

Tests of systemic insecticides for cone and seed insect control

Progress report, year one.

Introduction

In reaction to recent insect pest losses of up to \$1,000,000/year in BC seed orchards, a partnership of specialists from CanFor, Timberwest, and the Ministry of Forests started a project in 2005 to assess new systemic insecticides for cone and seed insect control. They developed a three-year project proposal, which was submitted to, and ultimately funded by the Forest Genetics Council of BC. This is the progress report for year one.

In the literature, two products showed particular promise: imidacloprid (Admire) and acetamiprid (Tristar). Both of these are registered in Canada for a variety of other uses -- a prerequisite for any additional minor use registrations. The objectives for the project were to:

1. Test the systemic pesticides imidacloprid and/or acetamiprid, using sprays, injections, or both, against cone and seed insects in Douglas-fir (Fdc), Western redcedar (Cwr), and Interior spruce (Sx) over 3 years. Target pests are: Douglas-fir seed chalcid; Douglas-fir cone gall midge, coneworms (*Diroyctria*), redcedar cone midge, spruce cone maggot, spruce seedworm, *Megastigmus* seed wasps.
2. Co-ordinate and co-operate with other forestry and seed orchard programs across Canada in the collection of efficacy data for registration. Target partners include: Forestry Canada, other provincial seed orchard managers, and the manufacturer.

Progress in 2005

Unfortunately, the 2005 field agendas for other agencies were full and they were not able to participate. None seem to be doing similar work, but they are very interested in our progress. We are still in contact, and may do some cooperative work in the future.

Imidacloprid (Admire) and acetamiprid (Tristar) were tested in three orchards: Timberwest's Mt Newton Seed Orchard in Saanichton, CanFor's Sechelt Seed Orchard, and the Ministry of Forests' Kalamalka Seed Orchard in Vernon. Because of timing for Western redcedar, and a lack of cones in Interior spruce, only coastal and interior Douglas-fir were included in the first year's test.

Injections, using Acecaps (acephate), were included in trials at Sechelt. We were not able to get injectable formulations of the other insecticides in time for the trial.

Ten trees for each treatment were flagged and labelled in the spring, prior to insect emergence. Subsequent orchard conelet samples predicted a small, but not overwhelming insect population in 2005.

Sprays were applied by hydraulic sprayer or backpack. Where possible, rates used were: 0.5x, 1.0x, 1.5x, 2.0x label rate (see below). Double applications (an initial spray, followed by a spray a few weeks later) were made for Admire and Tristar on the coast, and for Admire, Tristar, and dimethoate in the interior. A single dimethoate spray is the current control measure.

Because of a shortage of cone-bearing trees, all rates were not applied at all sites (see data tables for specifics). A general summary of rates is outlined in Table 1, and the actual treatments applied are listed in tables for each orchard. A dimethoate single spray and an unsprayed or water-sprayed control were included where possible.

Table 1. Rates for pesticides tested in 2005:

Treatment	Rate
Acecaps	1 cap/4" circumference
Admire 240 Flowable	0.5x - 190mL/ha 1x - 380ml/ha 1.5x - 570mL/ha
Tristar 70WSP	0.5x - 2.5 pkts/100L water 1.0x - 5 pkts/100L 2.0x - 10 pkts/100L
dimethoate	1% - 12.5L/1000L water (Vernon) 2% - 25 L/1000L (Sechelt)

At Vernon, cones were examined for Dioryctria damage on June 15. At all sites, sample cones were collected in the late summer and assessed during the fall/winter. Filled, empty, and chalcid infected seed were counted using x-ray images. Damage by other insects was not recorded because cones had turned too dry and brittle before assessments could be done.

The tables below summarize the data collected in 2005. Analysis is still underway, so any interpretation should be done with caution.

That said, it appears that both Admire and Tristar show some promise against chalcid in coastal orchards (Table 2; Table 3), and against Dioryctria in Vernon (Table 4). While there are many inconsistencies, most applications appear to have had at least some positive effect.

The Vernon data for chalcid is puzzling (Table 5). All insecticide treatments at Vernon had more chalcid than did water sprayed controls. However, the controls also had the most Dioryctria in cones. That may be influencing the result. Clearly, more analysis is necessary before any conclusions are made.

Acecaps show some promise at Sechelt. They take some time to dissolve into the sap stream, so an earlier application date may provide better results.

