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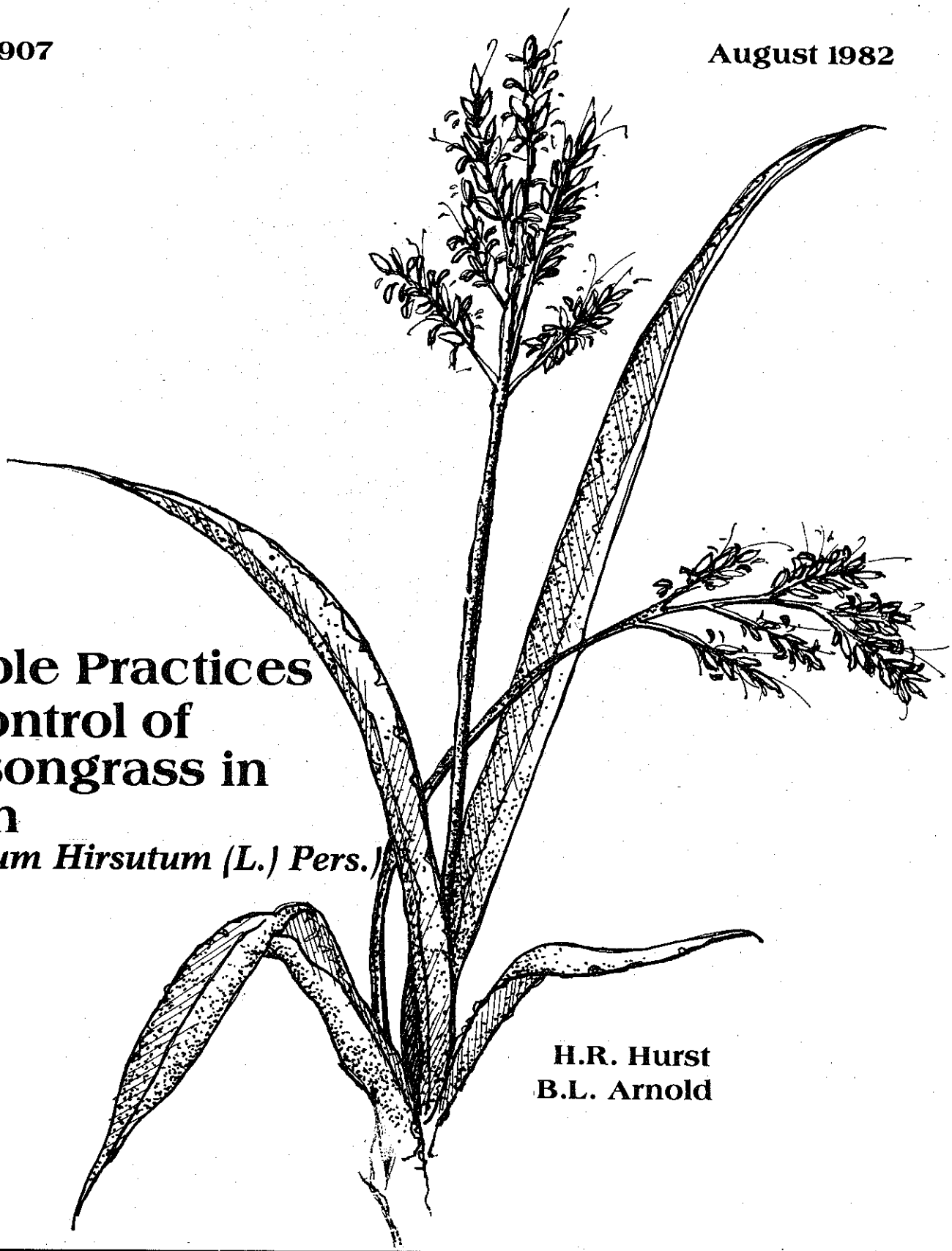

Multiple Practices for Control of Johnsongrass in Cotton

(Gossypium Hirsutum (L.) Pers.)

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It has been estimated that cotton farmers in Mississippi lost more than $81 million to weeds in 1978 (4). Each weed species usually requires a different control strategy, and many chemicals and/or mechanical techniques are used for control of problem weeds in cotton.

