BENEFITS OF TRANSGENIC BT/LIBERTY LINK SWEET CORN

Nicole D. Flowers and R. Gordon Harvey[1]

Wisconsin is one of the leading producers of sweet corn for processing in the United States. However, it is becoming more difficult to produce high yielding sweet corn in Wisconsin due to limitations in broadleaf herbicides labeled for use in that crop. Weed management in sweet corn relies on preemergence (PRE) combinations of triazine and chloroacetanilide herbicides. Toxicological and environmental concerns about triazine herbicides have resulted in restrictions on these products, particularly in Wisconsin. These concerns include local restrictions of atrazine, groundwater and surface water contamination concerns with Princep, and the phase-out of Bladex. Frequent crop injury caused by 2,4-D and limitations in lambsquarters and pigweed control common with Basagran places further limitations on broadleaf weed control in sweet corn. These five herbicides are currently the only registered herbicides that can be used broadcast to control broadleaf weeds in sweet corn. In 1999, Wisconsin's sweet corn acreage dropped below 100,000 acres for the first time in at least the last 40 years. There is little doubt that Wisconsin's atrazine rules are the primary factor in this loss of sweet corn acreage. Sweet corn acreage in Illinois and Minnesota, where farmers can still use atrazine, is increasing!

Limited alternative broadleaf herbicides, and cost restrictions of multiple insecticide applications have prompted the exploration of new alternatives for pest control in sweet corn. Bt/Liberty Link sweet corn hybrids have been released and may become an important tool for the Wisconsin sweet corn producer. Field trials were conducted at Arlington, WI in 1998 and 1999 to determine agronomic and economic differences between transformed hybrids with the "Bt" gene for control of European corn borer and corn earworm plus a "PAT" gene for tolerance to Liberty, and a related non-transformed hybrid. 'Bonus,' 'Heritage,'GSS-9377, 'Prime Plus,' and 'Sprint' were the non-transformed hybrids tested. The similar transformed hybrids tested were 'GH-0937,' 'GH-0943,' GSS-0975,' GSS-0966, and 'GH-0913.'

Three registered herbicide treatments designed to control common annual weeds including wild-proso millet were applied to the non-transformed hybrids, and three treatments that included Liberty were applied to the transformed hybrids. Treatments to the non-transformed hybrids were as follows: Eradicane + atrazine and a cultivation, atrazine followed by Accent + COC + 28% N, and Eradicane + followed by 2,4-D amine and a cultivation. Treatments to the transformed hybrids were as follows: atrazine + Dual II followed by Liberty + AMS and a cultivation, Liberty +AMS followed by Liberty + AMS, and Liberty + atrazine + AMS and a cultivation. All six treatments resulted in excellent weed control. However, the treatment that included Accent injured Heritage, GSS-9377, and Sprint resulting in yield reductions. Insect damage was observed in 20% of the ears on the non-transformed hybrids but was not observed in the transformed hybrids. Economic analysis shows greater profit with the transformed hybrids as compared to the non-transformed hybrids in the related pairs of Heritage and GH-0943 and Prime Plus and GSS-0966. The other three pairs showed no difference in the economic return although two of the pairs show a slightly higher return for the transgenic hybrid.

The conventional treatments included in this study cannot be used throughout the state. Atrazine cannot be used in atrazine prohibition areas, and 2,4-D and Accent can cause serious injury to many

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[1] Graduate Research Assistant and Professor, Department of Agronomy, University of Wisconsin-Madison, Madison, WI 53706.

important hybrids. Eradicane cannot be used every year because of enhanced soil biodegradation, and may not even be available in the state. Liberty Link / Bt hybrids could provide new options for weed and insect management; providing high yields, no crop injury, excellent weed control, and insect control in processing sweet corn. But, at this time most food processors are afraid to use transgenic sweet corn for fear of adverse consumer attitudes!

Table 1. Sweet corn yields and returns on weed and insect management in 1998 and 1999 wild-proso millet control in sweet corn study.

Treatment Hybrid	Rate	Yield	Return
	(lb/A)	(T/A)	($/A)
Eradicane + & atrazine / cultivation	6.0 & 0.5		
Bonus		8.05	$292.49
Heritage		7.18	$252.59
GSS-9377		7.55	$269.52
Prime Plus		6.68	$229.43
Sprint		7.68	$275.37
Eradicane + /2,4-D amine/ cultivation	6.0 / 0.5		
Bonus		8.01	$285.09
Heritage		6.72	$225.50
GSS-9377		6.94	$211.14
Prime Plus		6.80	$229.45
Sprint		7.51	$261.92
Atrazine / Accent & COC & 28%N	1.5 / 0.032 & 1.25 & 4 % v/v		
Bonus		8.11	$289.90
Heritage		4.52	$137.99
GSS-9377		5.17	$170.11
Prime Plus		7.28	$264.49
Sprint		6.12	$213.83
Atrazine & Dual II / Liberty & AMS	0.6 & 0.65 / 0.27 & 3.0		
GH-0937		8.07	$265.21
GH-0943		7.44	$273.92
GSS-0975		7.15	$260.71
GSS-0966		7.54	$278.38
GH-0913		6.66	$241.31
Liberty & AMS / Liberty & AMS	0.27 & 3.0 / 0.27 & 3.0		
GH-0937		8.48	$303.92
GH-0943		7.33	$262.68
GSS-0975		6.86	$241.12
GSS-0966		7.92	$289.50
GH-0913		6.53	$226.14
Liberty & atrazine & AMS / cultivation	0.27 & 1.0 & 3.0		
GH-0937		7.81	$299.03
GH-0943		6.84	$241.73
GSS-0975		6.29	$229.26
GSS-0966		7.12	$267.35
GH-0913		6.29	$229.26
	LSD (0.1) =	0.72	$33