

Insecticidal Effects of Sevin XLR When Applied as an Apple Thinning Agent

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Fruit thinning is perhaps the single most important annual management practice for apple growers. There are a number of effective chemical thinners registered in NY, and horticulturists have established programs for the forty-some cultivars and types grown in the state. Of those, approximately 30 percent are considered to be difficult to thin and multiple applications of thinners, including double applications of carbaryl, are recommended (Cornell Guidelines for Commercial Tree-fruit Production, 2004). The rationale for multiple carbaryl applications for thinning is adequately justified in Robinson et al. ("Practical Apple Thinning Programs for NY", NY Fruit Quarterly Vol. 6, 1998).

Because wettable powder formulations of carbaryl have historically been perceived as being detrimental to bees, carbaryl has not been commonly used close to bloom. The relatively new Sevin XLR, formulation of carbaryl, however, is less hazardous to bees than other carbaryl products, thereby making it possible to apply this effective thinner at a wide range of timings from petal fall to 20mm fruit size. The expanded role of carbaryl in thinning recommendations has given rise to questions pertaining specifically to control of plum curculio (PC). In general, previous formulations of carbaryl were not considered in PC management programs because of both the bee issue and perceived short residual toxicity. The availability of Sevin XLR, however, made it apparent that there were gaps in our knowledge about the efficacy and persistence of carbaryl for management of PC. For instance, growers often inquired about the effectiveness of Sevin XLR applications against PC and

other early-season insect pests, whether Sevin XLR should be tank-mixed with traditional PC materials, or if traditional cover sprays should be applied. These logical questions highlighted data gaps in our knowledge regarding the efficacy of XLR against PC and other early season pests.

We wanted to find answers to some of these questions, so during 2003 we compared Sevin XLR at 1.0 and 2.0 pints/100. Those two treatments were tank mixed with Guthion 50W, Guthion alone at 6.0 and 12.0 oz/100, and an untreated control. Treatments were applied once at petal fall (May 20). Damage to fruit was assessed eight days post application. Results showed that either rate of Sevin XLR was more effective than either rate of the Guthion standard. The addition of Guthion in a tank mix did not increase efficacy over that of Sevin XLR alone. Because rainfall was excessive during the trial (2.3 inches between petal fall and first cover, results may have reflected the superior rain fastness of Sevin XLR relative to Guthion. From those preliminary results during 2003, we concluded that the use of Sevin XLR at petal fall protected apples from damage by PC as well as the standard Guthion treatment and that the 1.0 pt/100 rate was sufficient for the management of PC. With funding from the NYS Apple Research and Development Program during 2004, we performed field trials to further assess the efficacy of Sevin XLR against PC and other insect pests.

Objectives

1. Compare efficacies against PC of thinning programs (designed for

When applied either in single or in double application fruit-thinning scenarios, Sevin XLR is effective against plum curculio and other early-season insects and can be substituted for traditional organophosphate sprays against those pests.

relatively 'easy to thin' and 'difficult to thin' cultivars) utilizing Sevin XLR in single and multiple applications, and in combination with traditional insect management programs.

2. Assess efficacy of the above scenarios against other early season pests of apple (e.g., tarnished plant bug, European apple sawfly and external Lepidoptera).



Figure 1. Adult plum curculio, *Conotrachelus nenuphar*, ovipositional scar and egg, extracted from within the wound for display.



Figure 2. Plum curculio damage as it appears at harvest.

- Compare cost efficiencies of each thinning/insecticide program scenario.

Procedures

Treatments were applied to two-tree plots, each representing a separate cultivar ('Liberty' & 'Jersey Mac') replicated four times in a randomized complete block design. Treatments were applied (petal fall and/or first cover; all treatments received Asana at pink stage) dilute to runoff using a high-pressure handgun sprayer operated at 300 psi, that delivers 1.5 gal/tree or 150 gal/acre. All insecticide dilutions (at amt/100 gal) are based on a standard of 300 gal/acre trees. Scions top worked on 'M.26' rootstock were six years old, and approximately 10 ft. high. Damage to fruit was assessed by randomly selecting 100 fruits on May 28 (8 days post application) and scoring for external damage by PC adults and other early-season pests. Damage data were converted to percent damage and transformed by arcsine prior to analysis by Fisher's Protected LSD. Insecticide costs were computed from information generated in a USDA RAMP project, with which we are involved.

