GRANULAR, LIQUID, AND SEED TREATMENT INSECTICIDES FOR MANAGEMENT OF WIREWORMS IN SUGARBEET

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Introduction:

Wireworms are the larval stage of click beetles. These larvae are capable of causing major stand reductions and, correspondingly, yield losses in Minnesota and North Dakota sugarbeet fields. Feeding injury has the greatest impact on the plant during the seedling stage of the plant. Wireworm infestations are sporadic and difficult to predict. Therefore, little is known regarding their control. This investigation was carried out to identify effective tools for management of wireworms in sugarbeet.

Materials and Methods:

Methods common to all trials: *Plot establishment* – Plots for all three experiments were established in a commercial sugarbeet field near Felton, MN using a 6-row John Deere 71 Flex planter. Each experiment was arranged in a randomized complete block design with four replications of the treatments. Individual treatment plots were 2-rows wide by 35 ft long, and 25-ft wide tilled alleys between replicates were maintained plant-free throughout the season. Two-row plots were in this trial because wireworm infestations are typically patchy and not uniform. A smaller test area allows for placement of plots over a slightly more uniform infestation than if the test were covering a large area. Seeds were planted at a depth of 1¼ inches and seed spacing was every 4 1/8 inches. The same variety (Crystal 822) was used for all experiments.

Planting-time granules – Granular insecticide treatments were either applied by band (B), modified in-furrow (M), or spoon (S) placement. Banded applications consisted of 5-inch swaths delivered through Gandy™ row banders. Modified in-furrow placement involved dropping granules down a tube over the row but directing the output back away from the seed drop zone and in front of the rear press wheel. This allowed some soil to cover the seed before granules entered the furrow so as to avoid direct insecticide/seed contact and the potential for phytotoxicity. Modified in-furrow placement resulted in delivery of a 2.5-inch band with the heaviest concentration of insecticide falling directly over the seed row. The spoon is a galvanized metal spoon-like apparatus with flanges on the outside edge to direct the granules in a miniature band over the row. A steel nut/bolt set (no. 10) was inserted in the center of the spoon near its tip, and two metal hex-shaped nuts were attached to the bolt to deflect the heaviest concentration of insecticide laterally to fall away from seed outside the furrow. Spoon placement results in a 2.5 to 3-inch miniature band over the row while avoiding the likelihood of granules entering the furrow. Output rates of the granular materials used in these experiments were controlled by using planter-mounted Noble metering units.

Data collection & Analysis – Treatment performance was assessed by collecting plant stand data at three dates after planting (June 10, July 1, and at harvest on September 30) at the Felton site, and on two dates (June 24 and July 19) at Raymond and Belgrade. Efficacy of the treatments was also compared by measuring yield response variables such as total recoverable sucrose, sugarbeet root yield, and percent sucrose content. Both rows of each plot were harvested by using a modified mechanical plot harvester. Subsamples of harvested roots from Felton were sent to the American Crystal Sugarbeet Quality Laboratory (East Grand Forks, MN) for quality analyses, and samples from Raymond were processed at the Southern Minnesota Beet Sugar Cooperative Quality Laboratory (Renville, MN). All stand count and yield data were subjected to analysis of variance (ANOVA) using the general linear models (GLM) procedure (SAS Institute, 1999), and treatment means were separated using the Fisher protected least significant difference (LSD) test at a 0.05 level of significance.

Methods specific to the respective experiments were as follows:

Study 1 – Granular Insecticides. The experiment was planted on May 26, 2004 in a field near Felton, MN to conduct a performance comparison of registered granular insecticides at various rates and by using different placement methods for wireworm control in sugarbeet. Counter 15G was tested at low to the highest labeled application rates (5.9, 8, 10 and 11.9 lb product/acre). Lorsban 15G was also tested in this experiment, but only at the high label rate (13.4 lb product/acre) and only applied using the spoon placement method. Lorsban 15G should not be used as a modified in-furrow application due to the risk phytotoxicity to sugarbeet seedlings.

