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INSECTICIDE AND INSECT GROWTH REGULATOR CONTROL OF GREEN PEACH APHID, BANDED GREENHOUSE THRIPS AND A FOLIAR MEALYBUG ON APHELANDRA[1]

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Abstract. **Insecticides, Ambush®, Diazinon®, Meta-Systox-R®, Orthene®, Pirimor®, Temik®, Vydate®, UC-51762 and the insect growth regulator, Enstar® were evaluated for control of green peach aphid,** Myzus persicae **Sulzer; banded greenhouse thrips,** Hercinothrips femoralis **(O. M. Reuter); and a foliar mealybug,** Phenacoccus solani **Ferris on** Aphelandra squarrosa **Nees. Temik granules were applied to the soil surface with remaining chemicals applied as foliar sprays at a 9 or 14 day interval. Ambush, Meta-Systox-R, Orthene and Pirimor effectively reduced aphids 1 day post-initial treatment. Ambush, Enstar, Meta-Systox-R and UC-51762 did not maintain low populations. Thrips were rapidly controlled generally by Ambush, Orthene and Temik. Following a second spray, thrip populations were controlled also by Meta-Systox-R and Vydate but not Diazinon. Orthene and Vydate effectively reduced** P. solani **7 days post-initial treatment while applications of Ambush, low concn of Enstar and Meta-Systox-R were less effective. No phytotoxicity was noted. Orthene and Vydate appear to be excellent candidates for broad spectrum insecticides that might be employed in the greenhouse production of** A. squarrosa.

Green peach aphid, *Myzus persicae* Sulzer; banded greenhouse thrips, *Hercinothrips femoralis* (O. M. Reuter); and a foliar mealybug, *Phenacoccus solani* Ferris are often economically important pests of ornamentals wherever intensive cropping occurs under greenhouse conditions (1, 2). In Florida, the important tropical foliage plant, *Aphelandra squarrosa* Nees (aphelandra), often is severely infested with these pests (3). Losses to growers occurs as a result of direct feeding activity, reduced aesthetic and market value and by quarantine restrictions often imposed on infested material. Effective control of these pests has proven to be extremely difficult with currently available chemicals thus resulting in infested plants often reaching consumers (3, 6).

The purpose of these evaluations was to determine the efficacy and potential phytotoxicity of several conventional insecticides and an insect growth regulator (IGR) in control of the previously mentioned pests.

Materials and Methods

Three efficacy tests were carried out in 1976-1977 using *A. squarrosa* cv. Dania, 8-10 inches[2] high, grown singly in 4 inch (Tests 1, 2) or 6 inch (Test 3) diam plastic containers with a soil mix of 3 parts Florida peat and 1 part mason sand plus 7 lb. dolomite, 3 lb. Perk® (minor elements supplement, Kerr-McGee Chemical Co., Jacksonville, FL) and 10 lb. Osmocote® 14-14-14 (Sierra Chemical Co., Newark, CA)/yd^3. Test plants were infested with individual pests from a greenhouse colony and following development of the population for 2-4 weeks, plants were arranged into a completely randomized design on raised greenhouse benches. All plants were maintained under conditions similar to commercial production. In all tests infested plants that were not treated served as controls.

In Test 1, *M. persicae* infested plants received 2 sprays, 14 days apart, of the following insecticides and lbs. AI/100 gal: Ambush® 2 EC (a new synthetic pyrethroid with the common name, permethrin), 0.125; Meta-Systox-R® 2 EC (oxydemetonmethyl), 0.375; Orthene® 75% S (acephate), 0.5; Pirimor® 50% WP (pirimicarb), 0.125, 0.25; UC-51762 75% WP (an experimental carbamate insecticide), 0.25, 0.5; and the IGR, Enstar® 5 E (Kinoprene), 0.317. Treatments contained 10 single plant replications with pretreatment and posttreatment populations counted on the newest developed apical leaves greater than 1 inch in length.

Aphelandra infested with *H. femoralis* comprised Test 2. Sprays were applied twice, 9 days apart, with the following insecticides and lbs. AI/100 gal: Ambush 2 EC, 0.125; Diazinon® 4 E, 0.5; Meta-Systox-R 2 EC, 0.375; Orthene 75% S, 0.25, 0.5; and Vydate® 2 L (oxamyl), 0.25, 0.5. Temik® 10 G (aldicarb) was included as a single application of 0.1 g/container (10 lbs. AI/Acre equivalent) followed immediately by a drench of 4 oz water/pot. Treatments contained 5 replications with 5 plants/replication and pretreatment and posttreatment no. of thrips were counted on a single leaf/plant/replication.

