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# HERBICIDES FOR GRASS CONTROL IN NO-TILL PLANTED Soybeans



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# HERBICIDES FOR GRASS CONTROL IN NO-TILL PLANTED SOYBEANS

The increase in soybean acreage in North Mississippi in the past decade has resulted mainly from the conversion of pasture and idle land to soybean fields. About 40% of the land is rented (1).

The demand for increased cash flow dictates farming practices of the tenant. Therefore, large acreages of pasture and idle land with a natural tendency to erode are being exposed to further erosion when converted to cropland.

The Soil Conservation Service (SCS) advocates no-till planting as an effective erosion-reduction practice. Consequently, farmers are encouraged to reduce or eliminate preplant tillage on sloping land if

possible. By using no-till planting practices, producers can plant soybeans on land with a 5 to 8% slope without increasing erosion. Research at the MAFES North Mississippi Branch has resulted in an annual savings of 8 tons of soil per acre by planting soybeans no-till on a Grenada silt loam soil with a 5% slope (2).

An estimated 85% of the fields of North Mississippi are infested with johnsongrass and bermudagrass. Where perennial grasses are a problem, the SCS advises that growers not use no-till planting or delay adoption of the practice until the grasses are controlled. Consequently, even though no-till plant-

ing would reduce erosion, it may not be suitable where perennial grasses are common.

The studies reported herein evaluated over-the-top applications of herbicides for control of johnsongrass. The first study (Part I) compared the efficacy of herbicides applied over-the-top for johnsongrass control in soybeans planted no-till and cultivated. The second study (Part II) compared pre-emergence and over-the-top herbicide treatments for control of annual weeds, grasses and johnsongrass in soybeans planted no-till and grown with and without cultivation.

## Part I

This study was conducted at the MAFES North Mississippi Branch in 1979, 1980 and 1981. The herbicides used can be safely sprayed over-the-top of soybeans without causing injury.

A site was selected on an eroded Grenada silt loam (6% slope) with a heavy infestation of rhizome johnsongrass. Eight herbicide treatments, an early cultivated treatment and a weedy check were located so that each treatment could be continued in the same area for the duration of the study. The treatments were arranged in a randomized complete block design with four replications. Herbicides, rates and application dates for 1979, 1980 and 1981 are presented in Table 1.

In 1979, Roundup® (glyphosate) at 1.0 lb/acre was applied to plots treated with Vistar 2S® (mefluidide) + X-77®, and paraquat at 0.5 lb/acre was applied to all other plots at planting. In 1979 and 1980, paraquat at 0.5 lb/acre was applied broadcast to all plots at planting as a burn-down treatment.

Forrest soybeans were planted June 11, 1979; May 14, 1980 and June 11, 1981. Plots were no-till planted with a John Deere 7000® planter equipped with fluted coulters. Fertilizer at the rate of 300 lbs/acre of 0-20-20 was applied 2 inches deep and 2 inches to the side of the row at planting. Plots consisted of four rows 50 ft long with 40 inch spacing.

All plots except the weedy check were cultivated twice in each growing season. Basagran® at 0.75 lb/acre was applied over-the-top to all plots about three weeks after planting for control of cocklebur.

Herbicides were applied in water at 20 gal per acre, using a tractor-mounted boom with nozzles spaced 20 inches apart. Johnsongrass was 24 inches tall when herbicides were applied in 1979 and 1981, 15 inches in 1980. Repeat treatments were made to six-inch regrowth.

Visual ratings for johnsongrass control (0 = no control, 100 = death) were made during the growing season. The two center rows of each plot were harvested with a plot combine.

## Results and Discussion

1979

Johnsongrass control with Poast<sup>®</sup> (sethoxydim) on July 18 ranged from 60% with 0.5 lb/acre to 83% with 1.0 lb/acre (Table 2). Johnsongrass control with Poast on September 25 ranged from 18 (Treatment 1) to 68% (Treatment 5) with one application and was 75 (Treatment 6) and 84% (Treatment 3) with two applications. No additional benefits were measured for the higher rate of Poast when two applications were made.

