2003 INSECTICIDE USE STUDY FOR CONTROL OF SUGAR BEET ROOT MAGGOT

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Purpose of the Study

The sugarbeet root maggot is the foremost insect problem for the sugarbeet crop in the Mini-Cassia area of The Amalgamated Sugar Co. Because of the demand for production acres in the area, the rotation frequency and the proximity of those rotated acres, the problem has greatly increased in the past five years. The Mini-Cassia area has always had a problem with the insects' larvae, with some hot spot areas being of major concern. However, with the developments over the past five years which I just cited, the problem has escalated tremendously.

Over the past dozen or more years, The Amalgamated Sugar Co. has been involved with monitoring the sugarbeet root maggot fly in the Mini-Cassia area in late May and early June. This is the point in time when the overwintering larvae have completed their development from pupae to adult root maggot fly and the adult flies are emerging in great numbers to start the next generation. The monitoring is conducted by placing pods of sticky stake traps in the production fields. Between 50 and 60 sites, distributed around the whole production area are monitored each year. They are read, (fly counts being taken and averaged for each site) every two days, starting the last ten days in May through the middle of June. Our observations from this endeavor are then posted on the company's web site for access by growers and anyone interested.

We have observed a steady increase in numbers from our collections at these sites over the past five years. This is not only in those areas which traditionally were high in population, but also a steady increase in general, with those areas of high concern expanded tremendously. Keeping in mind that the economic threshold for the number of flies collected is 40- 45 flies per site, the figures for the past five years are thus:

County or Area Averages For Root Maggot Collected Over a 3.5 – 4 Week Period Each Year

Year	Minidoka Co. sites	Cassia Co. sites	Raft River Area sites
1999	262	163	307
2000	409	311	377
2001	540	148	86
2002	818	276	511
2003	760	400	169

As indicated by the above figures, the populations have been on a steady increase over these past five years. By this observation as well as the even broader evidence of walking fields and observing the amounts of flies in them during this seasonal time period of fly emergence, gestation, and ovidepositing, and the resulting maggot hatch which becomes the sugarbeet insect problem, we determined that our pesticide use, type, and /or methodology was not adequately controlling the problem. It was observed that many of our growers were applying Counter CR, at planting and this was the only treatment being used for maggot control. In the traditionally "Hot" or heavily population areas, Temik15 G was generally being used but sometimes with late timing of application and/or activation by watering. We determined to

find out if Counter CR applied at planting was an adequate control measure or if it should not be more timely applied the end of May to first of June when the adult maggot fly is peaking emergence. Temik was observed to be giving good control, but sometimes better timing of application and activation by irrigation was needed to more adequately attain control. We also wanted to determine if taking a more direct approach by killing the adult maggot flies, before they have deposited their eggs would result in more positive control of the maggot larvae population. It had become apparent that the methodology being used was allowing too many larvae to hatch and make their way down the beet root below the soil surface, out of reach of most of the insecticides being used, and therefore perpetuating the problem to the next year in greater and greater numbers. It was also concluded that the crush of the numbers of adult flies which were emerging from previous years beet fields and easily finding their way to this years field, (usually just across the road), was also contributing to the failure of insecticide measures being taken.

The results from the 2002 study verified our concerns regarding the above cited timing and usage of the insecticides and their adequacy of activation. The Check was the normal, at plant, application of Counter CR. The more timely applications of Counter 15-G and Temik 15-G at the peak of fly emergence showed substantial improvement in returns of sugar per acre, which of course is the basis for grower income; being a combination of his tons and the percentage of sugar in those tons. We also used an over the row application of Asana (pyretheroid) insecticide to see if this improved control. We assessed that it aided and from this we determined to find out how much the topical applications might contribute to improving sugarbeet root maggot control.

Therefore, in 2003 we looked for differences between three commonly used granular, soil applied, insecticides, Temik 15-G, Counter 15-G, and Thimet 20-G, when applied timely relative to peak maggot fly emergence. We also looked at the effect of two pyretheroid compounds labeled for use in sugar beets, Asana XL, and Mustang when used in conjunction with the soil applied compounds. They were foliar applied, banded over the plant row.

