

HERBICIDE RESISTANCE IN ALBERTA: A GROWING THREAT

With limited growing space and an eye on achieving the maximum possible yield, we are all aware how important it is to ensure that our crops are not competing with unwanted weeds. On larger fields in which hand-weeding is impractical, the development of a wide range of herbicides has allowed us to limit the growth and propagation of these weeds for increased productivity and profitability.

Just as our crops are able to tolerate many of these herbicides, weeds can naturally develop resistant traits over successive generations due to natural selection. This builds tolerance to the selected mode of action of the herbicide, and the weed eventually becomes resistant to their effect. The result is increased weed development and lower crop yield, as well as increased tillage, fuel and labour causing higher farming costs. Worse still, once resistance has formed it significantly reduces or eliminates that herbicide as a weed control option.

WE NEED TO TAKE ACTION NOW TO PREVENT FURTHER RESISTANCE!

WEED RESISTANCE IN CANADA: UPDATE

Cases of herbicide resistance are becoming increasingly common, with over 58 weed biotypes reported in Canada, 22 of these biotypes are present in Alberta. Group 9 (EPSP Synthase Inhibitors) is of particular interest – since *Kochia* biotypes have been confirmed to exhibit glyphosate resistance – and this may pose a serious risk for the future in the prairies.

HERBICIDE GROUPS MOST AT RISK

GROUP 1 ACCASE INHIBITORS	GROUP 2 ALS INHIBITORS	GROUP 9 EPSP SYNTHASE INHIBITORS
EXTENT OF RESISTANCE	EXTENT OF RESISTANCE	EXTENT OF RESISTANCE
Globally: 42 Species	Globally: 129 Species	Globally: 24 Species
Canada: 4 Species	Canada: 25 Species	Canada: 5 Species
RESISTANCE SPECIES IN ALBERTA	RESISTANCE SPECIES IN ALBERTA	RESISTANCE SPECIES IN ALBERTA
Green foxtail Persian darnel Wild oat	Ball mustard Chickweed Cleavers Cow cockle Green foxtail Hemp-nettle Kochia Narrow-leaved- hawk's beard Russian thistle Shepherd's purse Spiny sow thistle Stinkweed Wild buckwheat Wild mustard Wild oat	Kochia

HIGH RISK RESISTANT WEEDS IN ALBERTA

WILD OAT	CLEAVERS	KOCHIA
First demonstrated resistance to Group 8 herbicides in 1989. Wild oat has since evolved to show extensive resistance to Group 1 and growing resistance to Group 2 herbicides.	First developed resistance to Group 4 herbicides in 1996. Cleavers have evolved multiple resistance to both Group 2 and Group 4 herbicides.	Group 2 resistant kochia was first confirmed in 1988.
HERBICIDE RESISTANCES	HERBICIDE RESISTANCES	HERBICIDE RESISTANCES
Group 1 (ACCase Inhibitors) Group 2 (ALS Inhibitors) Group 8 (Fatty Acid & Lipid Biosynthesis Inhibitors)	Group 2 (ALS Inhibitors) Group 4 (Synthetic Auxins)	Group 2 (ALS Inhibitors) Group 9 (EPSPS Inhibitors)

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AT RISK RESISTANT WEEDS IN ALBERTA

GREEN FOXTAIL

A monocot weed that first evolved resistance to Group 3 in Alberta in 1989.

HERBICIDE RESISTANCES

Group 1 (ACCase Inhibitors)
Group 3 (Cell Division Inhibitors)

