Section V
Soil Arthropods

CONTROL AND FECUNDITY OF ROOT WEEVILS IN RED RASPBERRY

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Three promising biorationale insecticides were tested in the laboratory at recommended field rates on the black vine weevil (BVW), *Otiorhynchus sulcatus*, strawberry root weevil (SRW), *O. ovatus*, rough strawberry root weevil (RSRW), *O. rugosostriatus*, and clay colored weevil (CCW), *O. singularis*. We are pleased with their performance and hopefully can field trial them next year. Adequate numbers of seasonal black vine, clay colored, strawberry and rough strawberry roots weevils were collected to detail their ovipositional period, rate of egg production and total fecundity. This knowledge will provide pest managers with a better understanding of each species' egg potential and associated larval levels needed to make a well-timed preovipositional application(s). If adult weevils are controlled before egg laying begins in the field, the potential in-field increases from one season to the next should be reduced

Though not significant, we observed differential responses by 4 root weevil species to bifenthrin (Brigade) and the experimental neonicotinoids in the Petri dish bioassays. Thiamethoxam (Actara) and acetamiprid (Assail) initial knock-down is not as rapid as Brigade, however, at 3 and 7 DAT there was no significant difference between both neonicotinoids compared with Brigade. The insect growth regulators diflubenzuron (Dimilin) and pyriproxyfen (Esteem) resulted in BVW laying infertile eggs. Dimilin is registered on cotton to control boll weevil through reproductive suppression (Tables 1-6). Figure 1 summarizes the reproductive trends for mature overwintering and summer-emerging black vine weevils, strawberry root weevil and clay colored weevil. Compared with last year's cumulative egg production data for overwintering and summer-emerging BVW collected from Whatcom County, this year's weevil data from Clark County showed slightly earlier emergence and egg laying and higher cumulative egg production for overwintering BVW. The average seasonal fecundity for the overwintering weevils was about 680 to 325 and for the summer-emergers about comparable at 210 to 225. CCW fecundity for the past two years in the Northwood area was comparable at 25 to 30 eggs per weevil. The fecundity for a Clark County SRW population averaged 375 eggs laid from late May to late August. These data for overwintering BVW and SRW underscore the need for small fruit growers to monitor for these two species as they have to potential to lay many eggs before the traditional preharvest cleanup spray. When winter and early spring months are not as mild as they were this year, CVW will emerge around bud break, browse buds and initiate egg laying during their relatively short ovipositional period that is over by early June. Their feeding injury is irreparable and we've shown this species will incur economic yield losses very early in the growing season.

Table 1. Black Vine Weevil Lab Bioassay

		% Mortality			
Treatment	lb(AI)/acre	1 DAT	2 DAT	3 DAT	7 DAT
Untreated check		26bc	26c	26b	26b
Actara 25WG	0.0625	94a	100a	100a	100a
Assail 70WP	0.15	34b	57b	80a	91a
Brigade 10WP	0.05	100a	100a	100a	100a
Brigade 10WP	0.10	100a	100a	100a	100a
Dimilin 25W	0.0625	9c	11c	11b	20b
Dimilin 25W	0.125	14bc	14c	17b	26b

Percentages within columns followed by the same letter are not significantly different (Tukey HSD test, $P < 0.05$).

Table 2. Rough Strawberry Root Weevil Lab Bioassay

		% Mortality			
Treatment	lb(AI)/acre	1 DAT	2 DAT	3 DAT	7 DAT
Untreated check		17c	20b	20b	29b
Actara 25WG	0.0625	77ab	77a	80a	91a
Assail 70WP	0.15	60ab	86a	91a	100a
Brigade 10WP	0.05	66ab	80a	83a	86a
Brigade 10WP	0.10	89a	91a	97a	100a
Dimilin 25W	0.0625	14c	23b	23b	26b
Dimilin 25W	0.125	49bc	91a	91a	91a

Percentages within columns followed by the same letter are not significantly different (Tukey HSD test, $P < 0.05$).

