

2013F008R – Biology and Management of Glyphosate-Resistant Kochia



**Alberta
Barley**



Funding Partners: Alberta Barley Commission, Alberta Canola Commission, Alberta Wheat Commission and Western Grains Research Foundation

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Background:

Kochia was identified as the first glyphosate-resistant weed in western Canada in 2011 and is now present in 7 counties in Alberta, 14 municipalities in Saskatchewan, and 2 municipalities in Manitoba. A three-year research study was conducted to gain new knowledge on kochia growth and development and to identify the most effective herbicides for its control.

Objectives:

Determine the timing of seed maturity, seed production potential, and seed dormancy characteristics of glyphosate-resistant kochia. Identify alternative herbicides to control glyphosate-resistant kochia in chemfallow, wheat, field pea, and canola.

What we did:

A kochia biology study was conducted at the AAFC Lethbridge Research Centre and University of Alberta Research Farm. Kochia was planted every two weeks from April until mid-August and harvested at maturity or when growth was terminated due to a killing fall frost. Data collection included emergence date, initiation of flowering, maturity date, aboveground biomass production, seed production, initial seed dormancy, and seed viability.

Herbicide experiments were conducted in fallow, spring wheat, field pea, and canola to identify the most effective herbicides to control glyphosate-resistant kochia. The four experiments were conducted at Lethbridge in 2013-2015, Coalgate in 2013-2014, and Edmonton in 2015. Data collection included visual crop injury ratings, visual kochia control ratings, and crop yield at maturity.

Key results:

Kochia is a prolific seed producer. In the absence of crop competition and at densities of 75-150 plants m⁻², kochia emerging in April and May produced up to 2.4 million seeds m⁻² in Edmonton and 5.2 million seeds m⁻² in Lethbridge. Kochia emerging in mid-July in Edmonton and mid-August in Lethbridge were still capable of producing viable seed before a killing fall frost. Seed was found to possess short-term dormancy (a few weeks) after maturity but subsequently germinated at high levels. Findings indicate that kochia will likely germinate or die within 1-2 years so growers can quickly reduce the soil seedbank if they also prevent new introductions.

The herbicide experiments determined that the glyphosate resistance trait did not confer crossresistance to any other class of herbicides. Farmers can be assured that if the herbicide they are currently using is effective on kochia then it should remain so on glyphosate-resistant kochia.

Results indicated that Banvel, Distinct, Heat, Optica Trio, and Aim are the best tank-mix partners with glyphosate to control kochia in chemfallow. In wheat, Infinity, Dyvel Dsp, Optica Trio, and any product containing fluroxypyr provided a high level of kochia control. In field peas, Authority Charge applied preplant provided superior kochia control and Viper ADV provided reasonable in-crop control. Liberty applied once or twice in Liberty Link canola gave consistent kochia control. Several unregistered herbicides were evaluated and a few showed sufficiently good potential for the respective crop protection companies to move forward towards registration.

Take home message for the industry:

Weed resistance continues to be an ever increasing problem for Canadian prairie farmers. The entire agricultural industry needs to work together on research and extension efforts to minimize further development and spread of herbicide-resistant weeds.

Value to the industry:

Kochia is a competitive weed species causing large reductions in crop yield. Additionally, due to it often being green at harvest time, it increases the need to use a desiccant, slows harvest operations, and increases grain moisture content. Thus, kochia is a weed of high economic importance and the presence of glyphosate-resistant biotypes only makes it more problematic. Results obtained in this study will help farmers manage kochia in a timely and cost-effective manner.

Value to the team:

This project is the basis for the thesis of a M.Sc. student at the University of Alberta. Funds facilitated the hiring of several summer students to conduct the research experiments and these students gained valuable experience in conducting agricultural research studies.