WEED CONTROL FOR NO-TILLAGE SOYBEANS IN RYE STRAW

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INTRODUCTION

Soybean (Glycine max L. Merr.) is an important cash crop to Florida agriculture. In recent years acreage has steadily increased and is expected to be over 500,000 acres by 1985, This crop has a potential gross value of over 100 million dollars annually, adding significantly to Florida's economy. Most of Florida's soybean crop is planted succeeding other crops such as small grains, vegetables, and corn in multiple cropping systems.

Significant acreage of small grains grown for grain is produced in Florida. Soybeans–is an ideal crop to succeed small grain in a succession double cropping system. Past experience shows that no-tillage planting of soybeans into small grain straw can have advantages as compared to conventional tillage management. Some of these advantages include: 1) Elimination of tillage for seedbed preparation, thus conserving time, fuel cost, and equipment, and (2) Conservation of soil and water due to ground cover from the straw.

Weed control in no-tillage soybeans planted into small grain straw can often get out of hand if proper herbicides and timing of herbicide application are not managed properly. Weeds probably cause the greatest yield loss and .is the most devistating pest encountered in soybean farming irrespective of tillage regeime. The objective of this study was to investigate herbicides and no-tillage management variables for control of weeds and treatment influence on yield of soybeans planted in rye straw.

MATERIALS AND METHODS

This study was conducted from 1977 through 1979 at the Green Acres Agronomy farm near Gainesville, Florida. Cobb soybeans were planted into rye straw in late May using a Brown Harden Superseeder minimum tillage planter. Soybeans were seeded in 30 inch rows at 12 seed per foot. Main treatments were no-tillage in-row subsoil versus no-tillage coulter slot-planting. Four sub-treatments were herbicide combinations as shown under Tables 1 and 2. The test was replicated three times. All plots received .25 pounds a.i. paraquat plus 1 pint Ortho x 77 per 100 gallons of water applied post directed when the crop was 14 to 18 inches in height.

Weed populations were estimated at harvest each year and are reported as percentage of the ground covered by weeds. No ground cover of weeds would represent 0%while complete ground cover would represent 100%.

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RESULTS AND DISCUSSION

Yield

Soybean yield was considerably higher than the Florida state average (Table 1). No-tillage coulter slot-planting gave the highest yield in 1977 as compared to no-tillage in-row subsoil. Weather conditions in 1977 were such that severe moisture stress occurred all over Florida. Several sources indicated that sufficient rainfall did not occur to seal up the subsoil slots in 1977 and instead of obtaining better soil moisture utilization, the reverse occurred. No data is available to substantiate this hypothesis: however, the open slot may have caused soil moisture to evaporate and be lost more easily. Main plot treatments had no affect on yield in 1978 or 1979.

Herbicide treatments had no effect on yield of soybeans in 1977. The area was in bahiagrass *(Paspalum Notatum* Flugge) Var.) sod and was destroyed by tillage in 1976. Weeds were not a big problem in 1977 as in subsequent years, Also bahiagrass reestablishment and competition did not become significant until after the first year. These combined factors are thought to be the reasons for all herbicides resulting in similar yield of soybeans in 1977.

A definite trend emerged among herbicide variables in 1978 and 1979. The best treatment (alachlor + metribuzin + glyphosate) gave a three-year average of 37 bu/A. This was a six bu/A advantage over using glyphosate alone, which resulted in the lowest yield. Applications of oryzalin + metribuzin + paraquat and prodiamine + metribuzin + paraquat were not statistically different in yield from alachlor + metribuzin + glyphosate.

Ground Cover of Weeds

The percentage ground cover of weeds at harvest time (Table 2) shows a strong relationship with yield. As yield increased weed cover decreased. Note that weed pressure was much greater where glyphosate was used alone. All other treatments had the same ground cover of weeds at harvest. This difference was due. to residual herbicides used in the first three treatments but not in treatment four.

If the three year average yield in Table 1 is plotted against the three year average percentage ground cover of weeds in Table 2 then we obtain a simple change relationship given by the following equation: yield = 38 bushels - .23(x change in percent ground cover of weeds). This means that soybean yield was reduced by 0.23 bu/A as the percent ground cover of weeds increased by 1%. If there had been no weeds, yield should have been 38 bu/A. If there had been 30% round cover of weeds, yield prediction would be 38 bushels - .23(30%)or 31 bu/A.