Study 2 – Experimental Liquid Insecticides. This experiment was also planted at the Felton site on May 26, 2004. It was established to compare the difference between Counter 15G and two liquid insecticides, MustangMax and Regent (alone and tank-mixed with 10-34-0 starter fertilizer) for wireworm control. Counter 15G was applied at high (11.9 lb product/acre) and standard (10 lb) rates, and either banded or applied modified in-furrow. Granules were incorporated into the upper 1/8 inch of soil using drag chains attached to the rear of the planter's row units.

Output of all planting-time liquid insecticide treatments was regulated by using a planter-mounted Raven ™ spray system. Liquid insecticides evaluated were Regent 4SC (at 1.25, 2.08, 3.20, and 4.16 fl oz product/acre) in-furrow, MustangMAX 0.8EC at 4 fl oz product/acre (as an in-furrow or 3-inch T-band application), and Vydate C-LV 3.77SL at 34 fl oz product/acre in-furrow. All water-based liquid insecticide treatments were applied in a finished spray volume of 5 GPA using TeeJet 6501E nozzles. In-furrow application of liquids was achieved by directing the nozzles such that the entire spray pattern was directed into the furrow over the seed.

Tank-mixes of 10-34-0 starter fertilizer with Mustang (4 fl oz product/acre) and Regent (2.08 and 4.16 fl oz rates) were also evaluated. To establish the starter fertilizer (10-34-0)/insecticide mixtures, the insecticides were initially pre-mixed with water at a ratio of 60:1 (water:insecticide) to minimize the likelihood of having incompatibility or nozzle clogging problems. A fertilizer control of 10-34-0 at the same ratio of fertilizer:water as in the insecticide treatments was established to monitor for possible yield impacts that could occur independent of the anticipated wireworm infestation, and an untreated check was also established.

One entry in this test was a postemergence rescue treatment of MustangMAX 0.8EC at 4 fl oz product/acre to determine if additive treatment banded over the rows would provide measurable levels of control. This treatment followed MustangMax applied at planting as an in-furrow application. Both applications were made a rate of 4 fl oz product/acre. The postemergence application was delivered in a 7-inch band over the row at a finished spray volume of 10 GPA by using TeeJet 6501E nozzles. This treatment was applied on June 24.

Study 3 – Experimental Seed Treatments & Liquid Insecticides. This experiment was carried out to determine the effectiveness of several seed treatments and two liquid insecticides (F-58038, a 2 lb/gallon liquid formulation; and Lorsban 75WG at 0.89 and 1.33 lb product/acre) for wireworm control. Planting date for the trial was May 24, 2004. The F-58038 was applied directly into the open seed furrow, and Lorsban 75W was applied in 3-inch T-bands, also over the open furrow. Seed treatments evaluated included Poncho+Cyfluthrin (30+8 and 60+16 grams ai/unit of seed), Poncho+Beta-cyfluthrin (60+8 grams ai/unit), Cruiser (60 and 90 g ai/unit), Cruiser+Tefluthrin (60+8 g ai/unit), Icon 6.2TS (25 and 50 g ai/unit), and an untreated check. The same seed variety (Crystal 822) was used for all seed treatments, conventional insecticide plots, and untreated controls in the experiment. Seed treatments were applied to seed by personnel at ASTEC, Inc. (Sheridan, WY). Although performance was measured by assessing both plant stands yield parameters, **the plant stand data is probably more reliable than yield at this site for making treatment performance comparisons because of a severe infestation of herbicide-resistant kochia that competed with the sugarbeet plants at the Felton site.**

Study 4 – Combined Trial. This experiment was carried out on two commercial sugarbeet field sites (one near Raymond and the other near Belgrade, MN) in the Southern Minnesota Beet Sugar Cooperative growing area. Space limitations at these sites only allowed for our establishment of a limited number of plots. Therefore, we chose to repeat representative treatments from the three above-mentioned experiments. Entries in this experiment included experimental seed treatments, and liquid insecticides, as well as registered granular materials, and all were applied as described above. Plots were planted on June 4, 2004 and harvested on September 13.

