SURVEY OF WEED CONTROL AND PRODUCTION PRACTICES ON SUGARBEET IN WESTERN NORTH DAKOTA AND EASTERN MONTANA IN 2011

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The fourteenth weed control and production practices questionnaire was mailed in September 2011 to sugarbeet growers in western North Dakota and eastern Montana. The last survey was conducted in 2009. Growers were requested to evaluate weed control and sugarbeet injury from specific herbicides, and to list the most important weed and production problems. In addition, growers were requested to list insecticide use, fungicide use, acreage by sugarbeet type, acres of hand-weeded sugarbeet, herbicide application methods, and cost of hand thinning and hand weeding. Growers were also requested to provide the number of row cultivations by sugarbeet type, whether conventional herbicide rates increased, if any glyphosate-resistant weeds were observed, and list suspected glyphosate-resistant weed species. Insecticide use and fungicide use portions of the survey can be found in the Entomology and Plant Pathology sections.

Growers planted 31,326 acres of sugarbeet in western North Dakota and eastern Montana in 2011. Twenty growers representing 20% of the total acres responded to the survey. Of the 6,134 acres reported, 500 acres were conventional sugarbeet and 5,634 acres were Roundup Ready® (RR) sugarbeet. Western North Dakota and eastern Montana growers continue to plant RR sugarbeet nearly exclusively as was reported in 2009.

Table 1 is a summary of herbicide use and performance averaged over all counties. The number of growers reporting the use of an herbicide treatment is listed and the acres treated are expressed as a percentage of the total reported acreage. Multiple herbicide treatments are tabulated for each herbicide treatment, thus the number of growers reporting in Table 1 exceeds the total number of responses. Also, multiple herbicide treatments on the same acreage are listed separately in the tables, thus acres treated exceeds 100%. The ratings of weed control and sugarbeet injury are presented as the percentage of growers evaluating weed control as excellent, good, fair, or poor and injury as none, slight, moderate, or severe.

The trade names listed in Table 1 for the herbicides are the original trade names. These old trade names also represent the generic formulations of the same active ingredient. Thus Nortron also represents Ethofumesate SC, Ethofumesate 42 SC, and Ethotron; Betamix also represents Phen-Des 8+8; Progress also represents BnB Plus; Stinger also represents Clopyr Ag, and Spur; Dual Magnum also represents Brawl and Charger Basic, Outlook also represents Establish and Propel, Select also represents Select Max, Prism, Arrow, Clethodim 2EC, Intensity, Intensity One, Section, Shadow, Trigger, and Volunteer; and Assure II also represents Targa. Betanex was removed from the survey since it has not been manufactured for several years and warehouse supplies are likely exhausted.

Total sugarbeet acreage treated with herbicides in 2011 was 219% (Table 1), compared to 237% in 2009, 411% in 2007, 400% in 2005, 440% in 2003, and 408% in 2001. Total acreage treated with herbicides declined 18% compared to 2009. Survey respondents have reduced the number of herbicide applications by 60% since 2007. Soil-applied herbicides, postemergence herbicides, preemerge & lay-by herbicides and other weed control methods were reportedly used by growers in 2011(Table 1) compared to postemergence herbicides being the only type of herbicides or method of control reported in 2009. Postemergence herbicide use was 210% in 2011, 237% in 2009, 277% in 2007, 311% in 2005, 312% in 2003, and 335% in 2001. Postemergence herbicides were applied 2.1 times in 2011, compared to 2.4 times in 2009 and 2.8 times in 2007. Only Nortron, glyphosate (PRE and POST), Progress, UpBeet, Outlook, Select, and Stinger were reportedly applied to sugarbeets in western North Dakota and eastern Montana in 2011. The most common herbicide treatment in 2011 was glyphosate applied at 1.125 pound acid equivalent per acre (lb ae/A). The average total rate of glyphosate applied per acre by survey respondents in 2011 was 2.18 lb ae/A compared to 2.4 lb ae/A in 2009 and 2.21 lb ae/A in eastern North Dakota and Minnesota in 2011. The average total rate of glyphosate applied per acre is calculated by multiplying a glyphosate rate listed in Table 1 by the total percentage (in decimal form) of acres treated for that particular glyphosate rate listed in Table 1 and by the total acres reported in Table 1. Repeat that procedure for each glyphosate rate listed (only 0.75, 1.0, and 1.125), add each of these numbers, and divide by the total RR sugarbeet acreage (6,134 acres total minus 520 no herbicide acres and 500 conventional herbicide acres). Stinger was only applied by survey respondents to 20.8% of the total sugarbeet acreage in 2010 (Table 1), compared to

