OPTIMIZING THE INTEGRATION OF ANNUAL FORAGES INTO TOBACCO SYSTEMS

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Lay Summary: Work conducted in the summer and fall of 2016 laid the foundation for the main focus of this project. Two fields were cropped to tobacco and annual forage mixtures were sown after harvest. In one field, we will be imposing different forage utilization practices this winter and next spring to study how these can influence the subsequent tobacco crop. In the other field, different weed management programs were utilized on the 2016 tobacco crop and we are currently assessing how these will impact the establishment of two common annual forage mixtures. Establishment to date of the rye-crimson clover and wheat-crimson clover mixtures was not affected by herbicide treatment, though lower crimson clover density was observed in mixture with rye than with wheat. Observations and data collection in both trials will continue through the winter and spring, and through the tobacco crop of 2017. Pending additional funding, this trial will be repeated in 2017/18.

Introduction

Many burley tobacco growers have integrated farming operations that include cattle production. Planting annual forage species following tobacco provides a source of grazing in the late fall/early spring when many perennial pastures are less productive, thereby lowering the need for costly hay production. These forages may serve as a cover crop for tobacco production and provide many benefits including reducing soil erosion, capturing mineralized soil N/excess fertilizer N, and suppressing winter annual weed species. Residue remaining from these species may also contribute to in-season weed management with the degree of suppression dependent on how the forage is utilized and the amount of residue remaining on the soil surface. While double-cropping forages and tobacco may improve the utilization of the land resource, appropriate management is necessary to balance the system for the greatest economic benefit for the grower.

The experiments described in this report are intended to identify management practices to improve the compatibility of burley tobacco with annual forage species in a double-cropping system. Specific objectives of this study include: i) examine the impact of tobacco harvest/forage planting date on productivity of the forage component, ii) evaluate the yield and nutritive value of different of annual forage mixtures double-cropped following burley tobacco, iii) evaluate the impact of the forage utilization method on the growth of strip-tilled burley tobacco, iv) examine the weed control provided by forage residues in burley tobacco, and v) evaluate in-season weed control of different herbicide programs on strip-tilled tobacco and their potential to damage forage seedlings.

Summary of Progress

<u>Experiment 1 (Annual Forage Utilization Methods on Subsequent Tobacco Yields):</u>

The past growing season served as a preliminary year to establish the conditions required for the experiment. One of the goals of the project was to replicate a scenario that may occur within a producer's operation. Therefore, tobacco was grown on the experimental area in 2016 to simulate the condition that may occur when establishing the annual forage mixtures (rye-crimson clover & wheat-

crimson clover) following a previous row-crop (i.e. low soil moisture, surface residues, etc.). The experimental area had been in pasture for at least the last 10 years. The existing sod was burned down with Round-up PowerMax (2.5 pt/acre) and soil preparation initiated with a strip tillage implement consisting of a disk openers, a sub-soil shank (running 8 to 10 inches deep), and a rolling basket. Before transplanting the strips were finished with a multi-vator tiller to provide prepared strips about 12 inches in width. The entire area was fertilized to soil test recommendations and sprayed with Spartan Charge (11.5 oz/A) and Gramoxone 2.0 (1.5 pts/A). Burley tobacco variety KT 212 LC was planted in the "early" strips on 5/25; variety KT 210 LC was planted about two weeks later on the "late" strips. The tobacco was harvested in late August and early September in order to establish the forages on an early (Sept. 1st) and late (Oct. 4th) planting dates. The plots of the early planting date established quickly, but the late planted plots required supplemental irrigation (~1 inch of water) in order to germinate. Each of the planting date treatments is now fully established and will receive its first grazing rotation in mid-December/early January (Fig 1).

Experiment 2 (Residual Tobacco Herbicide Activity on Annual Forage Species):

Tobacco was established in late May following a "burn down" of the experimental area with Round-up PowerMax (2.5 pt/acre). Strips were prepared as described above in Experiment 1. Six weed management treatments were implemented during the growth of the tobacco crop in order to quantify the potential injury to the cover crop by herbicide residues applied to the tobacco. The treatments included Spartan Charge applied at two rates (6.4 and 12.8 oz/acre), Spartan Charge (12.8 oz/acre) applied with Command (2 pts/acre), Spartan Charge (12.8 oz/acre) applied with Prowl (3 pts/acre), a weedy check, and a weed-free check. The tobacco was harvested in early September and the annual forage mixtures (rye-crimson clover & wheat-crimson clover) established in early October. As in Experiment 1, the forage mixtures required supplemental irrigation. The stand densities of each species in the mixture were estimated on Nov. 18.

As expected herbicide treatments resulted in reduced weed densities during the tobacco growing season. Crab grass was the primary weed problem observed with some yellow foxtail and carpet weed also counted. Overall the best weed control was achieved with Spartan Charge preplant followed by Command after planting. Tobacco was harvested from the two center rows to estimate the impact of weed control leaf yield. Tobacco herbicide treatments had no effect on the establishment of the forage mixtures as determined by total stand densities (the small grain plus the crimson clover; $P > 0.40$). However, the grain species utilized in the mixture did slightly affect stand composition. The two mixtures had similar total stand densities (i.e. total number of plants per acre; data not shown), but the rye mixtures contained less crimson clover compared to the wheat mixture ($p<0.07$; Table 1). This was to be expected as rye is known for its high seedling vigor which made it more competitive within the mixture.

