2016 Progress Report to the
BC CRANBERRY RESEARCH COMMITTEE

Project Title: Assessment of new pest management tools that address priority needs of the BC cranberry industry

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Project Summary: Different insecticides were assessed for control of cranberry tipworm. Two pyrethrum insecticides, Brigade and Danitol, provided the most consistent control across all trials. Torac, Beleaf and Applaud did not appear to have much activity on tipworm. Envidor, Silvanto, Harvanta, Exirel and a product derived from a peptide of the Austrian web spider, Vestron, combined with a Bt product for diptera, GNatural (Bt), had some activity and may be worthy of additional assessments.

Different fungicides were assessed for fruit rot control. These trials were conducted on beds with high levels of fruit rotting pathogens. Bravo treatments applied early to mid-bloom consistently increased yield and reduced fruit rot. In all six trials which had two Bravo treatments during early bloom, field rot was reduced in every study. None of the studies found any treatment that worked as consistently as Bravo. For the six studies with an early bloom + mid bloom treatment of Abound + Proline, there was an average 40% decrease in field rot over the untreated control, but no difference in yield. Bravo had 40% lower field rot and 42% higher yield than Abound + Proline applied during similar bloom times. For the three trials with Indar+ Abound there was essentially no difference in yield or field rot between the treated and untreated plots. Four newer fungicides looked promising: Propulse, Switch, Quadris Top and Aprovia also looked very favorable.

Project Results

Objective 1: Cranberry tipworm - assess control methodologies relevant to BC conditions, acceptable for export markets and compatible with chemigation.

Method:

A series of replicated plot trials were conducted between May and July across farms in Grayland and Long Beach infested with cranberry tipworm. The efficacy of different products was tested. There were four replications per plot. Plots were 6' by 6'. Spray volumes were done at chemigation volumes, or broadcast volumes, depending on the experiment. Efficacy was based on tip assessment for percent tip curled from tipworm and number of tipworm larvae and pupae per 25 uprights. Assessments were made one week to one month after the last treatment application.

Results and discussion:

The two pyrethrum insecticides, Brigade and Danitol, provided the most consistent control across all trials (Tables 1, 2, 3). Torac, Beleaf and Applaud did not appear to have much activity on tipworm (Tables 2, 4). Envidor, Silvanto, Harvanta and Exirel (Tables 1, 2, 3, 5) had some activity and may be worthy of additional assessments. Movento, as has been previous shown, had good tipworm activity (Table 3). A product derived from a peptide of the Australian web spider, Vestron, combined with a Bt product for diptera, GNatural (Bt), showed promise in one trial and is worthy of additional evaluations, due to its safety profile on pollinators (Table 4 & 5).

Conclusion:

Obtaining good efficacy data on tipworm control across a range of field conditions is challenging. Overall, results from 2016 were disappointing in terms of consistency, and obtaining high enough counts in the untreated plots to make strong inferences regarding efficacy. Additional studies, using chemigation application volumes that focus on the most promising compounds with registration potential in BC, will be required to develop more extensive data sets. Based on these results, several chemistries have potential.

Table 1. Efficacy of different insecticides on cranberry tipworm in Grayland WA, 2016

Treatment			# Cupped upright/25 uprights				# Larvae/25 uprights							
			6/8/2016		6/22/2016		6/8/2016		6/13/2016		6/22/2016		Total	
Control			3.4	a	5.5	a	2.8		1	a	0.1	a	3.8	a
Brigade	6.4	oz/a	0.1	b	5	a	0	a	0	a	0.1	a	0.1	b
Danitol	16	oz/a	0	b	7.3	a	0	a	0	a	0	a	0	b
Harvanta	22	oz/a	1.7	a	10.3	a	0	a	0	a	0.3	a	0.3	b
Treatment F			12.2		2.9		0		1		0.4		9.1	
Treatment probability			0.001		0.09		1		0.5		0.7		0.004	
Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)														
Treated on 5/11/16 and 5/18/16 using 750 gpa, no surfactants, 4 replicated plots 6' by 6'.														