Plants in Test 3, infested with *P. solani,* received 2 sprays, 14 days apart of the following chemicals and lbs. AI/100 gal: Ambush 2 EC, 0.125; Enstar 5 E, 0.4, 0.8; Meta-Systox-R 2 EC, 0.375; Orthene 75% S, 0.25, 0.5; and Vydate 2 L, 0.25, 0.5. Replications were 10 single plant containers with pretreatment and posttreatment populations determined/2 newest developed leaves.

Spray applications were applied to run-off to both leaf surfaces using a 1- or 2-gal compressed-air-sprayer (ca 40 psi). Shields were placed between treatments during spraying to eliminate drift. Meta-Systox-R, a currently used compound for aphid, thrip and mealybug control, was included in all tests as a standard for comparison. Plyac®, a spreader-sticker (Allied Chemical, Atlanta, GA) was added to all controls and treatments, except Orthene, at the rate of 2 oz/100 gal water.

Differences between treatment means were evaluated by analysis of variance with significant means separated by Duncan's multiple range test.

Results and Discussion

In Test 1, single sprays of Orthene, Pirimor, Meta-Systox-R and Ambush effectively reduced populations of *M. persicae* 1 day post-initial application (Table 1). However, while population suppression continued with Orthene and both concn of Pirimor, final populations treated with Meta-Systox-R or Ambush did not differ from controls. The experimental carbamate insecticide, UC-51762 as well as the IGR, Enstar, were ineffective treatments. It is significant to note that Orthene and Pirimor treatments were continually exposed to alate migration from untreated control plants

[1]Florida Agricultural Experiment Stations Journal Series No. 773. Mention of a trademark name or a proprietary product does not constitute a guarantee or warranty of the product by the University of Florida and does not imply its approval to the exclusion of other products that may also be suitable. Appreciation is expressed to Mrs. M. Wettstein for her assistance in the completion of this study.

[2]For metric equivalents, see Table near the front of this Volume. Ed.

Table 1. Greenhouse evaluation of insecticides and an insect growth regulator applied as 2 foliar sprays for control of *Myzus persicae* infesting *Aphelandra* (Test 1).

Chemical	Concn lb AI/100 gal	Avg. no. aphids/2 apical leaves[z] Pre-treatment	Days post-initial application[y] 1	7	21	35
Orthene® 75% S	0.5	43.3 a	0.8 a	0.0 a	0.0 a	5.7 a
Pirimor® 50% WP	0.25	42.8 a	0.0 a	0.1 a	0.0 a	2.5 a
Pirimor® 50% WP	0.125	41.8 a	0.0 a	2.0 a	0.0 a	4.8 a
Meta-Systox-R® 2 EC	0.375	43.8 a	8.1 ab	9.5 a	23.2 b	38.8 cd
Ambush® 2 EC	0.125	42.7 a	5.3 ab	13.3 ab	36.4 b	48.5 d
UC-51762 75% WP	0.5	39.1 a	23.9 c	28.4 b	32.0 b	30.6 bc
UC-51762 75% WP	0.25	39.5 a	15.0 bc	26.8 b	35.7 b	48.7 d
Enstar® 5 E	0.317	43.2 a	58.8 d	80.4 c	63.7 c	23.0 b
Control	—	40.4 a	65.0 d	87.9 c	102.4 d	54.7 d

[z]Means within a column not followed by the same letter are significantly different (P = 0.05) (Duncan's multiple range test).
[y]2nd application 14 days after initial application.

Table 2. Greenhouse evaluation of insecticides applied as 2 foliar or a singular granular application for control of *Hercinothrips femoralis* infesting *Aphelandra* (Test 2).