Johnsongrass control with Vistar was 5 (Treatment 7) and 15% (Treatment 8) on July 18; 13 (Treatment 8) and 43% (Treatment 7) on September 25. A second application of Treatment 8 was made but did not control johnsongrass in this study.

Annual grass control with the Poast treatments ranged from 85 (Treatment 1) to 91% (Treatment 4) on July 18. The first cultivation was delayed because the plots were too wet. Vistar alone and cultivation alone did not control annual grasses or johnsongrass at mid-season. Cultivation alone appeared to reduce yields.

Grain yields were low because of the low productivity level of the soil. There were no significant differences in grain yields among Poast treatments.

1980

Experimental herbicides were substituted for some of the Poast treatments that were used in 1979. All herbicides were applied twice at the same rate.

Johnsongrass control with Poast was slightly better on July 11 than on September 16 (Table 3). RO 13-8895 and Assure<sup>®</sup> provided excellent seasonal control and were equal or superior to Poast. Control of johnsongrass with Vistar was only 20% on July 11 and 32% on September 16.

Table 1. Over-the-top herbicide treatments evaluated for control of annual grasses and johnsongrass in soybeans planted no-till on a Grenada silt loam (6% slope) at the MAFES North Mississippi Branch, 1979, 1980 and 1981.

1979		1980 <sup>3</sup>		1981	
Herbicide	Broadcast Rate lb ai/acre % v/v	Herbicide	Broadcast Rate lb ai/acre % v/v	Herbicide	Broadcast Rate lb ai/acre % v/v
Poast 1.53 E <sup>®</sup> + Atplus 411 F <sup>®</sup> 1	0.5 1.25	Poast 1.53 E <sup>®</sup> + Atplus 411 F <sup>3</sup>	0.5 1.25	Poast 1.53 E <sup>6</sup> + Atplus 411 F	0.5 1.25
Poast 1.53 E + Super Savol <sup>®</sup> 1	0.5 1.25	Poast 1.53 E + Super Savol <sup>3</sup>	0.5 1.25	Poast 1.53 E <sup>6</sup> + Super Savol	0.5 1.25
Poast 1.53 E + Super Savol <sup>2</sup>	0.5 1.25	RO 13-8895 3E <sup>3,4</sup> + X-77	0.5 0.25	KK-80 4E <sup>6,8</sup> + X-77	0.5 0.25
Poast 1.53 E + Atplus 411 F <sup>1</sup>	1.0 1.25	RO 13-8895 3E <sup>3</sup> + Super Savol	0.5 1.25	KK-80 4E <sup>6</sup> + Super Savol	0.5 1.25
Poast 1.53 E + Super Savol <sup>1</sup>	1.0 1.25	RO 13-8895 3E <sup>3</sup> + X-77	0.25 0.25	NCI 96721 1.3 E <sup>6,8</sup> + X-77	0.5 0.25
Poast 1.53 E + X-77 <sup>2</sup>	1.0 1.25	Assure 0.9 E <sup>®3,5</sup> + X-77	0.25 0.25	RO 13-8895 3E <sup>6</sup> + X-77	0.25 0.25
Vistar 2S <sup>®</sup> 1 + X-77	0.25 0.25	Assure 0.9 E <sup>3</sup> + X-77	0.5 0.25	Assure 0.9 E <sup>6</sup> + X-77	0.5 0.25
Vistar 2S <sup>®</sup> 2 + X-77	0.25 0.50	Vistar 2S <sup>3</sup> + X-77	0.25 0.5	Vistar 2S <sup>7</sup> + X-77	0.35 0.5
Cultivated Check	---	Cultivated Check	---	Cultivated Check	---
Weedy Check	---	Weedy Check	---	Weedy Check	---

<sup>1</sup>Herbicides applied June 25; johnsongrass plants 24 inches tall.