Table 2. Efficacy of different insecticides on cranberry tipworm at two farms in Long Beach WA, 2016						
			Larvae #/25 uprights			
Treatment			6/27/2016 Farm 1		6/30/2016 Farm 2	
Control			2.8	a	2.1	a
Brigade	6.4	oz/a	0.3	a	0.7	a
Danitol	16	oz/a	0.6	a	1.4	a
Harvanta	22	oz/a	2.1	a	1.0	a
Treatment F			3		0.5	
Treatment probability			0.08		0.7	
Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)						
Farm 1 treated on 5/16/16, 5/23/, 6/1/16 and 6/24/16; Farm 2 was treated on 5/16/16 using 750 gpa, no surfactants , 4 replicated plots 6' by 6'.						

Table 3. Efficacy of different insecticides on cranberry tipworm in Long Beach WA, 2016												
			Larvae		Pupae		Larvae		Larvae		Total all dates	
Treatment			6/3/2016		6/3/2016		6/20/2016		6/28/2016			
Control			0	b	1.5	a	1.3	a	1.1	a	5.4	a
Beleaf	2.8	oz/a	0.4	ab	0.5	a	0.6	a	1.2	a	3.0	ab
Envidor	18	oz/a	0.1	b	0.3	a	0.9	a	0.1	a	1.8	ab
Applaud	46	oz/a	3.1	a	0.3	a	0.9	a	1.2	a	5.9	a
Exirel	20	fl oz/a	0	b	0.1	a	1.2	a	0.9	a	2.5	ab
Harvanta	22	fl oz/a	0	b	0.7	a	0.5	a	1.1	a	2.8	ab
Danitol	16	oz/a	0	b	0.1	a	0	a	0	a	0.2	b
Brigade	6.4	oz/a	0.4	ab	0.4	a	0	a	0.4	a	1.8	ab
Silvanto	14	oz/a	0.7	ab	0.1	a	0.4	a	0.3	a	1.6	ab
Torac	21	fl oz/a	0.3	ab	0.1	a	1.3	a	0.9	a	3.6	ab
Movento	8	oz/a	0.1	ab	0	a	0	a	0.3	a	0.9	ab
Treatment F			2.4		1.2		1.4		1.1		2.5	
Treatment probability			0.02		0.3		0.2		0.3		0.02	
Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)												
Treated on 5/27/16 and 6/22/16 at 100 gpa, no surfactants, 4 replicated plots 6' by 6'.												

Table 4. Efficacy of Vestron on cranberry tipworm at farms in Long Beach WA, 2016						
	6/30/2016					
Treatment	Larvae / 25 uprights		Pupae / 25 uprights		Total larvae & pupae/ 25 uprights	
Control	1.3	A	1.5	A	2.8	A
Vestron 5 ppt + Silwet @ 0.125%, + GNatural Bt 16 oz/100 gal.	0	A	0.5	A	0.5	B
Treatment F	2.1		1.2		5.4	
Treatment probability	0.2		0.3		0.04	
Treated on 6/22/16 at 30 gpa, 4 replicated plots 6' by 6'.						
Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)						

Table 5. Efficacy of different insecticides on late generation cranberry tipworm at farms in Long Beach WA 2016					
			Total larvae + pupae/ 25 uprights		
Treatment			7/5/2016	7/11/2016	Combined dates
Control			1.5	3.8	5.7
Beleaf	2.8	oz/a	1.2	2	3.4
Envidor	18	oz/a	0.9	2.8	3.9
Applaud	46	oz/a	0.7	2.1	3
Sevin XLR	2	qt/a	0.7	2.4	3.1
Vestron 5 ppt + Silwet @ 0.125% + GNatural Bt 16 oz/100 gal.			1.4	4.1	6.2
Treatment F			0.53	0.53	0.64
Treatment probability			0.75	0.75	0.67
Treated on 6/28/16 at 30 gpa.					

Objective 2: Assess fungicide strategies relevant to BC conditions that reduce fruit rot and are compatible with chemigation.

