

Section IV
Small Grain Pests

VALENT 2008
SPRING BARLEY SEED TREATMENT TRIALS

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Trial protocol. To study rates and efficacy of seed treatment insecticides on Cereal Leaf Beetle (CLB), Russian Wheat Aphid (RWA), and Basin Wire Worm, the barley variety Baroness was seeded into a RCBD design of 8 by 20 feet replications with 4 replications per treatment. Seeding date was May 15, 2008. Soil temperature at 6 inches was 52 F at seeding. Treatments included an UTC and two rates of Thiomethoxam (Cruiser 5C), two rates of Gaucho 600 ST, and four rates of Valent 10170. The first evaluation was a count of plant stand per ¼ square meter 10 DPE. Stand reduction is a standard measure of wire worm activity and damage in seedling cereals.

Table 1. One-Way AOV for: Cru10 Cru30 Gau32 Gau5 UTC V10 V20 V30 V5

Plants stand 10 DPE ¼ meter indicating early wire worm damage

Source	DF	SS	MS	F	P
Between	8	474.500	59.3125	36.19	0.0000
Within	27	44.250	1.6389		
Total	35	518.750			
Grand Mean	14.917	CV 8.58			

Homogeneity of Variances	F	P
Levene's Test	0.89	0.5407
O'Brien's Test	0.57	0.7951
Brown and Forsythe Test	0.49	0.8558

Welch's Test for Mean Differences

Source	DF	F	P
Between	8.0	47.20	0.0000
Within	11.1		
Component of variance for between groups		14.4184	
Standard Error of a Mean		0.6401	
Std Error (Diff of 2 Means)		0.9052	

Table 2. LSD All-Pair wise Comparisons Test Barley plant stand ¼ meter

Treatment	Mean plant stand
V30	21.000 A
V20	21.000 A
V10	16.000 B
Cru10	14.750 B
Cru30	14.500 B
Gau32	12.500 C
V5	12.250 C
Gau5	12.000 C
UTC	10.250 D

Alpha 0.1 Standard Error for Comparison 0.9052
 Critical T Value 1.703 Critical Value for Comparison 1.5419
 There are 4 groups (A, B, etc.) in which the means are not significantly different from one another.

Plant stand fort spring barley which does not tiller like wheat is critical for good production. The groups A and B have good plant stands even though SD. Groups C and D are SD from A and B which are poor to marginal. Wire worm efficacy is provided by all groups compared to the UTC.

Cereal Leaf Beetle was a serious defoliation pest in 2008 due to a long cold wet winter and spring. Barley is less a preferred host for CLB than wheat, but the number of larvae per plant did approach the wheat economic loss level. This was due in part to summer generation adults appearing in late July.

Table 3. One-Way AOV for: Cru10 Cru30 Gau32 Gau5 UTC V10 V20 V30 V5 as CLB larvae/Plant

Source	DF	SS	MS	F	P
Between	8	55.2637	6.90797	6.86	0.0001
Within	27	27.1952	1.00723		
Total	35	82.4589			

Grand Mean 2.0853 CV 48.13

Homogeneity of Variances F P

Levene's Test	1.34	0.2672
O'Brien's Test	0.86	0.5631
Brown and Forsythe Test	1.39	0.2471

Welch's Test for Mean Differences

Source	DF	F	P
Between	8.0	M	0.0000
Within	M		

Component of variance for between groups 1.47518
 Effective cell size 4.0
 Observations per Mean 4
 Standard Error of a Mean 0.5018
 Std Error (Diff of 2 Means) 0.7097

Table 4. LSD All-Pair wise Comparisons Test Cereal Leaf beetle larvae/plant per plant 7/10/08

Treatment	Mean CLB larvae per plant
UTC	4.0000 A
V5	3.5000 AB
Gau5	3.0000 B
Gau32	2.5000 B
Cru10	2.2500 B
V10	1.5000 C
V30	1.2525 D
V20	0.7550 D
Cru30	0.0100 E

Alpha 0.05 Standard Error for Comparison 0.7097
 Critical T Value 2.052 Critical Value for Comparison 1.4561

These data show a reduction in CLB larvae compared to the UTC, with the higher rates of V10170 and Cruiser 30 grams having close to no larvae per plant. A conclusion based on this trial and previous trials of the same products in wheat that the seed treatment products under test do affect CLB populations at higher rates. If this is true the same efficacy should show in managing populations of aphids in spring barley.

Russian Wheat Aphid (RWA) appeared in the trial about the same time as the CLB larvae and were countable as a crop pest for the first time in several years at Central Ferry. The RWA appearance was also affected by the lack of early season predation by *H. convergens* and parasitoidism by *D. rapae*, an introduced Braconidae parasitoid of aphids, below 70 F.

