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Does Chemical Leaf Burn of Double Crop Soybeans Reduce Yield?

L.J. Grabau, T.W. Pfeiffer, and S. Nevins

Most farmers who have applied acifluorfen (sold as Blazer or Tackle) for postemergence control of broadleaf weeds in soybean fields are aware that leaf crinkling, bronzing, and necrosis can result. Despite this, studies in Kentucky, Illinois, Arkansas, and South Carolina have shown that full season soybeans have plenty of time to recover from leaf burn caused by this herbicide, and no yield losses have been found. However, double crop soybeans are usually planted much later than the full season crop. This delay in planting may reduce the time for plants to complete vegetative growth before beginning the seed production process. Therefore, double crop soybeans may be limited in their ability to recover from acifluorfen injury in time to produce as much grain as non-sprayed soybeans. Our objective was to determine if yields of double crop soybeans are reduced by leaf burn due to the use of acifluorfen.

Materials and Methods

Douglas soybeans (mid Maturity Group IV) was planted near Lexington (1986 to 1988) in 14" rows at a rate of 160,000 viable seeds/A. Plots were 9 rows wide by 25 feet long. The soil was a Maury silt loam fertilized according to UK recommendations. Table 1 shows rainfall patterns during early and late summer, as well as some of the production practices employed. Rainfall from May to July was less than normal in all three years, especially in 1988. Late season rainfall was slightly above normal in 1986 and 1988, but far below normal in 1987. Full season soybeans were planted in early May of each year, but poor emergence (1986) and severe drought (1988) delayed double crop planting beyond the desired time-frame in those years. Since many Kentucky farmers planted soybeans in mid-July due to weather problems in both 1988 and 1989, this study represents weather related problems faced by double crop soybean producers during 1986 to 1989. Conventional tillage was used in 1986, whereas no-tillage practices were used in 1987 and 1988 in order to get better double crop emergence, as well as to conserve soil moisture. Additional herbicides were needed to control a broad

spectrum of weeds, thus eliminating differences due to weed competition (see Table 1). Soybean plots were treated with Roundup using a wick to eliminate any weeds escaping the other herbicides.

Acifluorfen was applied at 0.0, 0.5, or 1.0 lb a.i./A to soybeans at 2, 4 or 6 leaf stages. Since the recommended acifluorfen rate is 0.5 lb/A, we tested up to twice the normal rate in order to be assured of causing injury as well as to simulate the conditions that would occur with overlapping spray patterns. Treatments were applied with a CO₂ backpack sprayer, and included 0.20% (volume basis) of an 80% nonionic surfactant in 30 gallons of water per acre. Treatments were consistently applied between 8 and 10 AM in order to minimize potential time-of-day effects on leaf injury. Leaf injury was rated 48 hours after each application. Harvest was done with a small plot combine, and yields were converted to a 13% moisture basis.

Results and Discussion

Leaf Injury:

Table 2 shows how both soybean leaf stage and acifluorfen rate influenced leaf injury. Somewhat surprisingly, these three year averages showed very little difference in leaf injury between full season and double crop soybeans. The only significant difference between leaf injury of full season and double crop soybeans was at 0.5 lb/A acifluorfen at the 4 leaf stage. In that instance, leaf injury was slightly less for double crop soybeans. Injury ratings were variable and appeared to be influenced more by temperature and relative humidity at the time of treatment than when the crop was planted.

In general, the double acifluorfen rate (1.0 lb/A) caused substantially more leaf injury than the recommended rate. In addition, treatment at the two leaf stage caused more leaf injury than did later treatments. However, since acifluorfen is more effective in controlling small weeds than large weeds, it may not be advisable to delay spraying to reduce soybean injury. These results agree quite well with previous experiments in states surrounding Kentucky.

Soybean Yield:

Yields are shown in Table 3, and ranged from 6 to 50 bu/A for the years studied. Yields of double crop soybeans were not influenced by acifluorfen, even at the 1.0 lb/A rate, in 1986 or 1987. In 1988, only the 1.0 lb/A rate reduced double crop yield. However, the very low yields of control plots (due to the combination of late planting and early frost) may make this study less reliable than the 1986 and 1987 studies. Looking at these results in another way, when averaged over all three years studied, yield of double crop soybeans treated with the recommended rate of

acifluorfen (0.5 lb/A) was 13.1 bu/A compared to a yield of 13.2 bu/A for untreated double crop plots.

Conclusions

Acifluorfen caused no more injury to double crop soybeans than to full-season soybeans. Further, it reduced yields only during the unusual conditions of the 1988 double crop study and then only when it was applied at twice the recommended rate. Thus, our results indicate that soybean farmers do not need to be any more concerned about acifluorfen-caused leaf injury of double crop soybeans than of full season soybeans. However, it is important to note that these results may have been different if a more phytotoxic herbicide such as lactofen (Cobra) had been used. Thus, these studies should not be used to predict that yield of double crop soybeans will be unaffected by more phytotoxic herbicides.



Extension Soils Specialist

Table 1. Rainfall, planting dates, tillage systems, and herbicides used for weed control in herbicide injury studies from 1986 to 1988.

<u>Item</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>
Rainfall (inches) ^a			
May to July	9.5	10.9	6.9
Aug. to Sept.	7.8	1.7	7.4
Total	17.3	12.6	14.3
Planting date			
Full season	May 6	May 6	May 3
Double crop	July 22	June 16	July 14
Tillage system	conventional	no-till	no-till
Herbicides	Lasso Lorox Roundup ^b	Paraquat Lasso Lorox Basagran Roundup ^b	Paraquat Lasso Scepter ^c Fusilade Roundup ^b

^aLong term averages were 13.7 inches for May to July, and 6.2 inches for Aug. to Sept.

^bApplied using a hand-held wick to kill weeds which escaped the other herbicides.

^cWe switched from Lorox to Scepter in 1988 to get longer term control of broadleaf weeds.

Table 2. Leaf injury of full season and double crop soybeans as influenced by leaf stage and acifluorfen rates (averaged across years).

<u>Growth stage</u>	<u>Acifluorfen rate</u>	<u>Full season</u>	<u>Late planted</u>
	lb/A	----% leaf injury----	
2 leaf	0.0	0	0
	0.5	45 ^a	48
	1.0	72	73
4 leaf	0.0	0	0
	0.5	42	34
	1.0	58	53
6 leaf	0.0	0	0
	0.5	19	22
	1.0	35	36

^aLSD (0.10) for comparing any two numbers in the table was 5.

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Table 3. Influence of year, planting date, and acifluorfen rates on soybean yield averaged across times of application.

<u>Year</u>	<u>Planting date</u>	<u>Acifluorfen rate (lb/A)</u>		
		<u>0.0</u>	<u>0.5</u>	<u>1.0</u>
		-----bu/A-----		
1986	FS ^a	12.9	16.2	14.3
	DC	14.1	12.5	11.9
1987	FS	24.4	23.5	23.0
	DC	17.1	19.2	17.8
1988	FS	45.5	49.5	45.9
	DC	8.5	7.6	5.9

^aFS, full season, and DC, double crop.

^bLSD(0.10) for comparing yield at different acifluorfen rates within a single planting date in a given year was 2.5 bushels/A.