630 US ISSN 0271-9916 October 1988 RESEARCH EXTENSION SERIES 097

Phytotoxicity of Insecticides and Acaricides to Anthuriums

Trent Y. Hata and Arnold H. Hara

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The Library of Congress has catalogued this serial publication as follows:

Research extension series / Hawaii Institute of Tropical Agriculture and Human Resources.—001-—[Honolulu, Hawaii]: The Institute, [1980–
v. : ill. ; 22 cm
Irregular.
Title from cover.
Separately catalogued and classified in LC before and including no. 044.
ISSN 0271-9916 = Research extension series - Hawaii Institute of Tropical Agriculture and Human Resources.
1. Agriculture—Hawaii—Collected works. 2. Agriculture—Research—Hawaii—Collected works. I. Hawaii Institute of Tropical Agriculture and Human Resources. II Title: Research extension series - Hawaii Institute of Tropical Agriculture and Human Resources
S52.5R47 630'.5—dc19 85-645281
AACR 2 MARC-S
Library of Congress [8506]

THE AUTHORS

Trent Y. Hata is a research associate, Beaumont Agricultural Research Center (Hilo), Hawaii Institute of Tropical Agriculture and Human Resources, University of Hawaii at Manoa.

Arnold H. Hara is an associate entomologist, Beaumont Agricultural Research Center (Hilo), Hawaii Institute of Tropical Agriculture and Human Resources, University of Hawaii at Manoa.

ACKNOWLEDGMENTS

The authors gratefully acknowledge A. Magno and E. Notley for technical assistance, and Green Point Nurseries, Hawaiian Heart Inc., and Sunshine Farms for their cooperation. This research was supported by the State of Hawaii, Governor's Agriculture Coordinating Committee, Grant No. GACC 85-5.

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PHYTOTOXICITY OF INSECTICIDES AND ACARICIDES TO ANTHURIUMS

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INTRODUCTION

Insecticides and acaricides are commonly used on anthurium (*Anthurium andraeanum* Andre) to produce marketable flowers. A limiting factor in using certain insecticides and acaricides on anthurium is phytotoxicity, or plant injuries resulting from pesticide applications. Phytotoxic responses differ among anthurium cultivars; an insecticide that is safe on one cultivar may not be safe on another.

Phytotoxic pesticides usually produce a characteristic injury to anthurium cultivars that may affect the entire plant or only parts of the plant. Typical phytotoxic responses include chlorosis, necrosis, bronzing, mottling, abnormal growth, and leaf drop.

The purpose of this study was to test certain registered and experimental insecticides and acaricides for phytotoxicity to anthuriums.

MATERIALS AND METHODS

Twenty insecticides and acaricides were tested on various anthurium (*Anthurium andraeanum* Lind. and Andre) cultivars between March 1986 and March 1987 in Hilo and Mountain View, Hawaii. All anthuriums were grown in volcanic cinder and under 80 percent polypropylene net shade. Each test plot consisted of 18 plants. Pesticides were tested at four times the recommended rate and were sprayed at weekly intervals for a minimum of four weeks. Sprays were applied until runoff occurred (about 250 gallons per acre), using a compressed-air sprayer with a No. 8004 Teejet nozzle (Spraying Systems Co., Wheaton, IL) at 40 psi. Phytoxicity to flowers and buds and to leaves was evaluated weekly during the application period and for six weeks after the last application.

RESULTS AND DISCUSSION

Phytotoxic Symptoms

Table 1 lists the phytotoxic results of 20 insecticides and acaricides on 13 anthurium cultivars. The following discussion describes the phytotoxic symptoms caused by the tested insecticides and acaricides.

Dursban. All formulations of Dursban tested—4 Emulsifiable Concentrate (EC), 50 Wettable Powder (WP), and 1.0 Microencapsulated (ME)—were phytotoxic to certain anthurium cultivars (see Table 1) and resulted in chlorotic and necrotic injury to the mature leaves of the plant. Dursban 50 WP and Dursban ME were the least phytotoxic to the cultivars; Dursban 4 EC was the most damaging. Figure 1 shows characteristic phytotoxic symptoms resulting from Dursban application.

Vydate Liquid. Anthurium cultivars susceptible to Vydate L injury responded with mottled leaves and curled margins. Vydate L is a systemic insecticide; symptoms may appear four to six weeks after an application (Figure 2).

Orthene 75 Soluble Powder. Bronzed abaxial surfaces were a characteristic injury symptom. Whites and pastels were previously reported as very susceptible cultivars (Mau, 1982). Like Vydate L, Orthene 75 SP is a systemic insecticide, and symptoms took several weeks to appear (Figure 3).

