

Chemical Control/New Products

Residual Bee Poisoning Bioassay

D.F. Mayer and J.D. Lunden

Washington State University Department of Entomology, IAREC, Prosser, WA

Keywords: honey bee, *Apis mellifera*, alfalfa leafcutter bee, *Megachile rotundata*, alkali bee, *Nomia melanderi*, Assail, acetamiprid, Metasystox-R, oxydemeton-methyl, Dibrom, Naled, Proclaim, emamectin benzoate, alfalfa

These experiments were designed to determine the residue hazard of Assail 70WP (Rhone-Poulenc), Metasystox-R 2EC (Gowan) plus Dibrom 8EC (AMVAC), Proclaim 5SG (Novartis), Zeneca Experimental Chemical #1 and Zeneca Experimental Chemical #2 to honey bees (*Apis mellifera*), alfalfa leafcutter bees (*Megachile rotundata*) and alkali bees (*Nomia melanderi*).

Tests were conducted with insecticides applied with a R&D CO₂ pressurized sprayer at a rate of 26 gallons per acre using a hand-held boom with 4 (LF3) nozzles applied to 0.01 acre plots of first or second growth alfalfa. Field-weathered residual test exposures were replicated 4 times with 4 foliage samples per treatment and time interval. Samples consisting of about 400 cm of foliage taken from the upper 15 cm portions of plants and clipped to 1-inch lengths were placed into each plastic petri dish (15 cm diameter) whose tops and bottoms were separated by a wire screen (6.7 meshes/cm) insert (45 cm long and 5 cm wide).

Worker honey bees (HB) were obtained from the top frames of colonies and anesthetized with CO₂ to facilitate handling. Alfalfa leafcutter bees (LB) were emerged in an incubation chamber at 85°F., allowed to fly in the lab, and collected off the windows. Alkali bees (AB) were collected from nesting sites and chilled at 35°F. to facilitate handling. Residual test exposures were replicated 4 times by caging 30 worker HB, 25 LB or 20 AB with each of four foliage samples per treatment and time intervals. Bees in cages were fed syrup (1:1 ratio) in a wad of cotton (5 x 5 cm), and the bees held at 75°F. for 24 hour mortality counts.

Our work over the past 40 years has shown that materials or rates of materials that cause less than 25% mortality with 2 hour residues can probably be applied during early morning with little or no hazard to bees and those that cause less than 25% mortality with 8 hour residues can probably be applied during late evening with little or no hazard to bees.

Results and Conclusions

Assail at all 5 rates tested was non-hazardous to honey bees and alfalfa leafcutter bees (Table 1). Assail can be applied in late evening or early morning with little hazard to honey bees or alfalfa leafcutter bees. Assail at 0.15 lb ai/acre was moderately hazardous to alkali bees (Table 1). It may be possible to apply Assail at this rate in late evening. Assail at 0.3 lb ai/acre was hazardous to alkali bees (Table 1). It should not be applied to blooming crops or allowed to drift onto blooming plants where alkali bees are foraging.

Proclaim at the rate tested was non-hazardous to alfalfa leafcutter bees and alkali bees (Table 2). Proclaim can be applied in late evening or early morning with little hazard to alfalfa

leafcutter bees or alkali bees.

Metasystox-R plus Dibrom (tank-mixed) at the 2 rates tested was non-hazardous to alfalfa leafcutter bees and alkali bees (Table 2). Metasystox-R plus Dibrom can be applied in late evening or early morning with little hazard to alfalfa leafcutter bees or alkali bees.

Zeneca #1 at the rates tested was non-hazardous to honey bees and alfalfa leafcutter bees (Table 2). Zeneca #1 can be applied in late evening or early morning with little hazard to honey bees or alfalfa leafcutter bees.

Zeneca #2 at the rates tested was non-hazardous to honey bees and alfalfa leafcutter bees (Table 2). Zeneca #2 can be applied in late evening or early morning with little hazard to honey bees or alfalfa leafcutter bees.

Table 1. Mortalities of honey bees (HB), alfalfa leafcutter bees (LB) and alkali bees (AB) exposed to different age residues of insecticides applied to 0.01 acre plots. Prosser, WA. 1999.

		24 hr % mortalities of bees caged with treated foliage					
		age of residues					
Treatment	lb ai/acre	HB		LB		AB	
		2 hr	8 hr	2 hr	8 hr	2 hr	8 hr
Assail 70WP	0.05	0	0.8	4.2	6.8	7.0	10.8
Assail 70WP	0.075	2.6	1.7	5.8	4.5	7.0	6.9
Assail 70WP	0.1	0.8	2.6	9.4	0.1	17.1	15.8
Assail 70WP	0.15	1.7	5.8	9.6	11.7	28.4	31.0
Assail 70WP	0.3	2.5	4.2	10.2	15.9	32.0	66.4
Check	--	0	4.2	1.7	2.7	6.7	11.0

Table 2. Mortalities of honey bees (HB), alfalfa leafcutter bees (LB) and alkali bees (AB) exposed to different age residues of insecticides applied to 0.01 acre plots. Prosser, WA. 1999.

		24 hr % mortalities of bees caged with treated foliage					
		age of residues					
Treatment	lb ai/acre	HB		LB		AB	
		2 hr	8 hr	2 hr	8 hr	2 hr	8 hr
Metasystox-R 2EC+	1.5 pt +	--	--	5.8	3.3	8.5	9.5
Dibrom 8EC	5 oz						
Metasystox-R 2EC +	1.5 pt +	--	--	3.1	1.0	7.4	12.9
Dibrom 8EC	8 oz						
Proclaim 5SG	4.8 oz	--	--	1.0	2.0	0	0
Zeneca #1	0.05 ml/l	2.5	4.2	--	--	--	--
Zeneca #1	0.2 ml/l	2.6	4.2	--	--	--	--
Zeneca #1	0.8 ml/l	5.9	18.6	5.1	7.2	--	--
Zeneca #2	0.25 ml/l	2.6	2.6	--	--	--	--
Zeneca #2	1 ml/l	0	5.1	3.0	0.5	--	--
Check	--	3.4	12.5	4.1	2.5	6.7	11.0