IMPACT OF WHEAT HERBICIDES ON DOUBLE-CROPPED SOYBEANS

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INTRODUCTION:

Numerous weed species can infest wheat in Kentucky and several of these are particularly troublesome and can decrease wheat yield. Cheat, hairy chess, and Italian ryegrass are especially troublesome and difficult to control with currently available herbicides. Chickweed, purple deadnettle, henbit, and several mustard species are also problems. Because of the occurrence of these weeds, wheat growers are interested in the evaluation of herbicides labeled for use in wheat. There are several herbicides labeled for wheat in states other than Kentucky, primarily in continuous wheat. Double-cropped soybeans follow essentially all of the wheat grown in Kentucky and herbicides used for wheat weed control must not persist in soil and cause injury to soybeans.

OBJECTIVE:

Determine if wheat herbicides applied in the fall or spring cause injury to double-cropped soybeans.

METHODS:

Wheat was planted in October of 1997 and 1998 at Princeton and 1998 at Lexington. After wheat harvest in June of 1998 and 1999, soybeans were planted no-till into the standing wheat stubble. Two soybean varieties were evaluated: AG 4501, an STS (sulfonylurea tolerant soybean) and AG 4702, a non-STS. Several of the wheat herbicides discussed in this report kill weeds (and crops) by inhibiting the acetolactate synthase enzyme (ALS). STS soybeans were developed because of their tolerance to ALS inhibiting herbicides and we were interested in knowing if STS soybeans would be tolerant to these wheat herbicides.

Wheat herbicides were evaluated for double-crop soybean injury at Princeton in 1998 and 1999 and Lexington in 1999. Treatments were applied to actively growing wheat in late November and in mid-March. Soybean injury was evaluated in mid-August, 8 weeks after soybean planting. Listed in the following table are products evaluated in these studies:

HERBICIDE	RATE	ACTIVE INGREDIENTS
Harmony Extra75 DF	0.6 oz/A	*thfensulfuron & *tribenuron
Peak 57 WDG	0.75 oz/A	*prosulfuron
Ally 60 DF	0.1 oz/A	*metsulfuron
Maverick 75 WSG	0.5 oz/A	*sulfosulfuron
Assert 2.5 E	1.5 pt/A	*imazamethabenz
Sencor 75 DF	3 oz/A	metribuzin
Curtail 2.38 E	2.5 pt/A	clopyralid + 2,4-D

* ALS-inhibiting herbicides

RESULTS:

Soybean Injury

No injury was noted in 1998 to either soybean variety from fall or spring applications of the herbicides (Table 1). Rainfall was below normal from the time of wheat planting, and fall herbicide applications, until the spring herbicide applications in 1998. However, 22 inches of rainfall was received on the plots in April, May, and June. This excessive rainfall probably contributed to a more rapid herbicide loss in the spring. Substantial soybean injury was noted in 1999 at Princeton and Lexington (Table 1). Rainfall from the time of wheat planting until the spring herbicide treatments was near normal at Princeton and slightly below normal at Lexington.

Peak and Maverick caused the greatest injury in Princeton with fall and spring treatments on the non-STS variety with the spring treatment having greater injury. However, the STS variety exhibited much less injury from Peak and Maverick. Ally applied in the fall caused 10% injury to the non-STS and 3% injury to the STS variety at Princeton. A similar response was noted with the fall treatment of Maverick to the STS

variety. Assert , Harmony Extra and Sencor caused little, if any, injury at Princeton. The spring treatment of Peak produced the greatest injury to the non-STS variety at Lexington. Maverick injury was less at Lexington compared to Princeton for the non-STS variety. Less injury was noted at both locations with the STS variety for Harmony Extra, Peak, Ally, Maverick, and Assert.

Although Curtail is not an ALS-inhibiting herbicide it did cause injury to double-cropped soybeans at Princeton with the spring treatment and the fall and spring treatment at Lexington. The clopyralid component of Curtail is believed to have persisted in soil and caused injury to the double-cropped soybeans.

Soybean Yield

Over all locations, soybean yield was low (Table 2). Rainfall at Princeton in 1998 was very limiting during the soybean-growing season, although soil moisture was excellent at the time of planting. Soybean yield in 1999 at Princeton was low and averaged about 12 bushels per acre and was attributed to the low rainfall received during the soybean-growing season. The plots at Lexington were not harvested. These soybeans never produced pods with seeds due to the severe lack of water at this location. It was difficult to draw conclusions from these yield data because of the relatively low, to very low, yields; however, the greatest soybean injury was noted in 1999 with a spring treatment of Maverick and this treatment produced the lowest yield (Table 2). Curtail injury also reduced yield in 1999. Yield was generally greater with the STS variety compared to the non-STS variety in 1999.

SUMMARY:

This research shows the importance of following label restrictions regarding rotational crops. Some of the wheat herbicides in these studies persisted in the soil and caused injury to double-cropped soybeans during a year when the amount of rainfall was below normal. The magnitude and risk of soybean injury from most ALS-inhibiting herbicides in this study tended to be greater for spring applications compared with fall applications. The STS variety used in these studies exhibited less soybean injury than the non-STS variety. This response is encouraging because it might allow for the use of some herbicides for wheat weed control that could not be used. However, additional

research under more "normal" climatic conditions is needed.

TABLE 1. SOYBEAN INJURY OF NON-STS AND STS VARIETIES AT PRINCETON IN 1998 AND 1999 AND LEXINGTON IN 1999. SOYBEAN INJURY WAS EVALUATED IN MID-AUGUST OF EACH YEAR.

		PERCENT SOYBEAN INJURY					
		Princeton 98		Princeton 99		Lexington 99	
Herbicide	Timing	Non-STS	STS	Non-STS	STS	Non-STS	STS
Harmony Extra	Fall	0	0	3	0	0	0
Harmony Extra	Spring	0	0	0	0	0	0
Peak	Fall	0	0	10	0	7	0
Peak	Spring	0	0	23	3	40	0
Ally	Fall	0	0	10	3	0	0
Ally	Spring	0	0	3	0	3	0
Maverick	Fall	0	0	13	7	0	0
Maverick	Spring	0	0	47	0	13	0
Assert	Fall	0	0	0	0	10	0
Assert	Spring	0	0	3	3	7	7
Sencor	Fall	0	0	0	0	0	0
Sencor	Spring	0	0	0	0	13	0
Curtail	Fall	0	0	0	0	10	0
Curtail	Spring	0	0	23	10	13	3
LSD (0.05)	NS	NS	22	8	15	6	

TABLE 2. SOYBEAN YIELD OF NON-STS AND STS VARIETIES AT PRINCETON IN 1998 AND 1999

		SOYBEAN YIELD (BU/AC)			
		Princeton 98		Princeton 99	
Herbicide	Timing	Non-STS	STS	Non-STS	STS
Harmony Extra	Fall	15	19	12	13
Harmony Extra	Spring	18	17	13	13
Peak	Fall	18	18	12	18
Peak	Spring	13	26	13	16
Ally	Fall	16	18	12	13
Ally	Spring	26	21	10	12
Maverick	Fall	28	22	14	14
Maverick	Spring	17	23	7	12
Assert	Fall	18	15	14	12
Assert	Spring	17	15	11	13

Sencor		Fall	25	19	15	15
Sencor		Spring	25	23	13	15
Curtail		Fall	24	24	13	14
Curtail		Spring	26	22	9	14
		LSD				
(0.05)	NS	NS	NS	NS		