Isotox Insect Killer. Injury was characterized by crooked stems or leaf and spathe deformities with bronzed abaxial surfaces. Isotox contains Orthene and Kelthane and is also translocated systemically. Injury appeared three to six weeks after application. Ozaki cultivar developed purple spots on the spathe, presumably a result of the spray droplets. These spots, however, were unnoticeable within a few days (Figures 4 and 5).

Kelthane 1.6 EC. Within seven days of application, Kelthane 1.6 EC consistently damaged flowers in a majority of the cultivars tested. Damage was confined to the spathe, which developed distinct necrotic areas. Application to Calypso cultivar caused purple spots on the spathe, resulting from the spray droplets (Figure 6).

Vendex 4 L and Talstar 10 WP. These miticides were nonphytotoxic; however, an objectionable spray residue did occur at the 4x rate. When tested at the recommended use rate, both miticides left minor residues, which were unnoticeable on the flowers.

Tempo 2 EC. Tempo 2 EC was safe on the majority of cultivars tested; however, Mickey Mouse cultivar developed a white spotted appearance on the undersides of the leaves (Figure 7).

Studies showed that there is variation in the time period between application and manifestation of injury. Injury symptoms from contact insecticides appeared more quickly than those from systemic insecticides. Phytotoxic contact

Table 1. Phytotoxicity of certain insecticides and acaricides to various anthurium cultivars at 4x the recommended rate

Treatment and rate/100 gal	OZ[1]	NI	CA	KA	HB	KZ	MS	OS	MI	SE	AN	MK	KO
Avid 0.15 EC, 2.0 pt	S[2]	S	S	S	S	S	S	S	S	S	S	S	S
Cygon 400 EC,[3] 4.0 pt	S	S	S			S	S	S			S		S
Danitol 2.4 EC,[4] 21.2 fl oz	S	S	S	S	S	S	S	S	S	S	S	S	S
Dimethoate 267 EC,[5] 6.0 pt	S	S	S		S	S	S	S	S	S	S		
Dursban 4 EC, 4.0 pt	S	U	S	S	U	U	L		S	S	U	S	
Dursban 50 WP, 4.0 lb	S	U	S	S	M	U	L		S	S	S	S	
Dursban 1.0 ME,[3] 16.0 pt	S	M	S	M	S	M	S	S	M	S	S	M	S
Isotox Insect Killer, 37.5 pt	S	S	S	S		S	S			U	U	M	
Kelthane 1.6 EC,[3] 4.0 pt	U	U	L			U	U	U		S	U		U
Lannate L,[5] 8.0 pt	S	S	S		S	S	S	S	S	S	S		S
Malathion 5 EC, 8.0 pt	S	S	S	S		S	S	S		S	S	S	
Mavrik Aquaflow 2.0 F, 1.25 pt	S	S	S		S	S	S		S		S	S	S
Metasystox R 2 EC 6.0 pt	S	S	S		S	S	S		S	S	S		
Orthene 75 SP, 42.0 oz	S	S	S	S		S	S				U		
Pentac Aquaflow 4.0 F,[3] 32.0 fl oz	S	S	S			S	S	S			S		S
Savey 50 WP,[4] 8.0 oz	S	S	S			S	S	S			S		S
Talstar 10 WP,[6] 4.0 lb	S	S	S		S	S	S	S	S		S	S	S
Tempo 2 EC, 8.0 fl oz	S	S	S	S	S	S	S	S	L	S	S	S	S
Vendex 4 L , 4.0 pt	S	S	S		S	S	S	S	S				S
Vydate L,[3] 16.0 pt	S	U	M		U	S	U		U	S			

[1]Cultivar abbreviations: OZ = Ozaki, NI = Nitta, CA = Calypso, KA = Kaumana, HB = Hawaiian Butterfly, KZ = Kozohara, MS = Marian Seefurth, OS = Oshiro White, MI = Mickey Mouse, SE = Seapearl, AN = Anuenue, MK = Mauna Kea, KO = Kobayashi Obake.

[2]Relative safety: S = safe, M = moderate phytotoxicity, L = low phytotoxicity, U = unsafe.

[3]Not registered for use on anthuriums.

[4]Experimental insecticide or acaricide.

[5]Lannate L and Dimethoate 267 are registered under a special local needs (SLN) registration.

[6]For greenhouse use only.

insecticides directly damaged flowers, buds, and leaves, while most phytotoxic systemic insecticides caused injury to the primordia, which produced observable damage only to flowers and leaves that emerged several weeks after the application.

Other Factors

Many other factors affect phytotoxicity. Under certain conditions, pesticides that were reported safe in this report may be phytotoxic. The following are some of the more important factors that influence phytotoxicity.

Stressed plants. Insecticides should not be applied to plants that are stressed. Plants that are wilting are extremely sensitive to spray injury.

Temperature. Avoid spraying under extremely hot, sunny conditions (above 90°F). Spray during the early morning or late afternoon, when temperatures are cooler.

