

HERBICIDES ON SUGARBEET AT FIVE LOCATIONS, 2005.

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Kochia, common lambsquarters and pigweed species are the most problematic weeds in sugarbeet in eastern North Dakota and Minnesota. Difficulty in achieving timely application of micro-rate herbicide treatments and perhaps increasing herbicide tolerance by some weed populations contribute to insufficient weed control from micro-rate treatments. Nearly all kochia is resistant to UpBeet and the micro-rate has not generally provided adequate kochia control. A new label for 2005 allowed oil adjuvant to be used with higher rates of Progress, Betamix and Betanex than previously was registered. The objective of this experiment was to evaluate weed control and sugarbeet injury from the micro-rate, mid-rate and conventional-rate used with and without soil applied herbicides.

The experiment was established at seven location but excessive rain and flooding ruined two locations. The experiment was evaluated June 29 at Morris, July 5 at Prosper, June 31 at Wheatland, July 2 at Grand Forks and July 2 at St. Thomas. The planting dates, herbicide treatment dates and conditions at treatment are provided in Table 1. Counter 15G at 12 lb/A was applied modified-in-furrow on the planter at Grand Forks and St. Thomas. Sugarbeet seed was treated with Tachigaren at 45 grams per 100,000 seeds at all sites except St. Thomas. Herbicides were applied to the center four rows of six-row plots in 17 gpa of water at 40 psi through 8002 nozzles at 3 mph. Roundup was applied over a Roundup Ready Variety on July 5 at St. Thomas to give total weed control and allow evaluation of sugarbeet injury from the herbicides without significant weed competition. Eminent fungicide at 13 fl oz/A was applied at St. Thomas August 1 and September 6. Headline fungicide at 9 fl oz/A was applied August 24. Treatments were replicated four times. Weed Control and sugarbeet injury were evaluated visually at each location. Sugarbeet at St. Thomas was harvested from the center two rows of 30-foot-long six-row plots on September 26. The treatments in Table 2 are numbered for easier reference in the following discussion. The cost of the herbicide treatments in Table 2 includes the broadcast cost of the herbicides but does not include application cost.

All 15 treatments gave total control of quinoa, common lambsquarters, common mallow and common ragweed (Table 2). Extractable sucrose per acre at St. Thomas was similar among all treatment but root diseases were present in the experiment and the non-uniform patches of disease throughout the experiment caused a large experimental error and the lack of significant differences in yield. Harvested sugarbeet populations were variable and differences in population among treatments were not significant (data not shown). Sugarbeet injury varied from 9% to 32% with higher herbicide rates causing greater injury. The micro-rate (Treatment 1); the micro-rate + Nortron (Treatment 8); PRE Nortron followed by the micro-rate (Treatment 10); and the micro-rate plus lay-by Dual magnum (Treatment 14) gave 15% or less sugarbeet injury. The highest conventional-rate (Treatment 5) and PPI Nortron followed by a conventional-rate (Treatment 12) caused over 30% sugarbeet injury.

All treatments gave over 90% control of the three pigweed species (Table 2). However, pigweed control generally increased as herbicide rate increased at the micro-rate (Treatment 1) gave less control than the other treatments. The conventional-rates (Treatments 5 and 6); two micro-rates plus two conventional-rates (Treatment 9); and PRE or PPI Nortron followed by the micro-rate (Treatments 10-11), the mid-rate (Treatment 13) or the conventional-rate (Treatment 12) gave 99 to 100% pigweed species control.

Flax control of over 95% was observed from six treatments (Table 2). Treatments 5,6,7,9 and 12 included a conventional-rate of Progress. Treatment 13 had PPI Nortron followed by a mid-rate treatment. Canola control of over 95% was observed from a conventional-rate (Treatment 5); two micro-rates plus two conventional-rates (Treatment 9) and PPI Nortron followed by a conventional-rate (Treatment 12).

The kochia density at Wheatland was sparse while kochia was dense at Grand Forks. The kochia at Wheatland also seemed to be easier to control with the herbicides as compared to the kochia at Grand Forks. So, kochia control at

the two locations is reported separately in Table 2. All treatments except the micro-rate (Treatment 1) gave 93% or greater control of kochia at Wheatland. Only PPI Nortron followed by a conventional-rate (Treatment 12) gave over 93% control at Grand Forks.

Progress alone at a conventional rate (Treatment 7) at \$97/A broadcast gave better control of flax and kochia and similar control of other species compared to the micro-rate plus Nortron (Treatment 8) at \$98/A broadcast. The kochia at Grand Forks was nearly totally resistant to UpBeet so Progress alone (Treatment 7) gave kochia control similar to the conventional-rate (Treatment 5) which had the same rate of Progress plus other herbicides. PPI Nortron followed by a conventional-rate (Treatment 12) gave 9% kochia control at Grand Forks and 100% control at Wheatland.

