



**Colorado State University Extension**  
Golden Plains Area Extension

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**For Immediate Release**

November 17, 2014

**How Weed Resistance Develops**

(Burlington, Colo.)

Weed control has always been a critical challenge for crop producers because weeds compete with crops for light, water and nutrients. Herbicides used in modern agricultural systems enable farmers to manage most weeds across vast acreages, efficiently and up until current times, reliably.

However, weed adaptations can occur in response to herbicide use and other management decisions. Changes in weed populations begin when a small number of plants within a species, called a “biotype”, have a distinct genetic makeup that allows them to tolerate a particular herbicide application. Multiple weed biotypes can and do exist in a single field.

As a grower continues to use a particular herbicide without any other herbicide modes of action, or doesn’t use any other cultural practices, the resistant biotype continues to survive and produce seed. Subsequent populations of the resistant biotype will continue to increase until they are the dominant weed in the field.

Weed scientists cannot predict exactly which weed species will have biotypes resistant to certain herbicides. Prediction can be difficult due to complex biology and environmental interactions.

Scientists have found that there are particular weed characteristics that can facilitate development of herbicide resistance. These include:

- large amount of seeds produced per plant
- high levels of germination of those seeds
- several weed flushes per season
- high frequency of resistant genes within a weed population

Both company and university weed scientists have also identified specific common factors that are often present in areas where glyphosate resistance has developed. These factors are:

- limited or no crop rotation
- limited or no tillage practices
- a high dependency on glyphosate alone or a limited use of other herbicides
- reduced rates of glyphosate

Confusion about what is or is not weed resistance is common. Herbicides are not known to directly cause genetic mutations in weeds that lead to resistance. However, herbicide resistant biotypes may already exist in native weed populations. When a herbicide is applied over and over again, some of these biotypes survive, mature and produce seed. If a farmer relies on only one herbicide with the same mechanism of action, again, the percentage of the resistant biotypes in the population is likely to increase. This is referred to as herbicide selection pressure.

Strategies that address herbicide resistance issues include crop rotation and employing herbicides with multiple modes of action. Crop rotation includes exiting the corn-on-corn rotation. Wheat, sunflower, or soybeans are acceptable options for cropping choices. Keep in mind that with crop rotations, producers must also employ

alternative herbicides to achieve acceptable resistant weed control. Recent plant testing in the area has identified Kochia as showing resistance to glyphosate applications in some fields.

Therefore, if glyphosate resistance Kochia is the issue, also employ either pre-emergent or post-emergent herbicides which are not glyphosate type products that will control Kochia. Depending on the crop, there are numerous herbicides available that will continue to control this weed. However, the first step with Best Management Practices is to employ them.

As a result of employing Best Management Practices for resistant weeds a number of things happen. Fields are cleaner, the herbicide usefulness will be extended and producers will be more profitable.

**Source:** © 2011 Monsanto Company

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