

POSTEMERGENCE HERBICIDES ON SUGARBEET, 2000.

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Liberty, Roundup and Conventional Herbicides at Colfax and Wendell.

The objectives of these experiments were to determine weed control and sugarbeet injury from various postemergence treatments and to determine the benefit from Nortron, Dual and Outlook on sugarbeet. 'Beta 2084', 'Hilleshog 8277 Roundup Ready' and 'Beta 2012 Liberty Link' sugarbeet were seeded in adjacent experiments at both locations April 25. Sugarbeet was seeded 1.25 inches deep in 22-inch rows. Counter 15G insecticide at 12 pounds product/acre was applied modified in-furrow at planting. Preemergence Nortron and Dual were applied April 25. Postemergence application dates and conditions are given in [Table 1](#). All herbicides were applied in 17 gpa water at 40 psi through 8002 nozzles at 3 mph. Herbicides were applied to the center four rows of six row plots. Weed control and sugarbeet injury were evaluated June 16 and June 22 at Colfax and June 16 and June 28 at Wendell.

Roundup + AMS applied twice gave no sugarbeet injury and total control of all evaluated weeds ([Table 2](#)). Dual and Outlook could not add any weed control since Roundup alone gave such good control. Dual and Outlook did not cause significant sugarbeet injury.

Liberty + AMS applied twice gave no sugarbeet injury and nearly total control of redroot pigweed, lanceleaf sage, eastern black nightshade and green foxtail ([Table 3](#)). However, Liberty + AMS gave less control of common lambsquarters than of other weeds. Outlook or Dual + Liberty + AMS gave better control of common lambsquarters than Liberty + AMS but the maximum observed average control was 95%.

Progress + UpBeet + Stinger + Select or Betanex + UpBeet + Stinger + Select used at the micro-rate + Scoil or at conventional rates without Scoil gave total control of common lambsquarters and redroot pigweed at Colfax ([Table 4](#)). The micro-rates were applied four times and the conventional rates were applied three times. Nortron applied preemergence followed by postemergence Progress + UpBeet + Stinger + Select at conventional rates caused more sugarbeet injury than the other treatments but the level of injury was only 7%.

All treatments at Wendell caused similar sugarbeet injury of 8 to 10% and all gave excellent control of redroot pigweed, common lambsquarters, eastern black nightshade and green foxtail ([Table 5](#)). Lanceleaf sage control increased as Stinger rate increased from 1.3 to 2.6 to 3.8 fl oz/A. Stinger at 3.8 fl oz/A plus the micro-rate and Scoil applied four times only caused 9% sugarbeet injury in this experiment. However, higher levels of injury have been observed previously from Stinger at 3.8 fl oz/A applied four times so this rate of Stinger plus oil adjuvant applied multiple times should only be used for severe weed problems. Nortron or Dual applied preemergence followed by Betanex + UpBeet + Stinger + Select + Scoil at 0.5 pt + 1/8 oz + 2.6 fl oz + 2 fl oz/A + 1.5% applied four times postemergence gave 100% control of lanceleaf sage while the same postemergence treatment without the Nortron or Dual gave 94% control. Substituting Progress for Betanex in the postemergence treatment had no effect on control of lanceleaf sage.

Starane on Sugarbeet

Kochia was named as "worst weed problem" by 43% of the sugarbeet grower respondents to the 2000 annual survey. Redroot pigweed was named by 18% of the respondents. This is the first year since the "worst weed" question was first asked on the annual survey in 1977 that redroot pigweed was not named most frequently. The probable cause of the increase in responses naming kochia as worst weed is the development of kochia resistant to herbicides that inhibit the ALS enzyme. Approximately 45 different herbicide trade names registered in North Dakota and Minnesota are ALS inhibitors or include herbicides that are ALS inhibitors in a pre-mix combination. The buildup of kochia resistant to ALS inhibiting herbicides is due to the widespread use of these herbicides in most rotational crops and sugarbeet. UpBeet is an ALS-inhibiting herbicide that gives excellent control of kochia that is not resistant to ALS-inhibiting herbicides but will not control resistant kochia. Kochia seed was collected from sugarbeet fields in the fall of 1999 by sugarbeet cooperative agriculturists. Of the 502 samples collected, 461 produced plants in the greenhouse. Some or all of the plants from 451 of the 461 samples with viable seed were resistant to UpBeet. Therefore, 98% of the collected samples with viable seed produced resistant plants. The high percentage of seed samples that produced resistant plants