The micro-rate applied twice followed by the conventional-rate applied twice (Treatment 9) gave weed control similar to the conventional-rate (Treatment 5) for all species except kochia at Grand Forks. Adding extra Nortron to the micro-rate (Treatment 8) gave better control of pigweed species and kochia compared to the micro-rate alone (Treatment 1). The micro-rate plus Dual Magnum (Treatment 14) and the micro-rate plus Outlook (Treatment 15) gave better control of pigweed species, canola and kochia compared to the micro-rate alone (Treatment 1).

The mid-rate treatments (Treatments 2, 3 and 4) were first registered for use in 2005. These treatments gave better control of pigweed species, flax and kochia than the micro-rate (Treatment 1) but less control of pigweed species, flax, canola and kochia than a conventional-rate (Treatment 5).

SUMMARY

Decisions on postemergence herbicide rates and combinations are difficult. Increasing rates often improves control of weeds but sugarbeet injury may increase and cost per acre will increase. Conventional rates of Progress are needed for consistent kochia control and PRE or PPI Nortron followed by Progress at conventional rates will provide the best kochia control. UpBeet rarely provides significant kochia control since most kochia in North Dakota and Minnesota is resistant to UpBeet. Stinger does not control kochia. Progress alone at conventional rates generally will give kochia control equal to Progress plus UpBeet plus Stinger. UpBeet often will improve control of pigweed species, velvetleaf, nightshades, common mallow, venice mallow and nightflowering catchfly. Stinger often will improve control of Canada thistle, wild buckwheat, sunflower, cocklebur, lanceleaf sage, buffalo bur, ragweed, smartweed, marshelder and Russian thistle. Mixing Stinger and UpBeet with Progress often will improve overall weed control but will not improve kochia control.

Table 1. Herbicide application dates and conditions, 2005¹.

MORRIS					
Date	April 21	May 16	May 23	May 31	June 16
Time of day	11:00 A	11:00 A	12:20 P	12:00 P	3:30P
Air temperature (F)	54	52	73	76	79
Relative humidity (%)	34	46	29	31	36
6-inch soil temp. (F)	44	45	60	60	72
Soil moisture	good	good	good	good	good
Sugarbeet (Hilleshog 2463RZ)	PPI, seed, PRE	V1.0	V1.0-2.1	V2.2-3.8	V6.0-8.0
Common lambsquarters	-	cot-2 lf	cot-4 lf	2-6 lf	6-9" tall
Waterhemp/Redroot pigweed	-	-	cotyl	1-2 lf	2-8" tall
PROSPER					
Date	May 16	June 3	June 9	June 16	June 22
Time of day	3:45 P	11:45 A	12:30 P	10:00 A	3:00 P
Air temperature (F)	69	67	68	63	83
Relative humidity (%)	36	58	45	52	54
6-inch soil temp. (F)	48	47	58	60	71
Soil moisture	good	good	good	wet	good
Sugarbeet (Beta 4797R)	PPI, seed, PRE	V1.0-1.5	V2.1-2.8	V4.1-5.5	V4.8-7.1
Quinoa	-	2-4 lf	2-5" tall	2-7" tall	10-14" tall
Amaranth	-	cot-1 lf	2-3 lf	6-8" tall	6-10" tall
Flax	-	0.5-2" tall	0.75-4" tall	2-7" tall	8-12" tall
Canola	-	cot-2 lf	2-4 lf	2-6" tall	14-16" tall
ST. THOMAS (Harvested September 26)					
Date	May 3	May 25	June 1	June 10	June 16
Time of day	4:00 P	11:15 A	11:15 A	2:30 P	5:00 P
Air temperature (F)	57	62	64	67	75
Relative humidity (%)	14	43	61	51	40
6-inch soil temp. (F)	52	56	59	64	63
Soil moisture	good	good	good	good	good
Sugarbeet (Empire RR)	PPI, seed, PRE	V1.0-1.2	V2.1-2.4	V3.8-5.5	V6.0-9.3
Redroot pigweed	-	cot-1 lf	cot-2 lf	3-5 lf	1-3" tall
WHEATLAND					
Date	April 25	May 26	June 2	June 9	June 21
Time of day	10:30 A	9:45 A	10:00 A	9:30 A	12:30 P
Air temperature (F)	48	54	68	62	81
Relative humidity (%)	27	48	59	51	46
6-inch soil temp. (F)	38	45	59	58	70
Soil moisture	good	wet	good	good	good
Sugarbeet (Hilleshog 2463RZ)	PPI, seed, PRE	V1.2-2.1	V2.0-2.5	V5.5-6.5	V7.5-8.5
Kochia	-	0.25-0.75" diam	0.25-1.5" tall	0.5-2" tall	1.6" tall
Common ragweed	-	cot-2 lf	2-4 lf	4 lf	4-6 lf
Common mallow	-	cot-2 lf	cot-4 lf	2-6" diam	6" tall
Redroot pigweed	-	cotyledon	cot-2 lf	2-4 lf	6-8 lf
GRAND FORKS					

