

## Where Do Herbicide Resistant Weeds Come From, Part 2?

### AGRI-VIEWS

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What many of us knew, and others quickly discovered, was that there were several species of plants that were never well controlled by glyphosate, or were not readily controlled at the time when we were commonly applying glyphosate. With the removal of tillage, we suddenly started to see tree seedlings becoming a problem along field boundaries with timber stands. Weeds like marehail were never well controlled by glyphosate but hadn't become a problem because tillage or other pre-plant burn down herbicides were effective. We suddenly were creating environments where these species could thrive.

With any species of plants, there are often billions if not trillions of individual plants. Just like any natural population of any species, there is a very wide assortment of genes. With older style dose dependent herbicides, we had a very broad spectrum control. When that was coupled with tillage and additional herbicides at different times of year, there was no specific selection for any certain set of genes. It's hard for a plant to develop resistance to a disk or a plow!

Now let's start using more and more of one particular type of herbicide that may be very effective at very low rates. It either works or it doesn't. Let's also assume that out of the trillions of weeds of this one species, there are 7 plants that carry a gene that causes these plants to NOT be controlled by this herbicide. We very quickly start to kill out all the plants that are controlled and all that are left are the very few that are not controlled. In very short order we have caused a genetic shift in the weed population. All, or most, of the seeds from those few remaining plants are carrying the gene that causes the plant to be resistant to that herbicide. Most of the pollen that is floating around to pollinate other plants is carrying the gene that imparts herbicide resistance. Each time that particular herbicide is used it further weeds out the fewer and fewer remaining weeds that carried the herbicide susceptible gene.

There are many ways to keep this from happening. We use different herbicides with different modes of actions. Different chemicals work biochemically within plants in different ways. If we use different modes of action, we aren't constantly attacking the same susceptible point of the plant species. We keep a mix of genetic variation in the plant species population. From a genetics point of view, many of these herbicide resistant traits are recessive genes meaning that a plant has to have two of the same gene (one from each parent) to be resistant. The better the mix of genes in the plant, the better our chances of a herbicide working.

In the case of glyphosate resistant weeds we brought this on ourselves. We became overly dependent on Roundup Ready technology and the use of glyphosate ONLY for weed control. The important thing to remember is that glyphosate is still very effective in controlling a lot of weed species. What we should have done, and what we will now be doing, is to go back to utilizing a multifaceted weed control plan. We will use a mix of burndown herbicides or maybe occasionally do some minimal tillage to control weeds before planting. We'll go back to using herbicides that have residual action in the soil to control seedlings, stopping the weeds before they can get established. Then if we need to control growing weeds, again we'll use a mix of herbicides.

We knew this day would come and it will probably happen again. But through good stewardship and integrated weed control plans, we can delay how soon the next problem emerges.