Houston (1979) listed johnsongrass [*Sorghum halepense (L.) Pers*] as the fifth most common weed and the second most troublesome weed in cotton in 1978 (3), and the species is especially difficult to control in cotton. Studies have shown that dinitroaniline herbicides (e.g., trifluralin) control johnsongrass very effectively (2,5). Glyphosate also has controlled johnsongrass very effectively (1,6).

We report in this publication the results of a study of the effectiveness of herbicides for control of johnsongrass in cotton.

Figure 1. No Herbicide, only cultivation (for 3 years).
Picture — July 17, 1979.

Figure 2. MSMA 0.7 Over-the-Top + cultivation. MSMA applied OT 2″ cotton 5/27/77 + repeat 6/2 OT 2″ cotton 5/29/78. OT 6″ cotton 6/5/79.
Picture — July 17, 1979.

Materials and Methods

The three-year trial was conducted at the MAFES North Mississippi Branch on a silt loam (19.6% sand, 66.8% silt, 13.6% clay) with 1.2% organic matter and pH of 5.9. The design was a split plot with four replications.

Main plots were 16 rows (40 inches wide and 30 ft long), and treatments were a check (no herbicide) and preplant application of trifluralin, dinitramine/profluralin, butralin or Dowco 295® in 1976, 1977, 1978 and 1979 (Table 1). Fall-applied herbicides were incorporated 3-4 inches deep by two passes with a four-row tandem disk

Table 1. Design of trial for johnsongrass control in cotton, MAFES North Mississippi Branch, 1977-1979.

Main Plot Preplant Treatments[1]					Treatments Superimposed on Each Main Plot Treatment[2]				
		Lbs ai/	Broadcast and incorporated				Lbs/ai	Application		
No.	Herbicides	acre	Date	Method	No.	Herbicides	acre	Date	Method	Stage
		Fall 1976, Spring 1977						1977		
I	Trifluralin (Treflan 4E)	1.50	10-22-76	Tandem disk twice with 2nd pass at 45° angle to first	1	Fluridone (EL 171 4AS)	0.60	5- 9-77	Incorporated 2 inches deep on bed with power incorporator	Preplant
II	Dinitramine (Cobex 2E)	1.00	10-22-76	Tandem disk twice with 2nd pass at 45° angle to first	2	Metriflufen + surfactant (HOE 29152 3E)	1.50	6- 1-77	Post - Directed	4-inch cotton
	Profluralin (Tolban 4E)	1.50	4-20-77	Tandem disk twice with 2nd pass at 45° angle to first		MSMA (Hi-Yield 4E)	1.00	6- 2-77	Over-the-top	4-inch cotton
III	Butralin (Amex 4E)	3.00	10-22-76	Tandem disk twice with 2nd pass at 45° angle to first	3	MSMA MSMA	0.70 0.70	5-27-77 6- 2-77	Over-the-top Over-the-top	2-inch cotton 4-inch cotton
IV	None	---	---	---	4	None	---	---	---	---
		Fall 1977, Spring 1978						1978		
I	Trifluralin	1.50	10-14-77	Tandem disk twice with 2nd pass at 45° angle to first	1	Fluridone	0.60	5-18-78	Incorporated 2 inches deep on bed with power incorporator	Preplant
II	Profluralin	1.50	10-14-77	Tandem disk twice with 2nd pass at 45° angle to first	2	MBR 18337 2S MBR 18337	0.50 0.50	6-10-78 7-13-78	Over-the-top Over-the-top	6-inch johnsongrass 20-inch johnsongrass
III	Dowco 295 6E	3.00	5-18-78	Incorporated 2 inches deep after bedding with power incorporator	3	MSMA (Bueno 6E)	0.70	5-29-78	Over-the-top	2-inch cotton
IV	None	---	---	---	4	None	---	---	---	---
		Spring, 1979						1979		
I	Trifluralin	0.75	5-18-79	Incorporated 2 inches deep after bedding with power incorporator	1	Fluridone	0.60	5-18-79	Incorporated 2 inches deep on bed with power incorporator	Preplant
II	Profluralin	0.75	5-18-79	Incorporated 2 inches deep after bedding with power incorporator	2	MBR 18337 MBR 18337	0.50 0.50	6- 5-79 7- 6-79	Over-the-top Over-the-top	12-inch johnsongrass 24-inch johnsongrass
III	Dowco 295	3.00	5-18-79	Incorporated 2 inches deep after bedding with power incorporator	3	MSMA	0.70	6- 5-79	Over-the-top	6-inch cotton
IV	None	---	---	---	4	None	---	---	---	---

