

## Herbicide Rotation

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### What is Herbicide Rotation?

The practice of using a systematic, rotational sequence of herbicides in the same field helps prevent or manage herbicide-resistant weeds. In such a rotational program, both soil-applied and foliar-applied herbicides are used in sequence to target both annual and perennial weeds. The choice of herbicide depends on crop tolerance, the type and intensity of weed infestation, soil conditions, and climatic factors. The ideal rotational program aims to achieve the highest cumulative cost-benefit ratio, minimize residual issues, and limit the development of herbicide-tolerant weeds.

### Why Rotate Herbicides?

Farmers generally prefer to stick with what works for them, as farming is a business where a single untimely decision can lead to significant financial losses. It's understandable that once a farmer finds a herbicide that is effective, they may want to use it repeatedly on the same field each year.

Unfortunately, that is exactly the practice that causes herbicide resistant weeds. Some of the most notorious example of herbicide resistance around the world is populations of little seed canary grass (*Phalaris minor*) in India (resistant to herbicide Isoproturon) and wild oat (*Avena fatua*) in Canada (resistant to Thiocarbamates group of herbicides) and several examples are present in the world. Herbicide rotation is the best way to ensure weeds do not develop herbicide resistance.

### How do Weeds Become Resistant?

**Currently, five mechanisms of herbicide resistance in weeds have been identified:**

1. Altered target site: A mutation occurs at the herbicide's site of action, leading to partial or complete loss of inhibition.
2. Metabolic deactivation: The herbicide's active ingredient is converted into non-toxic metabolites.
3. Reduced absorption and/or translocation: Movement of lethal herbicide levels to the site of action is restricted.

4. Sequestration/compartimentation: The herbicide is immobilized away from its site of action, stored in areas like vacuoles or cell walls.

5. Gene amplification/overexpression: The target site is amplified or overexpressed, diluting the herbicide's effectiveness relative to the target site.

### **Basics of Effective Herbicide Rotation**

- Maintain precise records of both crop rotation and herbicide application. While it may be easy to recall what you did last year, keeping detailed documentation is essential for effective management.
- Avoid merely switching to another herbicide with the same mode of action. To effectively implement herbicide rotation, you should rotate between different herbicide groups rather than just changing the chemicals.
- Use clean seed, preferably certified. This will reduce the amount of outside weed contamination entering your fields.
- If you are depending on the herbicide alone to control your weeds, follows label instructions exactly. Reducing herbicide rates should only be used when other agronomic practices (e.g. higher seeding rates) are being employed that will provide the same level of weed control as the full rate of herbicide. Lowering herbicide rates just to save money will eventually result in resistant weeds and end up costing you more.
- Use mixtures or split applications of herbicides with different modes of action.
- Rotate crop types (cereals and broadleaves) and life cycles (annual, winter annual and perennial) to prevent selection for a specific type or species of weed.
- Scout your fields often so that you know what weeds are present and their stage before you spray.
- Spray effectively. Spraying at the proper rate, stage and weather conditions will eradicate the weeds as fast as possible and save you money on lost yield and over application.