Dimethoate Use in Hawaii -- Ornamental and Seed Crops

Hi Stephanie,

I had a very good Thanksgiving and hope you did, too. Much appreciation for your patience. Information for ornamental seed crops is attached. There are four files: a cover letter; theresponse document; and two references for ornamentals (reference 1 and reference 2). I will send you the information for the vegetable crops shortly.

Mahalo,
Cathy

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On 17 Nov 2006 at 15:52, Plummer.Stephanie@epamail.epa.gov wrote:

Hello, Cathy.

In our October 17th conference call, some of the participants agreed to provide EPA with crop-specific information (pests, application practices, alternatives, costs, etc.) within about a month. I'm just following up to see how things are coming along and find out when we can expect to receive the information. Thank you.

Stephanie Plummer
Chemical Review Manager
Office of Pesticide Programs
Special Review and Reregistration Division
(703) 305-0076

The Western IPM Center is headquartered in the UC Agriculture and Natural Resources Building at 2801 Second Street, Davis, CA 95618.

UNIVERSITY OF HAWAI'I AT MĀNOA

College of Tropical Agriculture and Human Resources
Department of Plant and Environmental Protection Sciences

November 27, 2006

Stephanie Plummer
Special Review and Reregistration Division (7508P)
Office of Pesticide Programs
Environmental Protection Agency
1200 Pennsylvania Ave., NW.
Washington, DC 20460–0001

Subject: **Dimethoate Conference Call Follow-up**

The attached comments are being submitted as the follow-up to a conference call on October 17, 2006 regarding important uses of dimethoate in Hawai'i. These comments are being submitted on behalf of the Western Integrated Pest Management Center.

In summary, grower representatives have indicated that dimethoate is important for the production of the following crops in Hawai'i:

leaf lettuce,
melons,
green beans,
tomatoes,
herbaceous ornamentals,
corn (seed crop),
soybeans (seed crop).

Attached is information for ornamental and seed crops. The information for the vegetable crops will follow shortly.

Please note the concern expressed by the seed industry and others in Hawai'i's agriculture community about the registration procedures of the Hawai'i State Department of Agriculture (HDOA) which could affect the availability of alternative chemistries. We are unable to speak to this issue. However, HDOA is in the process of revising the Administrative Rules on Pesticides. We are seeking clarification from HDOA to determine what policies or changes may assist in predicting the availability of various pest control chemicals.

Information and comments have been provided by staff of the Cooperative Extension Service of

3050 Maile Way, Gilmore Hall 310, Honolulu, Hawai'i 96822
Telephone: (808) 956-7076, Facsimile: (808) 956-2428, E-mail: peps@ctahr.hawaii.edu, Web: www2.ctahr.hawaii.edu
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the College of Tropical Agriculture and Human Resources and representatives of Hawai'i's seed and agricultural industries.

Comments compiled and submitted by:

Mike Kawate
Pesticide Registration Specialist
Voice: 808-956-6008
mike@hpirs.stjohn.hawaii.edu

Cathy Tarutani
Educational Specialist
Voice: 808-956-2004
cathy@hpirs.stjohn.hawaii.edu

Ornamentals

1. **Size of Industry** (2004 Hawai'i Department of Agriculture [HDOA] statewide values)

Greenhouse area	60.3 acres
Artificial Shade	608 acres
Open fields	3,206 acres
Total Area	3,874 acres
Number of farms	920
Ave farm size	4.2 acres

Although the average size of ornamental farms and nurseries is 4.2 acres, there is a large range from ¼ acre to over 80 acres. Most foliage growers have large acreages (20 acres is not uncommon) of mother plants to support their propagation nurseries. On the other hand, most lei flower growers have small acreages (less than 2 acres) because of the high labor requirements of their crops.

Usually the HDOA statistics do not list areas planted to individual ornamental crops except for Dendrobium Orchids which is 120 acres. Most of these growers have less then 2 acres in production.

	Wholesale Value (in million $)
Cut Flowers	13.1
Dendrobium Orchids	10.5
Other Orchids	12.3
Lei Flowers	3.3
Foliage	17.7
Potted flowers	6.0
Other Nursery Products[1]	30.1
Unspecified sales[2]	1.3
Total Wholesale Value	**$94.5**

[1] (bedding plants, plant rentals & other products)
[2] (sales of growers greater than $999 and less then $10,000)

2. **Application Information**
On the average, the ornamental flower growers that use dimethoate make 3 to 4 applications per year. They generally use between 1.5 and 3 pints per 100 gal of solution of 2.67 Dimethoate which has 30.5% ai.

