SURVEY OF WEED CONTROL AND PRODUCTION PRACTICES ON SUGARBEET IN WESTERN NORTH DAKOTA AND EASTERN MONTANA IN 2021

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The twenty-first annual weed control and production practices survey was mailed and polled in 2021 to sugarbeet growers in western North Dakota and eastern Montana. 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, sugarbeet acreage, acres of hand-weeded sugarbeet, and weed control and crop injury evaluations. Insecticide use and fungicide use portions of the survey can be found in the Entomology and Plant Pathology sections of the 2021 Sugarbeet Research and Extension Reports.

Growers planted 31,500 acres of sugarbeet in eastern Montana in 2021. Twenty-one growers representing about 25% of the total acres responded to the survey. All of the 7,801 acres reported were Roundup Ready® (RR) sugarbeet.

Table 1 is a summary of herbicide use and performance averaged over all counties. The number of responses for 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 responses in Table 1 exceeds the total number of growers who responded to the survey. 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 herbicide trade names listed in the tables are original trade names. The original trade names also represent the generic formulations of the same active ingredient. Thus, Nortron also represents Ethofumesate 4SC, Ethotron, and Nektron; Stinger also represents Clean Slate and Spur; Dual Magnum as a lay-by herbicide also represents Brawl, Cinch, Charger Basic, Medal, and Mocassin; Outlook also represents Commit; and 'Grass Herbicide' represents Assure II, Select, Select Max, Arrow, Clethodim 2EC, Intensity, Section, Shadow, Volunteer, and Targa.

Total sugarbeet acreage treated with herbicides in 2021 was 146% (Table 1), compared to 128% in 2017, 223% in 2015, 220% in 2014, and 219% in 2011. Postemergence herbicides were applied 2.7 times per acre in 2021, compared to 2.4 times per acre in 2017, 2.2 times in 2015, 2.2 times in 2014 and in 2011. Preemergence (PRE) herbicides were only used on 22% of reported acres and glyphosate was the only reported PRE herbicide used. The most common herbicide treatment in 2021 was glyphosate. Stinger and Betamix were the only herbicides other than glyphosate used by respondents in 2021.

Growers were asked if they anticipated using a preplant incorporated (PPI) or preemergence (PRE) herbicide in the 2022 growing season in sugarbeet. Twenty-nine percent of respondents answered yes. The remaining 71% of respondents said they do not anticipate using a PPI or PRE herbicide in the 2022 growing season in sugarbeet.

Zero percent of all survey respondents reported excellent weed control for postemergence herbicides in 2021 (Table 1), compared to 38% in 2017, 46% in 2015, 50% in 2014, and 75% in 2011. Fifty-two percent of survey respondents reported no sugarbeet injury in 2021, compared to 86% in 2017, 92% in 2015, 78% in 2014, and 74% in 2011. The average number of glyphosate applications applied POST per acre in RR sugarbeets in 2021 was 2.81 (Calculated from Table 2 values).

Sugarbeet acreage managed by survey respondents in 2021 varied from 90 acres to 1,055 acres (Table 3). The average number of sugarbeet acres per respondent was 371 acres, respectively, in 2021 (Table 4).

Forty-five acres of sugarbeet were seeded with a cover crop in 2021. An unnamed crop was used as a cover crop.

A summary of the "most serious production problem" responses from 1989 to 2021 is shown in Table 5. In 2021, 58% of respondents named weeds as their "most serious production problem" in sugarbeet. In 2021, 18% of respondents also named weather as their most serious production problem in sugarbeet.

Kochia was named most often in 2021 as the "worst weed" problem by 90% of respondents (Table 6). Five percent of respondents named "redroot pigweed" or "wild oats" as a "worst weed" problem in 2021.

Row crop cultivation was used by 43% of survey respondents in 2021. Seventy-eight percent of respondents who utilized row crop cultivation made one pass. Twenty-two percent of respondents who utilized cultivation indicated making two passes.

Hand weeding has virtually disappeared in western North Dakota and eastern Montana with 90% of growers reporting no hand weeding in 2021 (Table 7). The effectiveness of glyphosate applied to RR sugarbeet probably accounts for the near disappearance of hand weeding. Those who did hand weed, paid $31 to $40 per acre for that method of weed control (Table 8)

Wheat was the main crop to directly precede the 2021 sugarbeet crop (Table 9). Sixty percent of reported acres were preceded by wheat, 20% by corn, 9% by an 'other' crop, 5% by dry bean, 3% by soybean, and 3% by fallow.

The majority of respondents (35%) to this year's survey considered an agriculturist their most useful resource (Table 10). Twenty-nine percent of respondents considered their local agronomist as their most used resource. Twenty-five percent of respondents considered University Extension system (NDSU/MSU) as their most used resource. Nine percent of respondents indicated the internet was their most useful resource. Many respondents indicated using more than one of the listed resource options.