Chemical	Concn lb AI/100 gal	Avg. no. thrips/leaf[z] Pre-treatment	Days post-initial application[y] 7	21	35	49
Ambush® 2 EC	0.125	5.6 a	0.0 a	0.0 a	0.0 a	0.0 a
Temik® 10 G	10.0[x]	6.1 a	0.04 a	0.0 a	0.0 a	0.0 a
Vydate® 2 L	0.25	6.2 a	1.0 abc	0.0 a	0.04 a	0.4 a
Vydate® 2 L	0.5	6.3 a	1.9 bc	0.0 a	0.0 a	0.8 a
Orthene® 75% S	0.25	6.3 a	1.6 abc	0.0 a	0.08 a	0.5 a
Orthene® 75% S	0.5	6.3 a	0.6 ab	0.0 a	0.04 a	0.2 a
Meta-Systox-R® 2 EC	0.375	5.9 a	1.5 abc	0.0 a	0.04 a	0.2 a
Diazinon® 4 E	0.5	6.2 a	3.9 d	4.5 b	2.4 b	6.2 b
Control	—	5.4 a	2.4 cd	6.0 c	8.0 c	6.1 b

[z]Means within a column not followed by the same letter are significantly different (P = 0.05) (Duncan's multiple range test).
[y]2nd application 9 days after initial application.
[x]lb AI/acre.

and still these chemicals suppressed population development slightly longer than 1 month.

Numbers of *H. femoralis* (Test 2) were rapidly reduced generally at 7 days post-initial application by Ambush, Temik and the 0.5 lb. AI concn of Orthene (Table 2). Following the second application, and during the remaining time of the test, thrips also were effectively suppressed by Vydate and Meta-Systox-R. Only Diazinon sprays failed to produce effective thrip control. Orthene at similar concn has been shown to be effective against gladiolus thrips, *Taeneothrips simplex* (Morison) (7).

In Test 3, Orthene and Vydate effectively reduced populations of *P. solani* 7 days post-initial treatment (Table 3). Mealybug no. remained low for greater than 1 month following sprays of Orthene and 0.5 lb AI Vydate. Applications of Ambush, Meta-Systox-R and Enstar appeared somewhat less effective; however, population reduction with the 0.8 lb AI concn of Enstar equaled that of Orthene or Vydate at 21 days posttreatment. In previous evaluations with *P. solani* infested aphelandra, Vydate and Meta-Systox-R drench applications also provided effective control (5). Enstar at the 0.8 lb AI concn also significantly reduced populations of *P. solani* (4) and another ornamental pest, the citrus mealybug, *Planococcus citri* (Risso) (8).

Table 3. Greenhouse evaluation of insecticides and an insect growth regulator applied as 2 foliar sprays for control of *Phenacoccus solani* infesting *Aphelandra* (Test 3).

Chemical	Concn lb AI/100 gal	Avg. no. mealybugs/2 apical leaves[z] Pre-treatment	Days post-initial application[y] 7	21	42
Orthene® 75% S	0.5	12.4 a	0.5 a	0.0 a	0.0 a
Orthene® 75% S	0.25	12.3 a	4.0 a	2.4 ab	5.6 ab
Vydate® 2 L	0.5	12.1 a	1.1 a	1.2 ab	6.2 ab
Vydate® 2 L	0.25	11.9 a	3.8 a	4.3 ab	15.6 cd
Ambush® 2 EC	0.125	12.4 a	8.2 b	6.1 b	13.3 bc
Enstar® 5 E	0.8	12.7 a	9.1 b	4.3 ab	14.2 cd
Enstar® 5 E	0.4	12.3 a	9.9 b	11.7 c	22.4 d
Meta-Systox-R® 2 EC	0.375	12.5 a	11.4 b	11.5 c	22.0 d
Control	—	12.4 a	18.3 c	23.8 d	35.7 e

[z]Means within a column not followed by the same letter are significantly different (P = 0.05) (Duncan's multiple range test).
[y]2nd application 14 days after initial application.

In all tests, no phytotoxicity was observed. Based on the overall pest reductions reported herein, Orthene and Vydate appear to hold good promise as broad spectrum insecticides for commercial greenhouse production of *A. squarrosa*.

