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NF02-503 Atrazine and Non-Atrazine Herbicide Comparisons in Conventional Till Corn

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Atrazine and Non-Atrazine Herbicide Comparisons in Conventional Till Corn

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Summary: *Sequential herbicide applications (preemergence followed by postemergence) were more consistent in weed control across four environments because the postemergence treatments controlled weed escapes and second flushes. Singular herbicide treatments were less effective in that regard. Several single applications gave good control but not the excellent control of the sequential treatments. Atrazine in the preemergence application failed to control velvetleaf, but provided good control when used postemergence. The non-atrazine herbicides were at least as effective as the atrazine herbicides.*

Atrazine herbicide has been in an EPA special review since 1994 because of surface and groundwater contamination concerns. Applied to 85 percent of the corn acres, atrazine is a versatile herbicide used in preplant, preemergence, or early postemergence treatments. Most atrazine is used in combination with other herbicides to broaden the weed control spectrum and to reduce atrazine carryover concerns.

Beginning in 1997, we evaluated atrazine and non-atrazine herbicides in conventional tillage corn (1997 and 1998) and no-till corn (1999 and 2000) on university research farms at Clay Center and Lincoln, Nebraska. The objective was to compare some common atrazine and non-atrazine herbicides for weed control and crop response. Thirteen herbicides were selected to represent commonly used herbicide classes and treatment timings *(Table II)*. This NebFact reports the conventional till results. (See NF02-504 for the results in no-till corn.)

Results

Overall weed control exceeded 90 percent in 5 of 11 treatments and was less than 75 percent in only one treatment *(Figure 1)*. Overall weed control represents total effectiveness of the treatment across all weed species present in the test. A score above 90 indicates that all weed species were satisfac-

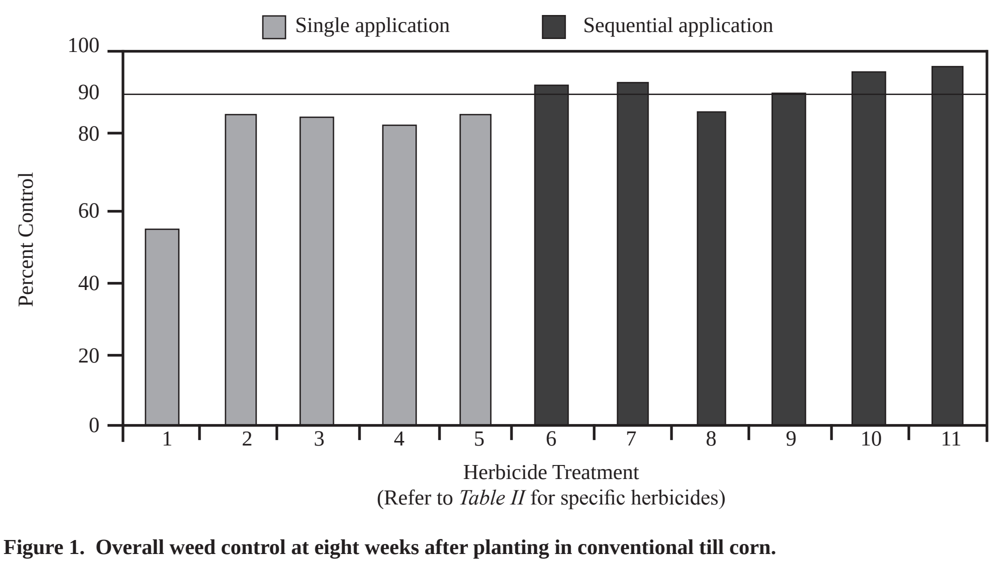

Figure 1. Overall weed control at eight weeks after planting in conventional till corn.