Results and Discussion:

Study 1 – Granular Insecticides. Plant stand data are presented in Table 1. The general trend was that modified in-furrow and spoon-applied Counter 15G performed at comparable levels to each other, and both are likely to provide better plant stand protection than banded applications of Counter at planting. Counter 15G efficacy was inconsistent when the product was used at lower (5.9 to 8 lb product/ac) rates, and its performance was especially poor when banded at those lower rates. For example, in our final stand count assessments, the banded application of Counter at 8 lb product/acre was the only insecticide treatment that did not provide an improvement in surviving plant stand when compared with the untreated check plots. In comparing the two granular products, plant stands were significantly greater in the plots treated with spoon-applied Counter than Lorsban. The difference in stand counts disappeared at harvest and the yield data supported the change (Table 2); however, the **yield data from this trial is questionable because of the herbicide-resistant kochia and because of extended periods of soil saturation in the plots during the summer.**

Table 1. ***Plant stand counts*** **in plots treated with registered granular insecticides to control wireworms, Felton, MN, 2004.**

Treatment/form.	Placement	Rate (lb product/ac)	Rate (lb ai/ac)	Stand count (plants/100 ft)		
				1st post-plant	2nd post-plant	Harvest
Counter 15G	S	11.9	1.8	100.7 a	97.5 ab	62.9 b
Counter 15G	M	10	1.5	100.0 a	103.0 a	76.4 a
Counter 15G	M	11.9	1.8	98.2 a	99.3 a	67.0 ab
Counter 15G	M	8	1.2	97.3 a	94.5 abc	63.4 b
Counter 15G	S	8	1.2	96.4 ab	93.2 abc	61.1 b
Counter 15G	M	5.9	0.9	92.5 ab	91.4 a-d	65.7 ab
Counter 15G	S	10	1.5	84.1 bc	85.4 b-e	63.4 d
Counter 15G	S	5.9	0.9	83.8 bc	80.9 def	59.1 b
Lorsban 15G	S	13.4	2.0	83.4 bc	80.5 def	60.2 b
Counter 15G	B	10	1.5	79.3 cd	83.9 cde	60.0 b
Counter 15G	B	11.9	1.8	78.8 cd	79.8 def	60.0 b
Counter 15G	B	8	1.2	76.1 cd	77.1 ef	38.4 cd
Counter 15G	B	5.9	0.9	68.4 d	69.6 f	44.8 c
Check	---	---	---	48.8 e	49.3 g	32.3 d
LSD (0.05)				13.13	12.18	11.43

Table 2. ***Yield parameters*** **from comparison of registered granular insecticides for control of wireworms, Felton, MN, 2004.**

Treatment/form.	Placement	Rate (lb product/ac)	Rate (lb ai/ac)	Recoverable sucrose (lb/ac)	Root yield (T/ac)	Sucrose (%)	Gross return ($/ac)
Counter 15G	M	10	1.5	2620 a	10.3 a	14.10 a	234 a
Lorsban 15G	S	13.4	2.0	2611 a	9.9 a	14.38 a	243 a
Counter 15G	S	5.9	0.9	2376 a	8.8 ab	14.58 a	228 a
Counter 15G	S	8	1.2	2357 a	8.7 ab	14.63 a	228 a
Counter 15G	M	11.9	1.8	2350 a	8.8 ab	14.48 a	223 a
Counter 15G	M	5.9	0.9	2247 ab	8.4 ab	14.40 a	213 ab
Counter 15G	B	10	1.5	2206 abc	8.1 abc	14.90 a	216 a
Counter 15G	B	11.9	1.8	2185 abc	8.0 abc	14.63 a	212 ab
Counter 15G	S	10	1.5	2181 abc	8.0 abc	14.78 a	214 ab
Counter 15G	S	11.9	1.8	2175 abc	8.1 abc	14.70 a	209 ab
Counter 15G	M	8	1.2	1957 abc	7.6 abc	14.25 a	177 abc
Counter 15G	B	5.9	0.9	1340 bcd	5.5 bcd	13.60 a	111 cd
Counter 15G	B	8	1.2	1312 cd	5.0 cd	14.40 a	121 bcd
Check	---	---	---	904 d	3.6 d	13.85 a	78 d
LSD (0.05)				922	3.3	0.85	94.99