Literature Cited

1. Denmark, H. A. 1976. The banded greenhouse thrips, *Hercinothrips femoralis* (O. M. Reuter) damage to ornamental plants. *Proc. Fla. State Hort. Soc.* 89:330-331.
2. Essig, E. O. 1915. Injurious and beneficial insects of California. *Supp. Calif. State Comm. Hort. Monthly Bul.* 4(4):1-541.
3. Hamlen, R. A. 1975. Populations of economically important insects and mites on Florida grown tropical foliage crops. *Florida Foliage Grower* 12(5):1-4.
4. ————. 1977. Laboratory and greenhouse evaluations of insecticides and insect growth regulators for control of foliar and root infesting mealybugs. *J. Econ. Entomol.* 70:211-214.
5. ———— and R. W. Henley. 1975. Control of solanum mealybug on zebra plant. *Florida Foliage Grower* 12(6):4-5.
6. Reinert, J. A. 1973. Cuban Laurel thrips = Systemic insecticides for control. *J. Econ. Entomol.* 66:1217-1218.
7. Schuster, D. J. and G. J. Wilfret. 1975. Evaluation of acephate on gladiolus for control of thrips and lepidopterous larvae. *Proc. Fla. State Hort. Soc.* 88:584-586.
8. Staal, G. B., S. Nassar and J. W. Martin. 1973. Control of the citrus mealybug with insect growth regulators with juvenile hormone activity. *J. Econ. Entomol.* 66:851-853.

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CHRYSANTHEMUM PRODUCTION SYSTEM VARIABLES AFFECT PEST POPULATION AND DAMAGE[1]

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Abstract. **Cultural variables of mulch, irrigation, cultivar, fertilization and chemical soil treatment were combined in a single factorial experiment to test their effects on insect pest populations and field growth of chrysanthemums.**

Data summed from weekly observations over the season indicate that larva-damaged plants were reduced in plots where mulch was used but mite frequency and density were increased. 'Manatee Iceberg' was more extensively damaged by larvae, mites, and leafminers than 'Albatross'; however, the latter cultivar was more readily attacked by aphids. Soil treatments by injection of oxamyl resulted in fewer leafmines but larger numbers of mites and aphids on foliage. The effects of fertilizer and irrigation variables on pest populations over the entire season were minimal. However, both had a significant initial and continued effect on plant growth in height.

Manipulation of agronomic and cultural practices to maximize their suppressant effect on crop pests is of much interest to crop protection scientists involved with crop management. Cultural practices augmented with resistant cultivars, biological control, and selective use of pesticides can result in more efficient and safe management of pests than reliance upon chemical toxicants alone. However, before manipulation of production variables can be integrated into the pest management scheme, their individual as well as interactive effects on pest populations must be described.

In Florida, production of chrysanthemum (*Chrysanthemum morifolium* Ram.) is accomplished in an intensively managed system that is dependent upon use of agrichemicals for pest control. Several variables in this system important as pest determinant factors were demonstrated for chrysanthemum grown under saran protection (1, 2, 3). Among the important variables were irrigation, fertilizer, mulch, chemical pesticide use and cultivar. Due to the high quality demand in cut flowers, the conventional damage threshold concepts have little application and consequently any cultural management practice that results in reduced pest potential or threat should gain ready acceptance.

This report summarizes data on the influence of production system variables on plant growth and pest populations and represents part of a series of experiments undertaken to determine the best cultural practices. Again, production practices—irrigation, use of bed covers, fertilization, cultivar, and pesticide use were treated as variables to determine how pest populations and plant growth respond.

Materials and Methods

The experimental plants were grown under a saran cover in 24 ground beds of Myakka fine sand, standard for chrysanthemum production. Land preparation included broadcast amendments of 1000 lbs/A dolomite,[3] 546 lbs/A triple superphosphate, 30 lbs/A FTE 503 fritted trace elements incorporated 4-6″ deep prior to forming the beds.

One-half of each 3′ x 72″ bed received 360 lbs/A KNO_3 and 71.6 lbs/A NH_4NO_3 broadcast and raked 1″ deep into the bed surface as a preplant fertilizer. Irrigation water was supplied once each hour throughout the crop season so that each day 0.46 in. water per bed-acre was distributed in each of four systems designed to vary the placement of water relative to bed width. The four systems were:

1. One Via-flo[R] type I micropore tube placed atop the center of the bed between positions of rows 3-4 of the 6-row bed.
2. Two tubes, placed between rows 2-3 and 4-5.
3. Three tubes, placed between rows 1-2, 3-4, and 5-6.
4. Two Anjac[R] biwall tubes with single emission parts 18″ apart, turned upward, between rows 2-3 and 4-5 of the 6-row bed.

One-half the beds were sealed with 40 lbs kraft paper with 0.25 mil clear polyethylene laminated to both sides. Liquid fertilizer at the rate of 30 lbs N/A/week for 10

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[3]For metric conversions, see Table near the front of this Volume. Ed.