Methods:

A series of replication plot trials were conducted between mid-May and early June across farms in Long Beach, WA. The efficacy of different fungicides was evaluated as a function of timing and variety. Plot size and replication varied by experiment. Efficacy was based on total yield, yield of good fruit and percent fruit rot by weight. Spray volumes were done at chemigation volumes or broadcast volumes, depending on the experiment. Most of these trials were conducted on beds that have never been treated with fungicides and have high incidences of fruit rot.

Results & Discussion:

The new hybrid variety BG is prone to field rot. Both fungicide treatments, alternating applications of Proline & Abound over 28 days, or two Bravo treatments, increased yield of good fruit and reduced fruit rot (Table 6). Two Bravo applications provided numerically better yield and lower field rot than multiple applications of Proline and Abound. With adequate fungicides applied during early to mid-bloom, it appears BGs can be managed for high yield and reduced field rot.

Post-bloom application of a series of different fungicide had no effect on field rot on four different varieties (Table 7). A combination of Proline, Abound, Manzate and Bravo, however, did numerically reduce field rot of Willapa Red compared to the untreated control. These results confirm that fungicide timings that miss the target window of early to mid-bloom will do little to suppress field rot. The non-significant trend for later bloom was Willapa Red.

A comparison of nine fungicides applied to Stevens during early and mid-bloom found that several new fungicides increased yield and reduced fruit rot (Table 8). Propulse had the highest yield of good fruit. Propulse, Switch and Bravo had the lowest percent of field rot. Although not statistically significant, Inspire Super and Kenja had the lowest yield and highest fruit rot of any fungicide treatments. With the exclusion of these two fungicides, the mean increase in yield with fungicides was 60 bbls/ac (23%) over that of the control and a 6% reduction in fruit rot (32%).

The efficacy of four different fungicide combinations was compared on Haines, Willapa Red and Stevens (Tables 9, 10 & 11). There was no consistent trend across varieties for yield or percent fruit rot. The lack of consistent effect could be due to the use of four replications, instead of 6 to 8. Fruit rot is notoriously variable. For Willapa Red, there was a slight trend for the fungicide treatment to reduce field rot (Table 9). For Stevens, both the Proline/Abound and Bravo treatments had lower fruit rot than the Quadris Top/Switch or Abound/Indar treatments (Table 10). Yield of good fruit was higher, although not significantly, with Bravo, than with other treatments. For Haines, the Bravo treatment also had the higher yield and lower rot than other treatments (Table 11). These differences, however, were not always significantly different. Averaged across all three studies, the two Bravo treatments decreased field rot by 40% compared to the control.

Four mid to late-bloom fungicide treatments were compared on Stevens for effects on yield and field rot (Table 12). The original timing of these plots was delayed because of rain. The site was also infested with late fireworm/fruitworm which resulted in a lot of incidental fruit rot, and highly variable yield. Several outlying data points with severe fireworm were removed. The Proline + Abound had higher total and good fruit yield than other treatments. The two broad spectrum fungicides, Bravo and Manzate, had lower percent field rot than the other treatments. It is possible that these two fungicides helped to minimize secondary field rot caused by a late fireworm infestation.

Chemigated Abound + Proline treatments were compared over a two year period on Willapa Red and Stevens for effects on yield and rot (Table 13 & 14). There was no significant effect on yield, but there was a trend for higher yield on beds with fungicide treatment. Harvest rot was reduced by the fungicide treatment by an average of 38% and 52% for Willapa Red and Stevens, respectively, over both years. These plots were also used to compare the effects of combined Proline + Abound to the application of these compounds applied by themselves sequentially during bloom (Tables 15 & 16). There were no differences between the two methods of applying Abound + Proline on yield or field rot. This lack of difference could be a result of the last two applications being applied late, due to rain delays.

Conclusion:

These trials were conducted on beds with high levels of fruit rotting pathogens. The results may not reflect what would happen on traditional PNW cranberry beds with histories of fungicide applications. There was a lot of variability between and within experiments, and results were not always consistent. Nevertheless, a few patterns emerge. Bravo treatments applied early to mid-bloom consistently increased yield and reduced fruit rot. In all six trials which had two Bravo treatments during early bloom, field rot was reduced in every study. The mean decrease in field rot was 46 ± 8.6%. Yield of good fruit was increased over the control in four of the six trials, with the mean increase 54 bbl/a (22 ± 9 % increase).