was expected since most sugarbeet fields in eastern North Dakota and Minnesota are treated with UpBeet each year. Thus, most surviving kochia plants in sugarbeet fields in the fall would have survived one or more treatments that included UpBeet.

Starane is a growth regulator herbicide that is known to give excellent kochia control. Starane and Stinger are in the same chemical family so experiments were initiated in 2000 to investigate the efficacy of Starane for kochia control in sugarbeet.

'Beta 2081' sugarbeet was planted at Felton, Hillsboro and St. Thomas. Starane was applied in combination with the micro-rate to the center four rows of six-row plots using a bicycle-wheel plot sprayer delivering 17 gpa through 8002 nozzles at 40 psi and 3 mph. The micro-rate was applied four times at seven-day intervals starting when sugarbeet was cotyledon to early two-leaf. Starane was applied in the second, third or fourth micro-rate application.

Starane plus the micro-rate gave better kochia control than the micro-rate alone (Table 6). However, Starane caused sugarbeet injury from 10 to 72% and rates of 2.6 fl oz/A or higher caused a significant reduction in sugarbeet extractable sucrose. Sugarbeet treated with Starane in the fourth application of the micro-rate were injured less than those treated in the second or third application (date not shown) so future research will be done to determine if sugarbeet become more tolerant to Starane as the plants become larger.

Kochia Control with Conventional Herbicides

The methods in this experiment were similar to those described previously. All treatments gave 6% or less sugarbeet injury (Table 7). All treatments gave 97 to 100% control of redroot pigweed and common lambsquarters. The micro-rate treatment with Progress at 5.7 fl oz/A gave 100% control of common mallow, Pennsylvania smartweed and wild buckwheat but only 54% control of kochia. UpBeet will give excellent control of kochia that is not resistant to ALS-inhibiting herbicides so the kochia at Felton and Hillsboro apparently had a significant portion of population that was resistant to ALS-inhibiting herbicides. Progress + UpBeet + Stinger + Select at the higher tested rates gave better kochia control than the same herbicides at the micro-rate including Scoil. However, the micro-rate gave better control of common mallow, Pennsylvania smartweed and wild buckwheat than the same herbicides at higher rates but without the methylated seed oil adjuvant. The Scoil apparently greatly increased control of common mallow by UpBeet and control of Pennsylvania smartweed and wild buckwheat by Stinger. Also, the micro-rate was applied four times while the higher rates were applied three times and the extra application may have increased control.

Nortron applied preemergence followed by the micro-rate gave better kochia control than the micro-rate alone (Table 7). However, Nortron applied preemergence followed by the conventional rate of Progress + UpBeet + Select gave better kochia control than Nortron followed by the micro-rate. Dual applied preemergence followed by postemergence herbicides tended to give less kochia control than Nortron followed by postemergence herbicides. Progress + UpBeet + Select at 18 fl oz + 1/4 oz + 2.6 fl oz/A applied three times gave kochia control similar to Progress + UpBeet + Select applied three times at 18 fl oz + 1/4 oz + 2.6 fl oz/23 fl oz + 1/4 oz + 2.6 fl oz/36 fl oz + 1/4 + 2.6 fl oz/A. Increasing the rate of Progress in the second and third application did not improve kochia control.

These results suggest that the best kochia control from herbicides would include a soil-applied herbicide followed by at least three and perhaps four applications of postemergence herbicides including Progress at conventional, not micro-rates. UpBeet should be included in the postemerge treatment since a portion of the kochia population will be susceptible and UpBeet is needed for improved control of redroot pigweed. Other steps to improve kochia control include: a) achieve excellent control in all rotational crops using non-ALS-inhibiting herbicides; b) cultivate to a narrow band, harrow, rotary hoe, hand labor; and c) kill all kochia before sugarbeet planting or emergence using tillage, glyphosate or paraquat. Kochia plants that have a head start on the sugarbeet will be very difficult to control with herbicides.

