

AGR1310
Glyphosate-resistant Kochia (<i>Kochia scoparia</i>) in Saskatchewan
INVESTIGATORS
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STUDY SPONSORS
Saskatchewan Pulse Growers, SaskCanola, SaskFlax
TYPE OF STUDY
AGRONOMY
OBJECTIVES
Determine the distribution and abundance of glyphosate-resistant (GR) kochia in southern and central Saskatchewan.
WHY STUDY NEEDED
Kochia is the 10th most abundant weed across the Canadian prairies, but fourth most abundant weed in the southern semiarid Grassland region. Glyphosate-resistant (GR) kochia (<i>Kochia scoparia</i>) was first identified in Kansas in 2007, and is now present in nine states. In 2011 and 2012, surveys documented the occurrence of GR Kochia in Alberta. To determine the geographical extent of this GR weed in Western Canada, surveys similar to that conducted in Alberta in 2012 were needed in the neighbouring provinces of Saskatchewan and Manitoba in regions where the weed is abundant. .
HYPOTHESIS
Although GR kochia had been confirmed in Saskatchewan based on samples submitted by growers, its distribution and abundance in the province can only be determined in a random survey.
STUDY DESIGN
A post-harvest field survey was conducted In the fall of 2013 across 342 sites (one population per site) in southern and central regions of Saskatchewan to determine the distribution and abundance of GR kochia. Populations were sampled in field border areas and other areas such as roadsides/ditches, railway rights-of-way, and oil well sites. Mature plants were collected, seed threshed, and progeny screened by spraying with a discriminating glyphosate dose of 900 g ae/ha under greenhouse conditions. Assessments were made relative to herbicide-treated and -untreated susceptible and resistance check

populations.

FINDINGS

The results of the survey and resistance screening confirmed 17 GR kochia populations in nine municipalities in west-central or central Saskatchewan. As expected based on previous survey findings, all populations were also resistant to tribenuron/thifensulfuron, an ALS-inhibiting herbicide. Together with the previously confirmed populations, GR kochia was present in a total of 14 municipalities in Saskatchewan in 2013. While the majority of GR kochia populations originated in chemical-fallow fields (10 of 17), some populations were found in cropped fields (wheat, lentil, GR canola) and non-cropped areas (oil well site, roadside ditch). During these surveys, it was common to see other kochia populations suspected to be GR in fields adjacent to the survey-targeted field, suggesting seed spread via tumbleweed movement or by farm equipment.

In one municipality near Moose Jaw, which is spatially isolated from the cluster of municipalities in west-central Saskatchewan with GR kochia, the first report of GR kochia in lentil and GR canola was confirmed. This field was cropped to lentil with glyphosate applied preseeding and preharvest, which is common practice, although immigration from adjacent land cannot be ruled out. No in-crop herbicides are available to control GR plus ALS inhibitor-resistant kochia in lentil. There are also no in-crop herbicide options to control this multiple-resistant biotype in this oilseed crop, other than growing a glufosinate-resistant canola cultivar.

The frequency of glyphosate resistance in confirmed populations varied from 12 to 96% (Table 1). Differences may be due to the time since glyphosate resistance was selected or introduced (either via seed or pollen), the amount of glyphosate selection that occurred in that population over time, or recent treatments that removed susceptible individuals from the population.

Table 1 Percentage of plants in a population resistant (R) to glyphosate or tribenuron/thifensulfuron, and the habitat (CF = chemical fallow) and municipality where populations were located in Saskatchewan. All populations were susceptible to dicamba.

Municipality	Habitat	Glyphosate-R	Tribenuron/thifensulfuron-R
161	Lentil field	71	91
228	Canola field	92	95
228	CF	31	93
228	Ditch	73	90
230	CF	51	82
230	CF	85	85
230	Ditch	86	61
231	CF	85	32
257	CF	70	92
259	Wheat field	41	95
259	CF	32	46
260	CF	96	17
260	CF	95	60
261	CF	72	95
261	CF	80	81

261	Oil well site	91	80
285	Lentil field	12	7
<p>The agronomic and economic impact of this GR weed biotype is compounded because of consistent multiple resistance to ALS-inhibiting herbicides. However, all GR kochia in Saskatchewan were susceptible to dicamba, an increasingly important auxinic herbicide used for control of this multiple-resistant biotype. Dicamba-resistant kochia has not been identified previously in Western Canada, but has been reported in the midwestern USA. Effectiveness of alternative herbicides on populations of this multiple-resistant biotype were confirmed in greenhouse studies. The ease of mobility of resistance genes from field to field demands a collective regional response in proactively or reactively managing this multiple-resistant biotype.</p>			
SIGNIFICANCE OF STUDY			
<p>The 2013 survey results together with the previously confirmed populations found GR kochia is now present in a total of 14 municipalities in Saskatchewan. Researchers expect GR kochia to rapidly spread across the prairies, similar to ALS inhibitor-resistant populations, and are watching with concern the increasing incidence of multiple-resistant weed biotypes. Although the majority of the GR kochia populations originated in chem-fallow fields, the first GR kochia were confirmed in lentil, GR canola, and wheat crops in Saskatchewan in this study.</p> <p>Other abundant species selected during preseeding or in-crop/fallow applications are also considered at risk of GR, including wild oat, green foxtail, cleavers, and wild buckwheat. Like kochia, these weeds have already been selected for resistance to herbicides with different sites of action used in-crop. Across the prairies, multiple-resistant weeds will continue to challenge growers, especially when one of those sites of action is glyphosate.</p>			
PUBLICATIONS, PRESENTATIONS, EDUCATIONAL MATERIALS PRODUCED			
<p>Beckie, H. J., Gulden, R. H., Shaikh, N., Johnson, E. N., Willenborg, C. J., Brenzil, C. A., Shirriff, S. W., Lozinski, C. and Ford, G. 201f. <i>Glyphosate-resistant kochia (Kochia scoparia L. Schrad.) in Saskatchewan and Manitoba</i>. Can. J. Plant Sci. 95: 345-349.</p>			
VALUE TO PRODUCERS			
<p>Surveillance of GR kochia across Western Canada will continue in the future, through periodic surveys and testing suspected samples submitted by growers each year.</p>			