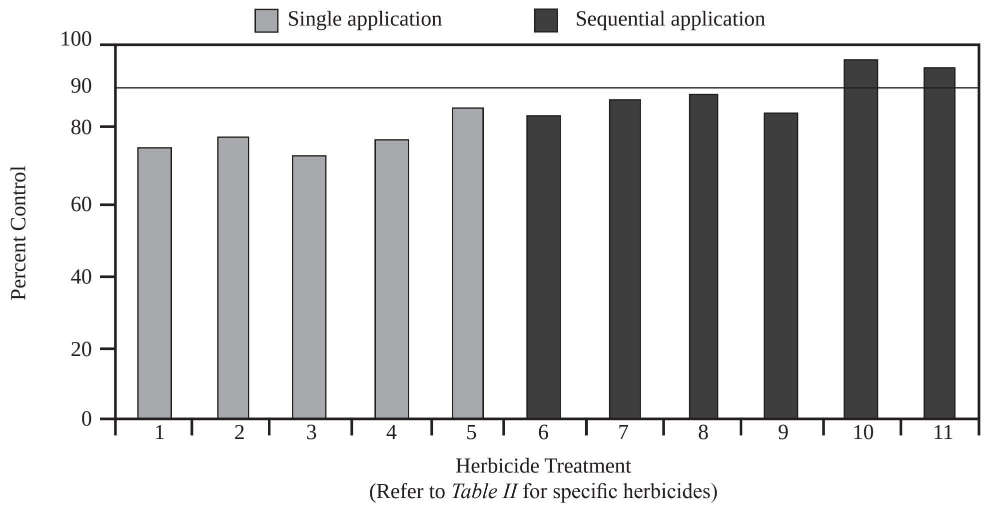

Figure 2. Foxtail control at eight weeks after planting in conventional till corn.

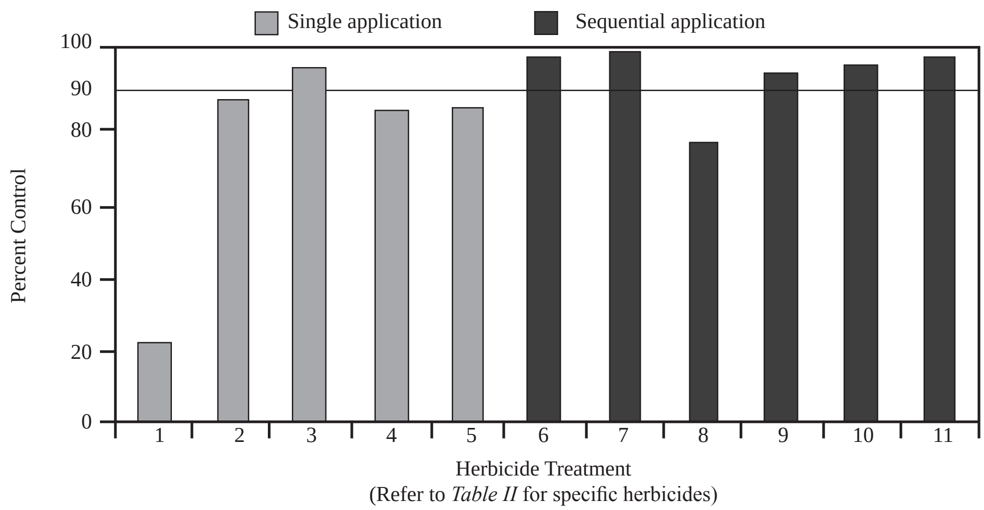

Figure 3. Velvetleaf control at eight weeks after planting in conventional till corn.