HEMP-NETTLE

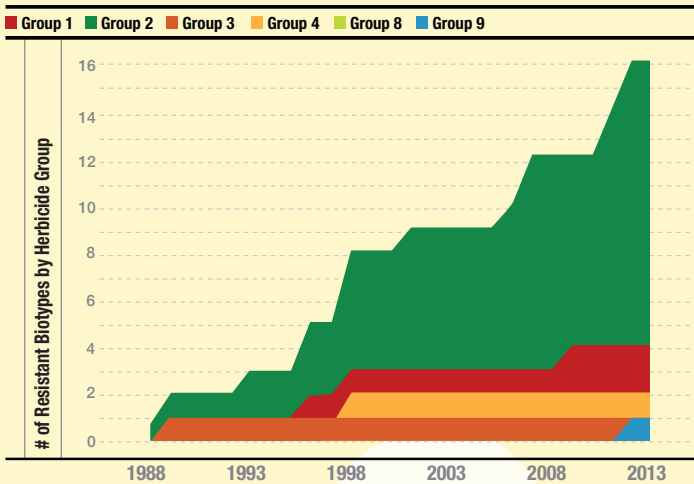
First demonstrated resistance to Group 4 herbicides in 1998 and evolved resistance to Group 2 herbicides in 2006.

HERBICIDE RESISTANCES

Group 2 (ACCase Inhibitors)
Group 4 (Cell Division Inhibitors)

In the fight against herbicide resistance, it's important to know how the problem developed to prevent it from developing further.

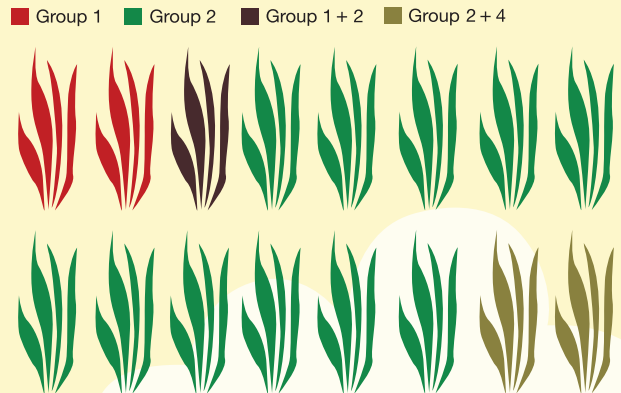
HERBICIDE RESISTANCE IN ALBERTA HAS BEEN STEADILY ON THE RISE



Source: Heap, I. WeedScience.org, 2014

Today, herbicide groups that are encountering resistant weeds are predominantly Group 2 (ALS Inhibitors), with Group 1 (ACCase Inhibitors) and Group 4 (Synthetic Auxins) on the rise. Though there have been reported cases of resistance to Group 3 (Cell Division Inhibitors), Group 8 (Fatty Acid & Lipid Biosynthesis Inhibitors) and Group 9 (EPSP Synthase Inhibitors), they are limited.

BREAKDOWN OF THE 16 RESISTANT WEEDS FOUND IN ALBERTA



Source: Heap, I. WeedScience.org, 2014

HOW CAN WE TAKE ACTION?

It's of utmost importance that herbicide resistance is stopped before it becomes unmanageable. Through increased crop rotation, the use of diverse and multiple modes of action, and early identification of resistant weeds, we can limit the development and growth of new resistant biotypes. This will ensure that treatment options in the future are still available.

Unique modes of action that have been widely accepted to effectively manage herbicide resistance include:

GROUP 27 HPPD INHIBITORS	GROUP 10 GLUTAMINE SYNTHETASE INHIBITORS	GROUP 6 PS II SITE B INHIBITORS
EXTENT OF RESISTANCE	EXTENT OF RESISTANCE	EXTENT OF RESISTANCE
Globally: 2 Species	Globally: 2 Species	Globally: 4 Species
Canada: 0 Species	Canada: 0 Species	Canada: 2 Species
PRODUCT LINES INCLUDED	PRODUCTS INCLUDED	PRODUCTS INCLUDED
Axial iPak* Infinity* Tundra* Velocity m3*	Liberty 150 SN	Achieve Liquid-Gold* Axial iPak* Buctril M* Infinity* Pardner Thumper* Tundra* Velocity m3*
<small>*Contains at least one non-Group 27 chemistry</small>		<small>*Contains at least one non-Group 6 chemistry</small>