The purpose of these studies was not to assess Bravo; it was used as the standard fungicide against which other fungicides were compared. None of these studies found any treatment that worked as consistently as Bravo. For the six studies with an early bloom + midbloom treatment of Abound + Proline, there was an average 40 ± 7% decrease in field rot over the untreated control, but no difference in yield. There were five trials where direct comparisons between Abound + Proline and Bravo can be made. Across those studies, Bravo had 40% lower field rot, and 42% higher yield than Abound + Proline applied during similar bloom times. These comparisons are illustrated graphically with box-whisker graphs in Figures 1 and 2. For the three trials with Indar + Abound there were essentially no differences in yield or field rot between the treated and untreated plots.

In our large comparative assessment study, several fungicides preformed equally to Bravo. Two fungicides with two active ingredients, Propulse (fluopyram + prothioconazole) and Switch (Cyprodinil + fludioxonil), looked most promising, based on data from one comparative trial. When looking at both yield of good fruit and fruit rot reduction, Quadris Top and Aprovia also looked very favorable.

Rain delays compromised the ideal timings on several studies. The results from those studies, however, are interesting in themselves. They support the concept that there is minimal value of late applications of fungicides on increasing yield or reducing fruit rot. The broad spectrum fungicides, Bravo and Manzate, however, might be beneficial in reducing secondary infection.

Table 6. Efficacy of different fungicides yield and field rot on BG cranberries in Long Beach WA						
Treatment	Total bbl/ac		bbl/ac good fruit		% rot at harvest	
Control	365	a	291	b	16.9	b
Proline 7 oz/ac 5/9/16 + Abound 14 oz/a 5/16/16 + Proline 6/3/16 + Abound 6/7/16	418	a	383	ab	8.6	a
Bravo 6.5 pt/a 5/9/16 and 6/3/16	476	a	446	a	5.2	a
Treatment F	2.5		4.6		4.3	
Treatment probability	0.14		0.05		0.05	
Plots were 3’ by 6', with 5 replications. Treatments were applied at 250 gpa.						
Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)						

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Table 7. Efficacy of different fungicides applied post-bloom on field rot of four cranberry varieties in Long Beach WA 2016.				
	% rot @ harvest			
Treatment	Crimson Queen	Mullica Queen	Stevens	Willapa Red
Control (center of plots)	10	4	5	14
Proline 6/15, Abound 6/20	7	5	2	8
Abound + Proline 6/15	10	6	5	4
Proline 6/15, Abound 6/20, Bravo 7/12, Manzate 7/21;	9	6	2	2
Bravo 7/12, Manzate 7/21	8	6	6	5
Treatment F	0.1	0.2	1.8	1.5
Treatment probability	1.0	0.9	0.2	0.3
Treatments applied 38 gpa, 3 replicated plots per treatment; varieties were 90% out of bloom on 6/15/16				

Table 8. Efficacy of different fungicides on yield and field rot on Stevens cranberries in Long Beach WA 2016								
Treatment			Total bbl/ac		bbl/ac good fruit		% rot at harvest	
Control			248	a	196	c	20.8	a
Quadris top	14	fl oz/a	289	a	243	abc	14.8	ab
Kenja	15.5	fl oz/a	279	a	216	bc	20.9	a
Bravo	6	pt/a	314	a	272	ab	12.6	b
Proline	5	fl oz/a	301	a	245	abc	17.6	ab
Aprovia	10.5	fl oz/a	290	a	245	abc	13.6	ab
Switch	14	oz/a	271	a	233	abc	13.0	b
Propulse	10.3	fl oz/a	334	a	292	a	12.3	b
Inspire super	20	fl oz/a	276	a	222	bc	17.1	ab
Merivon	11	fl oz/a	300	a	252	abc	14.7	ab
Treatment F			0.9		2.0		2.1	
Treatment probability			0.4		0.05		0.04	
Treatments applied 5/17/16 & 6/3/16 at 90 gpa application volume. Plots were 6' by 6' with 7 replications. Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls).								

