

Section VI.  
Soil Arthropods

**CHEMICAL CONTROL OF ROOT WEEVILS**

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The following laboratory trials were conducted to find insecticides that are efficacious against the black vine weevil, *Otiorhynchus sulcatus*:

**Trial 1:** The roots of strawberry plants were dipped in dilutions of endosulfan (Thiodan) or imidacloprid prior to planting. Weevil eggs were added two months later. Endosulfan and the higher rate of imidacloprid gave excellent control of the larvae (Table 1).

**Trial 2:** Strawberry leaves were dipped in dilutions of AC 303,630 or cryolite (Prokil 96). Adult weevils were placed on the leaves and observed for knockdown at intervals. Both chemicals gave excellent kill of weevils but cryolite was slower to do so (Table 2). Cryolite stopped weevil feeding, which may have contributed to their death.

**Trial 3:** The pyrethroid, esfenvalerate (Asana), and azinphosmethyl (Guthion) were tested alone and in combination against adult weevils. Strawberry leaves were dipped in the dilutions, weevils were placed on the wet leaves and then transferred to clean leaves two hours later, and knockdown of weevils was observed for two days. The combination was much more toxic to the weevils than either insecticide alone (Table 3).

**Trial 4:** Asana and malathion were tested alone and in combinations in the same way as the chemicals in Trial 3. Again, the combinations were more active than either chemical alone (Table 4).

**Trial 5:** A bait of 80% dried apple pomace and 20% cryolite was developed for use against adult black vine weevil on cranberries by Ocean Spray Cranberry entomologists. This bait and one in which wheat bran was substituted for apple pomace were compared. Other variables were moisture in the bait and the presence of a strawberry leaf as competition for the baits. The baits were very similar in efficacy and moisture or the presence of strawberry leaves had little effect. The bran bait molded very quickly (Table 5).

**Trial 6:** Fipronyl was tested using methods similar to those in Trials 3 and 4. However, weevils were placed on both the newly treated wet leaves and on dry leaves 48 hr. after treatment. Both rates gave excellent kill of weevils on both the new and 48-hr.-old residues (see Table 6).

Two field trials were conducted with insecticides against adult root weevils on strawberries:

**Vancouver, WA trial:** AC 303,630 and bifenthrin (Brigade) were tested as sprays and cryolite was tested as a bait (80% dried apple pomace, 20% cryolite) against black vine and strawberry root weevils on strawberry. The two sprays gave excellent control of both species of weevils. Cryolite bait gave excellent control of strawberry root weevil and fair control of black vine weevil (Table 7).

**Puyallup, WA trial:** AC 303,630 was tested at two rates and also as both daytime and nighttime sprays against adult black vine and obscure root (*Sciopithes obscurus*) weevils. Cryolite was tested as a spray (Prokil 96%) and as a 20% bait. All treatments gave equally good results against both species of weevils (Table 8). The results indicate that AC 303,630 will work as well when applied during the day as at night, which would obviate the necessity of workers applying chemicals at night.

Table 1 - Preplanting root dips to control larvae.<sup>a</sup>

Insecticide	Rate	Larvae/ 5 plants	Mean root rating
Thiodan 50WP	2 lb. 50WP/100 gal.	2	4.6
Imidacloprid 1.8F	0.04 gal./100 gal.	16	4.8
Imidacloprid 1.8F	0.44 gal./100 gal.	1	4.8
Untreated check	N/A	22	2.6

<sup>a</sup>Treated and planted in pots of field soil March 3; weevil eggs added May 3; larvae counted August 3.

Table 2 - Foliar treatments for control of adult black vine weevil.

Insecticide	Amount of formulation per 100 gal. water	No. knocked down after:*				
		1 day	2 days	3 days	6 days	10 days
AC 303,630 3SC	0.1 gal.	11	16	17	20	20
AC 303,630 3SC	0.05 gal.	6	17	20	20	20
AC 303,630 3SC	0.025 gal.	7	12	17	20	20
AC 303,630 3SC	0.0125 gal.	1	8	14	20	20
Cryolite (Prokil 96)	50 lb.	1	1	1	8	19
Cryolite (Prokil 96)	100 lb.	3	6	6	8	20
Cryolite (Prokil 96)	200 lb.	1	2	4	16	19
Untreated check	N/A	0	1	1	3	6

\*Out of 20 weevils.

\*\*Weevil feeding virtually ceased on cryolite-treated leaves.

Table 3 - Combinations of Asana &amp; Guthion against adult black vine weevil.

