OVICIDAL ACTIVITY OF AMBUSH™, A SYNTHETIC PYRETHROID INSECTICIDE, ON CORN EARWORM, FALL ARMYWORM, AND CABBAGE LOOPER[1]

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ABSTRACT

Laboratory bio-assays with Ambush® (m-phenoxybenzyl (±)-cis, trans-3-(2, 2-dichlorovinyl)-2, 2-dimethylcyclopropanecarboxylate) and chlordimeform (Galecron®) insecticides were conducted on eggs of the corn earworm, *Heliothis zea* (Boddie), the fall armyworm, *Spodoptera frugiperda* (J. E. Smith) and the cabbage looper, *Trichoplusia ni* (Hubner). Ambush displayed ovicidal activity on the 3 pest species comparable to that achieved with Galecron.

Synthetic pyrethroid insecticides are being hailed by many investigators in the field as a panacea for control of lepidopterous larvae on a number of crops (Rutz 1976). Although the structure and activity relationships have been well defined (Elliott et al. 1973) in the laboratory and reports on the contact action against cotton bollworms and tobacco budworms are just beginning to appear in the literature, the full spectrum of the inherent properties of the pyrethroids has yet to emerge. A substantial amount of work has been in progress with Ambush (m-phenoxybenzyl (±)-cis, trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylate), a synthetic pyrethroid being developed by ICI United States, to elucidate those properties of the compound which would be of value in the field.

This manuscript reports the results of tests conducted in the laboratory to demonstrate the ovicidal activity of Ambush insecticide on eggs of selected lepidopterous pests of economic importance on agricultural crops.

MATERIALS AND METHODS

Eggs of the cabbage looper, *Trichoplusia ni* (Hubner), the fall armyworm, *Spodoptera frugiperda* (J. E. Smith), and the corn earworm, *Heliothis zea* (Boddie), used in these tests were collected from adults reared in the insectary. The eggs were deposited by females on paper towels collected from the rearing cages. All eggs were surface sterilized with sodium hypochlorite to prevent a build-up of fungi and bacteria.

Eggs of *T. ni* and *S. frugiperda* deposited on 1 in.-square pieces of paper toweling were counted. Each piece of paper contained approximately 100 looper eggs and 120 fall armyworm eggs. The toweling was then immersed in solutions of Ambush 2EC and Galecron for 5 sec. The concentrations of Ambush evaluated were 37.5, 75.0, 150.0, 300.0, and 600.0 ppm and the concentrations of chlordimeform (Galecron) were 600 and 1,200 ppm. The pieces of toweling containing the eggs were allowed to dry before they were

[1]Lepidoptera: Noctuidae

inserted in 1 oz plastic cups supplied with pieces of filter paper moistened with water. The moistened paper provided a high humidity level thus enhancing the opportunity for optimum egg hatch. The cups were monitored on a daily basis until the eggs hatched.

The eggs of *H. zea* were treated somewhat differently. They were sprayed with a traversing, boom-type laboratory sprayer instead of being immersed in chemical solutions containing the toxicant. The sprayer was calibrated to deliver 60 gal/A at a speed of 1.5 mph. The spray chamber was programmed for a wind velocity of 6 mph to simulate outdoor conditions. One in^2. pieces of paper toweling containing the *H. zea* eggs were sprayed with 0.03, 0.06, and 0.12 lb ai/A of Ambush. Each piece of paper treated contained approximately 75 eggs. Galecron was used as the standard at 1.0 lb ai/A. The toweling with the eggs was permitted to dry before being inserted into 1 oz plastic cups containing moistened filter paper. The cups were observed 3 days later to determine the percentage of the egg hatch.

The eggs of all insect species were incubated at 27°C. At this temperature they would normally hatch in 2-4 days. All of the treated eggs were retained for 7 days to make certain that there was no delayed hatch as a result of the chemical treatments.

Results and Discussions

The results from the dipping test (Table 1) showed that all concentrations of Ambush and Galecron prevented the eggs of the cabbage looper from hatching. In the untreated control only 15% of the eggs did not hatch during the 4-day period of observation.