Table 9. Efficacy of different fungicides on yield and field rot Willapa Red cranberries in Long Beach WA 2016						
	Willapa Red					
Treatment	Total bbl/ac		bbl/ac good fruit		% rot at harvest	
Control	416	a	358	a	12.0	a
Proline 5/16, Abound + Proline 6/1, Abound 6/8	357	a	320	a	10.6	a
Bravo 5/16 & 6/1	386	a	355	a	7.6	a
Quadris Top 5/16, Quadris Top + Switch 6/1, Switch 6/8	389	a	361	a	6.9	a
Abound + Indar 5/16 & 6/1	350	a	299	a	8.3	a
Treatment F	0.4		0.5		1.3	
Treatment probability	0.73		0.79		0.3	
Treatments applied 5/16/16 & 6/1/16 at 1250 gpa application volume. Plots were 6' by 6' with 4 replications.						
Rates for Proline, Abound, Bravo, Quadris Top, Switch were 5 oz/a, 14.5 oz/a, 6.5 pt/a, 14 oz/a, & 14 oz/a, respectively. Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)						

Table 10. Efficacy of different fungicides on yield and field rot Stevens cranberries in Long Beach WA 2016						
	Stevens					
Treatment	Total bbl/ac		bbl/ac good fruit		% rot at harvest	
Control	230	a	204	a	11.3	bc
Proline 5/16, Abound + Proline 6/1, Abound 6/8	198	a	182	a	8.2	c
Bravo 5/16 & 6/1	288	a	258	a	9.6	c
Quadris top 5/16, Quadris Top + Switch 6/1, Switch 6/8	264	a	223	a	15.1	ab
Abound +Indar 5/16 & 6/1	266	a	219	a	17.6	a
Treatment F	1.6		1.3		9.6	
Treatment probability	0.2		0.3		0.001	
Treatments applied 5/16/16 & 6/1/16 at 1250 gpa application volume. Plots were 6' by 6' with 4 replications.						
Rates for Proline, Abound, Bravo, Quadris Top, Switch were 5 oz/a, 14.5 oz/a, 6.5 pt/a, 14 oz/a, & 14 oz/a, respectively. Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)						

Table 11. Efficacy of different fungicides on yield and field rot on Haines cranberries in Long Beach WA 2016						
	Haines					
Treatment	Total bbl/ac		bbl/ac good fruit		% rot at harvest	
Control	245	a	214	ab	13.1	a
Proline 5/16, Abound + Proline 6/1, Abound 6/8	154	b	142	b	6.6	a
Bravo 5/16 & 6/1	278	a	267	a	4.0	a
Quadris top 5/16, Quadris Top + Switch 6/1, Switch 6/8	197	ab	181	ab	7.7	a
Abound +Indar 5/16 & 6/1	282	a	231	a	11.8	a
Treatment F	3.2		3.5		2.5	
Treatment probability	0.05		0.04		0.1	
Treatments applied 5/16/16 & 6/1/16 at 1250 gpa application volume. Plots were 6' by 6' with 4 replications.						
Rates for Proline, Abound, Bravo, Quadris Top, Switch were 5 oz/a, 14.5 oz/a, 6.5 pt/a, 14 oz/a, & 14 oz/a, respectively. Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)						

Table 12. Efficacy of different fungicides yield and field rot on Stevens cranberries during mid to late bloom in Long Beach WA 2016.						
	Stevens					
Treatment	Total bbl/ac		bbl/ac good fruit		% rot at harvest	
Control	196	bc	144	bc	25.4	a
Proline + Abound	259	a	205	a	21.8	a
Bravo	153	c	136	c	13.0	b
Manzate	154	c	133	c	13.4	b
Abound + Indar	247	ab	191	ab	22.7	a
Treatment F	6.9		4.5		5.1	
Treatment probability	0.006		0.02		0.01	
Treatments applied 6/7/16 & 6/16/16 at 1250 gpa application volume. Plots were 6’ by 6’ with 4 replications. Plots were infested with fireworm/fruitworm at harvest that increased fruit rot variability. Two plots with badly infested fruit were removed from the analysis.						
Rates for Proline, Abound, Bravo, Manzate Pro Stick, and Indar were 5 oz/a, 14.5 oz/a, 6.5 pt/a, 6 lb/a, & 12 oz/a respectively. Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)						