Percent Crop Treated:
It is impossible to determine how much actually is being used statewide without the cooperation of the chemical distributors.

3. Targeted Pests

Aphids, Scale, Mealybugs, Mites, Thrips, Whiteflies and Midges, particularly the Blossom Midge *Contarinia maculipennis* Felt. See Hara (2002) (attached) for more details.

Although the midges are not listed under ornamentals they are listed on the Dimethoate label for juniper and sorghum. Midges attack many flowering crops including orchids, hibiscus, plumerias and pikake flowers. They are one of the most difficult pests to control.

Reference:
Hara, A. H. and R. Y. Niino-DuPont 2002. Blossom midge in Hawaii—a pest on ornamentals and vegetables. College of Tropical Agriculture and Human Resources, University of Hawai'i. <http://www.ctahr.hawaii.edu/oc/freepubs/pdf/IP-11.pdf>.

4. Alternatives

Although there are alternatives for some of the other pests listed, few alternatives have been found to control the blossom midge.

This insect seems to have developed a resistance to the organophosphates acephate and malathion. Therefore, a systematic rotation plan is followed by growers to avoid the development of resistance and the subsequent loss of any of the alternatives for dimethoate. The most effective chemicals besides dimethoate are the IGR's and the synthetic pyrethroids.

Synthetic Pyrethroids: bifenthrin, cyfluthrin, fenpropathrin, fluvalinate
Insect Growth Regulators (IGRs): azadriactin, pyriproxyfen, buprofezin
Organophosphates: acephate, malathion
Spinosyns: spinosad
Oils: paraffin, petroleum-based oil, neem oil
Insecticidal soaps
Chloronicotine: acetamiprid, imidacloprid
Carbamate: carbaryl

Reference:
College of Tropical Agriculture and Human Resources. 2004. Insect control chart for ornamental crops. Hara, A. H. and R. Y. Niino-DuPont. 2002. Blossom Midge in Hawaii—a Pest on Ornamentals and Vegetables. University of Hawai'i. http://www.ctahr.hawaii.edu/oc/freepubs/pdf/IP-19L.pdf.

5. Time Line

Almost all ornamental insect and mite pest populations build up in the drier months in the spring and summer. Their populations drop somewhat in the cooler, wetter and shorter days of winter. However most pests are present year round. Only the intensity of the infestations and rapidity at which their populations increase, change with the seasons.

Seed Crops

1. **Size of Industry**
   Values provided by the Hawaii Crop Improvement Association and USDA NASS Hawaii Field Office. September, 2006.

   Corn
   Acreage: 3,600 acres
   Value: $6.2 million

   Soybeans (includes very small contributions from other seed crops)
   Acreage: 400 acres
   Value: $2.4 million

2. **Application Information**
   Used predominately early in the crop cycles in corn and soybean nurseries.

   Percent crop treated: 100 % of the soybeans and corn get at least 1 application of dimethoate.

3. **Targeted Pests**
   Corn: Where the corn brown planthopper (*Perigrinus maydis* Ashm.) can transmit the deadly maize mosaic virus (MMV)

   Soybeans: Against the French bean fly (*Melanagromyza phaseoli* Try) where maggots can undermine the structural integrity of the stalk at the soil surface.

4. **Alternatives**
   The newer chemistries (nicotine based chemistries like imidacloprid) help keep brown planthopper populations low through systemic action of the active ingredient. However, the nature of how the planthopper transmits the disease means that the virus can still be transmitted prior to the death of the planthopper. The ability to spray dimethoate in these early growth time frames helps reduce the populations after the imidachloprid compound efficacy has abated, and because it has systemic tendencies tends to target these pests more effectively.

   Other chemicals that can be used to control pests in corn and soybean that can be considered as alternatives include: chlorpyrifos (Lorsban), carbaryl (Sevin), and esfenvalerate (Asana). All of these are older chemistries that are effective in controlling these pests but should not be sprayed repeatedly so as to avoid resistance of the target pests.

   Replacement chemistries are limited to what the HDOA will let into the State. Current philosophy in HDOA does not allow for chemistries with ground water warnings to be used in Hawaii. Currently, the State will only allow these chemistries into Hawaii if the

manufacturing companies change the status to a Restricted Use Pesticide. The chemical manufacturers hesitate to do this.

5. Economic Impact

This year, MMV infection rates have ranged from 2 - 8.5%. In corn nurseries this translates into 1 to 2 plants per row (Austin and Sellers, 2006).

The economic impact the seed industry has on Hawai'i is now at $142 million dollars/year (both operating and capital expenditures as well as multiplier effects: operating expenditures alone amount to $60 million dollars/year) (Loudat and Kasturi, 2006, NASS, 2006).