The preferred method of receiving technical information in 2021 was undecided. (Table 11). Nineteen percent of respondents use apps and 12% do not use apps but prefer them. Nineteen percent prefer hard copies.

The average age of grower in western North Dakota and eastern Montana who responded to this survey is 50-59 (Table 13). Forty-four percent of respondents were 50-59, 22% were 60-69, 19% were 30-39, 11% were 70-79, and 4% were 40-49.

Table 1. Summary of all herbicides used in sugarbeet in western North Dakota and eastern Montana in 2021. Twenty-one growers reported on 7,801 acres.

Treatment	No. of Responses	Acres Treated	Acres Treated % of Total	% of Responses Reporting Weed Control					% of Responses Reporting Crop Injury				
				NR*	Exc	Gd	Fr	Pr	NR	None	Slt	Mod	Sev
A. PRE-EMERGENCE HERBICIDES													
Glyphosate PRE	4	1,740	22	25	-	-	50	25	25	50	25	-	-
Total-PRE	**4**	**1,740**	**22**	**100**					**100**				
B. POSTEMERGENCE HERBICIDES													
Glyphosate	19	5,661	73	4	-	35	17	4	4	52	4	-	-
Glyphosate + Stinger	2	801	10	-	-	50	-	50	-	50	50	-	-
Betamix	2	130	2	-	-	-	-	100	50	-	50	-	-
Total-POST	**23**	**6,592**	**85**										
C. OTHER WEED CONTROL METHODS													
Cultivations	9	3,031	39	11	11	33	44	-	22	44	22	-	11
Total-Other Methods	**9**	**3,031**	**39**	**100**	**-**	**-**	**-**	**-**	**100**	**-**	**-**	**-**	**-**
TOTAL ALL TREATMENTS	**36**	**11,363**	**146**										

*NR=No Response;Exc=Excellent;Gd=Good;Fr=Fair;Pr=Poor;Slt=Slight;Mod=Moderate;Sev=Severe

Table 2. Glyphosate use rates per acre across all POST application timings in sugarbeet by county in 2021.

County	Total[1]	lb ae/A				fl. oz./A[2]									
		Other	0.7 to 0.84	0.85 to1.0	>1.0	22	24	26	28	29	30	32	34	40	64
		----------% of responses----------													
Roosevelt	7	57	-	-	43	-	-	-	-	-	-	-	-	-	-
Dawson	7	14	-	-	-	-	-	-	-	-	-	57	-	29	-
McKenzie	19	32	-	16	52	-	-	-	-	-	-	-	-	-	-
Prairie	3	100	-	-	-	-	-	-	-	-	-	-	-	-	-
Richland	28	36	11	25	7	-	-	-	-	-	-	21	-	-	-
Williams	7	57	-	-	43	-	-	-	-	-	-	-	-	-	-

[1] Total number of glyphosate applications made during the year.
[2]Based on a 4.5 lb/gal. acid equivalent formulation of glyphosate

Table 3. A summary of sugarbeet acres produced by survey respondents from 2001 to 2021.

Year	Responses number	Sugarbeet Acres									
		1-49	50-99	100-199	200-299	300-399	400-599	600-799	800-999	1000-1500	>1500
		----------% of respondents----------									
2021	21	0	5	19	32	19	5	10	0	10	0
2019[1]	-	-	-	-	-	-	-	-	-	-	-
2017	32	3	9	19	25	22	9	3	6	3	0
2015	22	0	19	10	28	24	14	5	0	0	0
2014	23	4	0	13	39	22	13	4	0	4	0
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

[1]Responses not recovered from grower meeting.

Table 4. Total sugarbeet acreage operated by survey respondents in 2021.

County	Respondents	Acres of sugarbeet								
		<50	50-99	100-199	200-299	300-399	400-599	600-799	800-999	1000+
		----------% of respondents----------								
Roosevelt	3	-	-	-	33	-	-	-	-	66
Dawson	4	-	25	-	25	50	-	-	-	-
McKenzie	6	-	-	-	32	17	17	17	-	17
Prairie	1	-	-	100	-	-	-	-	-	-
Richland	10	-	-	30	30	10	-	10	-	20
Williams	2	-	-	-	-	-	-	50	-	50
Total	26	-	4	15	27	15	4	12	-	23

Table 5. A summary of the most serious production problem responses from 2001 to 2021.

Year	Number of Respondents	Weeds	Weather	Root Diseases[1]	Labor Management	Emergence/ Stand	Cercospora Leaf Spot	No Problem	Insect Damages[2]
		----------% of respondents ----------							
2021	22	58	18	5	0	5	9	5	0
2019[3]	-	-	-	-	-	-	-	-	-
2017	37	16	16	11	0	27	3	14	14[b]
2015	22	0	18[a]	27	0	18	14	9	14[b]
2014	20	0	0	35	10	5	35	15	5
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	-

[1]Root Diseases include aphanomyces, fusarium, rhizoctonia, and rhizomania.
[2]Insect Damages include Root maggot, root aphid, springtails, and nematode.
[3]Responses not recovered from grower meeting.
[a]Hail Damage in 2015.
[b]Springtails in 2015 and 2017.