Table 13. Efficacy of different fungicides on fruit rot and yield of Willapa Red cranberries in 2015 and 2016.												
	bbl/ac good fruit						% harvest rot					
Treatment	2015		2016		2015+2016		2015		2016		Mean 2015+2016	
Control	287	a	258	a	545	a	17.0	a	10.6	b	13.8	a
Abound + Proline 2015 & 2016	273	a	236	a	509	a	11.7	a	5.4	a	8.5	b
Treatment F	0.06		0.20		0.2		1.9		8.1		5.1	
Treatment probability	0.8		0.7		0.7		0.2		0.01		0.04	
Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)												
Abound + Proline treated on 6/4/15, 6/17/15, 5/24/16, and 6/2/16 using 1000 gpa, Abound 6 replicated plots 6' by 6'.												

Table 14. Efficacy of different fungicides on fruit rot and yield of Stevens in 2015 and 2016.												
	bbl/ac good fruit						% harvest rot					
Treatment	2015		2016		2015+2016		2015		2016		Mean 2015+2016	
Control	133	a	164	a	297	a	37	a	20	b	29	a
Abound + Proline 2015 & 2016	161	a	211	a	372	a	19	b	10	a	15	b
Treatment F	0.06		0.20		0.2		9		6		17	
Treatment probability	0.8		0.7		0.16		0.01		0.03		0.0024	
Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)												
Abound + Proline treated on 6/4/15, 6/17/15, 5/24/16, and 6/2/16 using 1000 gpa, 6 replicated plots 6' by 6'.												

Table 15. Efficacy of different fungicides on yield and field rot on Willapa Red cranberries in Long Beach WA 2016.						
	Willapa Red					
Treatment	Total bbl/ac		bbl/ac good fruit		% rot at harvest	
Control	290	a	258	a	10.6	b
Proline + Abound	249	a	236	a	5.4	a
Proline, Abound, Proline, Abound,	261	a	241	a	7.6	a
Treatment F	0.5		0.2		5.1	
Treatment probability	0.5		0.7		0.01	
Proline + Abound 5/24/16 6/2/16 at 1000 gpa application volume. Proline, Abound, Proline, Abound were applied 5/24/16, 6/2/16, 6/8/16, 6/16/16, respectively, at 1000 gpa. Plots were 6’ by 6’ with 4 replications. The later application was delayed due to rain; it was likely too late to be effective.						
Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)						

Table 16. Efficacy of different fungicides on yield and field rot on Stevens cranberries in Long Beach WA 2016.						
	Willapa Red					
Treatment	Total bbl/ac		bbl/ac good fruit		% rot at harvest	
Control	206	a	164	a	20.0	b
Proline + Abound	235	a	211	a	10.3	a
Proline, Abound, Proline, Abound,	211	a	190	a	10.5	a
Treatment F	0.8		1.7		4	
Treatment probability	0.5		0.2		0.03	
Proline + Abound 5/24/16 6/2/16 at 1000 gpa application volume. Proline, Abound, Proline, Abound were applied 5/24/16, 6/2/16, 6/8/16, 6/16/16, respectively, at 1000 gpa. Plots were 6’ by 6’ with 4 replications. The later application was delayed due to rain; it was likely too late to be effective.						
Means followed by same letter do not significantly differ (P=.05, Student-Newman-Keuls)						

