Inc. New York.
9. Merlo, P. A. 1969. Anthracnose of *Acacia longifolia* caused by *Colletotrichum dimatium* f. *truncata*. Revista Fac. Agron. Univ. La Plata 45:53-59.
10. Mordue, J. E. M. 1971. *Glomerella cingulata*. Commonwealth Mycol. Inst. Descriptions of pathogenic fungi and bacteria. No. 315.
11. Terashita, T. 1962. Studies on the diseases of *Acacia dealbata*. I. Isolation of pathogens and some aspects of overwintering. Bul. Govt. Forest Exp. Sta. Meguro 147:119-127.
12. Terashita, T. 1962. Studies on the diseases of *Acacia dealbata*. II. Control of the seedling diseases by chemicals. Bul. Govt. Forest Exp. Sta. Meguro 147:129-136.
13. Terashita, T. 1963. Studies on the diseases of *Acacia dealbata*. III. Taxonomic opinion on the anthracnose fungus. Bul. Govt. Forest Exp. Sta. Meguro 155:1-22.
14. U. S. Dept. Agr. Forest Service. 1963. Internationally dangerous forest tree diseases. U. S. Dept. Agr. Misc. Publ. No. 939.

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OXYCARBOXIN A NEW FUNGICIDE FOR CONTROL OF FRANGIPANI RUST IN NURSERY AND FIELD¹

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Abstract. Foliar sprays of oxycarboxin, at 1.2 g and 1.7 g per liter effectively controlled rust [*Coleosporium domingense* (Burk.) Arth.] of frangipani (*Plumeria rubra* L.) in nursery and field trials. Oxycarboxin effectively stopped defoliation as well. Mancozeb, sulfur and mancozeb plus sulfur, and ferbam sprays were not as effective.

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Rust of frangipani caused by *Coleosporium domingense* (1, 3, 4) is found throughout the tropical range of the host (3). This rust is not controlled effectively in nurseries, field plantings, or door yard plantings of frangipani. The disease which is at its peak during the spring months causes serious leaf drop. Leaf drop renders the door yard plants very unsightly and reduces saleability of the nursery and field plants. Mancozeb, sulfur, and ferbam are fungicides that must cover all leaf surfaces during infection periods if rust is to be controlled. A more effective fungicide is needed to provide control of this disease. This paper reports nursery and field evaluations to determine the efficacy of the fungicide oxycarboxin for control of frangipani rust on *Plumeria rubra*.

Materials and Methods

Two tests were carried out in the spring of 1979; one on nursery stock and the second on field stock. A randomized complete block design with 4 replications was used in both tests. Each plot contained 4 plants. Oxycarboxin was applied 4 times at 2-week intervals and all other chemicals were applied 8 times at weekly intervals with a hand sprayer at 35 psi. Sprays were started at the first signs of rust pustules.

The severity of rust was estimated by counting the number of pustules on the fourth fully expanded leaf from the branch tip. The percentage defoliation caused by the rust was measured by counting the leaves at commencement of the sprays and number of leaves at the termination of the test.

The chemicals evaluated in the studies were: oxycarboxin (Plantvax-75 W) at 1.2 g and 1.7 g/liter; mancozeb (Dithane M-45) at 1.8 g/liter; sulfur at 8.3 g/liter and ferbam 1.8 g/liter.

Results

Rust caused severe defoliation of unprotected plants in the nursery and the field. The effectiveness of the fungicides was similar when applied to nursery or field plants (Table 1, 2). All chemical treatments reduced disease and leaf drop (Table 1, 2).

Table 1. Effect of fungicides on rust rating and percent leaf drop of nursery grown frangipani.