<sup>2</sup>Herbicides applied June 25; repeated July 23; johnsongrass plants 24 inches tall; regrowth 6 inches

<sup>3</sup>Herbicides applied June 3; repeated June 30; johnsongrass plants 15 inches tall; regrowth 6 inches

<sup>4</sup>Development discontinued after 1980

<sup>5</sup>Tested under code NCI 96683

<sup>6</sup>Herbicides applied July 8; repeated August 4; johnsongrass plants 24 inches tall; regrowth 6 inches

<sup>7</sup>Herbicides applied June 26; repeated July 8 and July 24

<sup>8</sup>Development discontinued after 1981

Table 2. Control of annual grasses and johnsongrass with over-the-top herbicides and grain yield of soybeans planted no-till on a Grenada silt loam (6% slope), by treatment, MAFES North Mississippi Branch, 1979.

Treatment	Herbicide	Broadcast Rate lb ai/acre % v/v	Estimated Control <sup>1</sup>			Grain Yield bu/acre
			7-18 Annual Grasses	7-18 Johnsongrass	9-25	
1	Poast 1.53 E <sup>®</sup> + Atplus 411 F <sup>®</sup>	0.5 1.25	85a	60 b	18 cd	14.8ab
2	Poast 1.53 E + Super Savol <sup>®</sup>	0.5 1.25	91a	80ab	53ab	21.3a
3	Poast 1.53 E + Super Savol <sup>2</sup>	0.5 1.25	88a	80ab	84a	21.2a
4	Poast 1.53 E + Atplus 411 F	1.0 1.25	91a	83a	55ab	17.0ab
5	Poast 1.53 E + Super Savol	1.0 1.25	90a	75ab	68ab	16.8ab
6	Poast 1.53 E <sup>2</sup> + X-77 <sup>®</sup>	1.0 1.25	90a	73ab	75ab	20.7a
7	Vistar 2S <sup>®</sup> + X-77	0.25 0.25	15 c	5 d	43 bc	11.8ab
8	Vistar 2S + X-77	0.25 0.50	48 b	15 c	13 d	17.3ab
9	Cultivated Check	---	0 c	0 d	15 d	8.6 b
10	Weedy Check	---	0 c	0 d	0 d	11.0ab

<sup>1</sup>Visually estimated...0 = no control; 100 = death. Means in a column followed by the same letter are not different (P < .05) according to Duncan's Multiple Range Test.

<sup>2</sup>Applied a second time when johnsongrass regrowth was about 6 inches.

As in 1979 yields were low but still were generally reflective of johnsongrass control.

## 1981

The first seven treatments were applied July 8 and repeated on August 4. Vistar (Treatment 8) was applied July 8 and repeated each time that johnsongrass reached eight inches in height—a total of three applications during the growing season.

Treatments 1-7 gave excellent johnsongrass control but yields among treatments varied appreciably (Table 4). This was attributed to the eradication of rhizome johnsongrass in some plots by continuous use of effective over-the-top grass herbicides. Seasonal johnsongrass control with Vistar was no better in 1981 than in 1979 or 1980 and was improved only slightly by making a second application. Grain yield did not differ significantly for treatment with Vistar and cultivation only.

Cultivation alone was not an effective practice for johnsongrass control. In some instances the crop was physically damaged by cultivation.

## Conclusions

Johnsongrass can be controlled with postemergence herbicides in soybeans planted no-till. Effective control is dependent on proper herbicides and timely applications. Two applications were necessary for effective seasonal johnsongrass control with the postemergence herbicides. Johnsongrass control with postemergence herbicides appeared to be influenced more by a timely follow-up treatment than by excessively high application rates. Cultivation alone did not prove to be an effective johnsongrass control measure with no-till planting. Soybean grain yields generally were improved by controlling johnsongrass.

Table 3. Control of annual grasses and johnsongrass with over-the-top herbicides and grain yield of soybeans planted no-till on a Grenada silt loam (6% slope), by treatment, MAFES North Mississippi Branch, 1980.

