COVER CROPS AND HERBICIDES INTEGRATION FOR WEED CONTROL IN COTTON Annu Kumari Department of Crop, Soil and Environmental Sciences Auburn University, Auburn, AL Andrew J. Price United States Department of Agriculture Auburn, AL

Abs<u>tract</u>

Cotton grows comparatively slower than other row crops in germination and root development during the initial vegetative stage. Therefore, it is important to keep cotton weed-free during this critical phase to maintain lint yield. An experiment was conducted with the objective of Increasing the adoption of integrated weed management tactics by integrating weed suppressive cover crop qualities and chemical weed control to maintain long-term viability for sustainable agriculture. Six cover crop systems were utilized as main plots in a split-plot design: winter fallow, cereal rye, black oats, crimson clover, radish, and a mixture of all. In addition, four herbicide treatments were used in subplots: no herbicide, combination of two pre-emergence herbicides (Prowl $H_2O + Reflex$), combination of two postemergence herbicide (Liberty + Dual Magnum), and pre followed by postemergence herbicides. Results showed the herbicide application was significant while the effect of cover crops was not found in any of the interactions due to low cover crop biomass attained. In conclusion, the impact of pre and postemergence herbicides was observed only at first two weeks after application. Whereas mixture of pre + postemergence herbicides was most effective in weed control and its effect remained late season.

Introduction

Conventional tillage deteriorates soil productivity and depletes soil organic matter (Feng et al., 2003). Conservation agriculture systems have been successfully adopted to address these concerns as they offer significant agronomic, environmental, and economic benefits. Conservation tillage has many benefits, but there are some issues with this system, including less weed control, improper establishment, and growth of main crop results in potential yield losses (Schwab et al., 2002). However, increasing more reliability towards chemical herbicides is becoming a major issue due to the herbicide-resistant weeds. Therefore, it is essential to establish integrated weed management tactics (IWM) in the crop production system to maintain long-term sustainability. Cover crops, multiple herbicides with different modes of action, and rotation effectively showed weed control in reduced tillage cotton (Price et al., 2021).

Cover crop and pre and postemergence herbicides

The objective of this study was to increase the adoption of integrated weed management (IWM) tactics by integrating weed suppressive cover crop qualities and chemical weed control to maintain viability for sustainable agriculture. Cover crops are effective for weed control by forming high residue mat on the ground and releasing allelochemical (Price et al. 2006). The selection of cover crops with the inclusion of both pre and postemergence herbicides will suppress weed density in cotton.

Materials and Methods

The field experiment was conducted at E.V. Smith Research Center, Shorter, AL, in 2020-2021. The experimental design was a split-plot with three replications. Cover Crop (Main-plot), Herbicides (Sub-plot) with repetitive measure (data collection three times during season). Cover crops were planted in the first week of November 2020, and fertilizers were applied as per recommendation. Then termination of the cover crop was done through rolling all plots with the JD 730 roller-crimper and the 3-section straight bar roller (large) using GreenStar GPS and spraying burndown glyphosate herbicide. Biomass samples of the cover crop were collected before planting the main crop with 1080 kg/A of rye, 665 kg/A of clover, 512 kg/A of radish, 595 kg/A of the mixture, and 712 kg/A of black oat, respectively. Cotton variety Phytogen 480 F3E was planted in the second week of May 2021 using an in-row subsoil tier. Application of pre and postemergence herbicides 1 and 3 weeks after planting. The first visual rating was recorded at ten days after application of each pre and postemergence herbicide, then three times at an interval of 10 days (0% = no control and 100% = complete control). Three times pictures were collected throughout crop season for groundcover and weed counts. Data were analyzed using generalized linear glimmix models' methodology as implemented in SAS® PROC GLIMMIX.

Cover Crop Treatments	Herbicide Treatments
Winter Fallow	Non treated (NT)
Rye (90 lb/A)	Prowl (2 pt/A) + Reflex (1 pt/A) (A)
Black Oats (60 lb/A)	Liberty (29 fl oz/A) + Dual Magnum (1 pt/ A) (B)
Crimson Clover (20 lb/A	Pre followed by post-emergence herbicides (A+B)
Radish (8 lb/ A)	
Mixture (64 lb/A)	

Results and Discussion

Overall herbicide, rating time, and their interaction were significant, but the cover crop effect was not noticed due to less biomass of cover crops before planting cotton. Because implementation of termination formed high residue biomass mat (>4,500 kg/ha required to offer weed control effectively) over the ground, on which seeds are planted (Norsworthy et al. 2011, Price et al. 2005). Effect of Prowl + Reflex (A) and Liberty + Dual Magnum (B) herbicides were statistically similar ten days after application and significantly higher than non-treated check while a mixture of pre and postemergence herbicides had the highest mean values (Figure C). The effect of Prowl + Reflex + Liberty + Dual Magnum (A + B) herbicides to control weeds in the cotton crop was observed longer, approximately up to 5 weeks after application. However lowest weed control was noticed in non-treated check (NT) throughout the crop growing season.

Table 1. Represents the results of ANOVA to check significance value for cover crops, herbicide, rating time, and their interactions.

1. Type III Tests of Fixed Effects					
Effect	Num DF	Den DF	F Value	Pr>F	
CoverCrop	5	10	1.36	0.316	
Herbicide	3	132	51.06	<.0001	
Time	2	132	65.73	<.0001	
CoverCrop*Herbici de	15	132	1.1	0.365	
CoverCrop*Time	10	132	0.34	0.96	
Herbicide*Time	6	132	2.55	0.023	
CoverCrop*Herbici de*Time	30	144	0.62	0.94	



Fig A. Weed control effect due to pre-applied (Prowl + Reflex), post applied (Liberty +Dual Magnum), and pre followed by postemergence herbicides with rating time in a gap of 10 days.

Conclusion

Effect of Prowl + Reflex (pre) and Liberty + Dual Magnum (post) applied herbicides were observed only at first two weeks (approx.) after application while the combination of pre + post herbicides was most effective in weed control and its effect remained consistently better throughout the growing season. Future research is needed under effective biomass of cover crops for its selection with different herbicide treatments.

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