Colfax				
Date (planted 4/25/00)	May 12	May 19	May 26	June 6
Time of day	11:00 AM	2:30 PM	9:30 AM	9:00 AM
Air temp. (?F)	55	72	65	67
Rel. humidity (%)	57	25	48	52
6-inch soil temp (?F)	52	57	53	56
Wind velocity (mph)	19	17	13	9
Cloud cover (%)	10	0	100	20
Soil moisture	good	good	good	good
Sugarbeet	v1.0	v1.0-1.8	V2.7-4.2	V4.0-6.5
Redroot pigweed	cotyl	cot-2 lf	2-4 lf	1-2 inches
Common lambsquarters	cot-2 lf	cot-4 lf	4-8 lf	2-4 inches
Marshelder	cotyl	2 lf	4 lf	6-8 lf
Wendell				
Date (planted 4/25/00)	May 12	May 19	May 26	June 3
Time of day	2:00 PM	11:30 AM	1:00 PM	8:30 AM
Air temp. (?F)	63	66	76	53
Rel. humidity (%)	41	28	28	45
6-inch soil temp (?F)	54	53	57	52
Wind velocity (mph)	21	12	15	10
Cloud cover (%)	50	0	90	90
Soil moisture	good	good	fair	good
Sugarbeet	v1.0-1.3	V1.5-2.2	V4.0-6.2	V6.5-7.8
Redroot pigweed	cot-1 lf	cot-4 lf	1-6 lf	4 lf-4 inch
Common lambsquarters	cot-2 lf	cot-4 lf	cot-8 lf	6 lf-4 inch
Lanceleaf sage	cotyl	cot-2 lf	2-4 lf	cot-8 lf
Eastern black nightshade	cot-1 lf	cot-3 lf	2-5 lf	3-7 lf
Green foxtail	0-0.5 inch	0.5-2 inch	0.5-3 inch	2-5 inch

Table 2. Weed control and sugarbeet injury from Roundup treatments averaged over two evaluations.^a

Two locations

Wendell

Treatment	(Date of application)	Rate	Sugb inj	Rrpw cntl	Colq cntl	Lasa cntl	Ebns cntl	Grft cntl
		lb/A	%	%	%	%	%	%
Roundup + AMS (May 19, June 3 or 6)		0.75+2	0	100	100	100	100	100
Roundup + AMS + Outlook (May 19)		0.75+2+1	2	100	100	100	100	100
Roundup + AMS (June 3 or 6)		0.75+2						
Roundup + AMS + Outlook (May 12)		0.75+2+1	1	100	98	100	100	100
Roundup + AMS (June 3 or 6)		0.75+2						
Roundup + AMS (May 19)		0.75+2	1	100	100	100	100	100
Roundup + AMS + Outlook (June 3 or 6)		0.75+2+1						
Roundup + AMS + Dual (May 19)		0.75+2+2	1	100	100	100	100	100
Roundup + AMS (June 3 or 6)		0.75+2						
Roundup + AMS + Dual (May 12)		0.75+2+2	0	100	100	100	100	100
Roundup + AMS (June 3 or 6)		0.75+2						
Roundup + AMS (May 19)		0.75+2	0	100	100	100	100	100
Roundup + AMS + Dual (June 3 or 6)		0.05+2+2						
	LSD (0.05)		NS	NS	NS	NS	NS	NS

^aAMS = ammonium sulfate, Sugb = sugarbeet, Rrpw = redroot pigweed, Colq = common lambsquarters, Lasa = lanceleaf sage, Ebns = eastern black nightshade, Grft = green foxtail.

