USING COVER CROP MULCHES FOR WEED CONTROL IN CONVENTIONAL AND ORGANIC COTTON PRODUCTION

R.A. Atwell
S.C. Reberg-Horton
K.L. Edmisten
A.C. York
North Carolina State University
Raleigh, NC

Abstract

Cover crop mulches have been used successfully for weed control in organic grain production and can help conventional producers manage herbicide-resistant weeds. Another short-term benefit that can be obtained from cover crop mulches is soil moisture conservation during the following cash crop season. The objective of this experiment was to determine the effect of a cereal rye (*Secale cereale*) / crimson clover (*Trifolium incarnatum)* cover crop mulch on cotton (*Gossypium hirsutum* L.) emergence, soil temperature, soil moisture, weed suppression, and cotton yield. This experiment was conducted in Lewiston, NC from 2014-2015 and Clayton, Lewiston, and Rocky Mount, NC from 2015-2016. A cereal rye (c.v. Abruzzi) and crimson clover (c.v. AU Robin) cover crop mixture was established in mid-October using a grain drill at seeding rates of 134.7 and 11.3 kg ha^{-1}, respectively. Cover crops were terminated 1 week prior to cotton establishment using a roller-crimper or herbicide burndown of paraquat (1.89 L ha^{-1}). Cotton variety ST 4946GLB2 was planted using a John Deere 7200 no-till planter modified to plant into heavy residue cover crop mulches. This study was conducted in a split-plot experimental design with six replications. Main plot was cover crop treatment and sub-plot was weed treatment. Cover crop treatments included: no cover crop, cover crop fertilized with 34 kg N ha^{-1} in March with residue moved from the cotton row, cover crop rolled and moved several inches from the cotton row, cover crop rolled and minimal residue movement from the cotton row, and cover crop terminated with paraquat and residue moved from the cotton row. Weed treatments included with and without herbicides. Herbicide treatments included acetochlor (1,260 g ai ha^{-1}) + fluometuron (840 g ai ha^{-1}) + fomesafen (210 g ai ha^{-1}) applied PRE and a POST herbicide application of glyphosate potassium salt (1,575 g ae ha^{-1}) + glufosinate-ammonium (819 g ai ha^{-1}) applied as necessary. The no herbicide treatment was included to represent an organic weed control scenario. Data collected includes cover crop biomass, cotton emergence, soil temperature, soil moisture, weed biomass, and cotton yield. Data were analyzed using PROC MIXED in SAS. Means followed by the same letter are not different at $P \leq 0.05$ based on Fisher's Protected LSD.

Cover crop dry biomass ranged from 3,820-6,610 kg ha^{-1} across our environments when the cover crop was not fertilized. Depending on the environment, fertilizing the cover crop in March enhanced cover crop dry biomass production by 250-1,320 kg ha^{-1}. Cotton emergence declined when cotton was planted directly into standing cover crop and when cover crop residue was moved minimally from the cotton row at planting. Soil temperature was reduced by the presence of a cover crop regardless of cover crop management strategy. Soil moisture conservation was observed in all treatments with a cover crop, and similar levels of soil moisture conservation were observed whether the cover crop was rolled or remained standing prior to cotton planting. Soil moisture conservation can be an important short-term benefit of using cover crop mulches. The cover crop biomass levels achieved in this experiment did not provide adequate weed control in the absence of herbicide use. When herbicides were used in combination with the cover crop mulch, excellent weed control was observed. At four of the five environments, cover crop management did not affect weed biomass when herbicides were not used and severe weed pressure prevented cotton harvest when herbicides were not used at these environments. In the Lewiston 2015 environment, weed biomass was reduced by the presence of a cover crop when herbicides were not used. Cotton lint yield results from the Lewiston 2015 environment indicated that weed suppression from the cover crop increased cotton lint yield in the absence of herbicide use compared to no cover crop. Cover crop management did not affect cotton lint yield in plots managed with herbicides at four of the five environments, indicating that producers have flexibility with cover crop termination and residue management at cotton planting. The cover crop biomass levels achieved in this experiment would not provide reliable weed control for organic cotton producers. Results from this experiment indicate that respectable cotton lint yield can be achieved when combing the use of a cover crop mulch and herbicides for weed control. An additional short-term benefit observed was soil moisture conservation from the cover crop, which could be important for cotton lint yield stability in a dry year.