Methodology

The grower cooperator which we worked with on this project farms North of Paul, Idaho in an area which is in the heart of what we not so fondly call, “Maggot Alley”. We knew that we would have sufficient evidencing of the problem to show results one way or the other. The field was in potatoes the season before and was fall plowed , and roller-harrowed. In the Spring it was roller harrowed again and planted with Holly, Phoenix variety, sugarbeet seed on 22" rows at 4 “ spacing. No insecticides were applied at planting.

We selected the north end of the field for our study area, allowing a 24 row border on the north, followed by 36 rows of trial strip, approximately a quarter mile in length. This was the Temik trial strip. 60 rows were then left as a check and buffer. The next 36 rows were the Counter 15-G trial strip. Following these rows was another 48 rows of check and buffer. The next 36 rows were the Thimet 20-G trial strip, followed by the rest of the field to the south. Rows ran east to west.

The field was sprinkler irrigated with wheel lines. This facilitated the activation of the these soil applied insecticides with the cooperation of the grower and his management of the irrigation timing.

The check for the study was the grower’s choice of insecticide and timing of application. He used Temik 15-G, at the rate of 15 lbs./acre, applied at the start of fly flight which was also the same time that we applied our granular applications on the study strips. He then followed with 2 oz. of Mustang, banded on with his last herbicide application on May 27.

We applied the soil applied granular insecticides on May 22, which was a week ahead of peak,

maggot fly emergence and flight. Temik was applied at 14 lbs./acre, Counter 15-G at 13 lbs./acre, and Thimet 20-G at 7.5 lbs./ acre. These were label rates. June 3, Mustang was applied to the south 12 rows of each 36 row strip at the rate of 2.3 oz. /acre, and Asana XL was applied to the north 12 rows of each 36 row strip at the rate of 3.5 oz. /acre. The middle 12 rows in each strip were not treated with any topical pyretheroid application by us. However, the grower cooperator made an application of 2 oz./ acre of Mustang over the whole field on May 27, about six days before we made our first application. This was an error, but was innocently done when the study strips were also banded with the last herbicide application which had 2 oz. of Mustang mixed in with it.

On June 13, another over the row application of Mustang was made in each strip, same rows, at the rate of 4.3 oz./ acre. Asana was applied to the same rows as before in each strip at the rate of 3.5 oz./ acre.

The field was top dressed with 120 lbs. of nitrogen fertilizer on the 11th and 12th of June, and irrigation and cultivating and all weeding and the other normal cultural practices were conducted throughout the summer on a regular and fairly timely basis.

On the 15th of July, we dug the beet roots from 100 feet of row in each of the treatments and evaluated them for the scarring resultant from root maggot feeding. This was accomplished by topping the foliage from the plants by hand, digging the roots and bagging and tagging them. Then they were transported to where we could wash the roots and evaluate each as to the severity of scarring and the resultant appearance from maggot feeding.

The field was harvested as "early beets", the first part of early harvest which was the week of the 15th through the 20th of September, 2003. The end rows were harvested and the check rows between the study strips were harvested to open up lands, and then the 12 rows of each different insecticide treatment were harvested separately so as to collect yield and sugar data and thereby determine any production differences. The study strips were harvested the 15th and 16th of September.

Results and Discussion

The results from the scarring evaluation of the roots showed that the Temik treatments had more scarring, though many and most were shallow, which is an indication that feeding did not go on for a prolonged time. The Check showed the next most scarring, (the insecticide used by the grower was also Temik). Counter was the next most scarred, and Thimet showed even a little less or the least of any. The scars on these insecticide treatments were fewer but often more pronounced . These results reflect those of previous researchers when they compared these same insecticides as to scarring. The yield data is always another matter though irrespective of the scarring which seems to result.

There were four treatments which showed an economic increase over the check treatment. In the Temik strip, Temik applied alone showed $147.55, increase in value over the check , (this is after the expense of the insecticide has been deducted), and Temik + Asana showed $92.30, increase. It's important to remember that the Check was also Temik, applied timely and with 2 oz. of Mustang over the top of it 5 days later. The Temik with 6.6 oz. of Mustang over top, was $30.74 less than the check per acre. This is interesting but relatively unexplainable. In the Counter strip, Counter plus 6.6 oz. of Mustang over the top showed a $14.70 increase over the Check. The other two treatments showed negative amounts. In the Thimet strip, Thimet with 7 oz. of Asana over the top was $18.70 better than the Check, and the other two treatments were less than the Check.

