**TECHNICAL BULLETIN**

**Glyphosate Resistant Kochia – Information and Management with Dow AgroSciences Herbicides**

**Overview:**
In January 2012, a glyphosate resistant kochia population was confirmed in southern Alberta by Agriculture and Agri-Food Canada (AAFC). The resistant weeds were found in three fields of chem. fallow localized to an area south of Lethbridge. While there have been 21 confirmed cases of glyphosate resistant weeds worldwide, this is the first confirmed case of a glyphosate resistant weed in western Canada, and the third glyphosate resistant weed confirmed in Canada. Glyphosate resistant populations of kochia have previously been identified and confirmed in Kansas, Nebraska and Colorado, with additional testing currently being conducted on populations of kochia in Montana, North Dakota and South Dakota.

In August of 2011, samples were collected from chemfallow fields that showed reduced kochia control despite multiple glyphosate applications. Seeds from surviving kochia plants were grown out and treated with an elevated rate of glyphosate. Approximately 50% of the plants survived glyphosate applications, and demonstrated that the population had a level of glyphosate resistance. AAFC and industry participants, including Dow AgroSciences, will be conducting further research into the best options and recommendations for integrated control of kochia, including glyphosate resistant bio-types. In other resistant weed populations (resistant to glyphosate or other groups), across multiple geographies, research has identified viable control options making use of the alternate and multiple modes of action to effectively manage resistant weed populations in cropping systems.

**Kochia Biology:**
A single kochia plant can produce ~14,000 seeds, which are typically spread by wind, water, hay and equipment. Kochia plants can self pollinate and outcross. Kochia seeds tend to germinate predominantly within the first year after seed production (~90%). Seed longevity is poor (2-3 years) and survival is further reduced if seeds germinate below an inch of soil depth. Because of these factors, control of the overall population of kochia is important and it is possible to contain and slow the spread of resistant bio-types into new fields.

**Recommendations:**
Best management practices include:
- The use of good agronomic practices such as crop rotations, different herbicide mode of action rotation, and use of herbicides for pre-seed and in-crop control that utilize multiple modes of action to optimize the level of control, proper use rates of herbicides, and other practices such as tillage have been shown to reduce the weed seed bank, and lower the risk of herbicide resistance development.
- **PrePass**™ **XC Herbicide with SoilActive™ technology utilizes multiple modes of action to deliver a high level of control in pre-seed, fallow and fall pre-seed application. Where populations of kochia are a concern, PrePass is registered as providing control. If the populations are suspected to be resistant to both group 2 and group 9 modes of action, utilize a tank mix of PrePass plus 2,4-D (group 4) for chem. fallow and fall pre-seed applications in cereals.
- Tank mix effective, registered, pre-seed herbicides with **Vantage™ Plus MAX II** and **Maverick™ III** applications before registered crops in the rotation.
- Use in-crop cereal herbicide solutions that offer the highest level of control available – **OctTain™**, **Attain™ XC, Prestige™ XC, Stellar™** or **Tandem™** provide a consistently high level of control and utilize an alternate mode of action (group 4).
- Use **Edge™** in pulse crops and canola to provide a foundation treatment for weed control, utilizing the group 3 mode of action.
- Be sure to include other crops in rotation with Roundup Ready® crops to allow greater opportunity for the inclusion of other effective modes of action.
- Control the weed populations at field margins and in non-crop areas to limit the spread of resistant weeds from non-cropland areas into cropping areas.
- Be thorough in cleaning tillage, planting, spraying, mowing, and harvest equipment when moving from one field to the next. Maintain good farm records in terms of herbicide use and crop rotations. Review any observations that you have made in the field during field scouting, swathing or harvest when planning your crop plan in succeeding years.