



Conservation Systems Research

Winter Cover Crop Residue Effects on Weed Control and Cotton Yield

RESEARCH PROJECT REPORT NO. 02

United States
Department of
Agriculture

Agricultural
Research
Service

National Soil
Dynamics
Laboratory

Conservation
Systems
Research

Research
Project
Report
No. 02

March 2005

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Cotton growing in rolled black oat residue. Black oat is widely recognized for its weed-suppressive characteristics in conservation tillage systems.

The Challenge

Cover crops in conservation tillage systems offer many advantages, one of which is weed suppression. When the cover crop is allowed to grow during the winter and early spring, then killed and mechanically rolled, a dense mat is formed on the soil surface. Weed growth is suppressed by the physical barrier and shading from the residue. Most cover crop residues also contain chemicals that suppress weed germination or growth (allelopathy). Differences among cover crop species in the amount of biomass they produce and any allelopathic chemicals they contain will affect how well they suppress weeds.

The objectives of this study were to:

1. Evaluate weed control effectiveness of three winter cover crops (black oat, rye, and wheat) in combination with three herbicide systems.
2. Determine any cover crop effects on cotton yield.

The Experiment

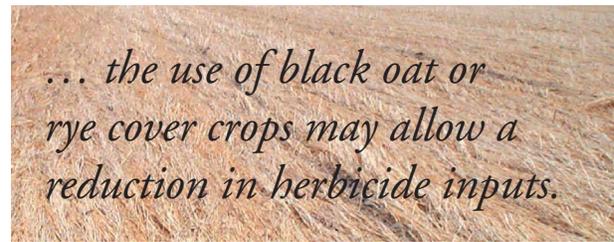
Field experiments were conducted from 1994-1997 at the Alabama Agricultural Experiment Station's Wiregrass Research and Extension Center, located near Headland, AL. The experimental area had been in a conservation tillage system for the previous eight years. Grasses, nutsedges, sicklepod, and Palmer amaranth were the dominant weeds present during cotton production all three years.

Weed-suppressive characteristics of three winter cover crops—black oat, rye, and wheat—were evaluated and compared to a winter fallow system. Three herbicide systems—no herbicide, preemergence herbicides only, or preemergence plus postemergence herbicides—were evaluated with each cover crop. Cover crops were established in early November of each year and were chemically terminated and mechanically rolled three weeks prior to planting cotton in early May. In all three years, residue formed a dense mat over the soil surface.

What We Learned

Weed control

No cover crop was effective in controlling weeds without herbicides, and the no-herbicide system resulted in substantial cotton yield losses. When black oat or rye cover crops were used with preemergence herbicides, weed control was similar to that of the preemergence plus postemergence application system, indicating that the use of black oat or rye cover crops may allow a reduction in herbicide inputs.



Rye and black oat cover crops were more effective than wheat for weed control. In two of three years, black oat biomass was equivalent to rye, and equivalent or greater than wheat. In one year, cold injury to the black oat limited biomass production, resulting in less effective weed control. Therefore, the cold tolerance of black oat compared to rye may limit its zone of utilization.

Cotton yield

There was a strong cotton yield benefit with the heavy winter cover crop residue, compared to a winter fallow system. The winter fallow, preemergence plus postemergence herbicide application system yielded significantly less two out of three years, compared to systems that included a winter cover crop.

Summary

Black oat and rye residue provided superior weed control to wheat and winter fallow, due to greater amounts of plant residue and, possibly, allelopathic effects on weed seedlings.

Black oat and rye residue reduced the amount of herbicide needed for optimal weed control.

Optimum cotton yields were only achieved in systems that included cover crop residues.

Related Publications

Ashford, D.L. and D.W. Reeves. 2003. Use of a mechanical roller-crimper as an alternative kill method for cover crops. *Am. J. Alt. Agric.* 18:37-45.

Reeves, D.W., A.J. Price, and M.G. Patterson. 2005. Evaluation of three winter cereals for weed control in conservation-tillage non-transgenic cotton. *Weed Technol.* (*in press*).