Increasing the rate of Counter 15G from 8 to 10 lb product/ac resulted in a 2.7 ton increase in root yield and a corresponding increase of 663 lb in recoverable sucrose/ac (a 34% improvement). One interesting result was that spoon-applied Lorsban at the full labeled rate of 13.4 lb product/ac provided a much more favorable level of control than was observed with banded applications in our previous research. This study is planned to be repeated in the future. Although these results suggest that Lorsban performance at controlling wireworms can potentially be improved by applying the material using the spoon placement method, growers should refrain from using this product for protection against wireworm damage until these results can be confirmed.

Study 2 – Experimental Liquid Insecticides. MustangMax provided good stand protection in this trial (Table 3). Plant stands were numerically higher (not significant) when it was applied directly in furrow than when T-band placement was used. Tank-mixing MustangMax with 10-34-0 did not increase efficacy against wireworms at this site, although it did have a positive impact at Raymond, MN. Counter 15G did not appear to be as effective at protecting stand as Mustang, and application rate did not improve Counter performance; however, the 11.9 lb/ac rate appeared to provide slightly more consistent wireworm control than the 10 lb rate. Tank-mixing the 2.08 fl oz/ac rate of Regent 4SC with 10-34-0 fertilizer provided greater stand protection than applying it without the 10-34-0. The fertilizer did not improve the high (4.16 fl oz) rate of Regent. Regent was also more effective than Counter 15G at the moderate (10 lb product/ac) rate, irrespective of whether the Counter was placed in a band or applied modified in-furrow. Vydate did not provide effective wireworm control in this experiment.

Table 3. *Plant stand counts* in plots treated with Counter, Regent, Mustang, and Vydate insecticides at planting to control wireworms in sugarbeet, Felton, MN, 2004.

Treatment/form.	Placement	Rate (product/ac)	Rate (lb ai/ac)	Stand count (plants/100 ft)		
				1st post-plant	2nd post-plant	Harvest
MustangMAX 0.8EC	IF	4.0 fl oz	0.025	115.7 a	114.1 a	61.3 a-e
MustangMAX 0.8EC+ Fert. 10-34-0	IF	4.0 fl oz	0.025	113.0 ab	109.3 abc	61.4 a-e
MustangMAX 0.8EC+ MustangMAX 0.8EC	IF 7” Band	4.0 fl oz 4.0 fl oz	0.025 0.025	112.3 ab	110.2 ab	72.0 a
Mustang MAX 0.8 EC	3” TB	4.0 fl oz	0.025	111.3 ab	108.0 a-d	51.0 c-g
Regent+ Fert. 10-34-0	IF	2.08 fl oz		105.0 abc	104.0 a-e	56.0 a-f
Regent 4SC+ Fert. 10-34-0	IF	4.16 fl oz		104.0 bcd	103.2 b-e	55.0 b-g
Regent 4SC	IF	4.16 fl oz		102.3 b-e	103.4 a-e	46.3 efg
Counter 15G	M	11.9 lb	1.8	100.2 c-f	99.3 c-f	71.1 ab
Counter 15G	M	5.9 lb	0.9	100.0 c-f	98.2 def	67.1 abc
Counter 15G	B	11.9 lb	1.8	97.0 c-f	97.0 def	64.0 a-d
Regent 4SC	IF	2.08 fl oz		93.0 def	95.0 ef	58.0 a-f
Regent 4SC	IF	1.25 fl oz		93.0 def	94.3 ef	65.0 abc
Counter 15G	B	10 lb	1.5	93.0 ef	94.3 ef	58.0 a-f
Counter 15G	M	10 lb	1.5	91.4 ef	90.4 f	62.0 a-e
Regent 4SC	IF	3.2 fl oz		89.3 f	92.0 f	60.0 a-f
10-34-0 Fert.	IF	---	---	67.0 g	70.0 g	39.0 g
Untreated	---	---	---	63.0 h	65.0 g	44.1 fg
Vydate 3.77SL	IF	34 fl oz	1.0	59.0h	61.0 g	48.0 d-g
LSD (0.05)				12.79	10.86	16.67

