UNDERSTANDING THE USE OF GLYPHOSATE/GLYPHOSATE RESISTANT TECHNOLOGY AND HOW IT MAY CHANGE GROWER CULTURAL PRACTICES

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Introduction:

There are 180,000-200,000 acres of sugar beets grown in the Amalgamated Sugar Companies growing area of southern Idaho, eastern Oregon and Washington. During the 2007 crop year we wanted to learn and understand the problems that commercial sugar beet growers would face when they were able to plant 100% of there acreage to glyphosate resistant sugar beets in crop year 2008.

Objective

The objective was:

1. To understand the problems that growers would face associated with the actual applications of glyphosate (rates, timing, etc.)
2. How this new technology would effect conventional tillage practices.
3. To see effects of delayed spraying of glyphosate

Materials and methods:

We choose a 32-acre commercial sugar beet field north of Gooding, Idaho. The field's previous rotation was a 2005 RR corn crop, using minimum tillage practices and cattle grazed off crop residues. In 2006, a malt barley crop was planted using minimum till practices and cattle grazed off crop residues. In 2007, we planted Roundup Ready® sugar beets.

The field was divided into 3 tillage regimes, low (least tillage or LT), medium (medium tillage or MT) and high (conventional tillage or CT). The same center pivot irrigated all the treatments. The 32-acre field has a natural split of 6 acres (LT) and 28 acres. The 28-acre part was then split into a 13.2 (MT) and 12.8 (CT) acre treatments. The treatments LT, MT and CT were not replicated.

All treatments were planted using a JD Maximerge® planter at a seed drop of 5 15/16" at the depth of ¾". The seed was Beta® 25RR05.

All treatments were soil sampled (to the 2nd foot) and fertilized following Amalgamated Sugar grower guidelines. The soil type was silt loam.

The LT treatment consisted of the use of a field renovator (S tine field cultivator) and harrowed 2 times run at 90° to each pass. Sugar beets were planted, received 5 applications of glyphosate, 1 cultivation at row closure to mark out for harvest, and harvested. The MT treatment was chisel plowed 2 times at 90° to each other, roller harrowed, bedded up, planted, received 5 applications of glyphosate, cultivated at row

closure and harvested. The CT treatment consisted of moldboard plowing, roller harrow, bedded up, planted, received 4 applications of glyphosate, cultivated 3 times and harvested (See table 1).

		PASSES				COSTS PER ACRE			
					C/AC				
DATE		CT	MT	LT		CT	MT	LT	
	PLOW	1	0	0	24	$24.00	$0.00	$0.00	
	CHISEL PLOW	0	2	0	17	$0.00	$34.00	$0.00	
	FIELD CULT	0	0	2	15	$0.00	$0.00	$30.00	
	ROLLER HARROW	1	1	0	16	$16.00	$16.00	$0.00	
	BEDD	1	1	0	24	$24.00	$24.00	$0.00	
13-Apr	PLANT	1	1	1	15	$15.00	$15.00	$15.00	
27-Apr	SPRAY 44 0Z PRE EMERG ROUNDUP	1	1	1		$18.16	$18.16	$18.16	
8-May	SPRAY 27 OZ ROUNDUP	1	1	1		$11.53	$11.53	$11.53	
	CULTIVATION	1	0	0	16	$16.00	$0.00	$0.00	
23-May	SPRAY 27 OZ ROUNDUP	1	1	1		$11.53	$11.53	$11.53	
	CULTIVATION	1	0	0	16	$16.00	$0.00	$0.00	
5-Jun	SPRAY 22 OZ ROUNDUP	1	1	1		$9.58	$9.58	$9.58	
	LAYBYE CULTIVATION	1	1	1	16	$16.00	$16.00	$16.00	
28-Jul	SPRAY 22 OZ ROUNDUP	0	1	1		$0.00	$9.58	$9.58	
					C/TON				
	SHREDDER	1	1	1					
	TOPPER	1	1	1					
	HARVEST	1	1	1	8	$293.43	$263.64	$283.76	
	TOTAL PASSES	14	14	12		$471.23	$429.02	$405.14	COST PER ACRE
						0	$42.21	$66.09	SAVINGS OVER CONVENTIONAL