Date	May 3	May 23	May 30	June 6	June 22
Time of day	11:30A	10:15 A	2:00 P	12:00 P	12:30 P
Air temperature (F)	52	67	68	63	83
Relative humidity (%)	13	58	45	52	54
6-inch soil temp. (F)	33	47	58	60	71
Soil moisture	good	good	good	wet	good
Sugarbeet (VDH46177)	PPI, seed, PRE	V1.0	V1.1-1.4	V2.0-2.5	V4.9-6.4
Kochia	-	cot-0.5" diam	0.5-1.0" diam	0.5-1.5" tall	6-10" tall

¹If = leaf or leaves, cot = cotyledon, " = inches, V = number of expanded leaves with decimal indicating partial expansion of the youngest visible leaf.

Table 2. Weed control, sugarbeet injury and sugarbeet yield following herbicide treatments at five locations in 2005. (Table continued on next page)

Treatment, Rate	Approx. broadcast cost	Amar ³	Quinoa	Flax	Canola
		Wahe Rrpw cntl 3 loc	Colq cntl 2 loc	Prosper cntl	Prosper cntl
fl oz/A or oz/A	\$/A	%	%	%	%
1. Progress + UpBeet + Stinger + Select + MSO ¹ 5.7 + 0.125 + 1.3 + 2 + 1.5% (T1-T4) ²	88	91	100	78	84
2. Progress + UpBeet + Stinger + Select + MSO 8.5(T1, T2)/11.4/15.6 + 0.125 + 1.3 + 2 + 1.5% (T1-T4)	106	96	100	85	78
3. Progress + UpBeet + Stinger + Select + MSO 11.4 + 0.125 + 1.3 + 2 + 1.5% (T1-T4)	101	98	100	91	84
4. Progress + UpBeet + Stinger + Select + MSO 11.4(T1,T2)/15.6 (T3, T4) + 0.125 + 1.3 + 2 + 1.5%(T1-T4)	108	97	100	93	86
5. Progress + UpBeet + Stinger + Select 17.8(T1)/23.5 (T2)/35.6 (T3-T4) + 0.25 + 2.6 + 3 (T1-T4)	202	100	100	100	96
6. Progress + UpBeet + Stinger + Select 17.8(T1-T2)/23.5 (T3-T4) + 0.25 + 2.6 + 3 (T1-T4)	194	100	100	100	94
7. Progress 17.8 (T1)/23.5 (T2)/35.6 (T3-T4)	97	96	100	100	85
8. Progress + UpBeet + Stinger + Select + MSO + Nortron 5.7 + 0.125 + 1.3 + 2 + 1.5% + 3 (T1-T4)	98	94	100	79	84
9. Progress + UpBeet + Stinger + Select + MSO 5.7 + 0.125 + 1.3 + 2 + 1.5% (T1-T2) Progress + UpBeet + Stinger + Select 35.6 + 0.25 + 2.6 + 3 (T3-T4)	158	99	100	99	96
10. Nortron (PRE) 120 followed by Progress + UpBeet + Stinger + Select + MSO 5.7 + 0.125 + 1.3 + 2 + 1.5% (T1-T4)	191	100	100	88	88
11. Nortron (PPI) 120 followed by Progress + UpBeet + Stinger + Select + MSO 5.7 + 0.125 + 1.3 + 2 + 1.5% (T1-T4)	191	99	100	89	92
12. Nortron (PPI) 120 followed by Progress + UpBeet + Stinger + Select 17.8(T1-T2)/23.5 (T3-T4) + 0.25 + 2.6 + 3 (T1-T4)	297	100	100	100	99
13. Nortron (PPI) 120 followed by Progress + UpBeet + Stinger + Select + MSO 8.5(T1-T2)/11.4 + 15.6 + 0.125 + 1.3 + 2 + 1.5% (T1-T2)	209	100	100	97	91

14. Progress + UpBeet + Stinger + Select + MSO 5.7 + 0.125 + 1.3 + 2 + 1.5% (T1-T4) Dual Magnum 27 (T3)	110	94	100	85	91
15. Progress + UpBeet + Stinger + Select + MSO 5.7 + 0.125 + 1.3 + 2 + 1.5% (T1-T4) Outlook 21 (T3)	112	95	100	80	89
	LSD (0.05)	2	NS	5	5

¹MSO = methylated seed oil from Loveland. ²T1 = first POST application, T2 = second POST application, etc.

