

Sugar Beet Injury from Simulated Herbicide Drift

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Introduction

- Sugar beet injury can occur from drift when postemergence herbicides are applied to crops in adjacent fields.
- Visual injury patterns are often irregular and yield loss can be difficult to quantify.
- Quantitative information on extractable sugar per acre loss would assist growers and agriculturists in assessing drift damage from common herbicides.

Objectives

- Assess visual sugar beet injury and losses in yield and quality from simulated postemergence herbicide drift.
- Compile photos documenting the appearance and severity of drift symptoms to augment yield and quality data.

Methods

- Drift was simulated using 15% of the label rate for 7 commonly used herbicides in southern Alberta.
- Treatments were broadcast on 6-leaf sugar beets using 8001VS nozzles at 94 liters/ha spray volume and 276 kpa pressure.

Treatment List

Herbicide common name	Herbicide trade name	Herbicide Group	Rate Applied (g ai/ha)
UNTREATED		-	-
bentazon ^a	Basagran	6	162
bromoxynil + MCPA	Buctril M	6 & 4	83
2,4-D + mecoprop + dicamba	Dyvel DS	4	80
2,4-D + dichlorprop	Estaprop	4	153
rimsulfuron ^b	Prism	2	2.2
metribuzin	Sencor	5	42
MCPA + mecoprop + dicamba	Target	4	89

^a Assist oil concentrate surfactant was applied with bentazon.

^b Agral 90 non-ionic surfactant was applied with rimsulfuron.

Environmental conditions during treatment application

June 16, 2003 (13:00 hrs) : 26°C, 26% RH, calm to 8 kph wind, clear skies.

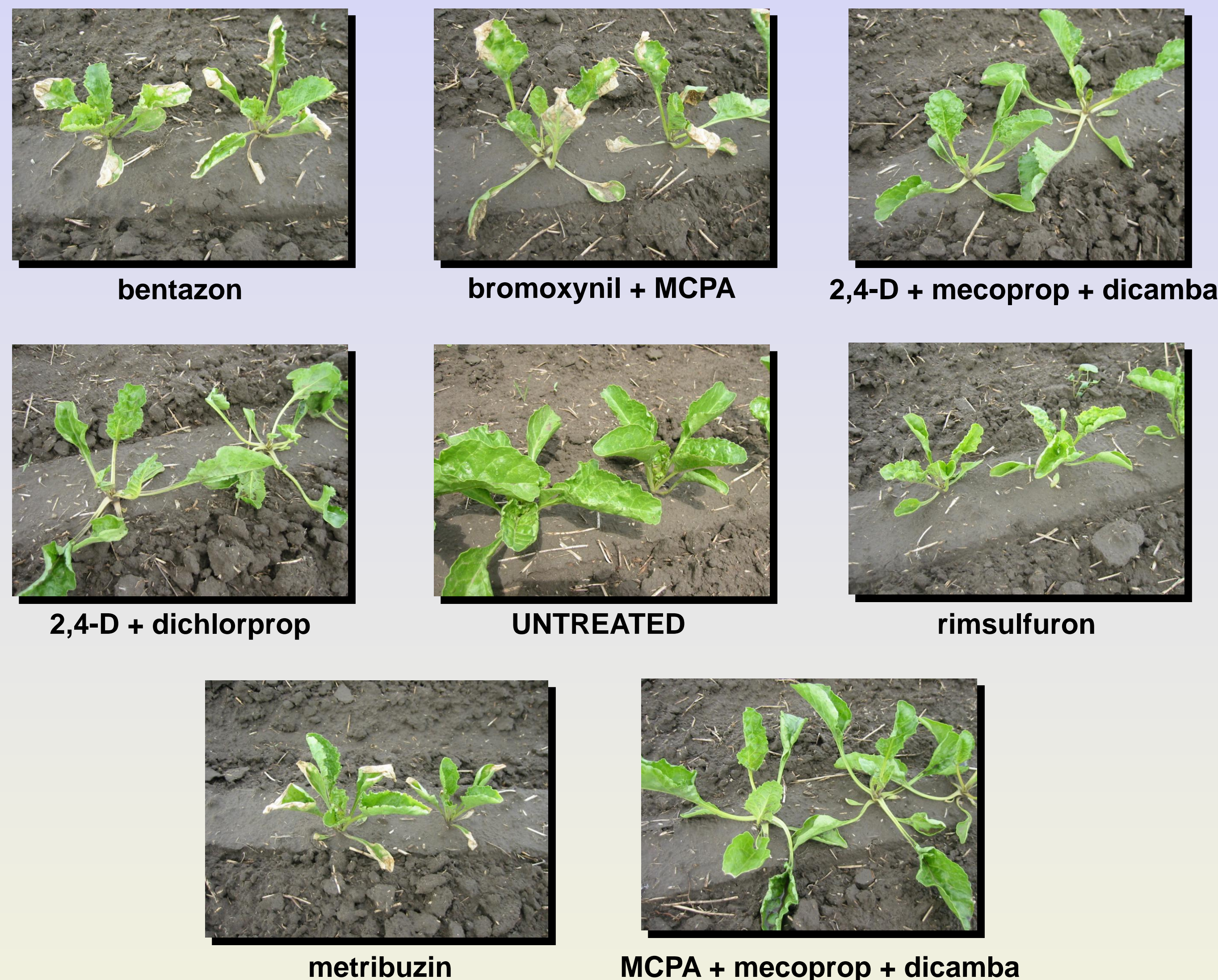
June 24, 2004 (17:30 hrs) : 23°C, 34% RH, calm to 3 kph wind, clear skies.

