Cover crop effects on weed suppression and soil water dynamics in sweet potato production

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Introduction

Due to the high frequency of intense rainfall events and seasonal hurricanes, water inundation and timely weed management have become a significant problem for Sweet Potato production in North Carolina. In this study, the use of cover crops will be evaluated as a potential management tool to lower weed pressure and improve water dynamics in an organic sweet potato crop.

Objective and Hypothesis

Objective: To determine which cover crops retain the most moisture in the soil and are the most effective at suppressing weeds.

Hypothesis: The cereal rye will suppress the most weeds as well as retain the most soil moisture due to its greater residue biomass and documented allelopathic effect on weeds as compared to the legume cover crops.

Materials and Methods

Field Study: Soil moisture and temperature data were collected from a subsection of a randomized complete block design study located at the Cherry Research Station in Goldsboro NC. The treatments evaluated included fall seeded Cereal rye (*Secale serale*), Crimson Clover (*Trifolium incarnatum*), Austrian Winter Pea (*Pisum sativum*) and a bare ground fallow (Figure 3). The cover crops were terminated in May 2021 and incorporated into sweet potato beds.

Soil moisture and temperature data were collected 3 times during the growing season. Data were collected with a Fluke IR Thermometer (temperature) and Hydrosense probe (soil moisture).

Greenhouse Study: Composite soils cores (0-15 cm) were collected from each plot at the field site. Soils were brought into a greenhouse and spread on 25 cm x 25 cm trays, with potting mix to create a 2.54 cm soil depth. Weed counts occurred weekly on these irrigated trays.

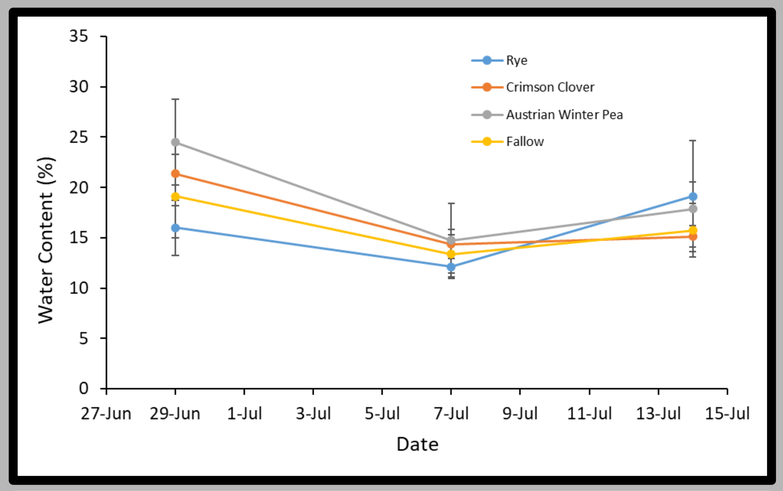

Figure 1. Water content values (%) of the cover crop treatments over the course of three sampling dates.

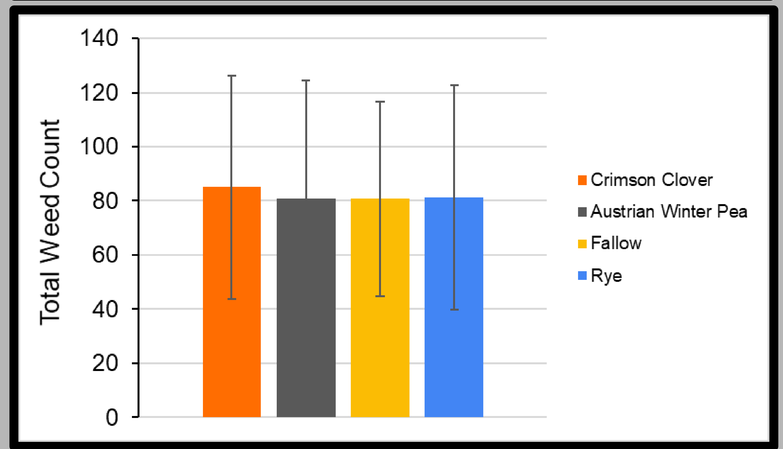

Figure 2. Total weed count over a three week period

Figure 3. Austrian Winter Pea (*Left*), Crimson Clover (*Center*) and Cereal Rye (*Right*)

Results and Conclusions

Field Study: The only treatment separation for soil moisture occurred on June 29th where Austrian winter pea showed greater moisture at 24.5%, as compared to cereal rye at 16% (Fig.1). At all other sampling times, soil moisture was not significantly different between treatments with an average range of 12.5 % to 30%, and no difference with the fallow plots. At the site, the cereal rye produced lower than average biomass (4 t ha^{-1} vs 8 t ha^{-1}) and therefore the residue's ability to modulate moisture may have been limited. The legume biomass was typical for the region. Temperature varied significantly between dates but there was no apparent effect of cover crops (data not shown).

Greenhouse Study: Total weed counts did not significantly differ between the cover crop treatments or bare ground fallow, however, there was large intra-treatment variability.

Conclusions: Cover crops are often promoted to provide a host of ecosystem services such as erosion control, soil carbon sequestration, nitrogen supply, weed control, etc. However, these impacts vary dramatically depending on management decisions. In this study, termination and incorporation of cover crops primarily for nitrogen supply did not show co-benefits of increased water retention or reduction in weed seed bank populations. Lower than normal cereal rye biomass at this site limits any broad conclusions regarding these effects. Future research should include fall fertilization of cereal rye to achieve desired biomass to fully assess this cover crop's capability.

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