The economic impact of Hawai'i's extends beyond the state itself. The seed industry in Hawai'i is comprised of many of the main seed company leaders (Pioneer HiBred, Monsanto, Syngenta, Dow, BASF) as well as several smaller companies like the Hawaii Agriculture Research Center (HARC). New seed hybrids and varieties produced in Hawaii go on to provide new commercial products not only for North America (81 million acres of corn and 75 million acres of soybean planted in 2005), but the world at large. The economic impact is enormous with corn sales at $21 billion dollars and soybean sales of $18 billion dollars recorded. American Soybean Association, 2005, National Corn Growers' Association, 2006.

References

American Soybean Association. 2005. SoyStats, 2005.

Austin, M. T. and C.B. Sellers. 2006. Personal communication.

Loudat, T. and P. Kasturi. 2006. Hawaii's Seed Crop Industry: Growth, Current and Potential Economic and Fiscal Contributions.

National Agricultural Statistics Service. 2006. Hawaii Seed Crops.

National Corn Growers' Association. 2006. World of Corn, 2006.

Cooperative Extension Service
College of Tropical Agriculture and Human Resources
University of Hawai'i at Mānoa

Insect Pests
June 2002
IP-11

Blossom Midge in Hawaii— a Pest on Ornamentals and Vegetables

Arnold H. Hara and Ruth Y. Niino-DuPonte
Department of Plant and Environmental Protection Sciences

Blossom midge, *Contarinia maculipennis* Felt (Diptera: Cecidomyiidae), has been present in Hawaii since the early 1900s and is thought to have originated in Asia (the "West Indies"). Currently, the blossom midge can be found on all of the major Hawaiian islands. Jensen (1946) presented compelling evidence that *C. maculipennis* had been misidentified in earlier reports as *C. solani* (Rübsaamen) or *C. lycopersici* Felt due to its diverse range of hosts. Elsewhere in the USA, the blossom midge was reported on dendrobium orchids in Florida in 1992.

Damage

Blossom midge maggots feed inside unopened flower buds, causing deformed, discolored buds and blossoms and, in severe infestations, premature bud or blossom drop (Fig. 1). As many as 30 maggots may be found infesting a single dendrobium bud.

Hosts

The blossom midge has a wide host range spanning at least six plant families, including the flower buds of orchids, plumeria, hibiscus, pikake (jasmine), white mustard cabbage or pak choi, tomato, eggplant, pepper, potato, bittermelon, and other vegetables and ornamentals.

Biology

The blossom midge reproduces year-round in Hawaii. The duration of its life cycle from egg to adult is approximately 21–28 days. The eggs are deposited in masses by the adult female into the open tips of flower buds. They are white to cream colored, invisible to the naked eye, and hatch within 24 hours into maggots that move into the bud and feed on fluids from the damaged plant tissue.

The maggots are white when newly hatched, becoming yellow with a pink tinge as they age (Fig. 2). As they mature in 5–7 days, growing to 1/12 inch long (about the thickness of a nickel), the maggots are capable of flipping themselves several inches into the air to exit the buds and burrow into the soil to pupate, like other ground-pupating fly larvae such as the melon fly and oriental fruit fly.

Pupation is most successful in soil that is moist but not wet. The late-stage pupa turns from yellowish-white to brown (Fig. 3) and burrows back up to the soil surface in preparation for emergence as an adult 14–21 days after entering the soil. The pupa works itself partially free of the soil, and the adult emerges, leaving the pupal skin protruding from the soil.

The adult blossom midge is tiny, about the thickness of a nickel in length; males are slightly smaller than females. The adult is somewhat mosquito-like, with typical fly features, and survives for only 4 days. It has relatively large, multifaceted eyes and a single pair of spotted wings about one to two times as long as its body (Fig. 4).

Behavior

Except for the adult, all stages of the blossom midge are secluded within the bud (as maggots) or in the soil (as pupae). Adult emergence from pupae in the soil usually occurs in the early evening.

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Figure 1. Feeding damage to flower buds by blossom midge: left, plumeria buds; center, dendrobium buds; right, dendrobium bud drop. (Photos: A. Hara, R. Mau)

When laying eggs, the adult female blossom midge is unable to penetrate plant tissues but rather inserts its ovipositor into the open end of a bud. To ensure an optimal food source and moist environment, the adult midge avoids late-stage buds and prefers to lay eggs in young buds whose growth to maturity will approximately parallel that of the maggot.