Results

Objective 1. Infestation pressure from PC was severe (Tables 1 and 2). Although infestation pressure was greater on 'Jersey Mac' than on 'Liberty', insecticide treatments performed equally on both varieties. Among standard treatments, the 10 oz Guthion rate was not superior to the 8 oz rate. In the 'easy-to-thin' application scenario, Sevin XLR alone at first cover performed as well as a tank-mix of Sevin XLR plus Guthion. Likewise, in the 'difficult to thin' scenario, Sevin XLR alone at petal fall and first cover performed as well as a tank-mix of Sevin XLR plus Guthion.

Objective 2: All application scenarios provided excellent control of tarnished plant bug (TPB), European apple sawfly (EAS) and external Lepidoptera (Tables 1 and 2). For early-season insects, the performance of Sevin XLR applied in either single or double application scenarios were not enhanced by tank mixing with Guthion.

Objective 3: In both the 'easy to thin' and the 'difficult to thin' scenarios, the addition of Guthion to Sevin XLR did not significantly enhance efficacy against PC

or other early-season pests. From an economic standpoint however, the addition of Guthion to the 'easy to thin' scenario and the 'difficult to thin' scenario increased the costs of management by 35% and 53%, respectively.

Conclusions

The results showed that the thinner/insecticide Sevin XLR (1.0 pt/100),

when applied either in single or in double application scenarios (for 'easy to thin' and 'difficult to thin' cultivars, respectively), is efficacious against plum curculio and other early-season insects and can be substituted for traditional Guthion sprays against those pests. Moreover, the addition of Guthion to Sevin XLR thinning-sprays does not enhance insecticide efficacy, but does add significantly to the expense of management.

TABLE 1

Insecticidal effects of Sevin XLR on 'Liberty' when applied as an apple thinning agent in 'easy' and 'difficult' to thin scenarios ¹ Hudson Valley Laboratory, Highland, N.Y. - 2004							
Treatment	Formulation (amt./100 gal.)	Timing	% Damaged Fruit ²				Clean fruit (%)
			TPB (%)	PC (%)	EAS (%)	LEP (%)	
<i>Standard PC programs⁴</i>							
1.	Guthion 8.0 oz	PF & 1C	0.3 a	0.0 a	1.3 a	0.0 a	97.5
2.	Guthion 10.0 oz	PF & 1C	0.5 a	0.0 a	0.0 a	0.0 a	99.5
<i>Easy to thin scenario⁴</i>							
4.	Sevin XLR 1.0 pt Guthion 8.0 oz	1C PF	1.0 a	0.3 a	0.3 a	0.0 a	98.5
5.	Sevin XLR 1.0 pt Guthion 8.0 oz	1C PF & 1C	0.8 a	0.3 a	1.0 a	0.0 a	98.0
<i>Difficult to thin scenario⁴</i>							
6.	Sevin XLR 1.0 pt	PF & 1C	2.5 a	0.0 a	0.3 a	0.3 a	97.0
7.	Sevin XLR 1.0 pt Guthion 8.0 oz	PF & 1C CPF & 1C	0.0 a	0.8 a	1.3 a	0.3 a	98.3
8.	Untreated		1.5 a	19.5 b	23.9 b	1.8 a	53.4

¹Data from 'Liberty' evaluation on June 1 (8 days post-application). All treatments received Asana XL at 5.0 oz / 100 at 'pink' stage.

²Mean separation by Fishers Protected LSD (P=<0.05). Treatment means followed by the same letter are not significantly different.

³PF on May 12 at 80% PF of JM; first cover on May 24.

⁴Degree-day model predicted that the second cover spray was not necessary.