Treatment	Herbicide	Broadcast Rate lb ai/acre % v/v	Estimated Control <sup>1</sup>			Grain Yield bu/acre
			7-11 Annual Grasses	7-11 Johnsongrass	9-16	
1	Poast 1.53 E® + Atplus 411 F®	0.5 1.25	84a	85ab	67abc	13.0ab
2	Poast 1.53 E + Super Savol®	0.5 1.25	73a	87a	85a	16.5ab
3	RO 13-8895 3E + X-77®	0.5 0.25	43ab	55 b	72ab	11.2abc
4	RO 13-8895 3F + Super Savol	0.5 1.25	46ab	58 b	65abc	19.0a
5	RO 13-8895 3E + X-77	0.25 0.25	55ab	77ab	85a	16.8ab
6	Assure 0.9 E® + X-77	0.25 0.25	73a	87a	93a	14.4ab
7	Assure 0.9E + X-77	0.5 0.25	94a	97a	83a	14.4ab
8	Vistar 2S® + X-77	0.25 0.5	0 b	20 c	32 bcd	9.7abc
9	Cultivated Check	---	0 b	0 c	23 cd	7.9 bc
10	Weedy Check	---	0 b	0 c	0 d	3.6 c

<sup>1</sup>Visually estimated...0 = no control; 100 = death. Means in a column followed by the same letter are not different (P < .05) according to Duncan's Multiple Range Test.

Table 4. Control of annual grasses and johnsongrass with over-the-top herbicides and grain yield of soybeans planted no-till on a Grenada silt loam (6% slope), by treatment, MAFES North Mississippi Branch, 1981.

Treatment	Herbicide	Broadcast Rate lb ai/acre % v/v	Estimated Control <sup>1</sup>			Grain Yield bu/acre
			7-17 Annual Grasses	7-16 Johnsongrass	9-22	
1	Poast 1.53 E® + Atplus 411 F®	0.5 1.25	69ab	79a	72 a	17.7 bc
2	Poast 1.53 E + Super Savol®	0.5 1.25	94a	93a	96a	27.9a
3	KK-80 4E + X-77®	0.5 0.25	44 bc	94a	87a	13.9 bcd
4	KK-80 4E + Super Savol	0.5 1.25	93a	95a	90a	24.1ab
5	NC1 96721 1.3E + X-77	1.0 0.25	15 c	88a	98a	16.5 bc
6	RO 13-8895 3E + X-77	0.25 0.25	15 c	73a	86a	14.0 bcd
7	Assure 0.9E + X-77	0.5 0.25	20 c	83a	86a	11.7 cd
8	Vistar 2S + X-77	0.35 0.5	0 c	25 b	33 b	7.1 cd
9	Cultivated Check	---	0 c	0 c	0 c	5.3 d
10	Weedy Check	---	0 c	0 c	0 c	5.5 d

<sup>1</sup>Visually estimated...0 = no control; 100 = death. Means in a column followed by the same letter are not different (P < .05) according to Duncan's Multiple Range Test.

## Part II

Sencor<sup>®</sup> (metribuzin), Surflan<sup>®</sup> (oryzalin), Dual<sup>®</sup> (metolachlor) and Lasso<sup>®</sup> (alachlor) were compared in 1980, 1981 and 1982 as pre-emergence treatments for seedling grass control in soybeans planted no-till. In conjunction with these preemergence herbicides, post-emergence herbicides applied directed and over-the-top were evaluated for rhizome johnsongrass control. The PRE and POST treatments are described in Table 5.

The experiment was conducted on a Grenada silt loam (2% slope). A well-established uniform stand of johnsongrass was present on the site at the beginning of the study. The experiment was designed so that each treatment could be continued in the same area for the duration of the study. Each plot was eight rows 32.5 feet long with 40 inch spacing. The experimental design was a split plot with four replications. Four adjacent rows within each plot were randomly

selected for cultivation each year.

A conventionally prepared seedbed treatment with Treflan<sup>®</sup> (trifluralin) at 0.75 lb a.i./acre applied preplant incorporated (PPI) and Sencor at 0.375 lb a.i./acre applied preemergence (PRE) was used as a standard each year. The seedbed preparation for the conventional plot consisted of early disking, chiseling and late disking while applying PPI, followed by an additional disking and one pass through the field with a seedbed conditioner before planting. Preemergence sprays were applied at planting.

No-till planting was directly into the previous years' soybean stubble. A broadcast application of Roundup or paraquat mixed with a residual preemergence herbicide was made to the no-till plots at planting (Table 5). Fertilizer (300 lb/acre of 0-20-20) was applied 2 inches deep and 2 inches to the side of the seed drill at planting. Forrest soybeans at the rate of 60 pounds per acre

were planted with a John Deere 7000 no-till planter on May 15, June 12 and May 20 in 1980, 1981 and 1982, respectively.