Formulations. Generally speaking, wettable powders are considered safer for plants than emulsifiable concentrate sprays. The latter type contains emulsifiers and solvents that can damage plants. However, the disadvantage of wettable powders is the white residue on the foliage, a problem with ornamentals.

Adjuvants. These are substances added to the spray tank to improve the physical and chemical characteristics of the pesticide spray. Adjuvants are most commonly used to improve wetting, sticking, or spreading. These adjuvants can sometimes cause injury to plants. Care should be taken in selecting adjuvants and in adding the recommended amount to the spray tank.

Spray-tank mixtures. Mixing different pesticides in the tank may result in plant injury

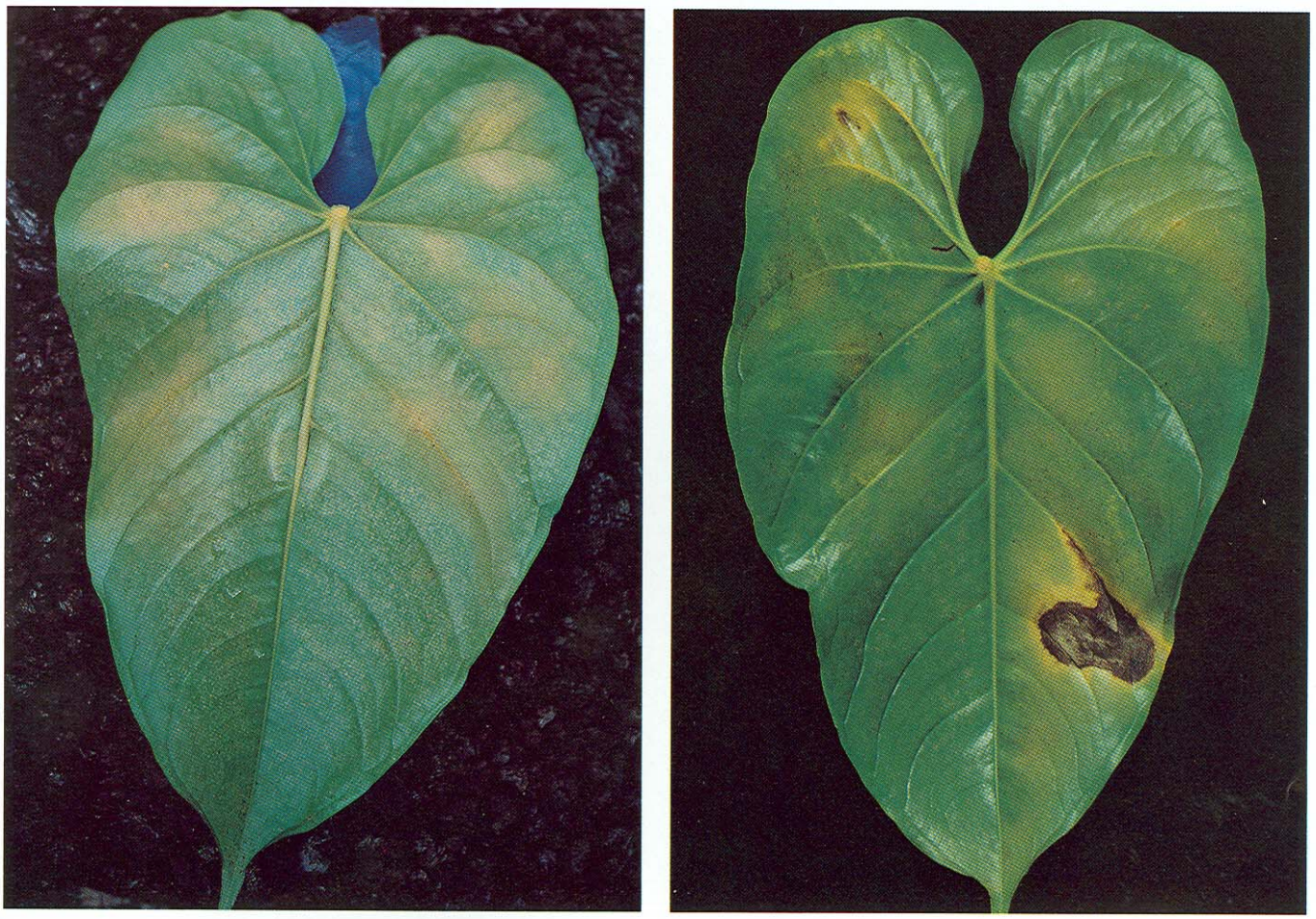

Figure 1. Dursban injury. Phytotoxic injury first appears as chlorotic leaves (left). In severe cases necrotic areas develop (right).

Figure 2. Vydate injury on Nitta cultivar. The first indication of phytotoxicity appears with the new emerging leaves (top). Leaves appear mottled and deformed at maturity (bottom).

