IMPACT OF COVER CROP TERMINATION ON SOIL HEALTH AND LINT YIELD OF COTTON

Bill Robertson
Amanda Free
Cheyenne Manuel
University of Arkansas System Division of Agriculture
Cooperative Extension Service
Newport, AR

Abstract

Utilization of cover crops and reducing tillage are two practices that can have a significant impact toward improving soil health. Issues with cover crops that presents most growers concerns relates to providing a "green bridge" for pests from the cover crop to the economic crop and obtaining a good stand through the residue. The objective of this study is to investigate the potential of timing cereal rye cover crop termination to provide the ample additional living roots in the soil profile to benefit soil microbes while avoiding excessive above ground residue to ease planting concerns. A replicated field study was utilized to evaluate five termination timings of cereal rye. These timings were based on the growth stage of the cereal rye to include 1) early-boot, 2) mid-boot, 3) late-boot, 4) full panicle exertion, and 5) anthesis. Termination timing did influence above ground biomass, root mass, and depth of rooting with greater quantities being produced as termination was delayed. Terminated cereal rye at planting did produce the greatest levels of above-ground biomass and root mass ratings. However, the treatment yielded significantly less than the termination timing two weeks prior to planting. It is possible to terminate cereal rye two weeks prior to planting cotton to achieve benefits associated with a cover crop while avoiding pest issues from the existence of a "green bridge".

Introduction

Utilization of cover crops and reducing tillage are two practices that can have a significant impact toward improving soil health. There are many measurements that can be used as an indicator of improved soil health. Water infiltration can be used as an indirect measure of soil health. As soil health improves water infiltration rates often improve as well. Living roots in a field as many months as possible help sustain soil microbes population which are important in improving soil health. Issues with cover crops that presents most growers concerns relates to providing a "green bridge" for pests from the cover crop to the economic crop and planting and obtaining a good stand through the residue. The objective of this study is to investigate the potential of timing cereal rye cover crop termination to provide the ample additional living roots in the soil profile to benefit soil microbes while avoiding excessive above ground residue to ease planting concerns.

Materials and Methods

A replicated field study was utilized to evaluate five termination timings of cereal rye. These timings were based on the growth stage of the cereal rye to include 1) early-boot, 2) late-boot, 3) late-boot, 4) full panicle, and 5) anthesis. Visual root ratings at a 6 inch interval down to 3 foot were recorded at planting to assess cover crop density and depth. Water-mark soil moisture sensors placed at a depth of 6, 12, and 18 inches were utilized to evaluate water infiltration in each termination timing. Lint yields were calculated from seedcotton weights from machine picked plots. Turnout was calculated from a grab sample pulled from each plot and ginned on a table top gin.

Results and Discussion

Visual ratings on a scale of 1 to 5 for each 6 inch section of a soil core sampled down to three foot in depth varied by treatment. Root mass was denser and extended deeper into the soil the later the cereal rye cover crop was terminated.

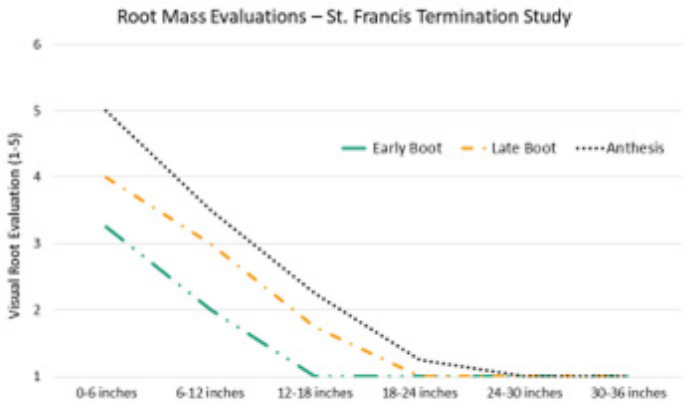

Figure 1.

Water infiltration at deeper depths was improved as rooting of cover crop increased. It is believed that deeper water infiltration will translate to deeper effective rooting for water and nutrient uptake by the plant.

Early- Boot Termination

The figure below shows that water infiltration from irrigation only impacted movement of the 6 inch sensor.