The over-the-top sprays were applied in water at 20 gallons per acre using a tractor-mounted, four row boom with nozzles spaced 20 inches apart when johnsongrass reached an average of 15 to 20 inches in height. Directed spray treatments were made to a 14-inch band with a two-row fender, cultivator applicator when soybeans reached eight inches. Two cultivations were made in four adjacent rows of each plot during the growing season. Two applications of Basagran (bentazon) were applied each year to control cocklebur. The two center rows of each cultivated and non-cultivated plot were harvested with a plot combine.

## Results

Annual grasses and seedling johnsongrass were not major pests in this study. The preemergence herbicides gave satisfactory annual grass control except in 1980 when Sencor (Treatment 1) and Surflan (Treatment 2) gave significantly less control ( $P < .05$ ) with and without cultivation (Table 6) than did conventional seedbed preparation (Treatment 6). However, control ratings were made early in 1980, and additional control likely would have been attained with POST applications to these plots.

Control of johnsongrass varied among treatments within years (Table 6). Control with Treatments 3, 4 and 5 applied to cultivated and uncultivated plots in the last year of the study was equal to the control

Table 5. Preemergence and postemergence herbicides evaluated for control of annual grasses and johnsongrass in soybeans planted no-till on a Grenada silt loam (2% slope) at the MAFES North Mississippi Branch, 1980, 1981 and 1982.

Treatment	Preplant Treatment		Postemergence Treatment					
	Herbicide	Broadcast Rate 1b ai/A %v/v	1980		1981		1982	
			Herbicide	Broadcast Rate 1b ai/A %v/v	Herbicide	Broadcast Rate 1b ai/A %v/v	Herbicide	Broadcast Rate 1b ai/A %v/v
1	Roundup 4E <sup>®</sup> + Sencor 4L <sup>®</sup>	1.0 0.375	Paraquat 2E + X-77 (Dir)	0.125	Paraquat 2E + X-77 (Dir)	0.125 0.5%	Paraquat + X-77 (Dir)	0.125 0.5%
2	Paraquat 2E <sup>®</sup> + X-77 <sup>®</sup> + Surflan 4AS <sup>®</sup>	0.25 0.5% 1.0	Lorox 50W + X-77 (Dir)	0.75 0.5%	Lorox 50W + X-77 (Dir)	0.75 0.5%	Lorox 50W + X-77 (Dir)	0.75 0.5%
3	Paraquat 2E + X-77 + Dual <sup>®</sup>	0.25 0.5% 2.0	KK-80 <sup>1</sup> + X-77	0.375 0.25%	Assure 0.9E <sup>®2</sup> + X-77	0.15 0.5%	Fusilade 4E <sup>®</sup> + Atplus	0.3 1.25%
4	Paraquat 2E + X-77 + Lasso 4E	0.25 0.5% 2.0	Poast 1.5E <sup>®</sup> + Atplus <sup>®</sup>	0.375 1.25%	Poast 1.5E + Atplus	0.3 1.25%	Poast 1.5E + Atplus	0.3 1.25%
5	Paraquat 2E + X-77 + Lasso 4E	0.25 0.5% 3.0	Poast 1.5E + Atplus	0.375 1.25%	Poast 1.5E + Atplus	0.3 1.25%	Whip 1E <sup>®3</sup>	0.15
6	Treflan 4E <sup>®</sup> Sencor 4L	0.75 PPI 0.375 PRE	None		None		None	

<sup>1</sup>Discontinued development after 1980.

<sup>2</sup>Tested under code NC1 96683 and OPX-Y 6202.

<sup>3</sup>Tested under the code HOE 33171.

where conventional seedbed preparation (Treatment 6) was used. Control in 1980 with Treatment 5 applied to cultivated soybeans and Treatments 4 and 5 applied to uncultivated soybeans was better than where conventional seedbed preparation was used. Only Treatment 3 applied to cultivated plots and Treatment 5 applied to uncultivated plots gave control as good as where conventional seedbed preparation was used in 1981. Late-season control with Roundup used as a burn-down at planting and paraquat used as a directed spray (Treatment 1) and paraquat used as a burn-down and Lorox as a directed spray (Treatment 2) was not acceptable.