1/ Dinitramine was used in 1976 but its availability was lost so profluralin was used in the spring and fall of 1977 and spring of 1979. Likewise, butralin was used in the fall of 1976 and its availability was also lost so Dowco 295 was used as a spring treatment after bedding in 1978 and 1979.

2/ Fluometuron (Cotoran 4L or 80W) was applied preemergence at 1.25 lb ai/A each year to treatments 2,3, and 4; all row middles were clean cultivated.

harrow, with the second pass at a 45° angle to the first. Spring applied herbicides were incorporated 2 inches deep with a power incorporater after bedding.

Herbicide treatments were superimposed on four rows of each herbicide-treated main plot in spring 1977, 1978 and 1979 (Table 1). The spring treatments were single or sequential applications of herbicides preplant incorporated on the bed, postdirected or over-the-top, and fluometuron (1.25 lbs ai/acre) was applied for broadleaf control except where fluridone was superimposed preplant incorporated.

The repeated treatments were applied to the same plots each year. All treatments were applied broadcast in 20 gal spray volume per acre.

'Stoneville 213' or 'Stoneville 731 N' seed were planted on or about May 10, 1977, 1978 and 1979. Recommended fertilization, planting and insecticide control practices were followed, and two or three cultivations were used to control weeds in the row middles.

Weeds on three 1 sq ft-areas of a preselected row of the untreated control were counted by species about three weeks after planting each year. Evaluations of weed control were made in June, July and September each year.

Yield determinations were based on once-over harvest from the two center rows of each superimposed plot.

Results

Weed counts in the untreated control three weeks after planting were highest for seedling johnsongrass each year (Table 2). Rhizome johnsongrass was not present in 1977 but had increased to 6.5 plants/3 sq ft by 1979.

The interaction between main plot and superimposed treatments in 1977 was not significant. Johnsongrass control was better and seed cotton yield was higher with trifluralin and dinitramine/profluralin applied preplant than for the untreated check and butralin applied preplant (Table 3). Superimposed treatment with metriflufen - MSMA gave significantly better johnsongrass control than resulted from other superimposed treatments when rated in June and July but was not significantly more effective than fluridone when rated in September.

The interaction between main plot and superimposed treatments was significant in 1978 and 1979. Johnsongrass control (September 1977 rating) with fluridone (73%) and metriflufen (81%) applied without preplant treatments (Table 3) did not extend into 1978 (Table 4) when control with fluridone and metriflufen (MBR18337) without preplant treatments (June 1978 rating) was 48 and 35%, respectively. Control of johnsongrass at each evaluation date in 1978 generally was best when MBR 18337 was superimposed on the preplant herbicides (Table 4); however, this advantage in johnsongrass control was not associated with significantly higher yields (Table 5).

The best control of johnsongrass with fluridone in 1978 was when it was superimposed on the profluralin treatment. MSMA superimposed on trifluralin gave better johnsongrass control (September 1978 rating) than was obtained with MSMA superimposed on the other preplant herbicides, and yields from plots with

Figure 3. Treflan 1.5 LB/A in fall 1976, 1977 (Disk incorporated) + 0.75 in spring 1979 (Power driven incorporated).

Picture — July 17, 1979.

Figure 4. Treflan (same as in 3 above). MSMA (same as in 2 above).
Picture — July 17, 1979.

MSMA superimposed on trifluralin were the highest in the 1978 trial.

Control of johnsongrass at each evaluation date in 1979 generally was best when MBR 18337 was superimposed on the preplant herbicides (Table 6), and this advantage in johnsongrass control was associated with higher yields ($P < .05$) in two main plot/superimposed treatments (Table 7). MSMA superimposed on trifluralin or profluralin gave better johnsongrass control (September 1979 rating) than was obtained with MSMA superimposed on butralin, and yields from the MSMA/trifluralin and MSMA/profluralin plots in 1979 were as high as yields from the MBR 18337/trifluralin and MBR 18337/profluralin plots.