1.4% in 2009, 245% in 2007, 269% in 2005, 302% in 2003, and 269% in 2001. Select was applied to 5% of sugarbeet in 2011 and is reported under "other combinations" in Table 1.

Seventy-five percent of all survey respondents reported excellent weed control for postemergence herbicides in 2011, compared to 55% in 2009, 16% in 2007 and 11% in 2005. Seventy-four percent of survey respondents reported no sugarbeet injury in 2011, compared to 65% in 2009, 10% in 2007 and 28% in 2005. Never in the history of this survey has so many respondents reported excellent weed control and no sugarbeet injury. This is likely due to the availability and adoption of RR sugarbeet.

Herbicides were broadcast applied with a ground sprayer to nearly 100% of acres treated in 2011 according to survey respondents (Table 2). Less than 1% of respondents reported application of herbicides by aircraft or in a band in 2011 (Table 2).

A summary of the "most serious production" problem responses from 1989 to 2011 is shown in Table 3. In 2011, 47% of respondents named root diseases (including aphanomyces, fusarium, rhizoctonia, and rhizomania) as their "most serious production" problem in sugarbeet, compared to 29% in 2010, 17% in 2005, 22% in 2003, and 25% in 1991. Weeds and "No Problem" were named as the next "most serious production" problem by18% and 18% of survey respondents, respectively in 2011. Weeds and root diseases were named more frequently this year as a "most serious production" problem compared to 2009.

Kochia was named most often as the "worst weed" problem by 75% of the survey respondents in 2007 and 2005, however only 10% of respondents named kochia as a "worst weed" problem in 2011 (Table 4). Common lambsquarters was named most often as the "worst weed" problem by 33% of respondents, the greatest percentage of responses every recorded for common lambsquarters in the history of the survey (Table 4). Twenty-nine percent of respondents named "none" as a "worst weed" problem in 2011, the greatest percentage in the history of the survey. Velvetleaf and common mallow were reported by two and one respondents, respectively as an "other" "worst weed" problem. The effectiveness of glyphosate compared to conventional herbicides greatly enhances weed control in sugarbeet. Only one grower suspected common lambsquarters and common mallow as being resistant to glyphosate in 2011. Neither of these species have been confirmed resistant and are not being tested for resistance.

Row crop cultivation was used by 15% of survey respondents in 2011 (Table 5), the lowest frequency of use since the beginning of the survey in 1989. Eighty-five percent of respondents indicated zero cultivation per field, the largest percentage in the history of the survey (Table5). The average number of row crop cultivations reported was 0.2 per field in 2011, compared to 0.4 cultivations per field in 2009 and 1.7 cultivations per field in 2007. The number of row crop cultivations has declined sharply, likely due to the effectiveness of glyphosate in RR sugarbeet.

Hand weeding has virtually disappeared in western North Dakota and eastern Montana with only 6% of acres reported receiving hand weeding in 2011 (Table 6). The effectiveness of glyphosate applied to RR sugarbeet probably accounts for the near disappearance of hand weeding.

Sugarbeet acreage operated by survey respondents in 2011 varied from 50 acres to 1,087 acres (Table 8). The average and median number of sugarbeet acres per respondent was 307 and 273 acres, respectively, in 2011.

TABLE 1. SUMMARY OF ALL HERBICIDES USED IN SUGARBEET IN EASTERN NORTH DAKOTA AND WESTERN MONTANA IN 2011. 20 GROWERS REPORTED ON **6,134 ACRES** OF WHICH 2 GROWERS WITH 520 ACRES REPORTED NO HERBICIDES USED.