Table 4. ***Yield parameters*** **from plots treated with Counter, Regent, Mustang, and Vydate insecticides at planting to control wireworms in sugarbeet, Felton, MN, 2004.**							
Treatment/form.	**Placement**	**Rate (product/ac)**	**Rate (lb ai/ac)**	**Recoverable sucrose (lb/ac)**	**Root yield (T/ac)**	**Sucrose (%)**	**Gross return ($/ac)**
Counter 15G	B	11.9 lb	1.8	3236 a	12.0 a	14.68 a	311
Counter 15G	M	5.9 lb	0.9	3161 a	12.2 a	14.28 a	286
Counter 15G	M	11.9 lb	1.8	3144 a	11.7 a	14.60 a	300
Counter 15G	M	10 lb	1.5	2986 a	11.2 ab	14.38 a	282
Counter 15G	B	10 lb	1.5	2916 ab	11.0 ab	14.53 a	275
MustangMAX 0.8EC+ MustangMAX 0.8EC	IF 7" Band	4.0 fl oz 4.0 fl oz	0.025 0.025	2877 abc	10.7 abc	14.63 a	275
Regent 4SC	IF	3.2 fl oz		2574 a-d	9.5 a-d	14.80 a	249
Regent 4SC	IF	1.25 fl oz		2518 a-e	9.5 a-d	14.43 a	236
Vydate 3.77SL	IF	34 fl oz	1.0	2515 a-e	9.2 a-d	14.78 a	247
Regent 4SC+ Fert. 10-34-0	IF	2.08 fl oz		2458 a-e	9.5 a-d	14.30 a	225
Regent 4SC	IF	2.08 fl oz		2392 a-e	9.2 a-d	14.38 a	221
MustangMAX 0.8EC+ Fert. 10-34-0	IF	4.0 fl oz	0.025	2332 a-e	8.8 a-d	14.28 a	218
Mustang MAX 0.8 EC	3" TB		0.025	1998 b-e	7.6 bcd	14.28 a	186
Regent 4SC+ Fert. 10-34-0	IF	4.16 fl oz		1923 cde	7.2 cd	14.45 a	181
Untreated	---	---	---	1714 de	6.6 d	14.35 a	156
Regent 4SC	IF	4.16 fl oz		1684 de	6.3 d	14.45 a	160
MustangMAX 0.8EC	IF	4.0 fl oz	0.025	1676 de	6.4 d	14.05 a	156
10-34-0 Fert.	IF	---	---	1590 e	6.2 d	14.00 a	141
LSD (0.05)				980	3.7	NS	