Summary

With proper management, no-tillage soybeans in rye straw can be grown successfully. Proper selections and timing of herbicides are critical for successful weed control in no-tillage soybeans. This study shows

that alachlor + metribuzin + glyphosate provided good overall yield and the least competing weeds. Other treatments, using residual herbicides and the contact herbicide paraquat were statistically equal in yield and in weed control to the above treatment. Soybean yield was reduced by almost 1/4 bu/A for each percentage increase in ground cover of weeds.

Table 1. Yield as affected by subsoiling and chemical weed control for minimum tillage soybeans.

Treatment	1977 Sub-Soil	1977 Coul.	1977 $\bar{X}$	1978 Sub-Soil	1978 Coul.	1978 $\bar{X}$	1979 Sub-Soil	1979 Coul,	1979 $\bar{X}$	3-Year Average Sub-Soil	3-Year Average Coul,	3-Year Average $\bar{X}$
	Percent											
1[†]	41	46	40a[§]	34	32	33a	38	31	35a	37	36	37a
2	33	47	44a	32	28	30ab	31	31	31ab	32	35	34ab
3	37	43	**40a**	30	28	29ab	31	31	31ab	32	34	33ab
4	37	41	39a	29	27	28 b	26	29	28 b	30	32	31 b
$\bar{X}$	37	44[‡]		31	29NS		32	31**NS**		33	34NS	

[†]1. Alachlor (Lasso) 3 lb. a.i./A + Metribuzin (Sencor 50WP) 0.38 lb a.i./A + glyphosate (Roundup) 2 lb a.i./A.
2. Oryzalin (Surflan 75W) 1 lb. a.i./A + Metribuzin (Sencor 50WP) 0.38 lb/A a.i. + paraquat (Ortho Paraquat CL) .5 lb a.i./A + Ortho X-77 added at 1 pt/100 gal. spray.
3. Prodiamine (Rydex) 0.33 lb a.i./A + Metribuzin (Sencor 50WP) .38 lb a.i./A + paraquat (Ortho Paraquat CL) .5 lb a.i./A + Ortho X-77 added at 1 pt/100 gal. spray.
4. Glyphosate (Roundup) 2 lb a.i./A.

‡Significant difference between tillage means at 0.05 level of probability.

§Means followed by common letters in the same column are non significant at the 0.05 level of probability.

NS = Non-significant

Alachlor - 2-chloro-2',6'-diethyl-N-(methoxymethyl)acetanilide
Metribuzin - 4-amino-6-tert-butyl-3-(methylthio)-as-triazin-5(4H)one
Glyphosate - N(phosphonemethyl)glycine
Oryzalin - 3,5-dinitro-N^4,N^4-dipropylsulfanilamide
Paraquat - 1,1'-dimethyl-4 4'-bipyridinium ion
Prodiamine - 2,4-dinitro-N3,N3-dipropyl-6-(trifluoromethyl)-1,3-benzenediamine

Table 2. Percent ground cover of weeds at harvest of minimum tillage as affected by tillage and chemical weed control.

Treatment	1977			1978			1979			3-Year Average		
	Sub-Soil	Coul.	$\bar{X}$	Sub-Soil	Coul,	$\bar{X}$	Sub-Soil	Coul.	$\bar{X}$	Sub-soil	Coul.	$\bar{X}$
	percent											
1.†	21.3	11.3	16.3 b§	12.0	14.0	13.0 b	6.8	12.5	9.7a	13.5	13.8	13.21
2.	25.8	17.0	21.4 b	15.3	13.0	14.2 b	16.0	18.8	17.4a	19.3	16.3	17.8'
3.	22.5	23.8	23.2 b	22.0	12.0	17.0 b	11.3	18.8	15.1a	18.8	18.3	18.61
4.	41.3	26.3	33.8a	61.3	43.8	52.6a	14.5	22.5	18.5a	39.0	28.3	33.7a
$\bar{X}$	27.8	19.6NS		27.7	29.7NS		12.2	18.2NS		22,7	18.9NS	

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