

Chemical Alternatives to Atrazine in Corn Weed Management Programs

The use of atrazine has come under increased scrutiny in recent years, primarily due to its detection in surface water and ground water supplies. Atrazine has been found more frequently in Iowa's water supplies than other commonly used agricultural pesticides. In the majority of cases, levels found in groundwater have been below the recommended health advisory.

Environmental concerns have resulted in new restrictions on atrazine use in Iowa. The Iowa Department of Agriculture and Land Stewardship has implemented atrazine management rules that restrict use rates to 3 pounds active ingredient per acre (lb. a.i. /A) in most areas, and to 1.5 lb. a.i. /A in areas with especially vulnerable groundwater, (Figure 1). The rules are unique in that they recognize differences in potential for groundwater contamination across the state.

Strictest regulations on atrazine use are found in areas with sinkholes, shallow bedrock aquifers, or agriculture drainage wells that can provide a direct route for agricultural chemicals into the ground water Extension publication Pm-1390, *Atrazine Management Rules for Iowa*, describes the atrazine regulations in detail.

This publication describes implications of reduced atrazine rates, and chemical alternatives to atrazine in corn weed management systems. Mechanical strategies, such as rotary hoeing and row cultivation, are effective control strategies that

should be integrated into a weed management program to reduce the reliance on herbicides.

Current Uses of Atrazine

The major use of atrazine has been as a preemergence herbicide for broadleaf weeds, usually applied in combination with Lasso, Dual, Sutan+, Eradicane or Bladex. On acres where corn is rotated with soybeans or other crops, the typical application rate is 1.5 lb. a.i. /A or less. The proposed restrictions will not have major implications for growers who use atrazine in this manner. Atrazine is present in a number of prepackage mixes (Table 1). The amount of atrazine applied with most package mixes is also below 1.5 lb. a.i. /A.

Rates of atrazine higher than 1.5 lb. a.i. /A are occasionally used for specific purposes. These uses may be affected by the new regulations. For most soils in Iowa, rates higher than 1.5 lb. a.i. /A may result in significant herbicide carryover, thus continuous corn acres will be impacted the most. Higher rates of atrazine (approximately 2 lb. a.i. /A) are often used to improve the consistency of velvetleaf and cocklebur control. This use pattern would need to be discontinued in those counties and townships restricted to 1.5 lb. a.i. /A of atrazine per year.

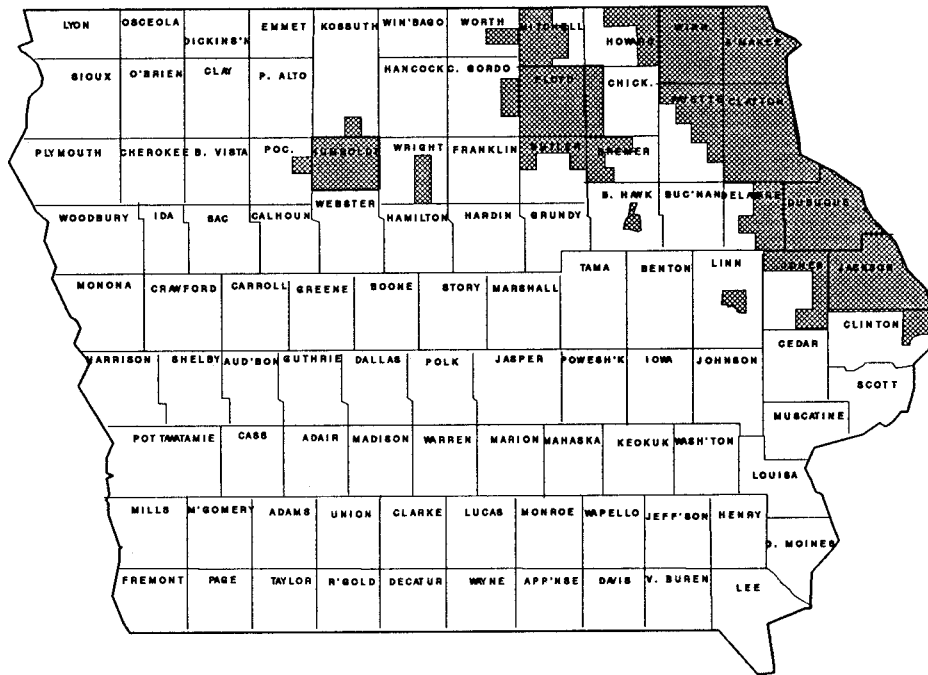
High rates of atrazine (4 lb. a.i. /A) have been used for quackgrass control in continuous corn. This use is now prohibited throughout the state of Iowa.

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Figure 1. Atrazine management areas where rate of application is limited to no more than 1.5 pounds active ingredient/acre/calendar year.



DESIGNATED ATRAZINE MANAGEMENT AREAS

Entire counties - Allamakee, Clayton, Dubuque, Floyd, Humboldt, Jackson, Winneshiek All areas within the townships of the following counties:

County	Township
Black Hawk	Poyner
Bremer	Douglas, Frederika, Jackson, Jefferson, Lafayette, Polk, Washington
Butler	Benezette, Butler, Coldwater, Dayton, Fremont, Pittsford
Cerro Gordo	Owen, Portland
Chickasaw	Bradford, Chickasaw, Deerfield
Clinton	Elk River, Hampshire
Delaware	Bremen, Colony, Delhi, Elk, Milo, North Fork, Oneida, South Fork, Union
Fayette	Auburn, Clermont, Dover, Eden, Fairfield, Illyria, Pleasant Valley, Union, Westfield, Windsor
Howard	Albion, Chester, Forest City, New Oregon, Vernon Springs
Jones	Castle Grove, Clay, Hale, Lovell, Oxford, Richland, Washington and Wyoming
Kossuth	Sherman
Linn	Marion
Mitchell	Burr Oak, Cedar, Liberty, Mitchell, Newberg, Osage, Otranto, Rock, Saint Ansgar, Union, West Lincoln
Pocahontas	Garfield
Worth	Barton, Kensett
Wright	Grant, Lincoln, Wall Lake