³Amar = amaranth, a tame pigweed; Wahe = waterhemp; Rrpw = redroot pigweed; Quinoa = a tame lambsquarters; Colq = common lambsquarters; Sugb = Sugarbeet; Coma = common mallow; Corw = common ragweed.

Table 2. (continued) Weed control, sugarbeet injury and sugarbeet yield following herbicide treatments at five locations in 2005.

Treatment, Rate	Coma				
	Corw cntl Wheatland	Kochia cntl Wheatland	Kochia cntl Grd Fks	Sugb injury 4 loc	Extractable sucrose St. Thom
fl oz/A or oz/A	%	%	%	%	lb/A
1. Progress + UpBeet + Stinger + Select + MSO ¹ 5.7 + 0.125 + 1.3 + 2 + 1.5% (T1-T4) ²	100	81	19	9	5770
2. Progress + UpBeet + Stinger + Select + MSO 8.5(T1, T2)/11.4/15.6 + 0.125 + 1.3 + 2 + 1.5% (T1-T4)	100	97	41	18	6590
3. Progress + UpBeet + Stinger + Select + MSO 11.4 + 0.125 + 1.3 + 2 + 1.5% (T1-T4)	100	95	49	20	7210
4. Progress + UpBeet + Stinger + Select + MSO 11.4(T1,T2)/15.6 (T3, T4) + 0.125 + 1.3 + 2 + 1.5%(T1-T4)	100	97	56	22	7260
5. Progress + UpBeet + Stinger + Select 17.8(T1)/23.5 (T2)/35.6 (T3-T4) + 0.25 + 2.6 + 3 (T1-T4)	100	99	88	32	6020
6. Progress + UpBeet + Stinger + Select 17.8(T1-T2)/23.5 (T3-T4) + 0.25 + 2.6 + 3 (T1-T4)	100	100	80	25	7490
7. Progress 17.8 (T1)/23.5 (T2)/35.6 (T3-T4)	100	100	91	28	6010
8. Progress + UpBeet + Stinger + Select + MSO + Nortron 5.7 + 0.125 + 1.3 + 2 + 1.5% + 3 (T1-T4)	100	93	46	12	6700
9. Progress + UpBeet + Stinger + Select + MSO 5.7 + 0.125 + 1.3 + 2 + 1.5% (T1-T2) Progress + UpBeet + Stinger + Select 35.6 + 0.25 + 2.6 + 3 (T3-T4)	100	99	72	27	6230
10. Nortron (PRE) 120 followed by Progress + UpBeet + Stinger + Select + MSO 5.7 + 0.125 + 1.3 + 2 + 1.5% (T1-T4)	100	99	68	15	7160
11. Nortron (PPI) 120 followed by Progress + UpBeet + Stinger + Select + MSO 5.7 + 0.125 + 1.3 + 2 + 1.5% (T1-T4)	100	98	62	20	6760
12. Nortron (PPI) 120 followed by Progress + UpBeet + Stinger + Select 17.8(T1-T2)/23.5 (T3-T4) + 0.25 + 2.6 + 3 (T1-T4)	100	100	96	31	6910

13. Nortron (PPI) 120 followed by Progress + UpBeet + Stinger + Select + MSO 8.5(T1-T2)/11.4 + 15.6 + 0.125 + 1.3 + 2 + 1.5% (T1-T2)	100	100	78	25	6930	
14. Progress + UpBeet + Stinger + Select + MSO 5.7 + 0.125 + 1.3 + 2 + 1.5% (T1-T4) Dual Magnum 27 (T3)	100	95	51	13	6000	
15. Progress + UpBeet + Stinger + Select + MSO 5.7 + 0.125 + 1.3 + 2 + 1.5% (T1-T4) Outlook 21 (T3)	100	93	46	17	6490	
	LSD (0.05)	NS	9	11	4	NS

¹MSO = methylated seed oil from Loveland. ²T1 = first POST application, T2 = second POST application, etc.

³Amar = amaranth, a tame pigweed; Wahe = waterhemp; Rrpw = redroot pigweed; Quinoa = a tame lambsquarters; Colq = common lambsquarters; Sugb = Sugarbeet; Coma = common mallow; Corw = common ragweed.