Ambush exhibited a mortality-dosage response against *S. frugiperda* in the same test (Table 1). Fewer eggs hatched as the dosage increased. At a concentration of 37.5 ppm, approximately one-third of the eggs hatched; at 75-150 ppm concentrations, only approximately one-fifth of the eggs hatched. Complete egg kill was achieved at a concentration of 300 ppm. Both Galecron treatments (600 and 1200 ppm) produced 100% mortality of the eggs. All of the eggs in the control hatched.

The difference in susceptibility of *S. frugiperda* and *T. ni* to Ambush may be the result of each insect's inherent egg tolerance or ovipositional differences in egg placement. With regard to the latter possibility, *T. ni* females lay eggs singly on paper toweling and thus enable the chemicals to contact each egg easily. *S. frugiperda*, however, deposits eggs in globose masses which are covered with scales from the female's body. This could have prevented a lethal dose of the active ingredient from reaching the surface of the egg especially at the lower Ambush concentrations.

When Ambush was applied to *H. zea* eggs under simulated field application conditions, a mortality-dosage response was obtained (Table 2). The 0.12 lb ai/A rate was superior to Galecron at 1.0 lb ai/A. The 2 lower rates of Ambush were also effective in preventing eggs from hatching.

In a subsequent experiment, eggs of *H. zea* were used to answer a few questions concerning egg hatch and larval survival—i.e., would more treated eggs hatch if incubated for a longer period of time and do emerging larvae survive?

The eggs were handled similarly to those in the previous experiment except that both toweling and eggs were placed on synthetic rearing media.

TABLE 1. THE OVICIDAL EFFECTS OF AMBUSH™ AND GALECRON® ON EGGS OF THE CABBAGE LOOPER* AND FALL ARMYWORM** IN THE LABORATORY 7 DAYS AFTER TREATMENT.

CHEMICAL	CONCENTRATION (ppm)	EQUIVALENT FIELD RATE (lb ai/A)	% OF EGGS HATCHING	
			CABBAGE LOOPER	FALL ARMYWORM
Ambush	37.5	0.03	0	30
	75.0	0.06	0	21
	150.0	0.12	0	21
	300.0	0.25	0	0
	600.0	0.50	0	0
Galecron	600.0	0.50	0	0
	1200.0	1.00	0	0
Control	Untreated	-	85	100

*_Trichoplusia ni_
**_Spodoptera frugiperda_

TABLE 2.—THE OVICIDAL EFFECTS OF AMBUSH™ AND GALECRON® 7 DAYS AFTER TREATMENT ON EGGS OF THE CORN EARWORM* IN THE LABORATORY USING A TRAVERSING BOOM-TYPE SPRAYER TO SIMULATE A FIELD APPLICATION.

CHEMICAL	FIELD RATE (lb ai/A)	% OF EGGS HATCHING**
Ambush	0.03	45
	0.06	34
	0.12	11
Galecron	1.00	23

* *Heliothis zea*
** Values corrected by Abbott's formula

The eggs were observed for 19 days and no additional hatch was seen after the first 4 days. Most of the treated eggs reached the brown ring or germ band stage 24 hr after treatment. The eggs which did not hatch progressed to the black head stage and remained in that state for the duration of the experiment.

Similar effects were seen with the standard, Galecron, although more larvae emerged from these eggs than from those receiving the Ambush treatments. Those few larvae which did emerge from Ambush treated eggs died shortly after emergence. Larvae emerging from Galecron treated eggs survived.

From all of these trials, it appears that Ambush, at rates of 0.05-0.2 lb ai/A currently being recommended for field evaluations, has substantial ovicidal activity which should be of benefit in controlling Lepidoptera.

The ovicidal action was demonstrated when Ambush was in contact with the egg. Since the insecticide is neither a systemic compound nor does it have significant translaminar movement, it would not provide ovicidal action on eggs laid inside the plant tissues or on the undersides of leaves when spray deposits do not contact them.

LITERATURE CITED

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