Conclusions

The 1979 results of this study suggest that two applications of MBR 18337 to the same plots in the previous two years eliminated the need for preplant herbicides. The excellent control of johnsongrass with MBR 18337 indicated its extended effectiveness, and this was reflected in the high yield from this treatment in 1979. Early-season, over-the-top applications of MSMA did not delay maturity or reduce yield of cotton; however, MSMA required the use of effective preplant herbicides for more effective johnsongrass control and higher cotton yields.

Results of our study reinforce the results of other studies with registered preplant, soil-incorporated herbicides for control of johnsongrass in cotton. The results also indicate a potential advantage for early-season use of over-the-top herbicides now being developed to augment or replace the preplant, soil-incorporated herbicides now used in a continuous cotton rotation.

Table 2. Weeds in the untreated control in a study of the effectiveness of herbicides for control of johnsongrass in cotton, MAFES North Mississippi Branch, 1977-79.[1/]

Species	Year 1977	1978	1979
	No/3 sq. ft.		
Seedling johnsongrass	8.3	52.5	48.0
Rhizome johnsongrass	[3/]	4.8	6.5
Large crabgrass	2.8	[3/]	0.5
Goosegrass	0.8	[3/]	[3/]
Annual morningglory[2/]	0.8	1.0	0.3
Common cocklebur	4.5	4.5	1.0
Redroot pigweed	0.5	[3/]	0.8

1/ Values are an average of three 1-sq. ft. areas of a preselected row.

2/ Equal numbers of ivyleaf, entireleaf, and pitted.

3/ Not present.

Table 3. Effect of main plot preplant herbicide treatments and superimposed herbicide treatments on johnsongrass control and seed cotton yield, by treatment, MAFES North Mississippi Branch, 1977.[1/]

Item	Johnsongrass control when rated in June	July	September	Seed cotton yield
	%			lbs/acre
Main Plot Preplant Treatments[2/]				
I. Trifluralin	92 a	68 a	64 a	1124 a
II. Dinitramine-Profluralin	83 a	79 a	79 a	1209 a
III. Butralin	56 b	34 b	35 b	774 b
IV. None	46 b	33 b	42 b	696 b
Superimposed Treatments[2/]				
1. Fluridone	70 b	50 b	73 a	1149 a
2. Metriflufen-MSMA	92 a	85 a	81 a	1171 a
3. MSMA	59 b	43 b	34 b	739 b
4. None	56 b	36 b	32 b	745 b

1/ Johnsongrass control was visually determined (0 = no injury, 100 = complete kill).

2/ Means in a column followed by the same letter are not different ($P < .05$) according to DMRT.

Figure 5. MBR 18337 0.5 LB/A Over-the-Top 6" JG 6-10-78 + repeat 7/13 and 12" JG 6/5/79 + repeat 7/6 Picture — July 17, 1979.

Figure 6. Treflan (same as in 3 above). MBR 18337 (same as in 5 above). Picture — July 17, 1979.

Table 4. Interaction effects of main plot preplant herbicide treatments and superimposed herbicide treatments on johnsongrass control in cotton, by treatment and dates johnsongrass ratings were made, MAFES North Mississippi Branch, 1978.

Main plot preplant treatments	Superimposed treatments 1. Fluridone	2. MBR 18337	3. MSMA	4. None	Average
	% Johnsongrass Control				
	June Rating				
I. Trifluralin	65 bB[1/]	95 aA	93 aAB	88 aAB	85
II. Profluralin	89 aA	95 aA	91 aA	58 bB	83
III. Butralin/DOWCO 295	68 bA	86 aA	68 bA	3 cB	56
IV. None	48 bA	35 bAB	38 cAB	3 cB	31
Average	68	78	73	38	
	July Rating				
I. Trifluralin	43 bB[1/]	94 aA	91 aA	68 aAB	74
II. Profluralin	83 aA	89 aA	88 aA	28 bB	72
III. Butralin/DOWCO 295	43 bB	83 aA	58 bAB	6 bC	48
IV. None	34 bAB	61 bA	35 bAB	5 bB	34
Average	51	82	68	27	
	September Rating				
I. Trifluralin	51 bC[1/]	96 aA	91 aAB	66 aBC	76
II. Profluralin	76 aAB	91 aA	64 bB	6 bC	59
III. Butralin/DOWCO 295	48 bB	89 aA	28 cBC	0 bC	41
IV. None	15 cAB	53 bA	3 cB	0 bB	18
Average	48	82	47	18	