Table 5. One-Way AOV for: Cru10 Cru30 Gau32 Gau5 UTC V10 V20 V30 V5 Russian Wheat

Aphid per 100 tillers on 7/10/08

Source	DF	SS	MS	F	P
Between	8	43.2654	5.40818	7.63	0.0000
Within	27	19.1354	0.70872		
Total	35	62.4009			
Grand Mean	1.2539	CV	67.14		

Homogeneity of Variances F P

Levene's Test	1.29	0.2919
O'Brien's Test	0.82	0.5896
Brown and Forsythe Test	1.11	0.3858

Welch's Test for Mean Differences

Source	DF	F	P
Between	8.0	M	0.0000
Within	M		
Component of variance for between groups	1.17486		
Effective cell size	4.0		
Observations per Mean	4		
Standard Error of a Mean	0.4209		
Std Error (Diff of 2 Means)	0.5953		

Table 6. LSD All-Pair wise Comparisons Test percentage Russian wheat aphid/100 plants

Treatment	Mean RWA on 7/10/2008
UTC	35.000 A
Gau5	25.000 A
Gau32	20.000 B
V5	10.025 C
V10	7.550 D
V20	7.550 D
Cru10	5.050 D
V30	2.575 D
Cru30	1.000 D

Alpha 0.05 Standard Error for Comparison 0.5953
 Critical T Value 2.052 Critical Value for Comparison 1.2214

These data are the mean percentage of RWA per 100 plants. The established RWA economic injury threshold for spring grains is ca. 16%. The treatments in the group C and D all provided efficacy below this threshold in this trial. Normally the RWA would not be noticed in spring barley.

Hippodamia convergens is the major Coccinellid predator of RWA and CLB in cereals. Ladybird Beetle larvae and adults can consume 40% of the CLB larvae and RWA in spring cereals. Since ladybird beetles have few natural enemies, counts of them indicate effects of the seed treatment insecticides that may pass through plant feeding insects.

Table 7. *Hippodamia convergens* adults (CLB predator) 100 plants on 7/10/08

One-Way AOV for: Cru10 Cru30 Gau32 Gau5 UTC V10 V20 V30 V5

Source	DF	SS	MS	F	P
Between	8	1624.22	203.028	5.98	0.0002
Within	27	916.75	33.954		
Total	35	2540.97			
Grand Mean	18.528	CV	31.45		

Homogeneity of Variances	F	P
Levene's Test	2.04	0.0798
O'Brien's Test	1.30	0.2831
Brown and Forsythe Test	1.26	0.3036

Welch's Test for Mean Differences

Source	DF	F	P
Between	8.0	4.26	0.0142
Within	11.2		
Component of variance for between groups		42.2685	
Effective cell size	4.0		
Observations per Mean	4		
Standard Error of a Mean	2.9135		
Std Error (Diff of 2 Means)	4.1203		

Table 8. LSD All-Pair wise Comparisons Test H.c 100 plants

Treatment	Mean Ladybirds per 100 plants 7/10/08
UTC	35.000 A
V30	25.000 B
Cru10	17.500 C
Gau32	17.500 C
Gau5	15.000 C
V10	15.000 C
V5	15.000 C
Cru30	13.750 C
V20	13.000 C

These very strange data show no SD in between treatments. Lower H.c populations are likely due to the Poisson distribution typical of active Coleoptera.

Table 9. One-Way AOV for: Cru10 Cru30 Gau32 Gau5 UTC V10 V20 V30 V5 barley yield

Source	DF	SS	MS	F	P
Between	8	1803889	225486	8.86	0.0000
Within	27	687500	25463		
Total	35	2491389			
Grand Mean		1219.4	CV 13.09		

Homogeneity of Variances	F	P
Levene's Test	2.01	0.0845
O'Brien's Test	1.28	0.2930
Brown and Forsythe Test	1.17	0.3515

Welch's Test for Mean Differences

Source	DF	F	P
Between	8.0	26.56	0.0000
Within	10.6		
Component of variance for between groups		50005.8	
Effective cell size		4.0	
Observations per Mean		4	
Standard Error of a Mean		79.786	
Std Error (Diff of 2 Means)		112.83	

Table 10. LSD All-Pair wise Comparisons Test for barley yield in lbs/acre

Treatment	Mean lbs barley acre
Cru30	1625.0 A
V30	1512.5 AB
Cru10	1350.0 BC
V10	1225.0 CD
V20	1150.0 DE
Gau32	1112.5 DE
V5	1100.0 DE
Gau5	1012.5 E
UTC	887.50 F

Alpha 0.1 Standard Error for Comparison 112.83

Critical T Value 1.703 Critical Value for Comparison 192.19

These data show SD in barley yield in three groups compared to the UTC. Several factors may have affected yield, but the basic and most likely factor in 2008 was wire worm damage to the stand. It is clear that 1650 lbs is about 50% of an expected yield and that cold weather in June damaged yield potential after wire worm damage occurred.

Conclusions:

Very late predation by *Hippodamia convergens* due to cold weather allowed RWA and CLB populations to increase above economic thresholds. Wire worm larvae reduced stand similar to other trials in the same rotation/location. So insect factors in this trial included Basin wire worm, Cereal Leaf Beetle, and Russian Wheat Aphid. Parasitoid activity was reduced by very cold and wet weather. Treatments of Chlothianidin and Thiomethoxam at the 30 grams/Kg level doubled yield over the UTC in this trial.