Table 1. Herbicide package mixes that contain atrazine as an active ingredient

Trade name	lb a.i. atrazine/gal or % atrazine	Herbicide mixed with Atrazine
Bicep	2.67 lb	metolachlor (Dual)
Buctril + Atrazine	2.01b.	bromoxynil (Buctril)
Bullet	1.51b.	alachlor (Lasso MT)
Extrazine II	21.4 %	cyanazine (Bladex)
Laddok	1.66 lb	bentazon (Basagran)
Lariat	1.51b.	alachlor (Lasso EC)
Marksman	2.1 lb.	dicamba (Banvel)
Prozine	35%	pendimethalin (Prowl)
Sutazine	1.31b.	butylate (Sutan +)

Replacements for Atrazine

Although a few preemergence products are available to replace atrazine for broadleaf control, none are as versatile or provide as broad spectrum control. Growers who choose to eliminate atrazine may need to place greater emphasis on postemergence products and mechanical control strategies.

Preemergence options - Herbicides that are used primarily for grass control usually have activity on certain broadleaf weeds. Consider what broadleaf weeds these herbicides will control when developing a weed management program.

Bladex (cyanazine). Like atrazine, Bladex is a triazine herbicide. The major differences between the two products are 1) Bladex has a shorter soil persistence and does not carry over; 2) Corn has a lower margin of tolerance to Bladex; 3) Bladex is weaker on certain broadleaf weeds, including velvetleaf, cocklebur, and pigweed; 4) Bladex has better activity on grasses than atrazine; and 5) Bladex has a higher cost per acre. Bladex can be used in all tillage systems. In no-till, the postemergence activity of Bladex may eliminate the need for a burndown herbicide such as Roundup or Gramoxone. Extra in certain situations.

Banvel (dicamba). Banvel is primarily used as a postemergence product, but it can be applied preemergence. Banvel should be used

preemergence only on silty clay loam or clay texture soils with greater than 2.5 percent organic matter. Crop injury may occur on light textured soils or in years with heavy rainfall soon after herbicide application. The residual activity of Banvel is shorter than that of atrazine or Bladex and may allow late emerging weeds to escape control in years with above average rainfall. Banvel should not be incorporated. Corn should be planted at least 1.5 inches deep in a firm seedbed. Banvel can be used in all tillage systems.

Postemergence Options - Eliminating atrazine from a weed management program may result in an increase in the use of postemergence herbicides for broadleaf weed control. Proper application timing and good coverage of weed foliage are critical factors in obtaining effective control with postemergence products.

Banvel (dicamba). Banvel provides broad spectrum control of annual broadleaf weeds and also has activity on certain perennial species. Elmely postemergence applications reduce the potential for severe crop injury and also extend length of control by delaying application dates. Banvel is often used in combination with 2,4-D to provide more consistent control of velvetleaf and certain other weed species.

Basagran (bentazon). Basagran has excellent crop safety, but has a narrower spectrum of activity than Banvel or Buctril. Basagran provides good control of cocklebur, jimsonweed, ragweed, sunflower, velvetleaf, and certain other annual broadleaf weeds. As Basagran is a contact herbicide, timing of application and good coverage of weed foliage are critical for good results. Basagran causes less drift injury to non-target plants than Banvel or 2,4-D.

Bladex (cyanazine). Bladex also may be used postemergence in corn. Apply from emergence to the four-leaf stage of crop development and before weeds exceed 1.5 inches in height. Crop injury may occur when applications follow cool, cloudy weather conditions.

Buctril (bromoxynil). Buctril is a contact herbicide. It requires good coverage of weed foliage for acceptable results. Elmely application to small weeds is critical for good control. Buctril provides good control of nightshade, cocklebur, lambsquarter, ragweed, and certain other annual broadleaf weeds.

2,4-D. The herbicide 2,4-D provides economical control of many broadleaf weeds. However, corn has a relatively low tolerance to 2,4-D. Application before the five-leaf stage of corn minimizes the risk of injury. Combinations with Banvel reduce the rate of 2,4-D required, and therefore the potential for injury.

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Inclusion of a trade name does not imply endorsement of that particular brand of herbicide nor does exclusion imply nonapproval.

Quackgrass Control - The primary alternative to the 4 pounds atrazine per acre split application for quackgrass control is the use of glyphosate (Roundup or Ranger). Applications should be made when 8 to 12 inches of actively growing quackgrass foliage is present. Treatment can be made in the fall following harvest or in the spring prior to planting. Do not use tillage following harvest prior to fall or spring applications. Delay tillage for at least three days following application of Roundup or Ranger. Follow label directions regarding spray additives and tank mixing.

Accent and Beacon are new herbicides that offer selective postemergence control of quackgrass in corn. Beacon was registered in 1990. Accent is expected to be registered in time for the 1991 growing season. The availability of these products, along with preplant glyphosate treatment, provides growers with effective alternatives to atrazine for quackgrass management in corn.

Additional information regarding weed management practices, herbicide selection, and water quality is available in Extension publications Pm-601, Weed Management Guide Pm-1390, Atrazine Management Rules for Iowa; Pm- 1393, Banding Herbicides for Row Crop Weed Management: Pm1394, Pesticide Use and Water quality in Iowa; Pm-1395, Pesticide and Synthetic Organic Compound Survey of Iowa Public Water Supplies; and Pm-1396, Iowa Statewide Rural Well Water Survey.

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