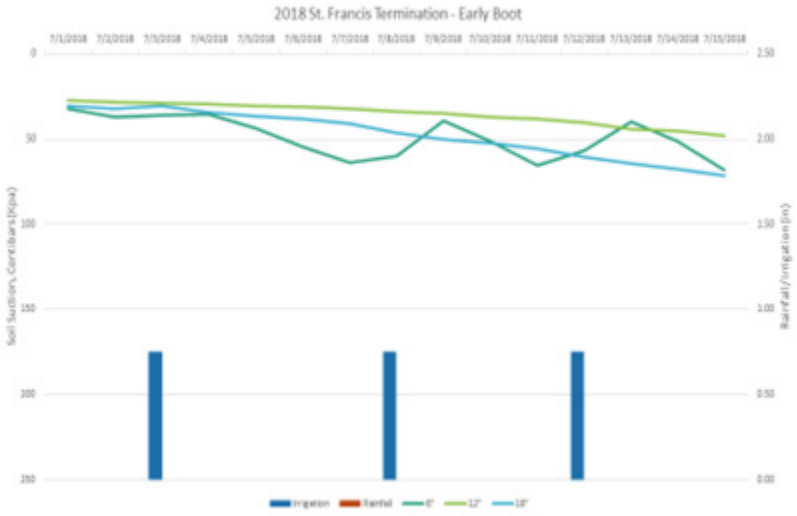

Figure 2.

Anthesis Termination

Figure 3 shows that water infiltration from irrigation impacted movement of each of the 6, 12, and 18 inch sensor.

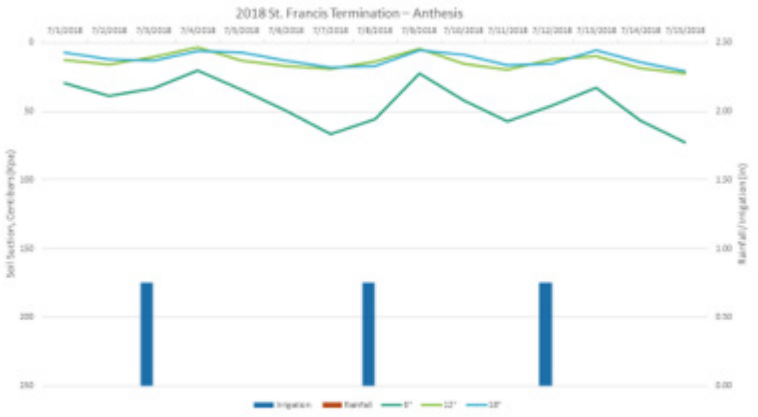

Figure 3.

Lint Yield

Lint yield was significantly impacted by termination timing in this one year study. The lowest yields were observed where biomass and root mass was the lowest at early-boot. Termination at anthesis also resulted in lower yields

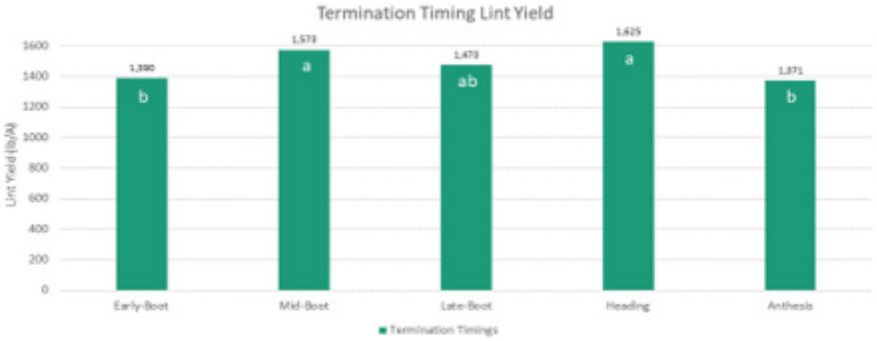

Figure 4.

As cereal rye matures the C:N increases. As the C:N increases, soil microbes must mine additional N from the soil competing with the cash crop. Producers have observed similar yield decreases after cereal rye moves into seed set or seed fill.

Summary

Termination timing did influence above ground biomass, root mass, and depth of rooting with greater quantities being produced as termination was delayed. Termination timing during mid-boot to heading resulted in the highest numerical yields. These timings ranged from 2 to 4 weeks prior to planting. Terminated cereal rye at planting did produce the greatest levels of above-ground biomass and root mass ratings. However, this treatment yielded significantly less than the termination timing 2 week prior to planting. It is possible to terminate cereal rye 2 weeks prior to planting cotton to achieve benefits associated with a cover crop while avoiding pest issues from the entrance of the “green bridge”.