Study 3 – Experimental Seed Treatments & Liquid Insecticides. The experimental liquid insecticide, F-58038, provided the highest stand protection in the study when applied at the high (19.2 fl oz/acre) rate. Plant stands in plots treated with this experimental, as well as those receiving Lorsban 75WG applied in a 3" TB at the high (1.33 lb product/acre) rate, and the Cruiser+Tefluthrin seed treatment were significantly higher than in those treated with Counter 15G at 10 lb. Few other differences were detected in this test due to low wireworm pressure, but encouraging performance was observed with the Poncho+Cyfluthrin, Poncho+Beta-cyfluthrin, Cruiser (60 g), and Cruiser+Tefluthrin seed treatments, and with Lorsban 75W. One finding that supported the observations in other research in 2004 was that 90 g ai/unit of sugarbeet seed imposes a negative impact on sugarbeet stand, even in the absence of major insect pressure. Future research should focus on different varieties and seed coating technologies, etc. to develop safer means of using this active ingredient to protect sugarbeet seedlings from wireworm injury and to avoid potential phytotoxic effects on the plant from the insecticidal protectant.

Table 5. ***Plant stand counts*** **from comparison of seed treatments, liquid insecticides, and conventional treatments for control of wireworms in sugarbeet, Felton, MN, 2004.**					
Treatment/form.	**Placement**	**Rate (product/ac)**	**Rate (ai/ac)**	**Stand count (plants/100 ft)**	
				1st post-plant	**2nd post-plant**
F-58038 2 lb/gal liquid	IF	19.2 fl oz	0.30 lb	95.5 a	97.1 a
Lorsban 75WG	3" TB	1.33 lb		94.6 a	93.4 ab
Cruiser+Tefluthrin	Seed		60+8 g ai/ unit	93.0 a	95.9 a
Cruiser	Seed		60 g ai/ unit	92.5 ab	92.3 ab
Poncho+Beta-cyfluthrin	Seed		60+8 g ai/ unit	91.3 ab	95.0 a
Icon 6.2 TS	Seed		50 g ai/ unit	90.4 ab	91.6 ab
Lorsban 75WG	3" TB	0.89 lb		88.9 ab	88.4 ab
Poncho+Cyfluthrin	Seed		30+8 g ai/ unit	88.2 ab	90.7 ab
Poncho+Cyfluthrin	Seed		60+16 g ai/ unit	87.7 ab	92.9 ab
Icon 6.2 TS	Seed		25 g ai/ unit	82.0 ab	90.0 ab
Untreated	---	---	---	80.7 ab	79.3 bc
Counter 15G	B	10 lb	1.5 lb	77.3 b	78.4 bc
Cruiser	Seed		90 g ai/ unit	60.2 c	66.8 c
LSD (0.05)				14.86	14.96

Table 6. *Yield parameters* from comparison of seed treatments, liquid insecticides, and conventional treatments for control of wireworms in sugarbeet, Felton, MN, 2004.							
Treatment/form.	**Placement**	**Rate (product/ac)**	**Rate (ai/ac)**	**Recoverable sucrose (lb/ac)**	**Root yield (T/ac)**	**Sucrose (%)**	**Gross return ($/ac)**
Lorsban 75WG	3" TB	0.89 lb		3225 a	13.3 a	13.5 a	253
Cruiser	Seed		60 g ai/ unit	2865 a	11.4 a	13.7 a	278
F-58038 2 lb/gal liquid	IF	19.2 fl oz	0.30 lb	2705 a	10.7 a	13.4 a	169
Lorsban 75WG	3" TB	1.33 lb		2679 a	11.2 a	13.2 a	189
Icon 6.2 TS	Seed		50 ai/ unit	2432 a	9.5 a	13.6 a	198
Icon 6.2 TS	Seed		25 ai/ unit	2423 a	9.5 a	13.9 a	231
Poncho+Beta-cyfluthrin	Seed		60+8 g ai/ unit	2385 a	9.6 a	13.7 a	217
Counter 15G	B	10 lb	1.5 lb	2382 a	10.3 a	13.0 a	193
Cruiser+Tefluthrin	Seed		60+8 g ai/ unit	2296 a	9.7 a	13.4 a	163c
Poncho+Cyfluthrin	Seed		60+16 g ai/ unit	2269 a	9.4 a	13.2 a	211
Poncho+Cyfluthrin	Seed		30+8 g ai/ unit	2244 a	9.1 a	13.6 a	215
Cruiser	Seed		90 g ai/ unit	2088 a	8.8 a	13.2 a	170
Untreated	---	---	---	1851 a	7.9 a	13.1 a	115
LSD (0.05)				NS	NS	NS	

