

Herbicide Resistance: A Challenge To Agriculture

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Weeds that resist an application of a once effective herbicide are not a new problem for northeastern farmers. We have managed or at least attempted to control triazine-resistant (TR) weeds in a number of crops for the last 15 years. Although triazine resistance continues to spread into new areas, most producers have resigned themselves to dealing with the problem by simply

switching to or including non-triazine herbicides in their control programs. Producers with triazine resistance have fewer effective herbicide options, require more tank-mixing, and make more trips over the field, all resulting in increased costs, potential poor control, and possibly greater yield or quality loss. Wouldn't a program targeted at prevention be more cost effective in the long run? It may very well be too late for many producers and triazine-resistance. However, there is still time to take action on other herbicides that are just beginning to show resistance problems. Some newer herbicide families of greatest concern to producers in the Northeast include the sulfonylureas, imidazolinones, and sulfonamide herbicides, all collectively known as the ALS inhibitors because of the site or enzyme for which they attack in susceptible plants. The ALS inhibitor class includes a number of products commonly used in corn, soybeans, small grains, and forage or hay crops (Table 1).

Table 1. Plant Rotation Strategy - Think Mode of action. This table classifies herbicides based on mode of action and commodity use. In planning a weed management program, identify opportunities for rotating between the different herbicide classes. In particular, concentrate on rotation of the ALS and the PSI classes.

Herbicide class	Corn	Soybeans	Wheat/barley	Alfalfa
ALS (sulfonylureas, imidazolinones, sulfonamides)	Accent, Beacon, Broadstrike, Exceed, Permit, Pursuit (IMH corn)	Broadstrike, Canopy, Classic, Pinnacle, Pursuit, Scepter	Harmony	Pursuit
ACCase (lipid synthesis inhibitors)	None	Assure, Fusilade, Fusion, Poast, Select	Hoelon	Poast
EPSP (glyphosate)	Roundup	Roundup	Roundup	Roundup
PSI (triazines, phenyl ureas, uracils, misc.)	Atrazine, Blades, Buctril, Basagran, Loro, Princep	Basagran, Loro, Lexone, Loro	Buctril	Buctril, Lexone, Sencor, Simbar, Velpar
Root (dinitroanilines)	Prowl	Prowl, Sonalan, Treflan	None	Balan
Shoot (chloroacetamides, thiocarbamates)	Dual, Frontier, Harness, Micro, Tech, Surpass, Eradicane, Sutan	Dual, Frontier, Micro-Tech	None	Eptam
Cell membrane (diphenyl ethers, paraquat)	Gramoxone, Resource	Gramoxone, Blazer, Cobra, Resource, Tackle	Gramoxone	Gramoxone
PGRs (phenoxys, benzoics, pyridines)	Banvel, Clarity, 2,4-D, Stinger	None	Banvel, 2,4-D, MCPA, Stinger	Butrac
Pigment (clomazone)	None	Command	None	None



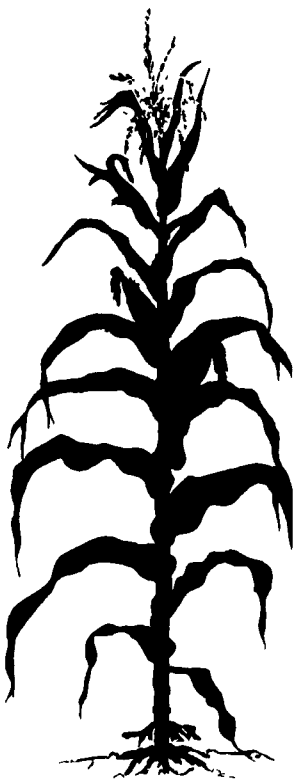
Resistance to this class of chemistry is currently not a major problem in the midwest or northeastern U.S. However, in dryland wheat-producing areas of the western U.S. and Canada, ALS resistance is a problem. There are several reasons why this class of herbicides pose such a threat for resistance development. First, these herbicides all attack a single site within susceptible plants (ALS). Resistant weeds have an altered form of ALS which is no longer inhibited by the herbicides. Scientists estimate that perhaps one in a million weeds that are traditionally susceptible to this class of herbicides may have an altered ALS. Herbicide families that act at multiple sites within plants are less likely to select for resistance. (The photosynthesis inhibitors including the triazine herbicides also act at a single site.) Secondly, the ALS herbicides are highly effective on a number of weed species. This means that few susceptible weeds escape treatment, so the selection pressure for resistant types is much greater. Weed species are not all equally susceptible to selection for resistance. In the Northeast, pigweed and cocklebur are very sensitive to several ALS herbicides and could become a problem more quickly (pigweed and lambsquarters were highly sensitive to the triazines). Third, some of the ALS inhibitor herbicides provide season-long control and in fact require plant-back restrictions because of their residual properties. Longer residual herbicides will continue to control highly susceptible weeds late in the growing season and potentially select for the resistant types. Finally, the effectiveness and sheer number of ALS inhibitor herbicides in the marketplace make it easy for producers to use one in virtually every crop, regardless of rotation. In addition, within the next five years, more than a half dozen new ALS inhibitor herbicides may be introduced in the corn, soybean, and small grain markets. On the positive side, resistance to one ALS inhibitor herbicide does not automatically guarantee cross resistance to

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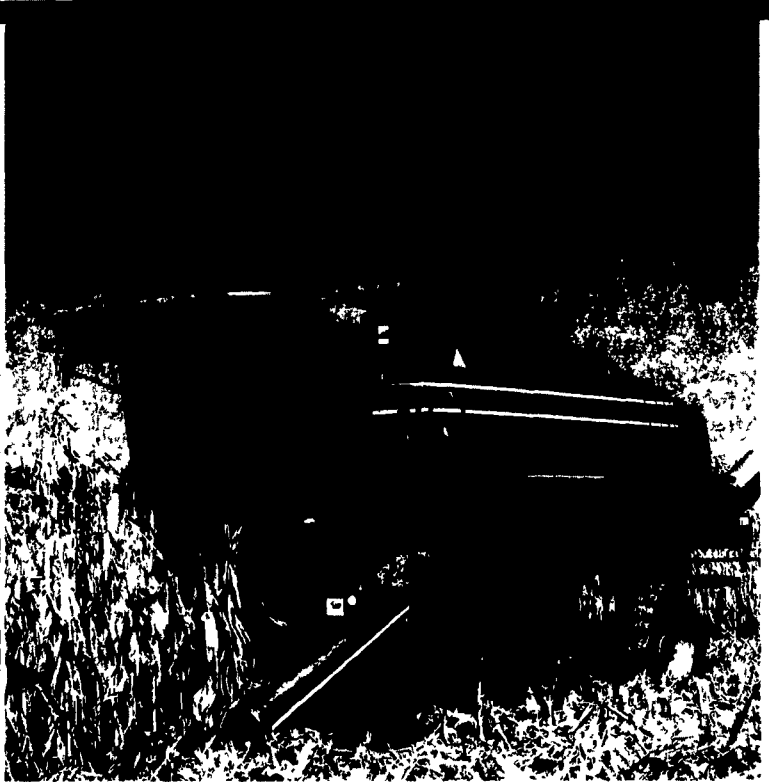


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