Analysis of the results is on-going, and preparations are underway for year two of the project.

Summary Data Tables

Table 2: Timberwest. Average number of filled seed, empty seed, and chalcid infested seed/tree based on 10 cone samples. Data is sorted for an ascending value for chalcid. Potential seed is the sum of chalcid, filled, empty and partial seed.

Timberwest	Average number of Chalcid/tree based on a 10 cone sample/tree				
	<i>Sorted by Chalcid</i>				
Treatment	Chalcid	Filled seed	Empty seed	Partial seed	Potential seed
H Tristar 2.0x1	0.3	75	61	1.8	138.1
I Tristar 0.5x2	0.7	82.9	76.1	1.7	161.4
F Tristar 0.5x1	1	114.3	84.1	2	201.4
C Admire 1.5x1	1.2	103.1	83.7	4.1	189.1
G Tristar 1.0x1	1.7	81.8	93.7	1	178.2
E Admire 0.5x1	2.3	85.9	101.3	1.6	191.1
A Control	2.9	89.6	81.4	1.4	175.3
D Admire 1.0x2	3.4	78.8	89	1.9	173.1
B Admire 1.0x1	10.4	65.6	108.4	3.2	187.6

Table 3: Sechelt. Average number of filled seed, empty seed, and chalcid infested seed/tree based on 10 cone samples. Data is sorted for an ascending value for chalcid. Potential seed is the sum of chalcid, filled, empty and partial seed.

Sechelt	Average number of Chalcid/tree based on a 10 cone sample/tree				
	<i>Sorted by Chalcid</i>				
Treatment	Chalcid	Filled	Empty	Partial	Pot/tree
6-Admire 1.5x2	2.4	31.7	93	1.1	128.2
9-Admire 1.0x1	3.3	39.7	105.8	1.7	150.5
8-Tristar 0.5x1	4	40	96.6	4.5	145.1
2-dimethoate	4.3	48.9	119	1.5	173.7
4-Acecaps	5.8	57.4	123.8	1.1	188.1
5-Tristar 1.0x2	6.3	40.1	138.6	3.7	188.7
7-control	7.1	57.4	141.8	3.3	209.6
1-tristar 1.0x1	12.1	40.7	117.2	2.1	172.1
3-Admire 1.5x1	12.6	55.2	109.6	2.3	179.7

Table 4: Vernon. Average number of filled seed, empty seed, and chalcid infested seed/tree based on 50 cone samples/tree, and number of Dioryctria infested cones based on 10 cone samples. Data is sorted for an ascending value for Dioryctria. Potential seed is the sum of chalcid, filled, empty and partial seed.

Vernon 1	Average number of Chalcid/tree based on a 50 cone sample/tree			
	<i>Sorted by Diory/10</i>			
	Diory/10	Filled	Empty	Chalcid
5 Admire 1X	2.0	79.1	320.1	26.8
3 Dimethoate double	2.3	259.6	389.7	58.8
7 Tristar 0.5X	2.5	136.2	529.7	44.4
6 Admire double	2.7	200.7	300.8	28.7
2 Dimethoate single	2.9	71.7	410.3	54.4
8 Tristar 1X	3.0	161.7	430.9	69
9 Tristar double	3.0	60.4	295.3	27
4 Admire 0.5X	3.2	107.6	546.5	71.1
1 Water control	4.9	25.6	156.6	7.3

Table 5: Vernon. Average number of filled seed, empty seed, and chalcid infested seed/tree based on 50 cone samples/tree, and number of Dioryctria infested cones based on 10 cone samples. Data is sorted for an ascending value for chalcid. Potential seed is the sum of chalcid, filled, empty and partial seed.

Vernon 2	Average number of Chalcid/tree based on a 50 cone sample/tree			
	<i>Sorted by Chalcid</i>			
	Chalcid	Filled	Empty	Diory/10
1 Water control	7.3	25.6	156.6	4.9
5 Admire 1X	26.8	79.1	320.1	2.0
9 Tristar double	27	60.4	295.3	3.0
6 Admire double	28.7	200.7	300.8	2.7
7 Tristar 0.5X	44.4	136.2	529.7	2.5
2 Dimethoate single	54.4	71.7	410.3	2.9
3 Dimethoate double	58.8	259.6	389.7	2.3
8 Tristar 1X	69	161.7	430.9	3.0
4 Admire 0.5X	71.1	107.6	546.5	3.2