Table 1

Due to extremely high weed pressures, all treatments had one 40-oz. application of Roundup Original Max® pre-emergence. All treatments received two, 26 oz. applications between emergence and 8 true leaves (TL). Treatments LT and MT received two, 22 oz. applications between 8 TL and 30 days before harvest. Treatment CT treatment received only one 22 oz. glyphosate application between 8 TL and 30 days before harvest. In all applications of glyphosate, 17 pounds of ammonium sulfate (AS) per 100 gallons of water were added. Only Roundup Original Max glyphosate was used to control weeds in pre or post-emergence applications.

Results and Discussion:

We learned much about the Roundup label including rates, timing of applications, and how dust affected glyphosate. Backing into the Roundup label for available rates is essential. It is important to leave the labeled 44 oz. of glyphosate for application between 8TL and 30 days before harvest for late emerging weeds. This means there is only 52 oz. (4 oz less that labeled max rate) available for emergence to 8TL. Between these two segments it equals the 96 oz. in season maximum. When you subtract 96 oz. from season total it allows 74 oz available for pre-emergence applications. Be aware that this is less that labeled maximum rates so that you don't get caught with weeds and have no labeled amount of glyphosate to control them. We also learned that is important to only spray actively growing weeds, with the right rate, before they begin to compete with sugar beets for light, water and fertilizer. Manage dust and dust skips by pre-irrigation, to wash off dust, when possible and by offsetting spray rig tire tracks. In the MT and LT, we used all 96oz. of labeled in season glyphosate, and in the CT we used 74 ounces of glyphosate. The last application of 22 oz. was not necessary in the CT treatment. We found that it was possible to control weeds in extreme weed pressure fields using only glyphosate.

We were able to reduce the number of passes and the intensity of the passes in the LT to 12 compared to 14 passes in CT (see table 1). This reduction in intensity and passes resulted in a $66.09 per acre savings in LT and $42.21 per acre savings in MT compared to CT. We had hoped we could get that number to 10 in LT and 12 in MT. Instead we decided that due to the fields minimum till rotation that an extra pass of the field renovator/ chisel plow were necessary and that some kind of mark would be helpful at harvest time. We think that in future plantings additional reductions of field passes are possible.

After harvest data was collected and analyzed (see table 2). The LT treatment had the highest gross return per acre. Remember none of the treatments were replicated.

Yield Results

Tillage	Sugar %	T/A	$/Acre
LT	18.69	34.4	$1461.92
MT	18.98	31.5	$1363.25
CT	18.19	35.5	$1457.65

* assumes $21 Net

Table 2

Net Savings compared to CT

LT	$ 61.82
MT	$(56.46)
CT	$ 0

Table 3

We learn that when input costs are subtracted, the LT treatment had the highest net return to the grower (see table 3). We believe that more passes can be eliminated and those remaining passes can be less intense, and that the return to the grower can be further increased.

Cost of Glyphosate Delay

Treatment	T/Acre	% Sugar	$/Acre
On time	37.23	16.19	$1322.95
Delayed	-35.33	-15.94	-$1230.88
Difference	2.10	.25	$ 92.07

Table 4

In a separate study in 2007, we experienced yield loss when glyphosate problems occurred and weed kill was delayed. Weeds were above the knee when control was reached. At harvest few if any weeds were seen, however a 1/4 of a percent of sugar and a 2.1 T/A yield loss was experienced (see table 4). Sugar beet growers must be timely in their glyphosate applications or yield loss will occur. Growers must spray and kill weeds before weeds begin to compete with sugar beets for light, nutrients and water.