

LIFE AFTER BLADEx IN SWEET CORN

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All registered uses of cyanazine, the active ingredient in Bladex, ended in 2002. Although cyanazine had some limitations, it was an important sweet corn herbicide because 1) it provided good preemergence broadleaf weed control, 2) it degraded soon enough in the soil that other rotational crops could be planted after sweet corn harvest, and 3) it provided an alternative to atrazine in prohibition areas. Without Bladex, sweet corn growers and field managers may wonder what options currently exist for weed management in sweet corn and what the prospects are for the future.

Preemergence Options: Currently there are only six active ingredients labeled for preemergence use in sweet corn (Table 1). Four of these herbicides primarily control annual grass weeds and have limited activity on broadleaf weeds. The current preemergence broadleaf herbicide options are limited to atrazine (Aatrex) and simazine (Princep). These herbicides are in the triazine family and share several features. Sweet corn has excellent tolerance to both herbicides. At typical use rates, both often provide excellent control of small seeded broadleaf weeds like lambsquarters, pigweed, black nightshade, common ragweed, and smartweeds. Both are less consistent on large seeded weeds like velvetleaf and giant ragweed. Neither of these herbicides are true annual grass herbicides, but they can improve grass control when tank mixed with a preemergence grass herbicide. Atrazine and simazine also share two features that limit their use – resistance and rotational restrictions. Fields with triazine-resistant smooth pigweed and common lambsquarters are well known by growers and fieldmen. However, people may be less aware that atrazine-resistant velvetleaf also exists in several fields across Wisconsin.

Perhaps the greatest limitation with atrazine and simazine are the rotational restrictions on their labels that prohibit rotations with other vegetable crops. The Aatrex label states “Do not plant sugar beets, tobacco, vegetables (including dry beans), spring-seeded small grains, or small-seeded legumes and grasses the year following application, or injury may occur.” Winter wheat is also prohibited as a follow crop because the label states “Do not rotate to any crop except corn or sorghum until the following year.” Soybeans can be planted the year after atrazine. These rotational restrictions also apply to the atrazine premixes (Table 1). With the lower atrazine rates used in Wisconsin, several vegetable or other crops could be grown safely as rotational crops, but the prohibition applies regardless of the rate applied. Modifications to the atrazine label that would expand the rotational options are not likely until after the EPA completes the atrazine special review, which is scheduled for the fall of 2003.

The net effect of simazine’s rotational restrictions are similar to atrazine. The Princep label has the same statement “Do not plant sugar beets, tobacco, vegetables (including dry beans), spring-seeded small grains, or small-seeded legumes and grasses the year following application, or injury may occur.” Soybean is an option as a rotational crop if the simazine rate was less than 3 lb ai/a. The label states “If Princep 4L is used at a rate higher than 6 pts./A or equivalent band rate, a crop of untreated corn should precede the next rotational crop.” This allows soybeans to be grown as a rotational crop at lower rates, but only corn at higher rates.

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Table 1. Soil-applied herbicides labeled for use in sweet corn.

Common name	Trade names	Comments
alachlor	Lasso, Micro-Tech	Acetamide family, controls annual grasses, pigweed, and nightshade
<i>alachlor+atrazine</i>	<i>Bullet, Lariat</i>	
dimethenamid-P	Outlook	Acetamide family, controls annual grasses, pigweed, and nightshade, do not use on sand with <3% OM when depth to groundwater is less than 30 ft
<i>dimethenamid-P+atrazine</i>	<i>G-Max Lite</i>	
s-metolachlor	Cinch, Dual II Magnum	Acetamide family, controls annual grasses, pigweed, and nightshade
<i>s-metolachlor+atrazine</i>	<i>Bicep Lite II Magnum, Cinch ATZ Lite</i>	
pendimethalin	Pendimethalin/Prowl	Dinitroaniline family, controls annual grasses, pigweed, lambsquarters, and suppresses velvetleaf, only apply after planting, plant at least 1.5 inches deep
atrazine	Aatrex, others	Triazine family, good control of many annual broadleaf weeds, can also be applied postemergence, cannot rotate to vegetable crops
simazine	Princep, others	Triazine family, good control of many annual broadleaf weeds, cannot rotate to vegetable crops

Atrazine and simazine can be effectively used for preemergence broadleaf control in sweet corn, but some additional management may be required in certain situations as compared to Bladex.

Options for triazine resistant weeds.

Smooth pigweed: Tank mixing any of the preemergence grass herbicides (alachlor, s-metolachlor, dimethenamid-P, or pendimethalin) with atrazine or simazine will control triazine-resistant pigweed. Triazine-resistant pigweed can also be controlled postemergence by nicosulfuron, carfentrazone, halosulfuron, or 2,4-D. However, these herbicides have specific limitations that are described below and may make them a second choice to using a preemergence grass herbicide.

Common lambsquarters: Tank mixing pendimethalin with atrazine or simazine will provide good lambsquarters control, but tank mixtures with the other grass herbicides will only suppress lambsquarters. Seedling lambsquarters needs to be treated while it is still small with bentazon (2 inches) or carfentrazone (3 inches) for adequate control.

Options for rotational and use restrictions.

Rotational restrictions: Because both atrazine or simazine prohibit rotation to vegetable crops, one choice is to adjust the rotation to include an allowed rotational crop such as field corn or soybean. During this second year, herbicides can be selected that allow rotation back to the desired vegetable crops. The other choice is to use a two-pass program (preemergence grass herbicide followed by a postemergence broadleaf herbicide) that does not rely on atrazine or simazine. The spectrum of broadleaf weed control may be less and the potential for injury may be greater with a

two-pass program, but this compromise may be acceptable to keep the desired rotation.