Fungicide	Rate (g/liter)	Schedule	Rust rating ^{z,y}	Leaf drop ^y (%)
oxycarboxin	1.7	biweekly	0.1 a	0.0 a
oxycarboxin	1.2	biweekly	0.1 a	0.0 a
mancozeb	1.8	weekly	2.3 b	34.1 b
ferbam	1.8	weekly	2.4 b	37.0 b
sulfur	8.3	weekly	3.2 c	61.4 c
control	—	—	4.5 d	80.5 d

^zRust ratings: 0 = no pustules to 5 = 99% leaf surface with pustules and leaf drop.

^yMean separation by Duncan's multiple range test, 5% level.

Oxycarboxin applied to foliage of nursery and field plants significantly reduced the incidence of frangipani rust. Leaf rust reduction by oxycarboxin at 1.7 g and 1.2 g/liter was better than all other treatments with a mean disease rating of 0.1 for both rates in the nursery test and 0.2 and 0.5 in the field trial as compared to the control with 4.5 in the nursery trial and 5.0 in the field test (Table 1). Oxycarboxin at both rates reduced leaf drop to 0.0% in both the nursery plants and the field trial as compared to the control with 80.5% in the nursery plants and 94.5% leaf drop in the field plants (Table 2). Mancozeb at 1.8 g/liter and ferbam at 1.8 g/liter were equal in effectiveness with

Table 2. Effect of fungicides on rust rating and per cent leaf drop of field grown frangipani.

Fungicide	Rate (g/liter)	Schedule	Rust rating ^{z,y}	Leaf drop ^y (%)
oxycarboxin	1.7	biweekly	0.2 a	0.0 a
oxycarboxin	1.2	biweekly	0.5 a	0.0 a
mancozeb	1.8	weekly	3.5 b	59.8 b
ferbam	1.8	weekly	3.2 b	60.3 b
sulfur	8.3	weekly	4.0 b	88.2 c
control	—	—	5.0 d	94.5 d

^zRust ratings: 0 = no pustules to 5 = 99% leaf surface with pustules and leaf drop.

^yMean separation by Duncan's multiple range test 5% level.

rust ratings of 2.3 and 2.4 in the nursery trial and 3.5 and 3.2 in the field trial. However, leaf drop in mancozeb and ferbam treatments was unacceptable with 34 and 37% in the nursery test and 59 and 60% in the field test. Sulfur at 8.3 g/liter provided poor disease control with a disease rating 3.3 in the nursery trial and 4.0 in the field trial. The percent leaf drop for the sulfur treatment was a little better than the control with 61% in the nursery trial and 88% in the field trial.

Discussion

Oxycarboxin (Plantvax-75W) is a wettable powder suitable for use as a spray when suspended in water. Oxycarboxin as a wettable powder is labeled for the control of geranium rust and as a liquid formulation is used as a drench for control of carnation rust (2). Frangipani rust is an annual problem for nurseries and home owners in South Florida and the Caribbean region. The disease reduces the saleability of nursery stock and the aesthetic beauty of a full foliage flowering plant. The use of oxycarboxin not only reduces the disease but has an obvious advantage over the other recommended fungicides since it only takes 4 applications as compared to 8 or more weekly sprays with presently used chemicals. Oxycarboxin as a soil drench might be effective as the foliar sprays but such evaluation has not been made.

There were no toxic effects observed on the leaves, flowers or stems with oxycarboxin at the test rates and spray frequencies evaluated. At present oxycarboxin is approved by Environmental Protection Agency (EPA) for use on ornamentals and is available on the market.

Literature Cited

1. Arthur, J. C. 1934. Manual of the Rusts in United States and Canada. The Science Press Printing Co. Lancaster, PA.
2. Shurtleff, M. C. 1966. How to Control Plant Diseases in Home and Garden. 3rd ed. Iowa State University Press, Ames, Iowa.
3. Wellman, F. L. 1972. Tropical American Plant Disease. The Scarecrow Press, Inc. Metuchen, N.J.
4. Westcott, Cynthia. 1971. Plant Disease Handbook. 3rd ed. Van Nostrand Reinhold Company.