

New Weed Resistance Hits Nebraska - Waterhemp to HPPD-inhibiting Herbicides

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A population of common waterhemp has developed resistance to postemergence applications of HPPD-inhibiting herbicides (e.g., Callisto, Laudis, Impact, and Armezon). This resistance occurred in a seed corn production system where these HPPD-inhibiting herbicides were repeatedly used over the last five years.

The good news is that the resistance was identified at only one location. The bad news is that this can easily happen in other fields, as HPPD-inhibiting herbicides are commonly used in Nebraska and the Midwest.

Resistance is a phenomenon that usually results from the repeated use of the same chemical. This can occur with herbicides and many other pesticides. In addition to the weeds already found in Nebraska to be resistant to glyphosate — marehail, giant ragweed, kochia — a new type of weed resistance has developed in the state.

Repeated use of the same herbicide can easily result in the evolution of weed resistance, regardless of the type of herbicide used. We have forgotten the time of atrazine and ALS resistance (15-30 years ago) and with the recent developments of glyphosate resistance, Mother Nature is reminding us that weeds can develop resistance to any type of chemical we develop.

Nebraska Findings:

Waterhemp seed was collected in fall 2010, and greenhouse bioassays were conducted during that winter and spring. An initial study was also conducted during the 2011 season to determine dose response for mesotrione at the field level.

Comparisons of dose response curves clearly showed mesotrione resistance level at a minimum of four times the normal rate (shown as 4X). For example, 90% control of a susceptible population was achieved with 3 oz/ac of Callisto applied POST (1X rate), while the resistant populations needed a minimum of 12 oz/acre (4X rate), and in some cases as much as 18 oz (6X).

HPPD-inhibiting herbicides can still be useful components of the crop production system, but obviously their use pattern should be carefully managed. HPPD-inhibiting herbicides are pigment inhibitors (carotenoid biosynthesis inhibitors). Carotenoid is a red

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pigment that protects the green pigment (chlorophyll) from harmful UV lights. By stopping the production of carotenoids, the green pigment (chlorophyll) is destroyed by UV light, the plant tissue turns white, and eventually dies.

That's why HPPD herbicides are commonly called "bleachers." Besides Callisto (mesotrione), this mode of action includes: Laudis (tembotrione), Balance Flexx (isoxaflutole), Huskie (pyrasulfutole), Impact (topramezone) and Armezon (topramezone) and some premixes: Capreno (thiencarbazone-ethyl+tembotrione) and Corvus (thiencarbazone-ethyl + isoxaflutole).

Managing to Avoid Herbicide Resistance:

It is easy to fall into a trap of overusing the same herbicide, or the group of herbicides with the same mode of action, when those products provide good weed control. However, the fact that some herbicides provide good weed control in the first few years of use does not mean they will provide the same level of weed control in future years. Repeated use of the same herbicide can put tremendous pressure on weed species to either develop resistance, or to shift from those easily controlled by the label rate to those more tolerant to it.

One example of this is the increase in glyphosate resistance. Almost 20 weed species worldwide — 11 in the U.S. — have developed resistance, due to repeated use of glyphosate. Therefore, proper use of any herbicide as a component of an integrated weed management program is the key for preserving the long-term benefits of such technology while avoiding many of the concerns about its use, or misuse.

Simply put, rotating herbicides with different modes of actions will make all herbicides last much longer for future generations.

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