

Section VII. Insecticide residues, regulation, application, and related problems.

RESIDUAL BEE POISONING BIOASSAY
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A series of test were conducted with insecticides applied with a R&D CO₂ pressurized sprayer at a rate of 25 gallons per acre using a hand-held boom with 4 nozzles applied to 0.01 acre plots of second or third growth alfalfa. Field-weathered residual test exposures were replicated 4 times with 4 foliage samples per treatment at any time interval. Alfalfa foliage samples (upper 6" portions of plants) were clipped into 1-2" lengths and about 500 cc was placed in each cage. Cages were prepared from a 15 cm diameter plastic petri dish and a circular insert formed from a strip of metal screen (6.7 meshes/cm) 45 cm long and 5 cm wide.

Worker honey bees (Apis mellifera) (HB) were obtained from the top frames of colonies and anesthetized with CO₂ to facilitate handling. Alfalfa leafcutting bees (Megachile rotundata) (LB) were emerged in an incubation chamger at 85 degrees F. and inactivated by chilling at 35 degrees F. Alkali bees (Nomia melanderi) (AB) were collected from nesting sites and chilled at 35 degrees F. to facilitate handling. Residual test exposures were replicated 4 times by caging 30 to 40 worker HB, 20 to 25 LB or 20 to 25 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 by 5 cm), and the bees held at 75 degrees F. for 24 hour mortality counts.

Abbott's formula was used to correct for the natural mortality.

Results:

Asana XL, Scout, and Spur + Butacide and Summer oil appeared to be fairly safe to alkali bees and non-hazardous to honey bees.

Asana XL was non-hazardous to alfalfa leafcutting bees. Spur + Butacide was moderately hazardous to alfalfa leafcutting bees.

XRD-522 was low in hazard to alkali bees and non-hazardous to leafcutting bees and honey bees. Fenoxycarb was not hazardous to adult bees.

The fungicides Rovral, Benlate, and Ronilan were not hazardous to alfalfa leafcutting or honey bees.

In July and August we did bioassay tests where we sprayed the foliage at 8:30 pm and then collected the foliage at 8:30 am (12 hour residues) and confined honey bees, leafcutting bees, and alkali bees with the treated foilage. At the rates used metasystox-R, Spur, and Asana caused more than 25% mortality of alkali bees (Table 2). Thiodan and Asana caused more than 25% mortality of leafcutting bees. We also buffered some of the insecticides to a pH of less than 3 to determine if low pH increased bee mortality. At the rates used Dibrom, Thiodan, and Capture caused more than 25% mortality of leafcutting bees. Buffering the insecticides to a pH below 3 did not appear to increase their hazard to leafcutting bees. Capture caused more than 25% mortality of honey bees.

There were no differences in the mortality of leafcutting bees using 2 different formulations of Asana and at the rates tested there was little bee mortality. Asana was hazardous to honey bees though there was no difference in the 2 formulations and a dosage response was evident.

Table 1. Mortalities of alkali bees (AB), alfalfa leafcutting bees (LB), and honey bees (HB), exposed to different age residues of pesticides applied to 0.01 acre plots of alfalfa. Prosser, WA. 1988.

Treatment	lb(AI)/a	24 hr % mortalities of bees, caged with treated foliage age of residues					
		AB		LB		HB	
		2 h	8 h	2 h	8 h	2 h	8 h
Asana XL 0.66 EC	0.0125	1	10	8	0	5	2
Asana XL 0.66 EC	0.0375	12	29	0	2	2	10
Asana XL 0.66 EC	0.05	--	--	4	4	50	66
Asana XL 0.66 EC	0.075	--	--	0	4	65	93
Asana XL 0.66 EC	0.1	--	--	8	1	95	100
Asana 1.9 EC	0.05	--	--	1	0	80	58
Asana 1.9 EC	0.075	--	--	6	0	69	81
Asana 1.9 EC	0.1	--	--	0	0	86	92
Scout 0.3 EC	0.019	1	16	--	--	2	3
Spur 22 EW + Butacide 8 EC	0.1 + 0.25	44	19	22	33	0	6
Summer oil	1 gal	0	0	--	--	0	2
XRD-522 0.3 EC	0.013	1	33	10	4	1	0
XRD-522 0.3 EC	0.015	0	37	16	15	0	0
fenoxycarb 25 WP	0.125	1	--	0	4	0	0
Rovral	1.0	--	--	0	--	0	--
Benlate	0.5	--	--	0	--	0	--
Ronilan	1.0	--	--	2	--	0	--

Table 2. Mortalities of alfalfa leafcutting bees (LB) and honey bees (HB) exposed to 12 hour residues of insecticides applied to 0.01 acre plots of alfalfa. Prosser, WA. 1988.

Treatment	lb(AI)/a	24 hr % mortalities of bees caged with treated foliage			
		July Test		August Test	
		AB	LB	LB	HB
Dylox 80 SP	1.0	6	5	8	--
Metasystox-R 25 EC	0.75	27	2	5	--
Metasystox-R 25 EC (buffered)	0.75	--	--	10	--
Spur 22 EW	0.15	44	6	16	--
Spur 22 EW (buffered)	0.15	--	--	12	--
Dibrom 8 E	1.0	0	18	26	--
Dibrom 8 E (buffered)	1.0	--	--	24	--
Phosdrin 4 EC	0.5	10	6	10	--
Phosdrin 4 EC (buffered)	0.5	--	--	4	--
Thiodan 3 EC	0.5	11	54	58	--
Thiodan 3 EC (buffered)	0.5	--	--	45	--
Asana XL 0.66 EC	0.0375	41	29	12	4
Asana XL 0.66 EC (buffered)	0.0375	--	--	7	4
Asana XL 0.66 EC	0.05	--	--	10	5
Capture 2 E	0.1	--	--	47	58
XRD-522 0.3 EC	0.015	--	--	13	0