Table 6. A summary of the worst weed responses from 2001 to 2021.

Year	Number of Responses	RRPW[1]	COLQ	KOCZ	NISH	WIOA	Other[2]	None
		----------% of responses----------						
2021	22	5	0	90	0	5	0	0
2019[a]	-	-	-	-	-	-	-	-
2017	32[b]	13	23	33	3	8	15	8
2015	24	12	21	17	4	8	21	17
2014	23	13	30	9	9	4	4	30
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	-	-

[1]RRPW=redroot pigweed, COLQ=common lambsquarters, KOCZ=kochia, NISH=nightshade, WIOA=wild oat,
[2]OTHER=common mallow, foxtail, common cocklebur, smartweed; (1), (1), (1), (1) respectively in 2017.
[a]Responses not recovered from grower meeting.
[b]Multiple responses.

Table 7. A summary of hand weeded acres as a percent of acres planted from 2001 to 2021.

Year	Respondent Acres Planted	Hand Weeded % of acres planted
2021	7,801	<1
2019[a]	-	-
2017	10,622	0
2015	6,132	0
2014	7,556	0
2011	6,134	6
2009	3,441	<1
2007	8,346	51
2005	7,733	41
2003	11,732	38
2001	22,125	23

[a]Responses not recovered from grower meeting.

Table 8. A summary of the cost of hand weeding plus hand thinning from 2001 to 2021.

		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
		% of responses												
2021	21	90	0	0	0	0	0	5	5	0	0	0	0	0
2019[a]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2017	32	100	0	0	0	0	0	0	0	0	0	0	0	0
2015	22	100	0	0	0	0	0	0	0	0	0	0	0	0
2014	23	100	0	0	0	0	0	0	0	0	0	0	0	0
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

[a]Responses not recovered from grower meeting.

Table 9. Percent of sugarbeet acres seeded in 2021 into various crop residues by county.

			Crop Preceding Sugarbeet						
County	No. of responses	Acres planted	Corn	Dry Bean	Soybean	Wheat	Barley	Fallow	Other
			% of acres planted						
Roosevelt	4	1,064	8	-	-	92	-	-	-
Dawson	7	925	-	49	16	29	-	-	6
McKenzie	7	1,635	9	-	-	91	-	-	-
Prairie	1	165	100	-	-	-	-	-	-
Richland	14	3,282	20	-	-	75	-	-	5
Williams	2	767	-	-	-	41	-	59	-
Total	35[a]	7,838[a]	20	5	3	60	0	3	9

[a]Multiple counties and acres reported per one response.

Table 10. Most used resources for information on sugarbeet production in western North Dakota and eastern Montana by county in 2021.

County	No. of Responses[1]	Agriculturalist	Local Agronomist	MSU	NDSU[2]	Internet[3]	No Response
		% of responses					
Roosevelt	6	17	32	17	17	17	-
Dawson	9	44	22	-	22	12	-
McKenzie	14	29	21	7	29	14	-
Prairie	2	50	50	-	-	-	-
Richland	22	41	27	14	9	9	-
Williams	2	-	100	-	-	-	-
Total	55	35	29	9	16	11	-

[1]Response was multiple choice, each survey taker could select multiple.
[2]NDSU/U of MN Extension Publication or Website.
[3]NDAWN Website.

Table 11. Preferred method of receiving technical information in western North Dakota and eastern Montana by county in 2021.

County	No. of Responses[1]	Use Apps and Prefer	No App Use but Prefer	Prefer Hard Copies	Undecided	No Response
		% of responses				
Roosevelt	3	-	33	-	66	-
Dawson	4	-	50	25	25	-
McKenzie	6	17	-	33	50	-
Prairie	1	-	-	-	100	-
Richland	10	40	-	20	40	-
Williams	2	-	-	-	100	-
Total	26	19	12	19	50	-

[1]Response was multiple choice, each survey taker could select multiple.

Table 12. Average age of respondent in 2021.

County	Respondents[a]	Age of Respondents 20-29	30-39	40-49	50-59	60-69	70-79	80-89	No Response
		% of respondents							
Roosevelt	3	-	66	-	33	-	-	-	-
Dawson	4	-	25	-	25	50	-	-	-
McKenzie	6	-	-	-	66	33	-	-	-
Prairie	1	-	-	-	-	-	100	-	-
Richland	11	-	18	9	37	18	18	-	-
Williams	2	-	-	-	100	-	-	-	-
Total	27	0	19	4	44	22	11	0	0

[a]Multiple responses per county.