

Introduction

- Nutrient Loss Reduction Strategy (Illinois NLRs, 2017), suggests winter cereal cover crops (WCCCs) are the best on-farm practices to reduce N loss in corn-corn or corn-soybean cropping systems.
- Solid planting (NP) of a WCCC such as winter cereal rye (WCR) before corn could decrease corn yield as a result of reduced N availability in spring due to N immobilization caused by high C:N ratio of WCR residue or soil moisture depletion by the WCR early in the spring.
- One management practices to reduce WCR negative effect on the following corn is by mixing rye with a legume cover crop such as crimson clover (CL).
- Precision planting (PP), skipping the future corn row when planting CC, is another strategy to further reduce the yield drag in corn following WCR (Fig. 1).
- This study is the first to test integrating cover crop mixture with PP approach to evaluate cover crop performance, corn stand density, grain yield, N requirement and balances.

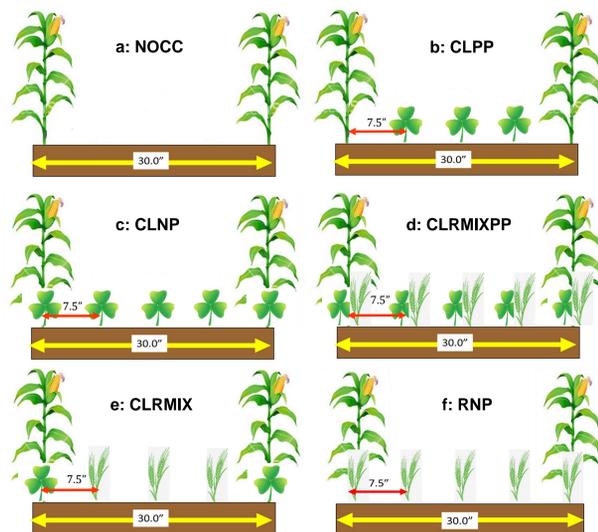


Fig. 1. Schematic presentation of cover crop treatments (a-f)

Objectives

The objectives of this study were to evaluate the effect of WCR, crimson clover, WCR and clover mixture, and precision planting CC on (i) cover crop biomass and weed suppression; (ii) corn plant population; (iii) corn yield and N requirement; along with (iv) N balance.

Research Questions

- Does PP and CC selection impact CC biomass and weed pressure?
- Does PP and CC selection impact corn plant population?
- Does PP and CC selection impact corn yield and N requirement, and balance?
- What trait drives the corn grain yield?

Materials and Methods

- Trial was conducted at the Agronomy Research Center in Carbondale, IL. Experimental design was split plot arranged in a randomized complete block design with four replicates:
- Main plots were cover crop treatments: NoCC control (NOCC), crimson clover precision planted (CLPP), crimson clover solid planted (CLNP), crimson clover on corn row WCR on middle rows (CLRMIXPP), crimson clover mixed with WCR (CLRMIX), and solid planted WCR (RNP) (Fig. 1).
- Subplots were the fertilizer N treatments: 0, 40, 80, 160, 240, 320 lbs ac⁻¹.
- Stater fertilizer (2x2x2) amount was 40 lbs ac⁻¹.
- Cover crop seeding rates were: CLPP (18.75 lbs ac⁻¹); CLNP (25 lbs ac⁻¹); CLRMIXPP (CL: 6.25 & WCR: 45 lbs ac⁻¹); CLRMIX (CL: 20 & WCR 30 lbs ac⁻¹); RNP (60 lbs ac⁻¹).
- Cover crop were planted on Sept. 23rd, 2020 and terminated on April 13th, 2021.
- Corn planting: May 1st; harvested: Oct. 5th 2021.

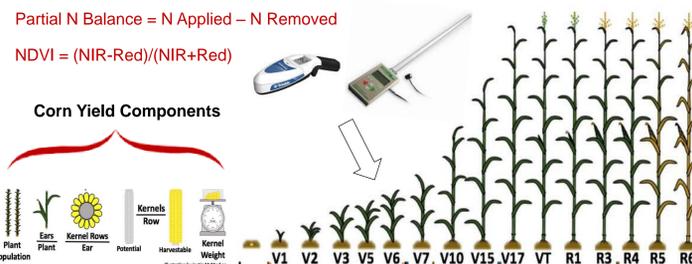


Figure 2. Measurements during corn growth, at and after corn harvest in 2021.

Results and Discussion

Cover Crop Biomass

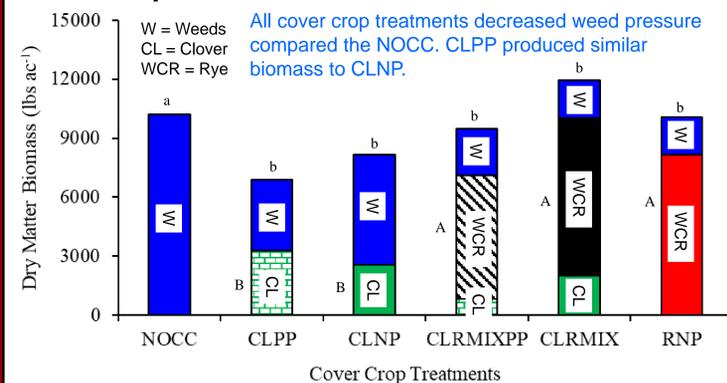


Figure 3. Cover crop (clover and rye) and weed dry matter biomass in each cover crop treatment. (lower case letters compare weed biomass and capital letters compare cover crop biomass) indicate significant difference (<0.05, Tukey).