- Soil-applied and postemergence sugar beet herbicides were applied over all treatments in both years to represent commercial agronomic practices prior to applying simulated herbicide drift treatments.
- Data was collected over 2 study years with a considerable range in environmental conditions and production potential.

Visual Injury Symptoms

- Sugar beet leaf injury symptoms were most pronounced 5 to 7 days after simulated drift application.
- The severity of visual sugar beet leaf injury was similar in both years of study.

Leaf injury symptoms 7 days after treatment application – 2003



- Bentazon reduced sugar beet plant counts by an average of 13%. Metribuzin reduced plant counts by 14% in 2004, with no reduction in 2003.



Trumpeting

- "Celery stalking" or "trumpeting" symptoms of sugar beet leaves were rated in September on a 0-3 scale where 0 = none, 1 = slight, 2 = moderate and 3 = severe.
- All group 4 herbicides exhibited trumpeting. A slight amount of trumpeting was observed for bromoxynil + MCPA, while moderate trumpeting was observed for 2,4-D + mecoprop + dicamba, MCPA + mecoprop + dicamba and 2,4-D + dichlorprop.

- Root crown deformity was rated at harvest time after defoliation, prior to digging sugar beets. Deformity was rated as none, slightly deformed or deformed.
- All group 4 herbicides exhibited crown deformity. Bromoxynil + MCPA resulted in very little deformity, 2,4-D + mecoprop + dicamba and MCPA + mecoprop + dicamba caused slight deformity while 2,4-D + dichlorprop was rated deformed.



No deformity Deformed

Extractable Sugar and Root Yield Results

- All simulated drift herbicide treatments significantly reduced extractable sugar per acre (ESA) relative to untreated beets in both years of study.
- 2,4-D + dichlorprop significantly reduced ESA relative to other herbicide treatments in both years.
- Percent ESA reduction from herbicide treatments compared to untreated beets averaged 9% greater in 2004 than in 2003. The greatest range between years occurred for 2,4-D + dichlorprop, rimsulfuron and metribuzin with differences of 16 to 17%. Differences for the other 4 herbicides ranged from 3 to 5% between the 2 years of study.

Summary of Extractable Sugar Results

Herbicide	Extractable Sugar (kg/acre)		% reduction in ESA relative to untreated		
	2003	2004	2003	2004	2-year average
UNTREATED	5320	3484	-	-	-
2,4-D + dichlorprop	3908	1943	27	44	35
rimsulfuron	4626	2491	13	29	21
bromoxynil + MCPA	4616	2840	13	18	16
2,4-D + mecoprop + dicamba	4555	2888	14	17	16
metribuzin	4991	2685	6	23	15
bentazon	4663	2943	12	16	14
MCPA + mecoprop + dicamba	4819	3009	9	14	12
LSD (.05)	242	244			
LSD (.01)	325	327			

- Climate conditions and root yield potential varied between the 2 years of study.
 - In 2003, untreated plots = 33.0 tonnes per acre (1 tonne = 1.1 tons)
 - In 2004, untreated plots = 23.2 tonnes per acre
- 2-year average root yield reductions ranged from 3.1 to 4.9 tonnes per acre for all herbicide treatments except 2,4-D + dichlorprop which reduced root yield by an average of 8.8 tonnes per acre. (data not shown)
- Percent sucrose was significantly reduced for selected treatments in one of the two study years and there was no treatment effect on molasses loss in either year. (data not shown)

Summary

- Simulated herbicide drift treatments resulted in reductions of 12 to 35% in extractable sugar per acre relative to untreated beets.
- Photo documentation of the appearance and severity of drift symptoms was compiled onto a CD-ROM as a tool to relate visual assessments to quantitative loss.

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