The lack of control of johnsongrass on the conventionally prepared seedbeds in 1980 was attributed to drought, which prevented effective competition by soybeans. Among the factors contributing to the excellent overall seasonal control of johnsongrass on the conventionally tilled plots in 1981 and 1982 were that (1) the seedbeds were prepared in early spring and some rhizomes were killed by exposure and (2) soybeans were planted late in 1981 and the later disking further reduced early competition by johnsongrass.

Yields on cultivated and uncultivated plots were highest on the conventionally prepared seedbeds each year (Table 7). However, yields from this treatment in the last year of the study were not significantly higher ( $P < .05$ ) than yields from Treatments 3 and 4 with cultivation

Table 6. Control of annual grasses and johnsongrass with preemergence and postemergence herbicides applied to soybeans planted no-till on a Grenada silt loam (2% slope) at the MAFES North Mississippi Branch, 1980, 1981 and 1982.

Treatment	Cultivated						Uncultivated					
	Annual Grasses <sup>2</sup>			Johnsongrass <sup>2</sup>			Annual Grasses <sup>2</sup>			Johnsongrass <sup>2</sup>		
	1980	1981	1982	1980	1981	1982	1980	1981	1982	1980	1981	1982
1	91 b	93a	94a	0 b	34 c	30 b	60 b	85a	96a	0 b	25 c	25 b
2	84 b	91a	94a	0 b	25 c	15 b	58 b	83a	96a	0 b	10 c	15 b
3	95a	94a	94a	24 b	79ab	91a	91a	94a	92a	24 b	68 b	94a
4	95a	95a	96a	20 b	59 bc	98a	91a	95a	91a	71a	55 b	95a
5	94a	91a	95a	66a	74 b	94a	91a	94a	90a	93a	70ab	92a
6	95a	95a	91a	24 b	90a	84a	95a	94a	93a	20 b	76a	86a

Means in a column followed by a common letter are not significantly different at the 0.5 level according to Duncan's Multiple Range Test.

<sup>1</sup>Cultivated June 3 and June 2, 1980; July 7, 1981 and June 11 and June 23, 1982.  
<sup>2</sup>Evaluations of AG, June 16; JG, September 9, 1980.  
 Evaluations of AG, August 5; JG, September 25, 1981  
 Evaluations of AG, July 28; JG, September 8, 1982.

Table 7. Grain yield response of soybeans to preemergence and postemergence herbicides applied to soybeans planted no-till on a Grenada silt loam (2% slope), by treatment, with and without cultivation, MAFES North Mississippi Branch, 1980, 1981 and 1982.

Treatment Number	Grain Yields					
	Cultivated			Uncultivated		
	Bu/A			Bu/A		
	1980	1981	1982	1980	1981	1982
1	24.6 b	11.9 b	17.9 b	18.7 b	11.9 b	20.4 b
2	22.8 b	11.2 b	16.4 b	18.4 b	11.2 b	20.6 b
3	24.7 b	16.7 b	35.6a	15.6 b	13.5 b	36.8a
4	22.4 b	13.6 b	34.5a	23.1 b	13.6 b	35.7a
5	23.3 b	17.6 b	32.9 b	19.5 b	14.6 b	36.7a
6	28.5a	29.5a	40.1a	26.7a	34.6a	38.8a

Means in a column followed by a common letter are not significantly different at the .05 level according to Duncan's Multiple Range Test.

and Treatments 3, 4 and 5 without cultivation.

In Treatment 6 (Table 7), yields were significantly higher than in Treatments 1-5 in 1980 and 1981 in the cultivated and uncultivated plots. In 1982 yields were lower where directed sprays (Treatments

1 and 2) were used to control johnsongrass in the uncultivated plots than where over-the-top herbicides were used. The greater control of rhizome johnsongrass improved the relative yields of soybeans at the end of the three years in the plots without seedbed preparation.

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