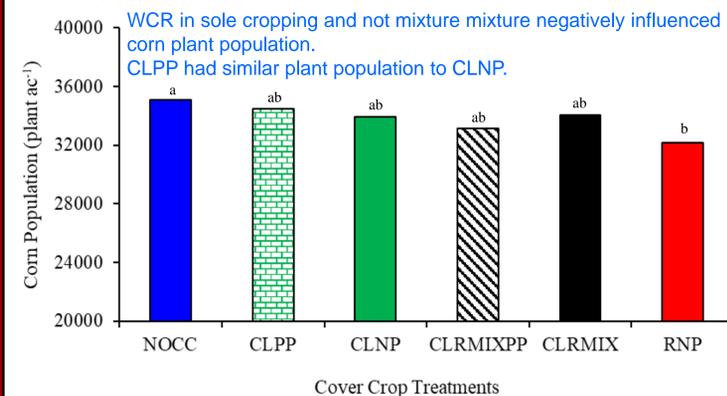


Figure 4. Corn plant population as influenced by cover crop treatments. (a, ab, b) indicate significant difference (<0.05, Tukey).

Results and Discussion

Corn yield, EORN, and N Balance

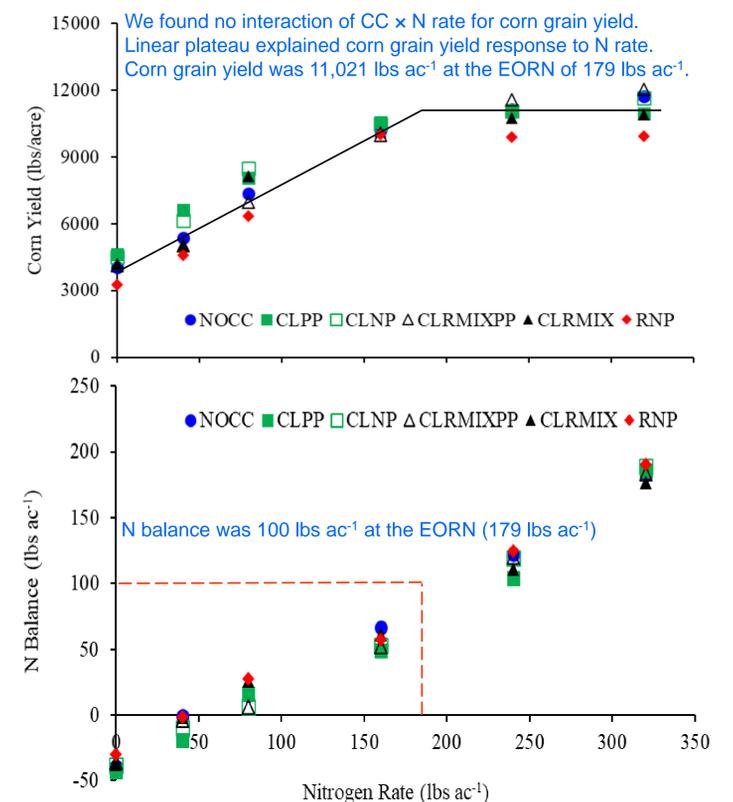


Figure 5. Corn grain yield and EORN (a) and N balance (b) as affected by CC and N treatments.

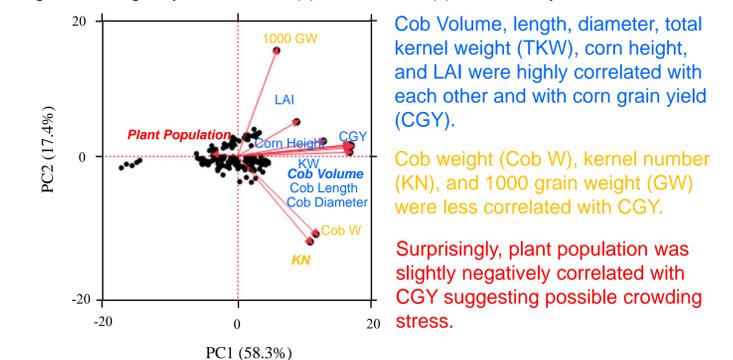


Figure 6. Biplot of first two components for 11 traits; six CC and six N rates in 2021.

Answers to Research Questions

- Does PP and CC selection impact CC biomass and weed pressure? **Yes!** Increasing WCR ratio in the CC increased CC biomass and weed suppression.
- Does PP and CC selection impact corn plant population? **Yes!** WCR decreases corn population compared to clover and NOCC.
- Does PP and CC selection impact corn yield and N requirement? **Not in 2021.** Corn yield was 11,021 lbs ac⁻¹ at EORN of 179 with N balance of 100 lbs ac⁻¹.
- What trait drives the corn grain yield? **Kernel weight (size) > kernel number.**