Table 3. Strawberry Root Weevil Lab Bioassay

		% Mortality			
Treatment	lb(AI)/acre	1 DAT	2 DAT	3 DAT	7 DAT
Untreated check		0b	0b	0b	10b
Actara 25WG	0.0625	81a	100a	100a	100a
Assail 70WP	0.15	95a	95a	100a	100a
Brigade 10WP	0.05	100a	100a	100a	100a
Brigade 10WP	0.10	100a	100a	100a	100a
Dimilin 25W	0.0625	0b	24b	24b	29bc
Dimilin 25W	0.125	14b	24b	38b	43c

Percentages within columns followed by the same letter are not significantly different (Tukey HSD test, $P < 0.05$).

Table 4. Clay Colored Weevil Lab Bioassay

		% Mortality			
Treatment	lb(AI)/acre	1 DAT	2 DAT	3 DAT	7 DAT
Check		0d	0c	0c	0c
Actara 25WG	0.0625	43bc	70ab	78ab	78ab
Assail 70WP	0.15	43bc	60ab	68ab	68ab
Brigade 10WP	0.05	78ab	90a	93a	98a
Brigade 10WP	0.10	90a	90a	100a	100a
Dimilin 25W	0.0625	3cd	3c	3c	3c
Dimilin 25W	0.125	45b	45b	45b	60b

Percentages within columns followed by the same letter are not significantly different (Tukey HSD test, $P < 0.05$).

Table 5. Black Vine Weevils Egg Bioassay

		% Hatch			
Treatment	lb(AI)/acre	1 DAT	2 DAT	3 DAT	7 DAT
Untreated check		82	100	100	100
Dimilin 25W	0.0625	75	14	0	14
Dimilin 25W	0.125		34	0	34

Table 6. Black Vine Weevil Eggs Bioassay

		% Hatch					
Treatment	Rate	1 DAT	2 DAT	7DAT	9 DAT	11DAT	14DAT
Untreated check		82	70	71	83	100	80
Esteem 0.86EC	8fl.oz/100gal	82	100	8	11	8	71

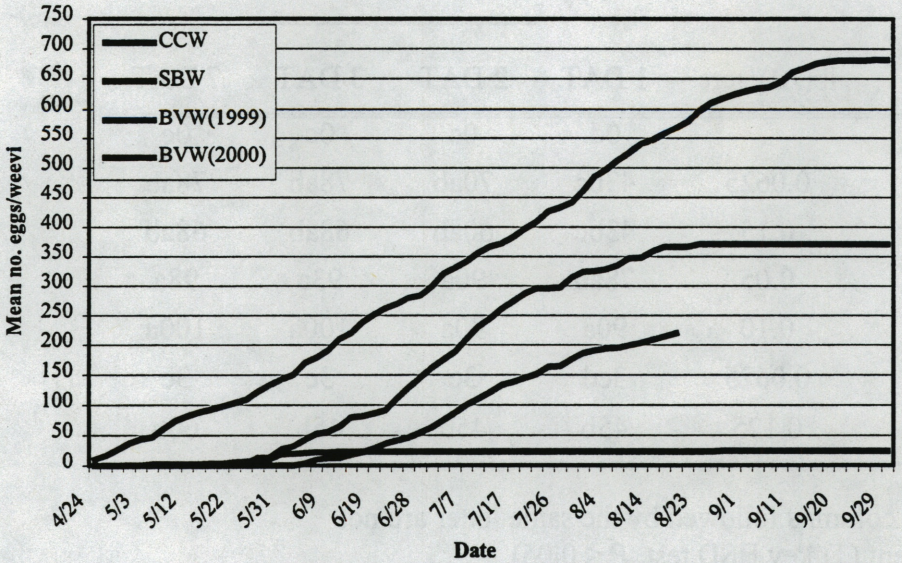

Fig. 1: Cumulative egg production for all root weevils studies, 2000.