If growing conditions become unsuitable for larval development (for example, if the flower or bud on which maggots are feeding begins to dry), immature maggots may leave the flowers or buds to pupate in the soil; however, their pupation may take a few weeks longer, and the emerging adult midges are invariably smaller than adults from fully mature maggots.

In Florida, blossom midge populations maintained in greenhouses were observed to decrease rapidly during the winter, even though the temperature was maintained at 65°F and the plants had sufficient numbers of buds.

Cultural control

Sanitation is the most important management practice for the blossom midge. Remove and destroy all dropped buds and infested buds still on the plant. Place infested flower buds in a plastic bag or a sealed container to prevent escape of maggots.

Due to the blossom midge's wide range of hosts, avoid planting possible alternate hosts around the crop area.

A certain variety of tomato was observed to be more susceptible to blossom midge infestation due to its flower structure, which facilitates ovipositing. Host plant varieties in which petals remain tightly fitted until the bud is almost ready to open may reduce susceptibility.

Biological control

To date, no parasites have been isolated or specifically introduced to Hawaii to control the blossom midge. The adults are vulnerable to general predators, such as web-spinning spiders and ants. Ants may also prey on pupae in the soil.

Chemical control

Only the adult stage of the blossom midge is vulnerable to contact insecticides, because the maggots are protected within the bud and the pupae are burrowed in the soil.

Some insecticides can be applied as a foliar spray against larvae as well as a soil treatment to target the pupal stage. Translaminar insecticides (those that move from the sprayed leaf surface to the lower surface) may

Figure 2. Blossom midge larvae in a dendrobium bud.

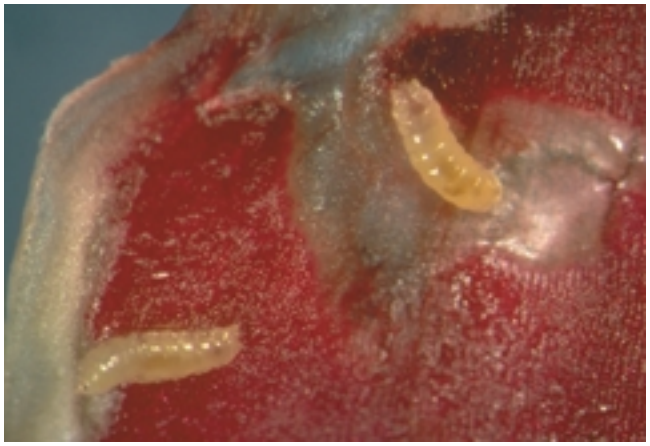

Figure 3. Blossom midge pupae from hibiscus.

Photos in Figures 2 and 3 by Walter Nagamine, Hawaii Dept. of Agriculture; Figure 4 photo by S. Chun.

The actual size of the larvae and pupae is 1–2 mm; the adult is about 2 mm long. 1 mm is just over 1/32 inch; the following lines are 1 and 2 mm long, respectively: – —

be capable of penetrating the bud to affect the maggots. Trials of systemic insecticides (those that are spread from the site of application throughout the rest of the plant) on dendrobium have been disappointing, possibly because the chemicals are not able to reach the flower buds to affect the maggots.

Consult the Hawaii Department of Agriculture or the CTAHR Cooperative Extension Service for registered chemicals that are known to be effective against the blossom midge.

Figure 4. Adult blossom midge.

References

Felt, E.P. 1933. A hibiscus bud midge new to Hawaii. Proceedings, Hawaiian Entomological Society 8(2): 247–248.

Gagné, Raymond J. 1995. *Contarinia maculipennis* (Diptera: Cecidomyiidae), a polyphagous pest newly reported for North America. Bulletin of Entomological Research 85:209–214.

Jensen, D.D. 1946. The identity and host plants of blossom midge in Hawaii (Diptera: Cecidomyiidae: *Contarinia*). Proceedings, Hawaiian Entomological Society 12(3):525–534.

Jensen, D.D. 1950. Notes on the life history and ecology of blossom midge *Contarinia lycopersici* Felt (Diptera: Cecidomyiidae). Proceedings, Hawaiian Entomological Society 14(1):91–100.

Osborne, L.S., T.J. Weissling, J.E. Pena, and D.W. Armstrong. 2001. A serious pest is causing significant problems for dendrobiums and hibiscus growers. In: Felter, L., T. Higgins, and N. Rechcigl (eds.), Proceedings, 17th Conference on Insect and Disease Management on Ornamentals. February 25–27, 2001, Orlando, FL. Society of American Florists, Alexandria, VA. p. 21.