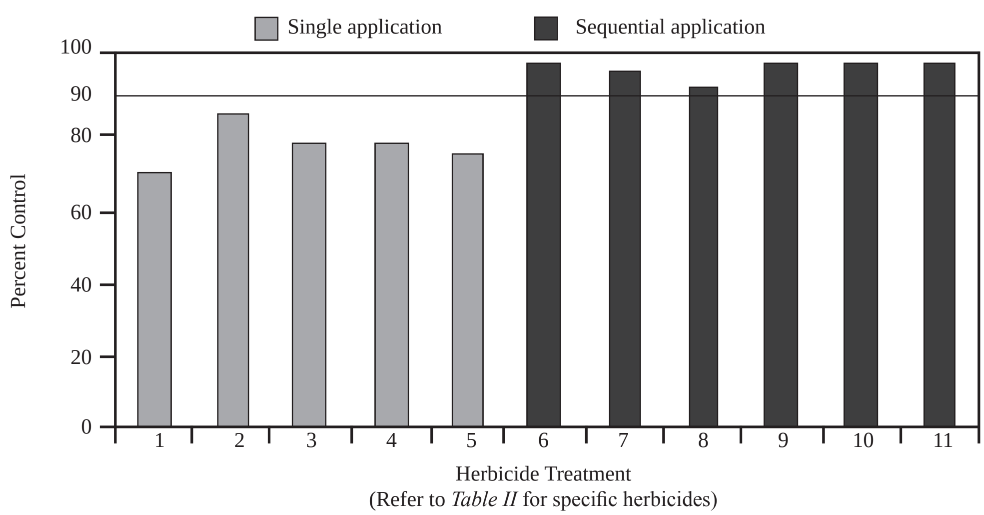

Figure 4. Sunflower control at eight weeks after planting in conventional till corn at Lincoln.

torily controlled. *Figures 2-4* show the control of individual species, i.e. foxtails, velvetleaf, and sunflower. Weeds caused a 2 percent to 13 percent yield reduction among herbicides (data not shown). Atrazine used postemergence (Treatment 6) provided acceptable overall weed control as did the other postemergence treatments. Atrazine applied preemergence in Bicep II did not provide satisfactory overall weed control. Bicep II controlled foxtail and sunflower at about the same level as other preemergence herbicides but faltered on velvetleaf control *(Figure 3)*.

The sequential application strategy provided better overall weed control than the single applications *(Figure 1)*. Postemergence treatments were applied 17 to 30 days after crop and weed emergence when the weeds were small *(Table I)*. Single application Treatments 1, 2, 3, and 4 were preemergence only and Treatment 5 was postemergence only *(Table II)*. Only sequential Treatments 10 and 11 using Spirit postemergence controlled foxtail species at a high level *(Figure 2)*. Five of the six sequential treatments controlled velvetleaf at a high level, but Balance (Treatment 3) was the only single application which controlled velvetleaf at that level *(Figure 3)*. All six sequential applications, but none of the single applications controlled sunflower above 90 percent *(Figure 4)*.

None of these herbicides caused significant corn injury or corn stand loss (data not shown). Weeds in the untreated plots reduced corn yield by 35 percent on the average. Yield losses in the four individual environments ranged from 5 percent to 87 percent with greatest loss at Lincoln, which was not irrigated and had sunflower competition. Corn yields tended to reflect the weed control with sequentials yielding slightly better than single treatments. The non-atrazine herbicides protected the corn yield as well as or slightly better than the atrazine treatments.

Procedure

Experimental procedures were similar at both locations in all years. A conventional hybrid was used for all treatments. The corn followed sorghum at Lincoln and soybean at Clay Center. Important dates and crop/weed sizes are given in *Table I*. Corn at Clay Center was sprinkler irrigated as needed. The Lincoln site was not irrigated. Experimental plot size was four, 30-inch rows wide by 33 feet long at Clay Center and six, 30-inch rows wide by 45 feet long at Lincoln. All treatments were replicated three times at Clay Center and four times at Lincoln. Herbicides were applied in water at 20 GPA using 11002 spray tips on small-plot, tractor-mounted sprayers operated at 30 PSI and 2.5 mph. Additives were appropriate for each herbicide and treatment timing. Postemergence treatments were applied topically to weeds and crop.