Atrazine prohibition areas: Simazine can be used in atrazine prohibition areas and provides similar broadleaf control. Otherwise, a two-pass program can be used where a preemergence grass herbicide is followed by a postemergence broadleaf herbicide. Cultivation will generally improve the control. To assist with the broadleaf control, the choice of the preemergence grass herbicide can make a difference. Pendimethalin would provide greater lambsquarters and pigweed control and suppression of velvetleaf than the acetamide grass herbicides (alachlor, s-metolachlor, and dimethenamid-P), but the acetamide grass herbicides control nightshade better than pendimethalin.

Postemergence options: There are only six active ingredients labeled for postemergence broadcast application in sweet corn (Table 2). Nicosulfuron (Accent) is primarily a grass herbicide and cannot act as a replacement for cyanazine. Atrazine and the premix of bentazon + atrazine (Laddok S-12) are very effective at controlling broadleaf weeds postemergence, but have many of the same limitations as described previously for atrazine. One key difference is that the Laddok S-12 label only prohibits the rotation to oats if soil has a calcareous surface layer. Other vegetable crops can be planted the following year because of the low atrazine rate. This makes Laddok relatively attractive in areas where atrazine can be used. Bentazon (Basagran) alone is very safe to use in sweet corn, but it is weak on the key weed species of lambsquarters, pigweed, nightshade, and ragweed. It is very effective on velvetleaf, smartweeds, and cocklebur.

Table 2. Postemergence herbicides labeled for use in sweet corn.

Common name	Trade names	Comments
<u>Postemergence broadcast</u>		
nicosulfuron	Accent	ALS inhibitor, controls many annual grasses including wild proso millet, smooth crabgrass is tolerant, only labeled for specific processing hybrids
atrazine	Aatrex, others	Triazine family, apply to corn before 12 inches tall, good control of many annual broadleaf weeds, cannot rotate to vegetable crops
bentazon	Basagran	good crop safety, weak on key broadleaf weeds, no rotational restrictions
bentazon + atrazine	Laddok S-12	good control of many annual broadleaf weeds, can rotate to vegetable crops
carfentrazone	Aim EW	Cell membrane disrupter, excellent on velvetleaf, can cause excessive burning if too much enters whorl
halosulfuron	Permit, Sandea	ALS inhibitor, may injure sensitive hybrids, only use if crop safety is known
2,4-D	many	Growth regulator, can injure sweet corn, especially during hot, humid weather
<u>Postemergence directed (require shielded or skid mounted nozzles)</u>		
ametryne	Evik	Apply after sweet corn is at least 12 inches tall
paraquat	Gramoxone Max	Apply after sweet corn is at least 10 inches tall

Carfentrazone (Aim EW) provides excellent control of velvetleaf and good control of pigweed, lambsquarters, and nightshade, but it is weak on ragweeds. Sweet corn can be injured by carfentrazone when applications are made to dew covered plants or when followed by dew or light rain, which can wash the herbicide down into the whorl. Applications that concentrate spray

in the whorl can also cause excessive injury. As a result, the preference would be to use drop nozzles when making applications. As a minimum, be sure the spray nozzles are at least 18 inches above the corn. Even with these precautions, the Aim label states that “Any crop response arising from the use of Aim EW herbicide on sweet corn is the responsibility of the user.”

Halosulfuron (Permit) controls several important broadleaf weeds like velvetleaf, common ragweed, cocklebur, and pigweed plus yellow nutsedge. Unfortunately, it does not control nightshade and is weak on lambsquarters. There is also a risk of injuring certain sweet corn hybrids that are sensitive to the ALS inhibiting herbicides. Broadleaf weeds can also be controlled with 2,4-D, but it also has a risk of injuring sweet corn and causing brittle stalks.

Ametryne and paraquat can control a broad spectrum of annual grass and broadleaf weeds in sweet corn. These nonselective herbicides can be safely used when applied with directed sprayers that spray small weeds below the corn canopy. However, an earlier herbicide application or rotary hoeing is usually required to establish the required height differential between the corn and the weeds. Directed sprayers typically are not available for processing sweet corn growers, but their use could be an excellent option for fresh market growers.

Future Options: Mesotrione and diflufenzopyr + dicamba (Distinct) are broadleaf herbicides that may be labeled for use in sweet corn for 2004. Mesotrione is the active ingredient in Callisto and is one of the components of Lumax (s-metolachlor + atrazine + mesotrione) and Camix (s-metolachlor + mesotrione). Lumax and Camix are soil-applied herbicides that control a broad spectrum of annual grass and broadleaf weeds and sweet corn has shown good tolerance to these herbicides. Callisto is typically applied postemergence and controls broadleaf weeds. A few hybrids have shown some bleaching after Callisto applications, but they have recovered well. Lumax contains atrazine so rotational crops are restricted with this formulation. Camix and Callisto currently prohibit rotations to alfalfa, peas, snap beans, and other vegetable crops the following year (18 month restriction). Distinct has growth regulator activity and controls many annual broadleaf weeds. To minimize the risk of injury, lower rates and reduced use of adjuvants are being evaluated.

Consumer concerns have kept processors from adopting sweet corn that has been engineered for glufosinate resistance (Liberty Link). If consumer resistance to genetically engineered food continues, the sweet corn industry could develop the Clearfield technology. Clearfield corn is resistant to Lightning (imazethapyr + imazapyr), which controls a broad spectrum of annual grass and broadleaf weeds. However, Clearfield corn is not genetically engineered. Rather, this corn's resistance was discovered through tissue culture selection and foreign genes were not added to make these plants resistant. As a result, Clearfield corn does not require special regulatory approval and consumers should not have concerns.