1/ Means with the same lower case letter in a column or with the same upper case letter in a row are not different ($P < .05$) according to DMRT. Johnsongrass rating was determined visually (0 = no control, 100 = complete kill).

Table 5. Interaction effects of main plot preplant herbicide treatments and superimposed herbicide treatments on seed cotton yield, by treatment, MAFES North Mississippi Branch, 1978.

Main plot preplant treatments	Seed cotton yield Superimposed treatments 1. Fluridone	2. MBR 18337	3. MSMA	4. None	Average
	lbs/acre				
I. Trifluralin	626 abB[2/]	893 aB	1350 aA	899 aB	942
II. Profluralin	1040 aA	899 aA	1144 aA	278 bB	840
III. Butralin/DOWCO 295	806 abA	986 aA	681 bA	131 bB	651
IV. None	463 aAB	697 aA	474 bAB	158 bB	448
Average	734	869	912	367	

1/ Yields generally were below average because of extensive drought during mid- and late-season.

2/ Means with the same lower case letter in a column or with the same upper case letter in a row are not different ($P < .05$) according to DMRT.

Table 6. Interaction effects of main plot preplant herbicide treatments and superimposed herbicide treatments on johnsongrass control in cotton, by treatment and dates johnsongrass ratings were made, MAFES North Mississippi Branch, 1979.

Main plot preplant treatments	Superimposed treatments 1. Fluridone	2. MBR 18337	3. MSMA	4. None	Average
	% Johnsongrass Control				
	June Rating				
I. Trifluralin	50 bC[1/]	98 aA	83 aAB	66 aBC	74
II. Profluralin	73 aA	86 aA	70 aA	15 bB	61
III. Butralin/DOWCO 295	75 aA	88 aA	76 aA	15 bB	64
IV. None	10 bB	55 bA	0 bB	16 bB	
Average	52	82	57	24	20
	July Rating				
I. Trifluralin	46 aC[1/]	99 aA	84 aB	68 aBC	74
II. Profluralin	55 aBC	98 aA	65 abB	30 bC	62
III. Butralin/DOWCO 295	68 aAB	90 aA	50 bcBC	28 bC	59
IV. None	28 bB	85 aA	21 cB	1 bB	34
Average	49	96	55	32	
	September Rating				
I. Trifluralin	44 aC[1/]	99 aA	89 aB	66 aBC	75
II. Profluralin	68 aBC	99 aA	73 abB	37 bC	69
III. Butralin/DOWCO 295	63 aB	90 aA	51 bBC	15 bC	55
IV. None	5 bB	99 aA	13 cB	0 bB	29
Average	45	97	57	30	

1/ Means with the same lower case letter in a column or with the same upper case letter in a row are not different (P < .05) according to DMRT. Johnsongrass control was determined whereby (0 = no control, 100 = complete kill).

Table 7. Interaction effects of main plot preplant herbicide treatments and superimposed herbicide treatments on seed cotton yield, by treatment, MAFES North Mississippi Branch, 1979.

Main plot preplant treatments	Seed cotton yield Superimposed treatments 1. Fluridone	2. MBR 18337	3. MSMA	4. None	Average
	lbs/acre				
I. Trifluralin	1231 aA[1/]	1481 aA	1497 aA	1481 aA	1423
II. Profluralin	1171 aBC	1710 aA	1470 aAB	768 bcC	1280
III. Butralin/DOWCO 295	1476 aB	1590 aAB	1220 aBC	861 bC	1287
IV. None	632 bB	1786 aA	653 bB	354 cB	856
Average	1128	1642	1210	866	

1/ Means with the same lower case letter in a column or with the same upper case letter in a row are not different (P < .05) according to DMRT.

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