

SCREENING HERBICIDES FOR CROP SAFETY IN SUGARBEET

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The objective of this trial was to screen pre-emergence and post-emergence herbicides alone and in tank-mixes for sugarbeet crop safety.

MATERIALS AND METHODS

An experiment was conducted near Hickson, ND in 2017. Fertilizer was spread May 2 and incorporated the same day with a field cultivator equipped with a spring tooth harrow. Seedex ‘Winchester’ sugarbeet, treated with NipsIt Suite, Tachigaren at 45g per unit, and Kabina at 7g per unit was seeded in 22-inch rows at 60,560 seeds per acre on May 3 with a John Deere 1700XP 6-row planter. Pre-emergence (PRE) treatments were applied May 3 immediately after planting. Rain events occurred on May 3, May 7, and May 16 with 0.09, 0.02, and 0.63 inches of rain respectively. Post emergence (POST) treatments were applied June 2. All herbicide treatments were applied with a bicycle sprayer in 17 gpa spray solution through 8002 XR flat fan nozzles pressurized with CO₂ at 40 psi to the center four rows of six row plots 35 feet in length. Sugarbeet stand was counted from 10 feet of each of the center two rows on May 26 when sugarbeet were in the cotyledon to 2 leaf stage. Sugarbeet were counted again at harvest. Roundup PowerMax at 32 fl oz/A + Veracity at 3qt/100 gal was applied June 12 and 26 to provide weed control. Escaped weeds were hand pulled throughout the season. Quadris at 16 fl oz/A was broadcast June 24 to control Rhizoctonia root rot. Proline at 5.7 fl oz/A + NIS at 0.125% v/v and AgriTin at 8 fl oz/A + Topsin at 12 fl oz/A were applied July 18 and August 2, respectively, to control Cercospora Leaf Spot. Sugarbeet in the center two rows by 27 feet long were harvested September 7, 2017. Roots were weighed and about 25 lbs of representative roots were collected from each plot and taken to Minn-Dak Farmers Cooperative Quality Lab in Wahpeton, ND for sugar and purity analysis.

All sugarbeet injury evaluations were a visual estimate of percent fresh weight reduction in the four treated rows compared to the adjacent untreated strip. Experimental design was randomized complete block with 4 replications for each trial. Data were analyzed with the ANOVA procedure of ARM, version 2017.4 software package.

Table 1. Application Information – Hickson, ND 2017

Date	May 3	June 2
Time of Day	3:00 PM	9:30 PM
Air Temperature (F)	63	86
Relative Humidity (%)	53	45
Wind Velocity (mph)	9	9
Wind Direction	NW	S
Soil Temp. (F at 6")	50	60
Soil Moisture	Good	Good
Cloud Cover (%)	100	5
Next Rainfall (amount)	May 3 (0.09")	June 11 (0.11")
Sugarbeet Stage	PRE	cot-4 leaf/ avg 2 leaf

SUMMARY

Sugarbeet stand counts were taken 7 days before POST treatments were applied. No significant differences were observed among PRE treatments as compared to the untreated check (Table 2). Sugarbeet stands were consistent across the trial. Sugarbeet were counted again on September 7 following defoliation but prior to harvesting. Sugarbeet treated with Satellite Hydrocap (pendamethalin), Cobra (lactofen), or Ultra Blazer (acifluorfen) showed or tended to show decreased stand compared to the untreated check. The treatment of Satellite Hydrocap + Devrinol 2-XT (napropamide) had the fewest sugarbeet of all treatments.

Table 2. Sugarbeet stand and injury ratings from herbicides, Hickson, ND 2017.

Treatment	Rate/A	Timing ¹	May 26	Sep 7	Jun 5	Jun 5	Jun 5	Jun 15	Jun 22	Jun 27
			Stand	Stand	Inj ²	Necr	Chlo	Inj	Inj	Inj
			--- #/100' ---		-----%-----					
Untreated			188	204	0	0	0	0	5	10
KFD 152-02	1 pt	PRE	184	204	25	0	25	3	15	8
Devrinol 2-XT	4 pt	PRE	194	202	8	1	1	3	13	13
KFD 152-02 + Devrinol 2-XT	1 pt + 4 pt	PRE	201	194	30	0	33	8	15	13
Satellite Hydrocap	1.58 pt	PRE	189	183	25	3	0	33	38	38
Satellite Hydrocap + Devrinol 2-XT	1.58 pt + 4 pt	PRE	199	175	25	3	0	33	40	38
Cobra + COC	10 fl oz + 1.5 pt	POST	198	183	65	70	0	70	80	68
UltraBlazer + COC	1 pt + 1.5 pt	POST	198	186	70	80	0	73	68	65
LSD (0.05)			NS	21	13	7	8	9	9	12

¹Timing information displayed in Table 1.