Study 4 – Combined Trial. These plots were planted to stand so comparisons could be made on treatment success or failure in protecting sugarbeet from wireworm-induced plant stand reductions and yield losses. However, an ambitious group of summer laborers mistakenly thinned the plots after the first stand counts were taken. Our presentation of the results from this study is, therefore, restricted to the stand count that was taken on June 24 before thinning. Accordingly, the harvest data are also not presented in this report. Stand counts from Raymond provided findings that correspond well with data from the three other trials that were conducted at Felton, MN. Treatments that resulted in the highest stands included the following: Cruiser at 60 g ai/unit of seed, Icon applied at either 25 or 50 g ai/unit, MustangMax and Regent when tank-mixed with 10-34-0 starter fertilizer, Poncho+Cyfluthrin (both high and low rates), and F-58038 at 19.2 fl oz/acre (Table 7). Plant stands in all of these treatments were statistically increased when compared with the untreated check and with Counter at the moderately low rate of 8 lb product/acre. MustangMax performance was significantly improved by adding the starter fertilizer. This appears to be an impact on the insect because no difference was observed between the 10-34-0 control plots and the true untreated checks. Tank-mixing Regent with the 10-34-0 resulted in stands that also were comparable to those observed in plots protected by the top-performing insecticide treatments in this study. Vydate did not provide sufficient protection from stand losses associated with wireworm injury in this trial. Finally, similar to our findings at the Felton location, Cruiser was phytotoxic to the minimum buildup Crystal 822 seed used in this study when the insecticide was applied at the high (90 g ai/unit of seed) rate. This was demonstrated by that treatment actually producing statistically reduced plant stands when compared with the untreated check plots. Data from the Belgrade location are not included in this report because of insufficient wireworm pressure.

Table 7. *Plant stand counts* from comparison of insecticide seed treatments, planting-time granules, liquid insecticides, and seed treatments for control of wireworms in sugarbeet, Raymond, MN, 2004.				
Treatment/form.	**Placement**	**Rate (product/ac)**	**Rate (ai/ac)**	**Stand count (plants/100 ft)**
MustangMAX 0.8EC+ Fert. 10-34-0	IF	4.0 fl oz	0.025 lb	110.7 a
Poncho+Cyfluthrin	Seed		30+8 g ai/ unit	107.0 ab
Icon 6.2 TS	Seed		25 g ai/ unit	106.0 ab
Poncho+Cyfluthrin	Seed		60+16 g ai/ unit	106.0 ab
Cruiser	Seed		60 g ai/ unit	105.9 ab
Icon 6.2 TS	Seed		50 g ai/ unit	105.4 abc
F-58038 2 lb/gal liquid	IF	19.2 fl oz	0.30 lb	103.2 abc
Regent 4SC+ Fert. 10-34-0	IF	3.2 fl oz		102.5 abc
MustangMAX 0.8EC	IF	4.0 fl oz	0.025 lb	101.1 bc
Lorsban 75WG	3" TB	0.89 lb		99.3 bc
Regent 4SC	IF	3.2 fl oz		97.7 bcd
Counter 15G	M	5.9 lb	0.9 lb	96.1 cde
Counter 15G	M	8 lb	1.2 lb	88.6 def
10-34-0 Fert.	IF	---	---	88.2 ef
Untreated	---	---	---	85.5 f
Vydate 3.77SL	IF	34 fl oz	1.0 lb	81.4 fg
Cruiser	Seed		90 g ai/ unit	72.9 g
LSD (0.05)				9.33

Reference Cited:

SAS Institute. 1999. SAS/STAT user's guide for personal computers, version 8.0. SAS Institute, Inc., Cary, NC.