

Weed Flaming Studies

In 2001, we initiated studies using flaming methods as part of an overall management system to control weeds in corn and soybeans. The objective of these studies is to determine the ability of flaming to control weeds in both conventional and ridge-till. To date, ridge-till has been superior to conventional tillage in regard to weed control; however, many growers who are interested in pesticide-free farming want to use conventional tillage. Flaming has the potential to eliminate small weeds close to corn and in the row of crops where conventional cultivators cannot reach. Also, in wet weather, flaming can be used if the ground is too moist for cultivation.

Corn can be flamed early when its growing point is still below ground and will not be injured, or later after its stem thickens. We conducted several experiments in 2001, and our best response to flaming was its use after cultivation, where 90-95 % of the giant foxtail in the row were killed. Data collected to date indicates this method is effective when weeds are 6 " or shorter; however, weeds over 8" tall generally survive flaming. Preliminary results with soybeans have yielded mixed results. Weed kill can be high, but injury to the soybeans can be severe. The focus of future flaming experiments will be to refine treatments which will enable us to kill weeds, but not injure the soybean crop.

Experiment 1: Flaming Corn in Ridge-Till

This corn was planted on 6/18/01, cultivated twice and ridged 1.5 weeks before flaming. Flaming occurred on 7/27/01 at 2 mph at 62 psi pressure when the corn was in the V-6 to V-9 stage (V-8 being the most common). Weeds were scored on 8/02/01 and 11/03/01 just prior to harvest. Yields were obtained by using a weigh wagon. Results of this experiment are shown in Table 1, below.

Flaming significantly reduced the number of weeds, especially grasses in the row. Although there were fewer weeds between rows after flaming, the differences in weed populations between rows were insignificant. Flaming was done when weeds were 4-6 inches tall, so kill was very effective. Although flaming increased foxtail control, there was no corresponding increase in yield after flaming.

Experiment 2: Flaming in Ridge-Tilled Soybeans

This experiment was flamed on 8/15/01 at 2.5 mph with 60 psi pressure. Soybeans were in early pod-fill stage and the 36 inch rows were about 1 foot apart from full canopy at flaming. Giant Foxtail was scored on 10/26 using percent ground cover as a basis. Weeds were flamed when giant foxtail were 6-20 inches tall. Yields were obtained by harvesting with a small plot combine. Results of this experiment are shown in Table 2, below.

Giant foxtail was significantly reduced by flaming, Table 2. The yield was slightly higher in the flamed plots, but the difference in yield was not statistically significantly different.

Table 1: The yield and weed scores of ridge-tilled corn after flaming. Weed scores are in percentage of ground cover by total weeds (broadleaves and grasses) and grass (giant foxtail) both in the row and between corn rows. In the row weeds encompassed the region 4 inches on both sides of the row's axis. Data is an average of 5 repetitions per treatment.

Yield	<u>Flamed</u> 100 Bu/ac	<u>Non-flamed</u> 101 Bu/ac
Weed Scores in the Row on 9/02/01		
Total Weeds	14 %	51 %
Total Broadleaves	9 %	19 %
Total Grasses (giant foxtail)	5 %	32 %
Weed Scores Between Rows on 9/02/01		
Total Weeds	1.0 %	1.9 %
Total Broadleaves	0.8 %	1.4 %
Total Grasses (giant foxtail)	0.2 %	0.5 %
Weed Scores in the Row on 11/03/01		
Total Weeds	13 %	39 %
Total Broadleaves	3 %	10 %
Total Grasses (giant foxtail)	10 %	29 %
Weed Scores Between Rows on 11/03/01		
Total Weeds	2 %	12 %
Total Broadleaves	1 %	1 %
Total Grasses (giant foxtail)	1 %	11 %
	LSD= 11%	LSD= 24%

Table 2: Table 2 below shows yield and weed scores of soybeans flamed at early pod-fill. Data is an average of 5 repetitions per treatment.

	<u>Flamed</u>	<u>Non-Flamed</u>
Yield	24 Bu/ac	19 Bu/ac
% cover of Giant Foxtail	20%	55%

Experiment 3: Flaming in Ridge-Till and Conventionally Tilled Corn

This was a complex experiment where flaming treatments were replicated in both ridge-till corn and in conventionally tilled corn. Note: The ridges were built just less than 2 months before planting instead of the previous season. Due to this spring activity, weed pressure was heavy on the ridges and required an immediate emergency cultivation after planting. The corn was planted on 5/30/01 and rotary hoed on 6/11. On 6/28 the crop was cultivated, and on 7/06 the fields were cultivated or ridged. Fields were flamed on 7/12 at different treatment speeds while the propane pressure was maintained at 60 psi. Weeds were scored on 7/30/01 and on 11/3 just before harvest. Yields were obtained by hand harvesting and shelling the ears of a 10 foot representative section from each plot. Treatments were replicated four times. The total number of treatments in this experiment was 16, Table 3.

The yields reflect the influence of weed control in the plots that were not cultivated. Yields were significantly less in both, ridge-till and conventional tillage, if the plots were not cultivated and weed control relied solely on flaming. Yields ranged from 73-81 Bu/ac and weed scores were mostly in the 94-100 % range if plots were only flamed for weed control.

Weed control for all treatments was generally better in ridged than in conventional plots; however, yields for comparable treatments were often greater in the conventionally tilled plots than in the ridged-tilled plots. It should be noted that the ridged corn was generally more pale than the conventional corn during the early part of the growing season; which indicates nutrient stress. The ridged corn treatment yielded 117 Bu/ac, while its conventionally tilled counterpart yielded 129 Bu/ac. This is particularly interesting since the weeds in the conventionally tilled plots were 3 times greater than the weeds in the ridge-tilled counterpart, Table 3. Consequently, weed control was not the only factor determining yields in these plots.

Variation between reps of treatments was great, so the least significant differences were high for all treatments.

Table 3: The yield and weed scores from corn plots grown with ridge and conventional tillage treated with several flaming methods.

Treatment	Yield (Bu/ac)	Weed Scores on 7/29/01 % Total Coverage	
		In Row	Between Rows
Conventional Tillage			
Cultivated Twice (6/28/01 & 7/6/01)	129	56	23
Cultivated Once (6/28/01)	126	59	43
Cultivated (6/28/01) Flamed at 3 mph	124	61	37
Cultivated (6/28/01) Flamed at 1.5 mph	118	66	40
Not Cultivated, Flamed at 3 mph	73	96	96
Not Cultivated, Flamed at 1.5 mph	75	100	94
Cultivated Once (7/6/01) Flamed at 3 mph	106	45	23
Cultivated Once (7/6/01) Flamed at 1.5 mph	117	52	24

Ridge-Tillage

Cultivated and ridged	117	17	5
Cultivated Once (6/28/01)	111	46	53
Cultivated, Ridged, Flamed at 3 mph	106	61	15
Cultivated, Ridged, Flamed at 1.5 mph	121	43	9
Not Cultivated, Flamed at 3 mph	81	84	100
Not Cultivated, Flamed at 1.5 mph	74	68	94
Cultivated (6/28/01), Flamed at 3 mph	104	68	50
Cultivated (6/28/01), Flamed at 1.5 mph	110	24	15

LSD= 21

LSD = 44

LSD = 38
