2010 British Columbia Insecticide and Herbicide Screening Trials in Support of Canadian Registration Requirements for Cranberry Crops

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Funding provided by:

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Investment Agriculture Foundation of British Columbia
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Summary

Of three products tested to replace diazinon, one product, Movento appeared to provide better control of Dearness Scale. Future work needs to identify if timing of treatments can wait until after bloom rather than being applied at the current timings of pre- bloom and mid-bloom.

The product Movento in its third year of testing in British Columbia still shows best results in controlling cranberry tipworm. No pytotoxicity was identified this year although minor crop discoloration was noted during the 2009 trials.

We completed crop tolerance trials for Select/Centurion, in BC and with our co-operator in New Brunswick, G. Graham with the New Brunswick Department of Agriculture and Aquaculture. Select/Centurion is a product used for grass control, particularly useful in new plantings for annual bluegrass control. Neither Poast nor Callisto currently gives satisfactory control of this weed in cranberries. Data will be provided to Bayer CropScience to enable the application for a label expansion for these products in Canada.

Screening trials for broadleaved weeds in cranberries did identify possible candidates for further testing. None appeared to be good candidates for control of horsetail, yellow loosestrife and sheep sorrel, still problem weeds in cranberries. The timing of applications of those products tested needs further work.

Objective 1: To Identify a Diazinon replacement for Dearness Scale that is compatible with chemigation.

Background Information

Diazinon is the only pest control product registered in Canada to control Dearness scale. Loss of this product in 2012 will limit the treatment of this pest in bogs where there is high pest pressure. As part of the azinphos-methyl replacement strategy with the Pest Management Centre and Pest Management Regulatory Agency we chose to test three possible candidates for control of Dearness scale.

The trial site was in Richmond, BC, on a cranberry (*Vaccinium macrocarpon*) bog infested with dearness scale (*Rhizaspidiotus dearnessi*). This site was selected for its history of high dearness scale population.

All applications were made as a "chemigation", to simulate a "wash out" period of 15 minutes.

The first application of the test products occurred on June 13, 2010 when the flower bugs were visible and at the emergence of the crawlers. All treatments were reapplied on Aug 5, 2010.

Crop tolerance was assessed at 15 and 19 days after the first application (DA-A) and 6 and 14 days after the second application (DA-B).

Scale sampling was conducted 3 days prior to the application to establish the population and at 15 DA-A and 14 DA-B. Sampling was conducted by collecting four subsamples of cranberry tips from four random 25 cm2 quadrants within the middle meter of each plot. The subsamples were transported to the lab in coolers with ice to slow down insect metabolism and kept refrigerated at the lab until evaluation.

Overall weather conditions were below normal from the 30 year average in the Richmond area.

Data was analyzed and presented using Tukey's HSD at a 5% significance level. This method is conservative and most accepted by the Pest Management Regulatory Agency (PMRA) for data submission and registration.

Results

Crop tolerance was excellent at all assessment dates. The cranberry cultivar, McFarlin, showed no injury to the tested insecticides.

One application of the tested products did not reduce the severity or incidence of scale within the plots when compared to the untreated or industry standard Diazinon®. After two applications, Movento® reduced the incidence of scale when

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compared to the untreated and Diazinon®. While all other tested products and Diazinon® were equivalent to the untreated and did not reduce the scale population. No differences were observed in the severity of scale within the plots, however a noticeable trend was observed with the Movento® treatment having a reduction in numbers compared to the other tested products and untreated. (See Table 1)

The trial site was visited again in late fall and it was observed that two of the three Movento® treated plots had a noticeable increase in the amount of green vegetation compared to other plots. This observation helps leads to support the data that Movento® may be having some level of activity on the scale population.

Table1: Insecticides screened for the control of dearness scale.

Treatment	Rate	% Incidence of Scale		Severity of Scale	
		15 DA-A	**14 DA-B**	**15 DA-A**	**14 DA-B**
1. Untreated Check		24.0 a	86.0 a	45.3 a	662.5 A
2. Movento® 2. Agral 90	730 ml/ha 0.25 %v/v	33.8 a	62.2 b	47.8 a	425.5 A
3. Assail®	160 g/ha	24.0 a	84.5 a	29.0 a	544.5 A
4. Altacor®	321 g/ha	15.5 a	87.0 a	20.3 a	652.0 A
5. Diazinon®	5 l/ha	40.8 a	89.5 a	60.8 a	731.0 A
Tukey's HSD (P=.05)		33.1	17.9	66.96	374.3

Means followed by same letter do not significantly differ (P=.05, Tukey's HSD)

Future work should consider retesting the products to confirm the results. In addition, work should be conducted to define an application window as these products have a different mode of action than Diazinon® which growers have become accustomed too. These traditional thresholds and application timings may not be appropriate for these newer products that act differently from Diazinon®.

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Objective 2: To generate the required crop tolerance data for the label expansion of Centurion® for use on cranberry.

