until monitoring techniques are completely studied. Otherwise, nurseries affected with this pest will rely on fixed calendar spray schedules, which may or may not control this pest.

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CONTROL OF SOME BACTERIAL DISEASES OF ORNAMENTALS WITH AGRIBOM[1]

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Abstract. **Agribrom was applied through an overhead mist system to determine efficacy against a variety of bacterial pathogens of ornamental plants. The first series of tests employed 55 ppm bromine delivered at the mist head every 30 min for 12 hour per day. Bromine treatments were initiated three days prior to pathogen inoculation. Disease severity was rated at different times following inoculation depending upon the specific disease. Agribrom gave a minimum of 40% control of the following diseases: Erwinia blight on *Philodendron selloum*, Pseudomonas leaf spot on chrysanthemum, and Xanthomonas leaf spots on English ivy, weeping fig, hibiscus, 'White Butterfly' syngonium, and anthurium. Bromine toxicity was noted on English ivy, weeping fig, and hibiscus at a rate of 55 ppm but not at 25 ppm (second series of tests). Agribrom provided less control of the diseases listed above when used at 25 ppm bromine. Diseases that were controlled at 25 ppm bromine included: Pseudomonas leaf spots on impatiens and bougainvillea and Xanthomonas blight on geranium.**

Bacterial diseases cause substantial losses in many floral, foliage and landscape crops throughout Florida. Currently available bactericides have limited usefulness due to lack of efficacy (1, 6), development of resistance (5, 7, 9, 10), or phytotoxicity (8). Development of bactericides for use on ornamental crops remains a low priority for the majority of pesticide manufacturers. During the past three years considerable research has been conducted on bactericidal effects of the fungicide fosetyl aluminum (Aliette 80WP)(2, 3). Although this fungicide may significantly aid in control of some bacterial diseases under some conditions, it will not fill all needs for bactericides on ornamentals.

Agribrom (Great Lakes Chemical Corporation, West Lafayette, IN 47906), has been labeled as an algicide for several years and claims have been made regarding its effectiveness in controlling both fungal and bacterial diseases. The following research was conducted to partially evaluate its potential for bacterial disease control on eleven different ornamental crops.

Materials and Methods

Mist treatment. Two benches in a fiberglass-covered greenhouse were used for all tests. One bench received the Agribrom treatment while the other bench served as the nontreated control. An Agribrom stock solution was prepared every other day by adding 8 g of the powder to 3L hot tap water and placing on a hot plate until completely dissolved (usually 1 hour). The stock was then stored in a holding tank shielded from light exposure. The stock solution was added to the mist system by a Dosatron proportioner (Dosatron International Inc., Clearwater, FL 34615) set at 4% which diluted the solution delivered to the leaf surface to about 55 ppm for the first series of tests and 25 ppm for the second series of tests. The mist system operated for 35 sec every half hour for 12 hours per day. This treatment was started three days prior to inoculation and continued until test completion (up to one month).

Plant and pathogen preparation. Plants were obtained as seedlings or were rooted from cuttings. They were grown in Vergro potting medium usually in a 10-cm (4-in) pot until they were well established. Fertilizer was applied once at planting at about 1.5 g/pot of Sierra 17-6-12 controlled-release fertilizer (Grace-Sierra, Milpitas, CA 95035). A minimum of 10 plants was used for each of the following treatments: 1) noninoculated-control, 2) inoculated-control, 3) noninoculated - Agribrom treated, and 4) inoculated-Agribrom treated.

Inoculum was grown for 2 days on nutrient agar medium and adjusted to concentrations between 1×10^6 and 1×10^8 depending upon the disease pressure desired. Plants were removed from mist, inoculated by spraying to drip with a bacterial suspension and returned 2 hours later. Disease severity was determined after 2 days to 4 weeks according to its development and was reflected by the number of lesions per plant for the majority of the diseases tested. The plants and pathogens included are listed in Table 1. Several tests were repeated with one or both rates of bromine.

Results and Discussion

Agribrom, applied at the 55 ppm bromine rate, provided some degree of control for the majority of diseases

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Table 1. Efficacy of Agribrom at application rates of 25 or 55 ppm bromine on some bacterial diseases of ornamentals.

Plant	Pathogen	Bromine (ppm)	Test	Percent control
Anthurium andraeanum	*Xanthomonas campestris pv. dieffenbachiae*	55	1	40
Bougainvillea sp.	*Pseudomonas andropogonis*	25	1	59
		25	2	0
Chrysanthemum morifolium	*Pseudomonas cichorii*	55	1	100
		25	2	71
Dieffenbachia maculata	*Xanthomonas campestris* pv. *dieffenbachiae*	55	1	12
Ficus benjamina	*Xanthomonas campestris* pv. *fici*	55 phyto[a]	1	63
		25	2	0
		25	3	66
Hedera helix	*Xanthomonas campestris* pv. *hederae*	55 phyto	1	88
		55 phyto	2	46
		25	3	87
Hibiscus rosa-sinensis	*Xanthomonas campestris* pv. *malvacearum*	55 phyto	1	100
		25	2	76
Impatiens Wallerana	*Pseudomonas syringae*	25	1	70
		25	3	60
Pelargonium hortulanum	*Xanthomonas campestris* pv. *pelargonii*	25	1	70
		25	2	67
Philodendron selloum	*Erwinia chrysanthemi*	55	1 high disease	80
		55	2 high disease	71
		55	3 low disease	100
		55	4 low disease	100
Syngonium podophyllum	*Xanthomonas campestris* pv. *dieffenbachiae*	55	1	70
		25	2	0

[a]Phytotoxicity occurred on these plants in the tests noted.

tested including each of the three major genera causing diseases of ornamentals (*Erwinia, Pseudomonas,* and *Xanthomonas*). Some diseases such as Xanthomonas blight were not significantly affected by Agribrom treatment on one host (dieffenbachia) but were significantly affected on other hosts (anthurium and syngonium) (Table 1). Control of Erwinia blight on *P. selloum* was directly affected by the severity of disease. When a very high rate of inoculum was applied, disease control was between 70 and 80% but reached 100% when a moderate rate of inoculum was applied. In general, the degree of control was reduced when the rate of bromine was dropped from 55 to 25 ppm. This can be seen for Pseudomonas leaf spot of chrysanthemum and Xanthomonas leaf spots of hibiscus and syngonium (Table 1).

Bromine toxicity was noted on three of the test plants (English ivy, weeping fig, and hibiscus) but was only present when the rate of bromine was 55 ppm and, although damage to older leaves did not disappear when bromine treatment was discontinued, new leaves were asymptomatic.

It seems likely that Agribrom could be an effective bactericide when used in a water treatment program such as that described here. Control of some diseases could be achieved with the 25 ppm bromine rate on a continuing basis because pathogen populations would be eliminated when they were at low levels. If foliar diseases are to be controlled, the foliage of the plants must receive treatment with bromine on a continuing basis. Previous work testing a single daily application failed to show any benefit against two fungal diseases (4). Mist systems and perhaps fog, capillary mat and ebb and flow systems may be good methods to use for Agribrom application for foliar or root pathogens.

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