Table 3. Weed control and sugarbeet injury from Liberty treatments averaged over two evaluations.^a

Treatment	(Date of application)	Rate	Two locations			Wendell		
			Sugb inj	Rrpw cntl	Colq cntl	Lasa cntl	Ebns cntl	Grft cntl
		lb/A	%	%	%	%	%	%
Liberty + AMS (May 19, June 3 or 6)		0.31+3	0	99	86	100	100	100
Liberty + AMS + Outlook (May 19)		0.31+3+1	2	100	90	100	100	100
Liberty + AMS (June 3 or 6)		0.31+3						
Liberty + AMS + Outlook (May 12)		0.31+3+1	1	100	92	100	100	100
Liberty + AMS (June 3 or 6)		0.31+3						
Liberty + AMS (May 19)		0.31+3	1	100	92	100	100	100
Liberty + AMS + Outlook (June 3 or 6)		0.31+3+1						
Liberty + AMS + Dual (May 19)		0.31+3+2	2	100	95	100	100	100
Liberty + AMS (June 3 or 6)		0.31+3						
Liberty + AMS + Dual (May 12)		0.31+3+2	4	99	93	100	100	99
Liberty + AMS (June 3 or 6)		0.31+3						
Liberty + AMS (May 19)		0.31+3	2	98	94	100	100	100
Liberty + AMS + Dual (June 3 or 6)		0.31+3+2						
	LSD (0.05)		NS	NS	5	NS	NS	NS

^aAMS = ammonium sulfate, Sugb = sugarbeet, Rrpw = redroot pigweed, Colq = common lambsquarters, Lasa = lanceleaf sage, Ebns = eastern black nightshade, Grft = green foxtail.

Table 4. Weed control and sugarbeet injury from conventional herbicide treatments averaged over two evaluations at Colfax.^a

Treatment	(Date of application)	Rate/A	Sugb inj	Colq cntl	Rrpw cntl
			%	%	%

Progress + UpBeet + Stinger + Select + Scoil (May 12, 19, 26, June 3) 0.36 pt + 1/8 oz + 1.3 + 2 fl oz + 1.5%	0	99	100
Betanex + UpBeet + Stinger + Select + Scoil (May 12, 19, 26, June 3) 0.5 pt + 1/8 oz + 1.3 + 2 fl oz + 1.5%	0	100	100
Progress + UpBeet + Stinger + Select (May 12, 19, 26) 1.1 pt + 1/4 oz + 2 + 2.6 fl oz	2	100	100
Progress + UpBeet + Stinger + Select (May 12, 19, 26) 1.1 pt + 1/4 oz + 2 + 2.6 fl oz/1.5 pt + sm/2.2 pt + sm	2	100	100
Betanex + UpBeet + Stinger + Select (May 12, 19, 26) 1.5 pt + 1/4 oz + 2 + 2.6 fl oz/2.0 pt + sm/3.0 pt + sm	2	100	100
Nortron (PRE) 3 qt/A Progress + UpBeet + Stinger + Select + Scoil (4X) 0.36 pt + 1/8 oz + 1.3 + 2 fl oz + 1.5%	2	100	100
Nortron (PRE) 3 qt/A Progress + UpBeet + Stinger + Select (3X) 1.1 pt + 1/4 oz + 2 + 2.6 fl oz/1.5 pt + sm/2.2 pt + sm	7	100	100
LSD (0.05)	5	NS	NS

^a Sugb = sugarbeet, Rrpw = redroot pigweed, Colq = common lambsquarters.

Table 5. Weed control and sugarbeet injury from conventional herbicide treatments averaged over two evaluations at Wendell.³

