EFFECT OF VARIOUS COVER CROP SPECIES ON WATER INFILTRATION

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Abstract

Cover crops are defined as any living cover grown between the harvest and planting of a cash crop in which the land would otherwise be fallow. Cover crops are typically associated with conservation tillage or no-till production systems but can be utilized in conventional tillage systems as well. There are different types of cover crops which include brassicas, legumes, and grasses. Characteristics of each type of cover crop provide the producer with different benefits. The large tap-root system associated with brassicas aid in soil hard pan-penetration. The nitrogen-fixing capabilities of legumes are beneficial in that they provide nutrients in a timely manner to the proceeding cash crop. Grasses are typically high biomass which aid in erosion control and ground cover. Other benefits of cover crops include improved soil moisture and quality. The residue that they provide helps to reduce the amount of moisture evaporated from the soil. Cover crops also help to increase soil aggregate stability and increase organic matter. Cover crops also aid in water infiltration. Water infiltration rate is the function of how quickly water can move into the soil profile. Cover crops can be especially beneficial in soils that are prone to crusting in that they break up the soil surface and reduce runoff. The objective of this research was to determine the effect various cover crop species on overall soil health and water infiltration rate. This experiment was conducted in Starkville, MS and Tribbett, MS in 2017. Plots in each location were 3.9 m wide and 12 m long. Cover crop species seeded in this study include crimson clover (*Trifolium incarnatum*; 11 kg ha^{-1}), radish (*Raphanus raphanistrum*; 11 kg ha^{-1}), oat (*Avena sativa*; 56 kg ha^{-1}), cereal rye (*Secale cereale*; 56 kg ha^{-1}), and blends of rye + crimson clover (45 + 6 kg ha^{-1}) and rye + radish (45 + 6 kg ha^{-1}). Cover crops species were seeded in late November and early December in 2016 due to drought conditions experienced across the state. Cotton seeded in this study was PHY 444 WRF at a rate of 110,000 seeds ha^{-1}. A blanket application of 134 kg N $^{ha-1}$ was applied in season. Watermark soil moisture sensors were placed at depths of 15, 30, 60, and 90 cm in one replication and when sensors averaged 75 kPa irrigation was triggered. All cover crop treatments were grown under both irrigated and dryland conditions. Water infiltration readings were taken in season using single-ring infiltrometers. Rings were placed in traffic furrows, non-traffic furrows, and on top of the beds in three replications in each location. Once installed, rings were filled with water and measurements were taken periodically to determine the infiltration rate. Bulk density measurements were also taken at this time from traffic furrows, non-traffic furrows and on top of the beds. Data collected throughout the season were analyzed in SAS v9.4 using the PROC GLIMMIX procedure. Data were subjected to analysis of variance (ANOVA) and means were separated using Fisher's Protected LSD at $\alpha = 0.05$.

At the Starkville, MS location, significant differences were found in cotton height at bloom based on cover crop species. Cotton planted following a crimson clover cover crop produced significantly taller plants than cotton grown following a blend of rye + crimson clover cover crops and a blend of rye + radish cover crops. Cotton height in the untreated control was not significantly different than cotton height following a crimson clover cover crop. Cotton yield in Starkville, MS followed this same trend. It is hypothesized that the in-season N application coupled with the nitrogen-fixing capabilities of crimson clover resulted in increased plant height. No significant differences were found amongst water infiltration rate or bulk density measurements across the treatments. Traffic furrows exhibited lower infiltration rates and greater bulk density measurements than non-traffic furrows. Water infiltration rates on top of the bed exhibited the greatest levels of water infiltration rate and lowest bulk density measurements. Benefits of cover crop species to a cash crop production system are not typically seen short-term. This experiment will be repeated in the following year to further evaluate the impact of cover crop species on water infiltration.