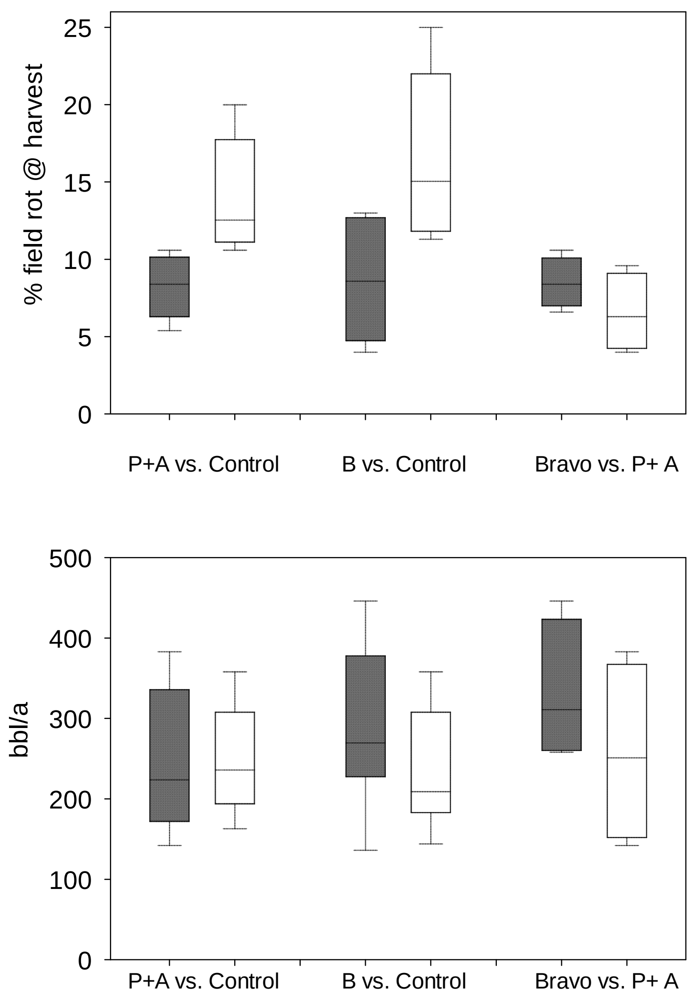

Figure 1. Box whisker graph for fungicide comparisons across multiple experiments. Data used were the treatment means for yield and field rot for each experiment. For the P+A (Proline + Abound) vs. control comparison, N=6. For the B (Bravo) vs. control comparison, N=4. For the P+A, N=4. Treatment differences for yield were not significant. For field rot, both Proline + Abound and Bravo were significantly different from the control treatment at the 0.01 probability level. There was no difference in field rot for the Bravo vs. P+A comparison.

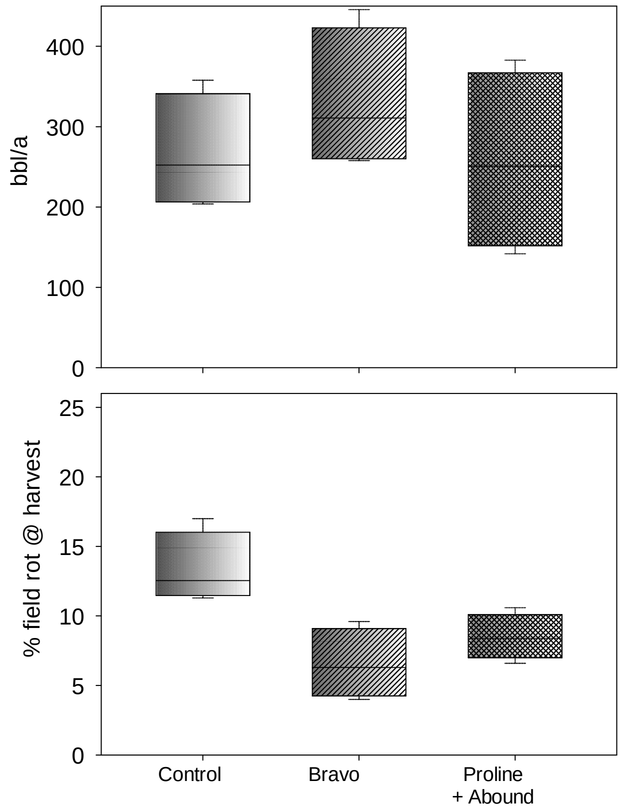

Figure 2. Box whisker graph for fungicide comparison across multiple experiments for treatment mean yield and field rot. N=4. Bravo & Proline + Abound were significantly different from the control treatment at the 0.01 probability level for percent field rot. There was no treatment effect on yield.

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