Background Information

Bayer CropScience requested that crop tolerance data was needed before this registrant could consider adding cranberries to the label of Centurion and Select. We established three trials in BC and worked with New Brunswick Department of Agriculture and Aquaculture where two more trials were carried out.

Crop tolerance trials were conducted at Pitt Meadows, Richmond and Fort Langley, BC, selected for their uniform, weed free stand of cranberry (*Vaccinium macrocarpon*).

Centurion (also known as Select®) was tested at the half, full and 2x label rates and was compared to an untreated and Poast Ultra standard.

Treatments were applied on all three trials on June 22nd and the crop staging ranged from advance stem elongation to early flowering. The treatments were applied as a broadcast application with a 4 nozzle, 2 meter CO2 powered backpack sprayer using Teejet 8001 nozzles spaced at 50 cm with an operating pressure of 40 PSI.

Crop tolerance was assessed at 20, 36, and 57 days after application. Yield was assessed at maturity of the crop.

Data was analyzed and presented using Tukey's HSD at a 5% significance level. This method is most accepted by the Pest Management Regulatory Agency (PMRA) for data submission and registration.

Results

No crop injury was observed in the plots at all three sites at 20, 36 and 57 days after application. The cranberry cultivars at the three sites had excellent tolerance to all rates of Centurion®.

At all three trial sites, no differences in cranberry yield were observed between the treatments.

The cranberry cultivars at the three sites showed excellent crop tolerance to Centurion® when applied at the label rate and at the 2X rate. In addition to this, no yield differences were observed between the label rate and 2X rate when compared to the untreated or industry standard. The data generate from these three trials will be submitted to the registrant “Bayer CropScience” for the expansion of the Centurion® label to include use on cranberries in Canada. The trial data will be submitted to the registrant in Mid Dec 2010 in hopes of an expansion for use in the 2011 field season.

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Objective 3: Investigate chemigation applications of alternate products for cranberry tipworm and refine use pattern for another.

Background Information

Cranberry tipworm populations were monitored at 4 sites and the two were selected for trial sites. The trial sites were at Maple Ridge and Richmond, BC, on a cranberry (*Vaccinium macrocarpon*) bog infested cranberry tipworm (*Dasineura oxycoccana*). This trial was intended to test these products in early post bloom as a means of reducing pest population to such a degree that bud set would not be affected. Due to circumstances beyond our control timing of applications were delayed.

All applications were made as a "chemigation", to simulate a "wash out" period of 15 minutes. Assail® at the 1x rate was applied as a groundspray in treatment 5.

Each trial consisted of two application timings. Treatments were applied after bloom on July 23rd and Aug 3rd to each trial and repeated on August 25th and 28th.

Tip samples were assessed at 0 and 16 days after application-A, followed by 15 days after application-B. Samples consisted of four subsamples of cranberry tips from four random 30x30 cm quadrants within the middle meter of each plot. Twenty tips were selected from each subsample and the number of eggs, L1 larva, L2 larva, L3 larva, pupa, dead pupa, adults, and numbers of dead cranberry tips were counted using a dissecting microscope. Incidence was then calculated by assessing the percentage of uprights containing each life cycle. Severity was calculated by summing each data point per plot. Population is the total L1, L2, L3 larva and pupa found within the plots.

Data was analyzed and presented using Tukey's HSD at a 5% significance level. This method is conservative and most accepted by the Pest Management Regulatory Agency (PMRA) for data submission and registration.

Results

Both sites showed treatment effect on tipworm at different stages of the pest's life cycle. Prior to the application of the second application, the incidence of pupa were equivalently reduced by all rates of Assail, Movento and Diazinon when compared to the untreated. While at the other site, similar results were observed with the L2 larva. After the second application, the population of tipworm dropped off at both sites and no differences were observed between the treatments. No difference in tip damage was observed between treatments at both sites.

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Both sites will be revisited in winter to evaluate bud set and to determine if any treatment differences have occurred.

Table 2: Tipworm Treatment list.

Treatment	Rate	Pupa Incidence 15 DA-A Site 1	L2 Incidence 16 DA-A Site 2
1. Untreated		12.2 a	31.3 a
2. Assail® (0.5x)	80 g/ha	0.3 a	3.1 b
3. Assail® (1x)	160 g/ha	0 b	1.8 b
4. Assail® (2x)	320 g/ha	0 b	2.5 b
5. Assail® (1x)	160 g/ha	0 b	3.1 b
6. Movento®	730 ml/ha	0.3 b	4.3 b
7. Diazinon®	7 L/ha	0 b	4.3 b
Tukey's HSD (P=.05)		2.09	8.95

Objective 4: To screen herbicides for broadleaf and grassy weeds control in cranberries.

Grass Screening

Background Information

The trial site was located in Richmond, B.C., selected for its uniform population of annual bluegrass (*Poa annua*), stand within the cranberry (Vaccinium macrocarpon) bog.

Treatments (see table 3) were selected based on their potential to control various grassy weed species within other crops and the potential for their label to be expanded to included cranberry. One product in particular, is commercially used within rice production. One benefit of this is that environmental fate data would be available for cranberry production.