HERBICIDES (IN ORDER OF ACRES TREATED)	NUMBER GROWERS RPTG.	ACRES TREATED % OF TOTAL	Avg no. of appl	% GROWERS REPORTING WEED CONTROL					% GROWERS REPORTING CROP INJURY				
				NR*	EXC	GD	FR	PR	NR	None	Slt	Mod	Sev
A. SOIL APPLIED HERBICIDES:													
NORTRON (PPI/PRE)	1	3.6	1.0	0	0	100	0	0	0	0	100	0	0
TOTAL-PPI&PRE	1	3.6	1.0	0	0	100	0	0	0	0	100	0	0
B. POSTEMERGENCE HERBICIDES:													
GLYP 1.125 LB	5	76.1	2.0	0	60	20	0	20	0	80	20	0	0
GLYP 1.0 LB	8	63.7	2.0	0	100	0	0	0	0	100	0	0	0
GLYP 0.75 LB	5	42.7	2.2	0	80	20	0	0	0	100	0	0	0
OTHER COMBINAT.	2	19.2	3.5	0	0	50	50	0	0	0	100	0	0
GLYP OTHER LB	1	6.5	2.0	100	0	0	0	0	100	0	0	0	0
RR STINGER	1	0.8	1.0	0	100	0	0	0	0	0	100	0	0
GLYP+STINGER	1	0.8	1.0	0	100	0	0	0	0	0	100	0	0
TOTAL-POST	23	209.9	2.1	4	74	13	4	4	4	74	22	0	0
C. PREEMERGE & LAY-BY HERBICIDES:													
OUTLOOK (LAYBY)	1	3.6	1.0	100	0	0	0	0	100	0	0	0	0
GLYP (PRE)	1	1.6	1.0	0	100	0	0	0	0	100	0	0	0
TOTAL-PRE&LAY-BY	2	5.2	1.0	50	50	0	0	0	50	50	0	0	0
D. OTHER WEED CONTROL METHODS:													
CON CULTIVATIONS	2	6.8	1.5	0	0	100	0	0	0	50	50	0	0
RR CULTIVATIONS	1	3.7	1.0	100	0	0	0	0	100	0	0	0	0
TOTAL-OTHER	3	10.5	1.3	33	0	67	0	0	33	33	33	0	0
TOTAL TREATMTS	29	229.3	1.9	10	62	21	3	3	10	66	24	0	0

*NR=NO RESPONSE; EXC=EXCELLENT; GD=GOOD; FR=FAIR; PR=POOR.

Table 2. Method of herbicide application in sugarbeet in 2011.

Herbicide	Acres treated	Band	Broadcast with ground sprayer	Broadcast with aerial application
		----------% of acres treated----------		
Nortron	220	0	100	0
Glyphosate (Pre)	100	0	100	0
Prog+Sting	880	0	100	0
Prog+Sting+UpB+Sel+Oil	300	0	100	0
Stinger	50	0	100	0
Glyphosate	11198	1	99	0
Glyphosate+Stinger	50	0	100	0
Total	12,798	<1	100	0

Table 3. A summary of the most serious production problem responses from 1989 to 2011.

Year	Number of Respondents	Weeds	Weather	Root Diseases[1]	Labor Management	Emergence/ Stand	Cercospora Leaf Spot	No Problem
		% of respondents						
2011	17	18	0	47	6	0	12	18
2009	14	0	7	29	0	29	7	21
2007	18	44	6	17	6	11	6	5
2005	21	48	10	10	0	14	0	5
2003	41	36	7	22	5	10	5	12
2001	64	23	3	6	2	25	39	0
1999	45	42	2	11	0	9	24	2
1997	46	24	15	10	0	22	20	2
1995	61	44	5	5	2	13	26	3
1993	56	21	18	7	4	23	12	9
1992	64	28	8	5	0	36	11	3
1991	84	23	0	25	5	6	24	2
1990	70	41	13	11	6	10	0	9
1989	81	20	5	22	6	21	0	14

[1]Root Diseases include aphanomyces, fusarium, rhizoctonia, and rhizomania.

