

Pome Fruits—Pesticide Resistance

Bioassay, Field-Aged Residues of Conventional Insecticides Against Leafrollers, 1992

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Using a leaf-disk bioassay, different insecticides were evaluated for their effect on PLR larvae. Products were applied to Red Delicious apple trees at their recommended field rates as shown in Tables 1 and 2, using a handgun sprayer at 300 psi to the point of drip, simulating a dilute spray of approximately 400 gallons per acre. Treated apple leaves were collected 1, 3, 6, 9, 14, 21 and 28 days post-treatment. Two punches (2.3 cm diameter) were taken from each of 20 leaves per treatment on each date. Four punches were placed in a petri dish (Falcon 1006, 50 x 9 mm). Five one- to two-day-old leafroller larvae (PLR or OBLR) were placed on the leaf disks, and the petri dish lid was put in place. Ten dishes were used for each insecticide treatment (50 larvae per treatment) on each date. Dishes were placed inside a food storage container with a wet paper towel to maintain a high humidity and kept at 75°F ($\pm 2^\circ\text{F}$) constant temperature and 16:8 photoperiod. Dishes were examined after 48 hours to determine larval survival. Data were corrected for untreated mortality using Abbot's formula.

All insecticides resulted in nearly 100% mortality of PLR-Yakima larvae through 14 days of aged residue (Table 1). Some differences were observed, however, at 21 days after treatment (DAT) especially with the insecticides methyl parathion and azinphosmethyl (Guthion). By 28 DAT, Lorsban had also lost effectiveness and methyl parathion caused only 38% mortality. High mortality of PLR-Yakima larvae occurred through 28 DAT for Asana and Penncap-M. There was not a sufficient supply of eggs of the PLR-Marley strain to conduct a bioassay until 9 DAT and again not enough to test at 28 DAT. However, the PLR-Marley strain was less susceptible (more resistant) to methyl parathion, Guthion and Lorsban at 9, 14 and 21 DAT and less susceptible to Penncap-M at 21 DAT compared to the PLR-Yakima strain. Esfenvalerate (Asana) at one-tenth the recommended field rate resulted in high mortality of PLR-Yakima strain larvae, equal to that of encapsulated methyl parathion (Penncap-M). This treatment was also as effective as Penncap-M against the less susceptible PLR-Marley strain.

All insecticides were highly toxic to OBLR-Canada larvae through 21 DAT with the exception of methyl parathion where percent mortality dropped to 60% (Table 2). At 28 DAT percent mortality of larvae exposed to both methyl parathion and Lorsban was significantly less compared with the other insecticides. However, a much different result was noted when OBLR larvae of the Davis strain was tested. There were only enough young larvae available to conduct a bioassay at 9 and 14 DAT except for the chlorpyrifos treatment at 21 DAT. At 9 DAT OBLR-Davis larvae showed significantly less mortality to Lorsban, methyl parathion and Guthion when compared to the OBLR-Canada strain (Table 2), and at 14 DAT OBLR-Davis larvae showed significantly less mortality to all insecticides. Given these limited data, the OBLR-Davis strain seems highly tolerant of several insecticides compared to a very susceptible OBLR-Canada

strain.

Table 1. Corrected percent mortality of PLR larvae from two different populations, Yakima and Marley, exposed to field-aged residues of different insecticides.

Insecticide	Rate/acre	Corrected percent larval mortality, 48 hr (days after treatment)						
		1	3	6	9	14	21	28
PLR—Yakima colony								
Pennacap-M	4 qt	100	100	100	100	100	96	100
Lorsban 50WP	3 lb	100	100	100	100	100	98	74
methyl parathion	2 qt	100	100	100	100	98	56	38
Guthion 35WP	3 lb	100	100	100	100	100	80	74
Asana	1.6 oz	100	100	98	100	100	100	100
PLR—Marley colony								
Pennacap-M	4 qt				100	98	86	
Lorsban 50WP	3 lb				82	76	40	
methyl parathion	2 qt				98	34	30	
Guthion 35WP	3 lb				82	56	48	
Asana	1.6 oz				94	98	100	

Table 2. Corrected percent mortality of OBLR larvae from two different populations, Canada and MF-Davis, exposed to field-aged residues of different insecticides.

Insecticide	Rate/acre	Corrected percent larval mortality, 48 hr (days after treatment)						
		1	3	6	9	14	21	28
OBLR—Canada colony								
Pennacap-M	4 qt	100	100	100	100	100	100	94
Lorsban 50WP	3 lb	100	100	100	100	100	94	80
methyl parathion	2 qt	100	100	100	100	100	60	54
Guthion 35WP	3 lb	100	100	100	100	100	100	100
Asana	1.6 oz	100	100	100	98	100	100	100
OBLR—Davis colony								
Pennacap-M	4 qt				100	86		
Lorsban 50WP	3 lb				84	62	14	
methyl parathion	2 qt				74	32		
Guthion 35WP	3 lb				84	58		
Asana	1.6 oz				98	78		