²Inj=injury, Necr=necrosis, Chlo=chlorosis

Sugarbeet injury from herbicide treatments varied from 0 to 80% (Table 2). Devrinol 2-XT gave non-significant injury at all visual evaluations. KFD 152-02 (clomazone) applied alone or with Devrinol, showed 25% to 33% chlorosis/bleaching injury early in the season with these injury symptoms diminishing as the season progressed. Satellite Hydrocap applied alone or with Devrinol gave similar sugarbeet injury ranging from 25% to 40% and was generally consistent across evaluations. Variable injury responses were noted from plant to plant from the Satellite application where one plant could be healthy and the adjacent plant showed reduced stature. Cobra or Ultra Blazer applied with crop oil concentrate (COC) gave the greatest amount of injury from 65 to 80%. The injury was leaf necrosis. Both Cobra and Ultra Blazer were applied to small sugarbeet (cot – 4 leaf) and hot weather followed application. These factors may have helped increase injury to such high levels. Injury was generally similar between Cobra and Ultra Blazer, but, as time passed, sugarbeet treated with Ultra Blazer tended to show slightly less injury than those treated with Cobra.

Sugarbeet yield parameters varied by herbicide treatment (Table 3). Root yield was similar from the untreated check, KFD 152-02, Devrinol 2-XT, KFD + Devrinol, Satellite Hydrocap, and Satellite + Devrinol. Sugarbeet treated with Cobra or Ultra Blazer showed 6.2 and 6.8 ton/A reductions in root yield compared to the untreated check. No significant differences were detected in percent sugar, however, there was a tendency from KFD 152-02, Satellite Hydrocap, and Satellite + Devrinol to reduce sugar percentage 0.5% to 0.7% from the untreated check. Purity from these three treatments also tended to be less than the untreated check. Extractable sucrose per acre was greatest from the untreated check. Satellite Hydrocap and Satellite + Devrinol reduced sucrose by about 1,000 lbs/A compared to the check. Cobra and Ultra Blazer reduced extractable sucrose by about 2,000 lbs/A compared to the check.

Table 3. Sugarbeet yield and quality from herbicides, Hickson, ND 2017.

Treatment	Rate/A	Timing ¹	Yield	Sugar	Purity	Ext. Sucrose	Ext. Sucrose
			ton/A	%	%	lb/ton	lb/A
Untreated			31.8	16.7	90.8	288	9149
KFD 152-02	1 pt	PRE	31.3	16.0	89.6	270	8422
Devrinol 2-XT	4 pt	PRE	31.1	16.9	90.3	288	8964
KFD 152-02 + Devrinol 2-XT	1 pt + 4 pt	PRE	30.8	16.9	90.8	291	8967
Satellite Hydrocap	1.58 pt	PRE	30.0	16.2	89.5	273	8185
Satellite Hydrocap + Devrinol 2-XT	1.58 pt + 4 pt	PRE	29.5	16.0	89.8	271	7981
Cobra	10 fl oz	POST	25.2	16.6	90.5	284	7082

+ COC	+ 1.5 pt						
UltraBlazer	1 pt	POST	25.0	16.7	90.9	289	7128
+ COC	+ 1.5 pt						
LSD (0.05)			2.9	NS	NS	NS	979

¹Timing information displayed in Table 1.

CONCLUSIONS

Devrinol 2-XT appears very safe to sugarbeet when applied PRE at 4 pt/A. KFD 152-02 and Satellite Hydrocap tended to impact sugarbeet quality to a greater extent than root yield. Sugarbeet treated with Cobra or Ultra Blazer were severely injured and failed to make a full recovery in time for harvest. Improved crop safety from these products may be seen with reducing rates or delaying application to larger sugarbeet, but additional research should be conducted to test this hypothesis.