Plans for Future Work

Experiment 1 (Annual Forage Utilization Methods on Subsequent Tobacco Yields):

Five utilization methods will be applied to the forage mixture in the upcoming winter/early spring and a second tobacco crop grown in the spring of 2017 to determine the impact these methods may have on tobacco growth. A rotational grazing treatment will be applied beginning in mid-December/early January and will be continue when there is appreciable growth. Two of the treatments will use the forage mixtures as a traditional cover crop with their growth being terminated with glyphosate (1.0 lbs a.i./A) in early March and April, respectively. Lastly, a "mob" grazing and hay

treatment will be applied in mid-late April. The tobacco crop will be planted in early May follow application of the latter two utilization methods.

In addition to finishing the collection of the first year of data, the authors also anticipate growing an additional tobacco crop to simulate the initial condition required for the second year of Experiment 1, pending approval of additional financial support.

Experiment 2 (Residual Tobacco Herbicide Activity on Annual Forage Species):

Visual ratings of the annual forages will continue in this experiment throughout the winter of 2016/2017 to assess plant vigor and potential herbicide damage. Prior to termination, weed density will be measured and recorded to species. Biomass samples will be collected prior to spring burndown, and separated into the two annual forage species and weeds. Nutrient content of the forage species will be analyzed to determine potential nitrogen contributions to the subsequent tobacco crop. Tobacco will be sown using similar methodology as in Experiment 1, using the same herbicide treatments as in 2016. Weed density will be sampled in all plots to determine the impact of the annual forages, in combination with these herbicide treatments, on in-season weed management.

Figures and Tables

Table 1: Stand densities (# plants/0.25 m^2) of two cover crop mixtures established after tobacco. A p value of less than 0.10 indicates that the cover crop density differs between the two treatments.

Crop Species	Stand Density (# plants/0.25 m^2)	
	Grain	*Crimson Clover*
Rye	39.19	39.10
Wheat	35.23	43.69
S.E.	***1.59***	***1.68***
P-Value	***0.087***	***0.063***

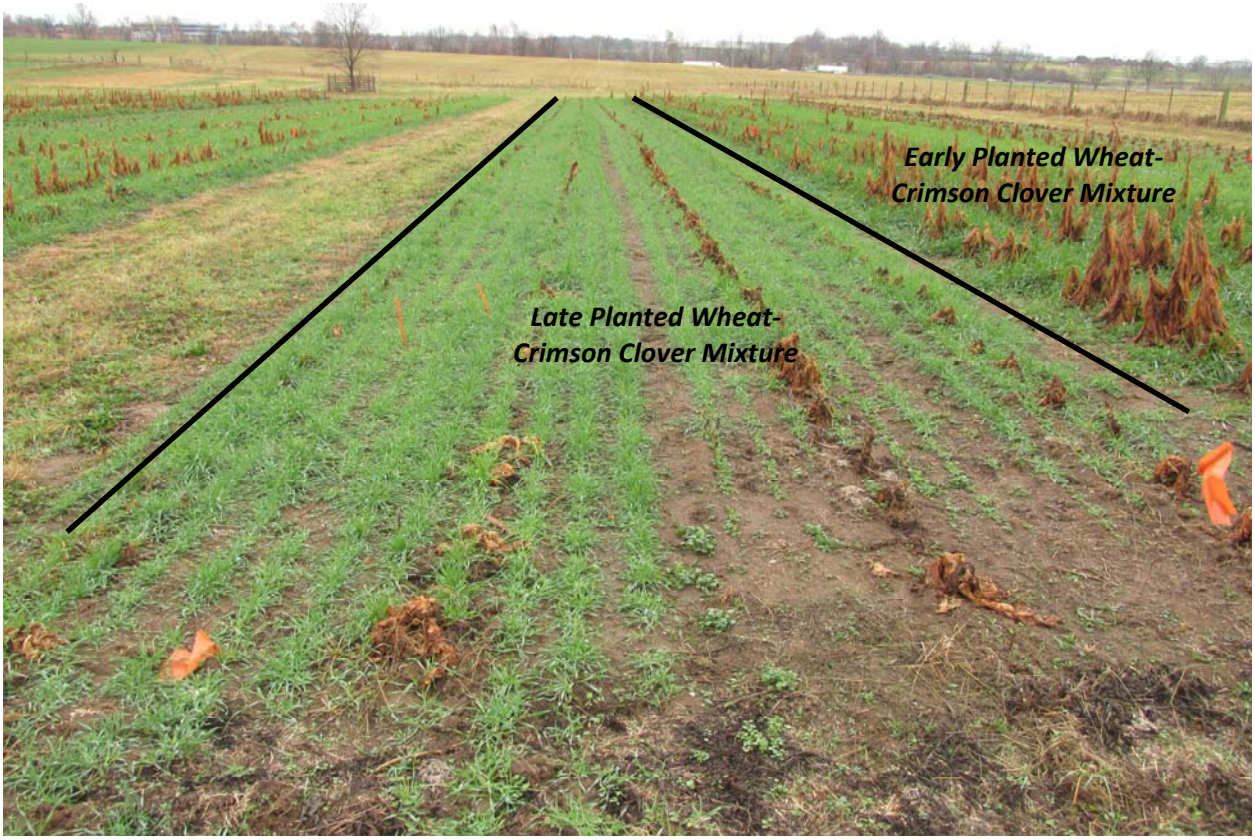

Figure 1: Early and late planted wheat-crimson clover mixture in experimental area.