Crop response and weed control were evaluated at eight weeks after planting (WAP) and at harvest. The weed species present were yellow and green foxtails, velvetleaf, and sunflower (Lincoln only). Data were analyzed as individual herbicide treatment comparisons. To enhance comparisons treatments are grouped by single or sequential application strategies in the figures. *Table II* lists the herbicide treatment costs by strategy, and application based on November 2000 prices.

Table I. Dates and plant stages for application events, 1997-1998.

Nebraska location	*Year*	*Event*[1]	*Date*	*Crop height (inch)-stage*	*Moisture rec'd after event + 10 days (inch)*	*Weed heights (inch)*		
						Velvetleaf	*Foxtail*	*Sunflower*
Clay Center (CC)	1997	Pre	April 29	0-0	1.0	0	0	not present
		Epost	June 5	7-V4	0	0.75	0.75	
		Mpost	June 13	11-V5	1.2	3.5	2.0	
	1998	Pre	May 5	0-0	1.1	0	0	not present
		Epost	June 12	12-V4	1.9	4.0	2.0	
		Mpost	June 17	15-V6	1.1	5.0	3.0	
Lincoln (LN)	1997	Pre	May 13	0-0	0	0	0	0
		Epost	June 10	8-V3	0.5	2.0	1.5	3.0
		Mpost	June 16	11-V4	2.8	3.0	2.5	4.0
	1998	Pre	May 12	0-0	1.4	0	0	0
		Epost	June 3	6-V2	2.7	2.0	1.5	3.0
		Mpost	June 12	12-V4	3.1	5.0	2.5	5.0

[1]Pre=Preemergence, Epost=Early postemergence; and Mpost=Medium postemergence.

Table II. Herbicides used in conventional till corn 1997-1998.

Treatment number	*Herbicide treatment*[1]	*Product rate per acre*	*Application timing* [1]	*Application strategy* [2]	*Treatment cost per acre* [3]
1	Bicep II	2.4 qt/A	Pre	Single	$26.78
2	Dual II+	2.0 pt/A	Pre	Single	$38.81
	Hornet	4.0 oz/A	Pre		
3	Balance	2.0 oz/A	Pre	Single	$24.32
4	Dual II+	1.5 pt/A	Pre	Single	$32.71
	Balance	1.5 oz/A	Pre		
5	Basis+	0.33 oz/A	Epost	Single	$14.34
	NIS+	0.5% V/V	Epost		
	UAN	2.0 qt/A	Epost		
6	Dual II	2.0 pt/A	Pre	Seq	$34.97
	Buctril/Atr+	2.5 pt/A	Epost		
	UAN	2.0 qt/A	Epost		
7	Axiom	16.0 oz/A	Pre	Seq	$38.01
	Basagran+	1.5 pt/A	Epost		
	UAN	2.0 qt/A	Epost		
8	Topnotch	2.5 qt/A	Pre	Seq	$32.47
	Clarity	8.0 oz/A	Epost		
9	Harness	1.7 pt/A	Pre	Seq	$18.03
	Permit+	0.67 oz/A	Mpost		
	COC	1.2% V/V	Mpost		
10	Dual II	2.0 pt/A	Pre	Seq	$36.27
	Spirit+	1.0 oz/A	Mpost		
	COC+	1.2% V/V	Mpost		
	UAN	2.0 qt/A	Mpost		
11	Axiom	16.0 oz/A	Pre	Seq	$36.97
	Spirit+	1.0 oz/A	Mpost		
	COC+	1.2% V/V	Mpost		
	UAN	2.0 qt/A	Mpost		

[1]Abbreviations: AMS=ammonium sulfate, COC=crop oil concentrate, MSO=methylated seed oil, NIS=nonionic surfactant, Pre=Preemergence, Epost=Early postemergence, Mpost=Medium postemergence.
[2]Single=one application time; Seq=Sequential application (Pre followed by Post).
[3]Cost of herbicides, additives, and application. Application cost figured at $5.00/A per application.

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Elbert C. Dickey, Dean and Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.