Figure 3. Orthene injury. Bronzed abaxial surfaces are a characteristic injury symptom.

Figure 4. Isotox injury on Seapearl cultivar: flower injury (right) and leaf injury (left). Bronzed abaxial surfaces and curled margins are characteristic injury symptoms. Leaves and flowers also may become necrotic.

Figure 5. Isotox injury on Anuenue cultivar. Abaxial surfaces appear bronze.

Figure 6. Kelthane injury on Kobayashi cultivar. Damage is confined to the spathe, which develops distinct necrotic areas.

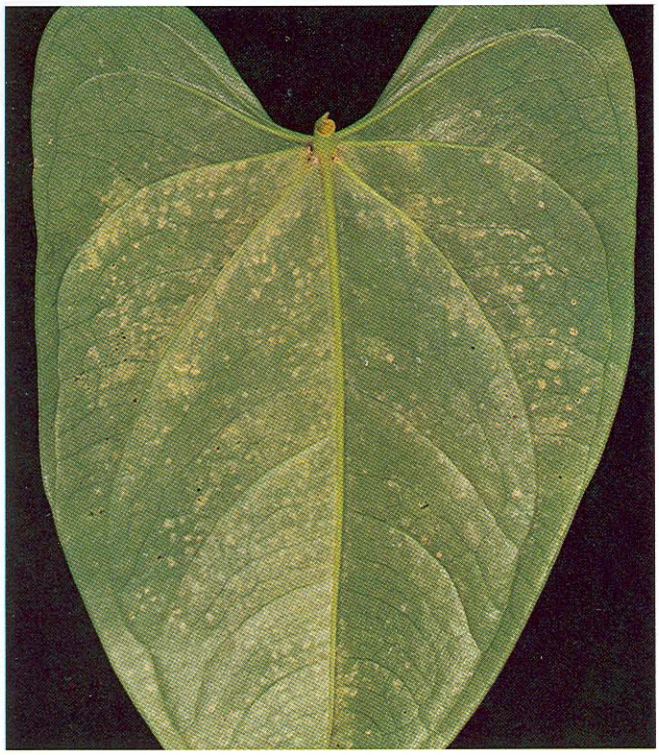

Figure 7. Tempo 2 EC was safe on the majority of anthurium cultivars tested; however, white spots appeared on the undersides of leaves on Mickey Mouse cultivar.

that would not occur if each pesticide were applied separately. Before pesticides are tank mixed, a compatibility chart should be consulted. Wettable powders should be mixed with other wettable powders and emulsifiable concentrates with other emulsifiable concentrates. Plant injury also may occur when equipment previously used for herbicides is used to apply insecticides.

Each grower has unique conditions. It is highly recommended that the grower first test the pesticide on a small group of plants before treating the entire crop. Two to three applications should be made at five- to seven-day intervals, allowing two to three weeks after the last application to observe for phytotoxicity. When testing systemic insecticides, the waiting period should be extended four to six weeks.

Use pesticides safely. Follow the manufacturer's instructions on the use and application as well as storage and disposal. This publication is for educational purposes only. Consult your Cooperative Extension Service or the Hawaii Department of Agriculture for authorized special local need registrations or additional information.

GLOSSARY

Acaricide A substance that kills mites.

Bronzing Coppery bronze coloration of the leaves.

Chlorosis Yellowing, usually caused by subnormal development of chlorophyll.

Curl Abnormal bending or curling of leaves.

Insecticide A substance that kills insects.

Leaf drop Premature falling of leaves.

Mottle Variegated pattern of light and dark areas with diffused borders.

Necrosis Death of cells and tissues.

Pesticide A generic term for any substance used to control any pest.

Phytotoxic insecticides Insecticides that cause injury to plants.

Phytotoxicity The ability of a substance to injure the plant.

Special local need (SLN) registration A special state registration given to pesticides for use on specific local crops or sites not listed on the pesticide product label.

REFERENCES

Hara, A. H., and R. F. L. Mau. 1987. Guide for chemical control of insect and mite pests of anthuriums. Cooperative Extension Service, Dept. of Entomology, University of Hawaii, HITAHR Brief 008.

Hara, A. H., R. F. L. Mau, R. A. Criley, and M. K. Wong. 1983. Phytotoxicity of insecticides and miticides to ornamental plants. Proc. First Fertilizer & Ornamentals Workshop, University of Hawaii, HITAHR Research Extension Series 037:97–101.

Mau, R. F. L. 1982. Evaluation and registration of insecticides and miticides on anthurium. Final report to the State of Hawaii, Governor's Agriculture Coordinating Committee.

Hawaii Agricultural Experiment Station
HITAHR, College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa
Noel P. Kefford, Director and Dean

RESEARCH EXTENSION SERIES 097—10/88(2.3M)