Table 3: Grass trial treatment list.

Treatment	Rate	Comments
1. Untreated		
2. Centurion®	190 ml/ha	
Amigo	0.5 % v/v	
3. Callisto®	210 ml/ha	
Agral 90®	0.2 % v/v	
4. Penoxsulam	208 ml/ha	Rice product, has activity on grasses, broadleaves and sedges
5. Venture®	2 L/ha	
6. Poast Ultra®	1.1 L/ha	
Merge®	1.0 % v/v	

The treatments were applied on June 24, 2010 at advance stem elongation to pre bloom. The treatments were applied as a broadcast application with a 4 nozzle, 2 meter CO2 powered backpack sprayer using Teejet 8001 nozzles spaced at 50 cm with an operating pressure of 40 PSI.

Crop tolerance and weed control were assessed at 20, 36, and 53 days after application (DA-A).

The monthly precipitation during the trial period was below normal.

Data was analyzed and presented using Tukey's HSD at a 5% significance level. This method is most accepted by the Pest Management Regulatory Agency (PMRA) for data submission and registration.

Results

Control = At least 80% consistent reduction in weed stand and/or growth.

Suppression = A minimum of 60% reduction in weed stand and/or growth.

Unacceptable Crop injury = great than 10% injury.

Minor crop injury (<1.5%) from all treatment except Poast Ultra® were observed at all assessment dates this injury did not differ from the untreated.

Annual bluegrass control of the products were lower than expected as all products only provided low suppression of the weed at all assessments. Examining the weather data, the next rain fall after application occurred 48 hrs later and in discussion with the grower, no irrigation occurred within the period either which may have affected product uptake. The products were applied at a later than typical stage than if the products were applied in the crop they are labelled in. This is attributed to the fact the weed is growing in a perennial production system and will not go through seedling stages. Another possibility is that temperatures began to climb after the first assessment to levels which may have triggered dormancy in the weed. Annual bluegrass is known to go into dormancy states in hot dry conditions.

The level of control may be enhanced if the products were applied earlier in the growing season. Possibly targeting a late March/early April application date will enhance product activity as the weed will be coming out of winter dormancy, be more active and provide more uptake of the products.

Broadleaf screening

Background Information

Trials were conducted at Pitt Meadows, Richmond and Abbotsford, BC, selected for their selection of weed species within the cranberry (*Vaccinium macrocarpon*).

Treatments were applied on to the trials on June 24-25th and the crop staging ranged from advance stem elongation to early flowering. The treatments were applied as a broadcast application with a 4 nozzle, 2 meter CO2 powered backpack sprayer using Teejet 8001 nozzles spaced at 50 cm with an operating pressure of 40 PSI.

Crop tolerance and weed control were assessed at 17-19, 33-36, and 53-61 days after application.

Data was analyzed and presented using Tukey's HSD at a 5% significance level. This method is most accepted by the Pest Management Regulatory Agency (PMRA) for data submission and registration.

Results

At 17-19 days after application, the cranberry showed significant injury (12%) from Florasulam in one of the trials while only moderate (6.5%) was observed in the others. By 53-61 days after the application, the level of injury had decreased but was only marginally acceptable. No crop injury was observed in a site tour in late fall.

Minor injury (1.5%) was observed in the Indaziflam plots, but by 53-61 DAA the crop has grown out of the injury.

The tank mix of Callisto® + Indaziflam + Florasulam caused unacceptable injury at all assessments. The injury observed was being caused by Florasulam.

No products applied alone control sheep sorrel, however, the tank mix of Callisto® + Indaziflam + Florasulam provided control in one of the sites while it did not at the other two. The difference at this site was the sheep sorrel was at a more advance staging (finishing bloom), possibly at a stage when the plant was actively moving more plant reserves to the root system and allowing for more product uptake. At 63 days after application no suppression of horsetail was achieved by any of the treatments

Aminopyralid suppressed white clover but had unacceptable activity on the other weeds. As this product has 1 year weed control in the crops that it is currently registered in, the trials will have to be revisited to assess any reduction of regrowth in the following spring (see table 4).

During a site visit in the fall it was observed in some of the plots that; Aminopyralid was providing some control of Blackberry and Hardhack; Indaziflam was providing some witchgrass control; Florasulam was providing some grey sedge control and creeping buttercup control. These sites will be revisited again and a full rating of all the plots will be assessed.

Table 4: Broadleaf Control at 53-61 days after application.

Treatment	White Clover	Fire-weed	Sheep Sorrel	Loose-Strife
1. Indaziflam	X	S	X,X,X	X,X
2. Callisto® + Indaziflam + Florasulam +Merge®	C	C	X.X,C	S,S
3. Callisto® + Poast Ultra® + Merge®	X*	X	X,X,X	X,X
4. Aminopyralid	S	X	X,X,X	X,X
5. Florasulam	S	X	X,X,X	X,S
6. Callisto® + Agral 90®	X*	X	X,X,X	X,X
X = <60% control, S = 60% -79% control, C = 80%> control *control reduced due to regrowth				

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