Insect Control Chart

for Ornamental Crops

E = effective*, S = suppression*, L = listed on the label
Use sites: G = greenhouse, N = nursery, TL = turf and landscape

INSECTICIDES					INSECTS													
Common name	Chemical class	Use site(s)		Brand name**	aphids	armored scales	beetles, weevils	blossom midge	caterpillars	foliar mealybugs	lace bugs	leafhoppers	leaf miners	root mealybugs	soft scales	thrips	whiteflies	Comment
abamectin	macrocyclic lactone	G	N	Avid	L			E					E			E	L	
acephate	organophosphate	G	N	Orthene 97	E	L	L		L	L	E		L		L	E	E	
		G		Precise												E		potted plants only
acetamiprid	chloronicotine	G	N	Tristar	E					L		L	L			L	L	
azadiractin	insect growth regulator	G	N	Azatin XL	E	L			L	L		L	E		L	L	L	
Bacillus thuringiensis	microbial (bacterium)	G	N	Dipel DF					E									
		G	N	Gnatrol					E									
bifenthrin	pyrethroid (synthetic)	G	N	Talstar F	L	L	E		L	L					E	L	L	
buprofezin	insect growth regulator	G	N	Talus (Applaud)		E				E		L			E		E	
carbaryl	carbamate		N	Sevin 50WP, 80WP	L	S	E		E			E	L		E	L		
			N	Carbaryl 4L	L	S	E		E			E	L		E	L		
chlorpyrifos	organophosphate	G	N	Dursban 50WP	E	L	E		E	E	E	L	L	E	L	E	L	
			N	Dursban TNP	E	L	E		E	E	E	L	L		L	E	L	
				DuraGuard ME	E	L	E		E	E	E	L	L		L	E	L	
cyfluthrin	pyrethroid (synthetic)	G	N	Decathlon WP	L	L	E	L	E	L	L	L	L		L		L	
diflubenzuron	insect growth regulator	G		Adept					L				L				S	

Cooperative Extension Service, College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa **CTAHR Insect Pest Publication IP-19, Nov. 2004**

*This information is accumulated from a search of world literature and interviews with researchers, extension agents, chemical sales representatives, and other agricultural professionals in Hawaii.
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diazinon	organophosphate		N		Diazinon WP	E	L	L		L	E	L	L	L		L	L	L	
					Knox Out GP	E	L	L			E			L		L	L		
dimethoate	organophosphate		N		Dimethoate EC	E	S	L		L	E	L	E	L		E	E	E	
fenpropathrin	pyrethroid (synthetic)	G	N		Tame EC	L		E		E	L	L	L	L		L	L	L	
fluvalinate	pyrethroid (synthetic)	G			Mavrik F	L		L		L	L					E	L	L	
insecticidal soap	K salts of fatty acids	G	N		M-Pede	E	S	L		L	L	L				L	L	L	
imidacloprid	chloronicotine (nitroguanidine)	G	N	TL	Marathon	E	L	E			E	E		L	E	E	S	E	
		G	N		Marathon WP	E	L	E			E	E		L		E	S	E	
					Merit WP	E	L	E			E	E		L		E	S	E	
imidacloprid +cyfluthrin	chloronicotine +pyrethroid		N	TL	Discus	E	S	E			E	E		L	E	E	S	E	
malathion	organophosphate	G	N		Malathion	L		L		L	L	L	L	L		L	L	L	
methiocarb	carbamate	G	N		Mesurol WP	E											E		
neem oil	botanical oil	G	N		Triact 70	E	L				L		L			E	S	L	

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paraffinic and other petroleum-based oils	unsulfonated oil of refined petroleum (hydrocarbon distillate)	G	N	Ultra-fine Oil	E	S				L		L	L		E		L	
		G	N	Sunspray	E	S				L		L	L		E		L	
		G	N	Volck	E	S				L		L	L		E		L	
		G	N	Stylet	E	S				L		L	L		E		L	
		G	N	Biocover	E	S				L		L	L		E		L	
pedestal	insect growth regulator	G	N	Novaluron					L				S			L	L	
phosmet	organophosphate		N	Imidan 70W					L	L		L	L				L	
pyrethrins/pbo+	natural pyrethrins	G	N	Pyrenone	L		L		L	L	L	L	L			L	L	
silicon dioxide	silica compounds / diatomaceous earth	G	N	Organic Solutions	L		L		L	L	L	L	L			L	L	
pyridaben	pyridazinone	G	N	Sanmite WS													L	
pyriproxyfen	insect growth regulator	G	N	Distance	S	S				S					E		E	
s-kinporene	insect growth regulator	G	N	Enstar II	L	L				L				L	L		E	
spinosad	spinosyns	G	N	Conserve SC			L		E				E			E		

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