Insecticide**	Amount of formulation per 100 gal. water	No. knocked down after:*	
		24 hr.	48 hr.
Asana XL	2.4 fl.oz.	7	4
Asana XL	4.9 fl.oz.	16	12
Asana XL	9.7 fl.oz.	13	13
Guthion 50WP	0.25 lb.	3	3
Guthion 50WP	0.50 lb.	5	8
Guthion 50WP	1.0 lb.	11	12
Asana XL +Guthion 50WP	2.4 fl. oz. + 0.25 lb.	20	20
Asana XL +Guthion 50WP	4.9 fl. oz. + 0.5 lb.	19	19
Untreated check	N/A	0	0

\*Out of 20 weevils.

\*\*Weevils on wet freshly treated leaves for 2 hours; then transferred to clean containers.

Table 4 - Combinations of Asana &amp; malathion against adult black vine weevil.

Insecticide**	Amount of formulation per 100 gal. water	No. weevils knocked down after.*			
		24 hr.	48 hr.	72 hr.	96 hr.
Malathion 25WP	8 lb.	2	3	2	4
Asana XL	2.4 fl.oz.	0	2	2	4
Asana XL	4.9 fl.oz.	3	2	2	3
Asana XL	9.7 fl.oz.	12	7	9	15
Asana XL+malathion 25WP	2.4 fl.oz.+8 lb.	4	3	4	6
Asana XL+malathion 25WP	4.9 fl.oz.+8 lb.	12	10	10	10
Asana XL+malathion 25WP	9.7 fl.oz.+8 lb.	17	17	19	19
Untreated check	N/A	0	1	1	1

\*Out of 20 weevils.

\*\*Weevils on wet freshly treated leaves for 2 hours. Then transferred to clean containers

Table 5 - Comparison of dried apple pomace and wheat bran as baits for adult black vine weevil.

Treatment**	No. weevils down after.*		
	1 day	7 days	11 days
Bran bait	0	8	20
Bran bait + leaf	0	3	19
Apple bait	0	11	20
Apple bait + leaf	0	10	18
Strawberry leaf only	0	0	1
Water only	0	0	14

\*Out of 20 weevils.

\*\*Both baits contained 20% cryolite by weight.  
The bran bait molded quickly.

Trial 6 - Test of fipronyl against adult black vine weevils.

Treatment	Lb. actual toxicant per 100 gal. water	No. weevils down after.*				
		Newly treated wet leaf			Dry leaf after 48 hr.	
		24 hr.	48 hr.	72 hr.	24 hr.	72 hr.
Fipronyl 80WG	0.01	18	20	20	17	20
Fipronyl 80WG	0.02	20	20	20	18	20
Untreated check	N/A	0	0	1	1	2

\*Out of 20 weevils.

Table 7. Control of adult black vine and strawberry root weevils on strawberries, Vancouver, WA, 1994.

Treatments**	Rate***	No. weevils per 45-ft. row*					
		June 23		June 28		July 6	
		SRW	BVW	SRW	BVW	SRW	BVW
AC 303,630 2SC	0.32 lb. aia	0.8a	0a	0.3a	0.3a		
Brigade 10WSB	0.1 lb. aia	0a	0a	0a	0a		
Cryolite bait****	30 lb./acre			1.3a	5.0b		
Cryolite bait	60 lb./acre			0.3a	2.8b	0a	6.5a
Untreated check	N/A	18.8b	20b	14.8b	11.5c	41.3b	9.3a

\*Means followed by the same letter are not significantly different (Tukey's HSD Test, P=0.05).

\*\*Applied on June 21. Sprays applied between 10:00 & 11:00 PM.

\*\*\*Lb. aia = pounds actual insecticide per acre; lb/acre = pounds of bait per acre.

\*\*\*\*80% dried apple pomace, 20% cryolite by weight.

Table 8. Control of adult black vine and obscure root weevils, Puyallup, WA, 1994.

Treatment	Rate	Mean no. weevils / 3 10-ft.rows*	
		Black vine	Obscure root
AC 303,630 2SC	0.16 lb ai/acre (night application)	0.5a	0.0a
AC 303,630 2SC	0.32 lb ai/acre (night application)	0.3a	0.0a
AC 303,630 2SC	0.32 lb ai/acre (applied 6 PM)	0.3a	0.0a
Cryolite bait, 20%	60 lb. bait per acre	0.5a	0.0a
Cryolite bait, 20%	30 lb. bait per acre	1.3a	0.0a
Cryolite (Prokil 96%)	48 lb. actual per acre	1.0a	0.0a
Untreated check	N/A	8.8b	5.0b

\*Means followed by the same letter are not significantly different (Tukey's HSD test, P=0.05).