Treatment	(Number of applications)	Rate/A	Sugb inj	Rrpw cntl	Colq cntl	Lasa cntl	Ebns cntl	Grft cntl
			%	%	%	%	%	%
Betanex + UpBeet + Stinger + Select 1.5 pt + 1/4 oz + 3.8 fl oz + 2 fl oz (4X)			10	100	100	94	100	100
Betanex + UpBeet + Stinger + Select + Scoil 0.5 pt + 1/8 oz + 1.3 fl oz + 2 fl oz + 1.5% (4X)			8	98	96	82	100	100
Betanex + UpBeet + Stinger + Select + Scoil 0.5 pt + 1/8 oz + 2.6 fl oz + 2 fl oz + 1.5% (4X)			8	100	100	94	100	100
Betanex + UpBeet + Stinger + Select + Scoil 0.5 pt + 1/8 oz + 3.8 fl oz + 2 fl oz + 1.5% (4X)			9	100	100	98	100	100
Progress + UpBeet + Stinger + Select + Scoil 0.36 pt + 1/8 oz + 2.6 fl oz + 2 fl oz + 1.5% (4X)			9	98	100	94	100	100
Nortron (PRE) 3 qt Betanex + UpBeet + Stinger + Select + Scoil 0.5 pt + 1/8 oz + 2.6 fl oz + 2 fl oz + 1.5% (4X)			9	100	100	100	100	100
Dual (PRE) 25 fl oz Betanex + UpBeet + Stinger + Select + Scoil 0.5 pt + 1/8 oz + 2.6 fl oz + 2 fl oz + 1.5% (4X)			9	100	100	100	100	100
LSD (0.05)			NS	NS	NS	5	NS	NS

^a Sugb = sugarbeet, Rrpw = redroot pigweed, Colq = common lambsquarters, Lasa = lanceleaf sage, Ebns = Eastern black nightshade, Grft = green foxtail.

Table 6. Kochia control averaged over Felton and Hillsboro and sugarbeet injury and yield from hand weeded sugarbeet at St. Thomas.

Treatment	Starane	Felton Hillsboro	St. Thomas	
		Kochia	Sugb	Extractable

Rate/A	rate	control	inj	sucrose
	fl oz/A	%	%	lb/A
Betamix + UpBeet + MSO (4 applic) 0.5 pt + 1/8 oz + 1.5% (micro-rate)	0	82	1	4580
Micro-rate (4 applic), Starane in second or third application	1.3	92	10	4590
	2.6	97	25	3770
	5.1	98	44	3670
	10.7	98	72	2410
LSD (0.05)		6	9	600

Table 7. Weed control and sugarbeet injury at Hillsboro, Felton and Humboldt with conventional herbicides.^a

Treatment Rate/A	3 loc. Sugb inj	2 loc. Colq Rrpw cntl	2 loc. Kochia cntl	1 loc. Coma cntl	1 loc. Pesw Wibw cntl
	%	%	%	%	%
Progress + UpBeet + Stinger + Select + Scoil (micro-rate) 5.7 fl oz + 1/8 oz + 1.3 + 2.0 fl oz + 1.5% (4X)	5	98	54	100	100
Progress + UpBeet + Stinger + Select 18 fl oz + 1/4 oz + 2.0 + 2.6 fl oz (3X)	4	99	84	85	92
Progress + UpBeet + Select 18 fl oz + 1/4 oz + 2.6 fl oz/23 + sm/36 + sm	6	98	84	83	87
Nortron PRE/Progress + UpBeet + Stinger + Select + Scoil 3 qt/5.7 fl oz + 1/8 oz + 1.3 + 2.0 fl oz + 1.5% (4X)	5	100	73	100	100
Nortron PRE/Progress + UpBeet + Select 3 qt/18 fl oz + 1/4 oz + 2.6 fl oz/23 + sm/36 + sm	6	97	88	90	87
Dual PRE/Progress + UpBeet + Stinger + Select + Scoil 25 fl oz/5.7 fl oz + 1/8 oz + 1.3 + 2.0 fl oz + 1.5% (4x)	6	98	65	100	100
Dual PRE/Progress + UpBeet + Select 25 fl oz/18 fl oz + 1/4 oz + 2.6 fl oz/23 + sm/36 + sm	6	97	82	79	90
LSD 0.05	NS	NS	14	7	5

^aSugb = sugarbeet, Colq = common lambsquarters, Rrpw = redroot pigweed, Coma = common mallow, Pesw = Pennsylvania smartweed, Wibw = wild buckwheat.