It's interesting to see that in each strip of different granular insecticide used there was one treatment with a pyretheroid applied over top of it that showed a positive increase over the Check. This would indicate that the trend might be that they do contribute to increased control. The Asana showed a

positive increase in two of the treatments and the Mustang only in one. It should be noted that the first application of Mustang was only 2.4 oz. instead of the 4.3 oz. recommended rate. The reasoning for this was that 2 oz. of Mustang had gone on the plots from the grower just five days before, so we intended to add 2.3 oz. more to this for an initial 4.3 oz. of product. Better understanding of the initial knock-down value of pyretheroids and the importance of the proper rate to accomplish this came after the fact however.

The anomaly from this study is the 12 rows of Temik alone ,which in actuality were the same as the Check, and showed $147.55 increase over the check on production. It might be noted that the Temik strip received the irrigation most directly after application in relation to the other products. This was during the critical peak period of fly emergence. This was no more that 8 to 10 hrs. ahead of the other treatments though.

It might be concluded from this data that the use of a pyretheroid insecticide, timely applied does contribute much to control of the adult maggot fly which in turn translates into less larvae escapes and better control, hence better production. The positive dollar amounts however, favor the more soluble Temik, both in the test strip as well as the Check.

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ROOT SCARING & DAMAGE RATINGS

David Elison – Agronomist Joe Freiburger – Fieldman
The Amalgamated Sugar Co. LLC, Mini-Cassia District

Insecticide Control used	number of beets per 100 ft. of row	0 scars 0	> 10 scars 1	< 10 > 25 scars 2	< 25 scars 3	< 25 & 1/4 root covered 4	> 50 & 1/3 root covered 5	> 75 & 1/2 root covered 6	over 3/4 root covered 7	ranking of severity
CHECK	164	37	88	30	7	2				**2**
% of count		23	54	18	4	1				4
TEMIK	146	15	112	18	1					
% of count		10	77	12	> 1					3
TEMIK + Mustang	161	12	117	29	3					**1**
% of count		7	73	18	2					2
TEMIK + Asana	166	2	64	73	25	2				
% of count		1	39	44	15	1				1
COUNTER	114	32	76	5	1					
% of count		28	67	1	> 1					7
COUNTER + Mustang	146	26	108	12						**3**
% of count		18	74	8						5
COUNTER + Asana	163	73	90							
% of count		45	55							10
THIMET	182	34	136	12						
% of count		19	75	6						6
THIMET + Mustang	110	42	68							**4**
% of count		38	62							8
THIMET + Asana	155	64	90	1						
% of count		41	58	> 1						9

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HARVEST DATA

David Elison – Agronomist , Joe Freiburger – Fieldman
The Amalgamated Sugar Co. LLC, Mini-Cassia District

Grower Cooperative Strip Trial conducted in Minidoka, Co. Idaho

Insecticide Control used	tons per acre yielded	sugar %	$ value per ton	$ value per acre	cost of insectic-ide	$ value/acre less cost of insecticide	$ nett decrease per acre over ck	$ nett increase per acre over ck
CHECK	29.95	12.81	$29.19	$874.27	$53.88	$820.39		
TEMIK	31.56	13.77	$32.18	$1,015.54	$47.60	$967.94		$147.55
TEMIK + Mustang	31.06	12.19	$27.26	$846.75	$57.10	$789.65	minus $25.06	
TEMIK + Asana	31.54	13.27	$30.62	$965.82	$53.13	$912.69	plus	$92.30
COUNTER	30.94	11.96	$26.55	$821.33	$26.00	$795.33	minus $25.06	
COUNTER + Mustang	30.98	12.46	$28.10	$870.59	$35.50	$835.09	plus	$14.70
COUNTER + Asana	31.35	11.63	$26.05	$816.72	$31.53	$785.19	minus $35.20	
THIMET	31.75	11.79	$26.02	$826.04	$16.50	$809.54	minus $10.85	
THIMET + Mustang	31.62	11.64	$25.55	$807.90	$26.00	$781.90	minus $38.49	
THIMET + Asana	32.98	11.82	$26.11	$861.12	$22.03	$839.09	plus	$18.70

