Biological Control

Colpoclypeus florus and *Trichogramma platneri*

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Summary: In 1994 the effect of insecticides on *C. florus* was examined using bioassays to characterize contact toxicity and as field-aged residues. When sprayed directly on the parasitoids, most insecticides with a neurotoxic mode-of-action were highly toxic at 10% of the recommended field rate to both C. *florus* and *T. platneri.* The insect growth regulators were not toxic to either parasite, and the *Bt* products and insecticidal soap were not toxic to *C. florus.* However, *Bt* products and insecticidal soap were highly toxic to *T. platneri.* Most of the insecticides that were highly toxic to the parasitoids when applied directly were toxic as field-aged residues. However, the duration over which residues remained toxic varied with the chemical. Admire and Agrimek which were highly toxic when applied as direct sprays were essentially nontoxic as one-day-old residues. The growth regulator Comply (Insegar), insecticidal soap (M-Pede), and the *Bt* (Dipe1) all were nontoxic as one-day-old residues. Sublethal effects were examined only for *C. florus.* Only Dimilin and Asana showed a sublethal effect on *C. florus.*

Bioassay. The chemicals tested for direct toxicity were those listed in the "Predator Toxicity Guide—Apple" chart in the *1994 Crop Protection Guide for Tree Fruits in Washington*. The *Bts* (Dipel, Javelin and MVP), the growth regulators (Insegar, Dimilin, RH-5992 and RH-2485) and M-Pede were tested at 100% of the recommended field rate while neurotoxins were initially tested at 10% of the recommended field rate. Ten microliters of a spreader (Triton B-1956) were added to each of the *Bt* formulations. For the assay, *C. florus* females were taken from a colony maintained at the WSU-TFREC. The age of *C. florus* was standardized at 2 to 5 days after emergence from the pupal stage. Fifty females from at least five different cups were selected for each of the chemicals tested. Cards containing *T. platneri* pupae were divided into small units which were placed into small petri dishes. The age of *T. platneri* was standardized at 2 to 4 days after emergence, and 50 females from at least five different petri dishes were selected for each of the chemicals tested. Females of both parasitoid species were anesthetized with CO_2, placed on a piece of 11 cm filter paper and transferred to a Potter spray tower. The tower applied 4 ml of pesticide at 6 psi of pressure to the parasites. *C. florus* were transferred to Falcon 1006 (50 x 9 mm) petri dishes with snap-on lids. A small cube of artificial diet used to rear leafrollers and a smear of honey-water (*C. florus*) or a thread dipped in honey (*T. platneri*) were added to the petri dishes. Five *C. florus* or *T. platneri* were placed into 10 petri dishes for each of the chemicals (50 total per chemical). Surviving parasites were counted at 24 and 48 hours. Treatments with significant parasitoid survival at 10% of the recommended field rate were tested at 50% of the recommended field rate, and treatment with survivors at this rate were tested at the full field rate.

C. florus females surviving direct insecticide applications (48 hours) were transferred individually to a small plastic cup which contained a leafroller host larva (4th or early 5th instar). The cup also contained a small cube of artificial diet used to rear leafroller larvae and honey-water smeared on the lid. These cups were placed in a growth chamber at 25°C and 40 to 50% relative humidity. After offspring were produced, the number and sex of *C. florus* in each cup were determined along with the number of leafroller pupae.

Results are given in Table 2. None of the insecticides showed a sublethal effect on *C. florus* with the exception of Dimilin and Asana. *C. florus* surviving the Dimilin exposure successfully stung the leafroller hosts, but no progeny were produced. Dimilin either sterilized the *C. florus* females or in some way affected the parasitoid eggs. There were fewer survivors of the Asana exposure than for other insecticides, and the number of female progeny produced was less compared to other insecticides or the check.

Table 1. Mortality of *C. florus* and *T. platneri* adults exposed to direct sprays of different pesticides.

		Average corrected % mortality—48 hours					
		10% field rate		50% field rate		Full rate	
Chemical	Field rate (ppm)	*C. florus*	*T. platneri*	*C. florus*	*T. platneri*	*C. florus*	*T. platneri*
Agrimek 0.15EC	7	100	100	--	--	--	--
Diazinon 50WP	600	100	60	--	--	--	--
Dimethoate 2.67EC	400	100	100	--	--	--	--
Lorsban 4EC	450	100	100	--	--	--	--
Lorsban 50WP	450	100	100	--	--	--	--
Supracide 2E	300	100	100	--	--	--	--
Guthion 50WP	300	98	67	--	--	--	--
Imidan 50WP	750	88	75	100	89	--	--
Penncap-M 2F	520	78	0	100	30	--	--
Sevin 50WP	300	74	79	100	98	--	--
Carzol 92SP	400	54	64	100	85	--	--
Vydate 2L	225	20	62	94	--	--	--
Thiodan 50WP	450	8	18	92	2	--	--
Pounce 3.2EC	50	26	50	56	--	100	--
Admire 2F	48	--	--	--	--	86	100
Asana 0.66EC	25	6	69	28	--	72	--
Mitac 50WP	450	24	31	12	--	18	--
Omite 30WP	450	2	4	2	23	0	--
Vendex 4L	300	0	33	4	--	0	--
Dimilin 25WP	75	--	0	--	--	0	--
Insegar 25WP	37.5	--	2	--	--	0	--
RH 5992[1]	150	--	--	--	--	0	0
RH 2485	150	--	--	--	--	0	--
M-Pede	1 gal/100	--	--	--	--	2	98
Javelin	4 oz/100	--	--	--	--	0	100
MVP	4 oz/100	--	--	--	--	0	100
Dipel	4 oz/100	--	--	--	--	0	100
Check	0	0	0	0	0	0	0

--indicates no bioassays were run at this rate for a particular chemical.

[1]RH 5992 (tebufenozide) is a new class of insect growth regulator, an ecdysone agonist, and RH 2485 is an analog that also shows promise as a soft insecticide.

Table 2. Sublethal effects of insecticides on *C. florus* surviving for 48 hr direct exposure to insecticides.

Chemical	N	No. females	% females	Total *C.f.*	% LR pupae
MVP	30	14.7	74.8	18.7	0
Javelin	30	13.9	80.5	16.3	0
Dipel 2X	30	13.7	87.0	13.6	17
Insegar	30	11.6	74.8	14.1	3
Dimilin	30	0.0	0.0	0.0	0
RH 5992[1]	25	13.4	79.0	16.9	8
RH 2485	25	14.7	80.7	18.3	5
Asana	12	7.5	40.0	15.4	17
Untreated	30	12.0	80.5	14.7	0

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