Table 4. A summary of the worst weed responses from 1989 to 2011.

Year	Number of Responses	RRPW[1]	COLQ	KOCZ	NISH	WIOA	Other	None
		% of responses						
2011	21	5	33	10	0	5	19	29
2009	18	0	22	17	6	6	-	22
2007	20	5	15	75	0	0	-	-
2005	24	8	13	75	0	0	-	-
2003	44	11	16	61	0	0	-	-
2001	64	14	16	62	2	0	-	-
1999	47	19	21	45	2	2	-	-
1997	43	58	16	12	5	0	-	-
1995	63	52	3	29	0	5	-	-
1993	58	17	17	28	3	12	-	-
1992	69	35	12	33	3	6	-	-
1991	84	43	7	26	10	2	-	-
1990	70	46	10	23	4	3	-	-
1989	81	43	11	22	3	1	-	-

[1]RRPW=redroot pigweed, COLQ=common lambsquarters, KOCZ=kochia, NISH=nightshade, WIOA=wild oat, OTHER=2011 velvetleaf (3), common mallow (1);

Table 5. A summary of the number of row crop cultivations per field for weeds from 1989 to 2011.

Year*	Responses	Number of cultivations 0	1	2	3	4	5
	number	% of respondents					
2011	20	85	10	5	0	0	0
2009	15	67	27	6	0	0	0
2007	19	6	26	63	6	0	0
2001	64	2	16	69	13	0	0
1999	47	2	24	60	13	0	0
1997	43	2	0	43	55	0	0
1989	81	0	0	26	53	20	1

*This question was not present on surveys from 2005, 2003, 1995, 1993, 1992, 1991, and 1990

Table 6. A summary of hand weeded acres as a percent of acres planted in eastern Montana and western North Dakota from 1989 to 2011.

Year	Respondent Acres Planted	Hand Weeded
		% of acres planted
2011	6,134	6
2009	3,441	<1
2007	8,346	51
2005	7,733	41
2003	11,732	38
2001	22,125	23
1999	12,296	21
1997	11,059	26
1995	12,338	51
1993	9,242	62
1992	12,791	76
1991	15,784	85
1990	12,607	78
1989	15,857	89

Table 7. A summary of the cost of hand weeding plus hand thinning from 1991 to 2011.

		Dollars per Acre											
Year	Responses	0	1-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	51-55	56-60	>60
	number	% of respondents												
2011	20	95	0	0	0	0	0	5	0	0	0	0	0	0
2009	15	93	0	0	0	0	0	0	0	0	7	0	0	0
2007	21	29	0	4	0	10	14	10	0	0	14	0	10	10
2005	24	50	0	4	4	8	4	4	4	3	8	4	8	0
2003	38	39	0	5	11	13	0	11	16	3	0	0	0	3
2001	65	69	2	0	3	6	8	3	5	0	2	0	2	2
1999	47	68	0	4	17	4	2	0	2	2	0	0	0	0
1997	43	49	0	9	14	2	12	0	2	0	0	0	5	7
1995	53	41	8	8	13	11	6	2	0	0	4	2	0	6
1993	46	15	4	13	2	11	4	0	0	0	2	24	15	9
1992	54	0	4	11	9	11	6	2	4	4	11	22	11	6
1991	73	0	0	8	3	7	0	1	3	0	8	29	18	23

Table 8. A summary of sugarbeet acres produced by survey respondents from 1997 to 2011.

		Sugarbeet Acres									
Year	Responses	1-49	50-99	100-199	200-299	300-399	400-599	600-799	800-999	1000-1500	>1500
	number	% of respondents									
2011	20	0	20	15	15	35	0	10	0	5	0
2009	15	7	40	13	7	13	7	13	0	0	0
2007	21	5	19	5	19	10	24	0	14	5	0
2005	24	4	13	17	13	38	8	4	0	4	0
2003	44	11	16	21	11	24	5	5	3	5	0
2001	64	5	15	28	20	9	5	11	2	5	2
1999	47	2	17	28	23	11	8	4	4	2	0
1997	43	4	23	25	12	25	8	0	2	0	0