DATES & RATES OF INSECTICIDE APPLICATIONS, & COSTS OF PRODUCTS

PRODUCT	DATE APPLIED	RATE ACRE	PRODUCT	DATE APPLIED	RATE ACRE	COST PER UNIT	COST PER ACRE
Temik 15 G	May 22	14 lbs				$3.40	$47.60
Counter 15 G	May 22	13 lbs				$2.00	$26.00
Thimet 20 G	May 22	7.5 lbs				$2.20	$16.50
Mustang	June 3	2.3 oz.	Mustang	June 13	4.3	$1.44	$9.50
Asana XL	June 3	3.5 oz.	Asana XL	June 13	3.5	$0.79	$5.53
Grower applied check							
Temik 15 G	May 22	15 lbs	Mustang	May 27	2.0	$1.44	$53.88

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The Amalgamated Sugar Co. LLC
Mini-Cassia District

ROOT SCARING & DAMAGE RATINGS

Insecticide Control used		number of beets per 100 ft. of row	0 scars 0	> 10 < 25 scars 1	< 10 > 25 scars 2	< 25 scars 3	< 25 & 1/4 root covered 4	> 50 & 1/3 root covered 5	> 75 & 1/2 root covered 6	over 3/4 root covered 7	ranking of severity
CHECK											
Counter CR	A	152	2	39	54	23	30	3	1		
apllied at plant	B	116	2	21	56	30	6	1			
avg. count		134	2	30	55	26.5	18	2	0.5		
% of count			1.5	22.4	41.0	19.8	13.4	1.5	0.4		1
Counter 15G applied at peak											
fly flight or	A	135	11	72	30	5	14	2		1	
1st cultivation	B	111	6	45	36	16	8				
avg. count		123	8.5	58.5	33	10.5	11	1		0.5	
% of count			6.9	47.6	26.8	8.5	8.9	0.8		0.4	4
Counter CR applied at plant											
+ 2 applications	A	158	5	52	67	32	2				
Asana	B	170	10	83	54	19	4				
avg. count		164	7.5	67.5	60.5	25.5	3				
% of count			4.6	41.2	36.9	15.5	1.8				2
Temik 15G	A	163	13	80	48	12	10				
split application	B	148		69	52	21	5	1			
avg. count		155.5	6.5	74.5	50	16.5	7.5	0.5			
% of count			4.2	47.9	32.2	10.6	4.8	0.3			3
Temik 15G applied at peak											
fly flight or	A	169	12	88	61	8					
1st cultivation	B	130	17	73	29	9	2				
avg. count		149.5	14.5	80.5	45	8.5	1				
% of count			9.7	53.8	30.1	5.7	0.7				5

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HARVEST DATA

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Mini-Cassia District

Grower Cooperator was in Minidoka Co. in an area know as "maggot alley", where maggot fly count pressure was at 36 x economic threshold

Insecticide Control used	tons per acre yielded	sugar %	$ value per ton	$ value per acre	% increase over ck	$ value/acre less cost of insecticide	$ net increase per acre over ck
CHECK Counter CR apllied at plant 9 # @ $2.65 $23.85 cost / acre	22.31	18.2	$45.90	$1,024.04		$1,000.19	
Counter 15G applied at peak fly flight or 1st cultivation 10 # @ $2.00 $20.00 cost / acre	23.52	18.6	$47.24	$1,111.05	108.4	$1,091.05	$90.86
Counter CR applied at plant + 2 applications Asana 7 oz. @ $00.79 $5.53 cost / acre	26.29	18	$45.22	$1,188.73	116.1	$1,159.35	$159.16
Temik 15G split application 17 # @ $3.40 $57.80 cost / acre	24.44	19	$48.51	$1,185.69	115.8	$1,127.89	$127.70
Temik 15G applied at peak fly flight or 1st cultivation 14 # @ $3.40 $47.60 cost / acre	25.86	18.7	$47.49	$1,228.02	119.9	$1,180.42	$180.23
Rest of field 113.5 acres	22.06	17.97	$45.25	$998.15	97.5		