TABLE 2

Insecticidal effects of Sevin XLR on 'Jersey Mac' when applied as an apple thinning agent in 'easy' and 'difficult' to thin' scenarios ¹ Hudson Valley Laboratory, Highland, N.Y. - 2004							
Treatment	Formulation (amt./100 gal.)	Timing ³	% Damaged Fruit ²				Clean fruit (%)
			TPB (%)	PC (%)	EAS (%)	LEP (%)	
<i>Standard PC programs⁴</i>							
1.	Guthion 50W 8.0 oz.	PF & 1C	0.3a	0.3a	0.0a	0.0a	99.5
2.	Guthion 50W 10.0 oz.	PF & 1C	0.5a	0.5a	0.0a	0.0a	99.0
<i>Easy to thin scenario⁴</i>							
4.	Sevin XLR 1.0 pt. Guthion 8.0 oz	1C PF	0.0a	1.3a	0.0a	0.0a	98.8
5.	Sevin XLR 1.0 pt. Guthion 8.0 oz	1C PF & 1C	0.5a	0.0a	0.0a	0.0a	99.5
<i>Difficult to thin scenario⁴</i>							
6.	Sevin XLR 1.0 pt.	PF & 1C	0.0a	0.0a	0.0a	0.0a	100.0
7.	Sevin XLR 1.0 pt. Guthion 8.0 oz	PF & 1C PF & 1C	1.5a	0.0a	0.3a	0.3a	98.0
8.	Untreated		2.5a	29.3b	5.5b	1.0b	61.8

¹Data from 'Jersey Mac' evaluation on June 1 (8 days post-application). All treatments received Asana XL at 5.0 oz / 100 at 'pink' stage.

²Mean separation by Fishers Protected LSD (P=<0.05). Treatment means followed by the same letter are not significantly different.

³PF on May 12 at 80% PF of JM; first cover on May 24.

⁴Degree-day model predicted that the second cover spray was not necessary.

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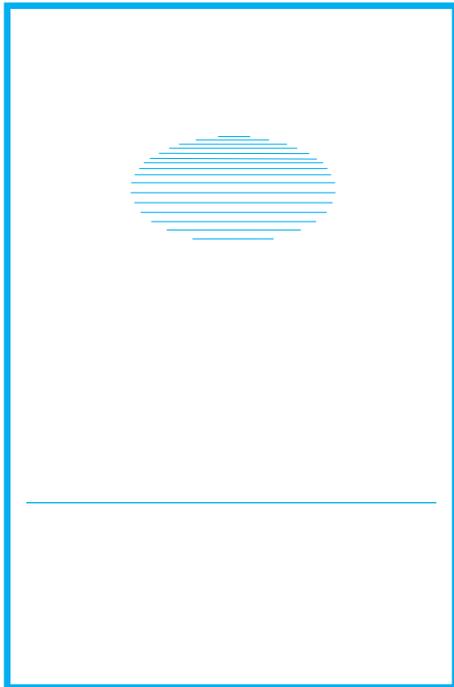


TABLE 3

Relative costs of concurrent programs used to manage crop load and the plum curculio, Hudson Valley Laboratory, Highland, N.Y. – 2004

Treatment	Schedule	Total cost for insect control (2 cover sprays) ^{1,2}	Relative difference
Standard PC programs			
1. Guthion W @ 8.0 oz/100	PF & 1C	\$24.96	
2. Guthion W @ 10.0 oz/100	PF & 1C	\$31.20	
Easy to thin scenario			
4. Sevin XLR @ 1.0 pt/100 Guthion W @ 8.0 oz/100	single thin @ 1C PF	\$23.52	4 vs. 5 \$12.48 (35%)
5. Sevin XLR @ 1.0 pt/100 Guthion W @ 8.0 oz/100	single thin @1C PF & 1C	\$36.00	
Difficult to thin scenario			
6. Sevin XLR @ 1.0 pt/100	double thin @ PF & 1C	\$22.08	6 vs. 7 \$25.06 (53%)
7. Sevin XLR @ 1.0 pt/100 Guthion W @ 8.0 oz/100	double thin @ PF & 1C PF & 1C	\$47.04	

¹General 2004 prices provided to USDA RAMP project by cooperating suppliers.

²Dilutions were based on trees requiring 300 gallons volume/acre.

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