Herbicide Group Classification

Limiting the resistance of weeds to herbicides is a big concern for most farmers. Herbicide resistance leads to reduced yields, increased control costs and stress. Traditionally herbicide resistance develops when a producer uses the same herbicide or herbicides with the same mode of action repeatedly over some time. Depending on the cropping system, weeds present and the herbicides used, resistance can develop quickly.

In corn production, the presence of triazine resistant lamb's quarters and pigweed is well documented. They originated with the continuous use of atrazine based products over several years. As a result, similar herbicides, with the same mode of action as atrazine can be ineffective against some of these populations. In recent years, fields in the mid western United States, that have been in continuous Roundup Ready corn and soybean rotations, are showing several glyphosate resistant weed species.

There are several ways to minimize herbicide resistance development: Using robust crop rotations, integrating physical weed control strategies (tillage) and rotating herbicides with different modes of action.

Herbicide rotation is not as easy as it sounds. Simply using a different herbicide may not give the desired effect of mode of action rotation. Using two different herbicides, with the same mode of action, could illicit the same resistance response in a particular weed. For example, switching from atrazine to simazine may still encourage triazine resistance, as they are both triazines and have similar modes of action.

Mode of action: The mode of action indicates the way that a pesticide works to stop the normal function of the pest, and eventually suppress or even kill the pest. Mode of action includes how the herbicide gets into the plant and the "mechanism of action" or how it actually affects the weed physiology.

A system of herbicide groupings has been developed that helps classify herbicides into different groups based on how they work. Some herbicides have two or more active ingredients that may cause it to fall into more than one herbicide group.

What follows is a breakdown of some common herbicide groups with representative product names and a description of the mode of action. The grouping numbers are found on each pesticide label and can assist in a herbicide rotation program. **It is important to note that not all herbicides in each group have the same weed control spectrum**. Some products have very subtle differences from each other while others in the same group may have drastic control differences. For example hexazinone has a much broader weed control spectrum (grasses, broadleaves and woody perennials) than terbacil (some annual broadleaves and grasses)

Some Common Herbicide Groups:

Group 1 – ACCase inhibitors – (Fops and Dims) – These products are typically grass herbicides that block the formation of lipids in roots and growing points. They typically work on actively growing grasses and are applied post emergently.

- Venture L (fluazifop-p-butyl), Poast Ultra (sethoxydim), Select (clethodim), Hoegrass (diclofop-methyl)

Group 2 – ALS/AHAS inhibitors – These products block the normal function of this enzyme which is critical in amino acid (proteins) synthesis. Without these proteins the plants die. These products should be applied post emergently and typically don't have soil activity.

- Pursuit (imazethapyr), Spartan (tribenuron-methyl), Accent (nicosulfuron), Ultim (Nicosulfuron/rimsulfuron)

Group 3 – Microtubule assembly inhibitors – These chemicals inhibit cell division in roots. These products need to be applied to the soil before weed germination. Often they need to be incorporated into the soil with tillage or rain/irrigation.

- Treflan (trifluralin), Edge (ethalfuralin)

Group 4 – Synthetic auxins – These chemicals disrupt plant cell growth in newly forming stems and leaves (malformed growth). These products need to be applied to actively growing plants and have very little soil activity.

- 2,4-D, Banvel II (dicamba), Lontrel (clopyralid), Milestone (aminopyralid), MCPA, MCPB

Group 5 – Photosynthetic inhibitors at Photosystem II Site A – These chemicals disrupt photosynthesis so carbohydrates can't be produced and the plant dies. These chemicals have activity when applied to leaf tissue but they are typically used as per-emergent applications, as they are taken up by the roots of newly emerging weeds.

- Atrex (atrazine), Velpar (hexazinone), Sinbar (terbacil), Princep Nine-T (simazine)

Group 7 - Photosynthetic inhibitors at Photosystem II Site B – Work similarly to group 5 but at a different site in the photosynthesis pathway. These products have both soil and leaf activity and can be used either way depending on the crop and the target weed.

- Lorox (linuron), Karmex (diuron)

Group 10 – Inhibitors of EPSP synthesis – These chemicals inhibit amino acid synthesis through the shikimate pathway. This group of chemicals have no activity in the soil. They need to be applied to green tissue and are translocated to the roots. They are very broad spectrum.

- Roundup (glyphosate), various brand names

Group 15 – Inhibitors of cell growth and division. This group does have leaf tissue activity, but are typically used as a soil applied treatment, where roots of emerging weeds take up the chemical.

- Kerb (propyzamide), Dual II Magnum (metolachlor)

Group 22 – Cell membrane disruptors – These chemicals disrupt the internal cell membrane. These chemicals have little to no soil activity and need to be applied to weed. This group is non selective and will damage most plant species; however they don't translocate so control of perennial species is limited.

- Gramoxone (paraquat), Reglone (diquat)

For a more complete list of Herbicide Groupings you can refer to Publication 75 from the Ontario Ministry of Agriculture Food and Rural Affaires.

http://www.omafra.gov.on.ca/english/crops/pub75/pub75toc.htm

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