Conservation Systems Research

Cover Crop Biomass Influences Weed Suppression

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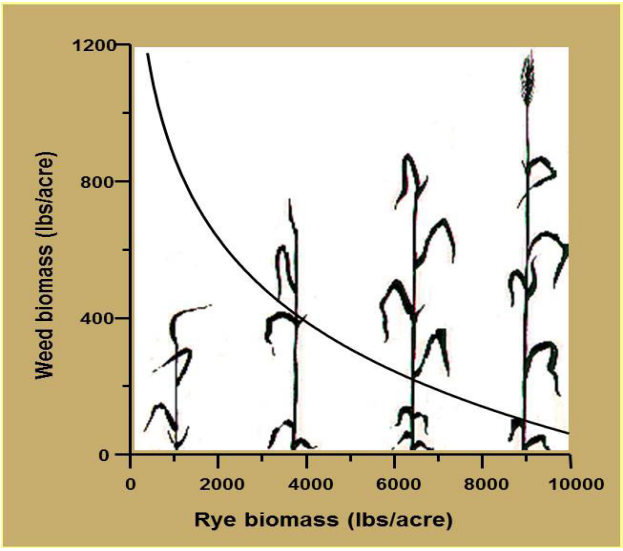
Resistance management has become the dominating weed science research and extension focus. In the Southeastern and Mid-South U.S., questions concerning management of herbicide resistant Amaranthus species, horseweed, and Italian ryegrass, comprise the majority of Cooperative Extension Service (CES) calls in these regions. The Weed Science Society of America (WSSA) ranked Palmer amaranth (Palmer pigweed) as the most troublesome weed in the US. Conservation agriculture (CA) practices are especially threatened by the emergence and rapid spread of glyphosate-resistant Palmer amaranth. Hundreds of thousands of CA acres are at risk of being converted to higher-intensity tillage systems due to the inability to reliably control herbicide-resistant weeds in CA systems, especially dry land systems where soil applied herbicides risk non-activation. Currently, integration of high-residue cover crop systems, inversion of the soil profile facilitating burial of the surface seedbank, and overlapping residual herbicides are increasingly being recommended by state CES throughout the Southeastern Coastal Plain and Mid-South Delta for herbicide-resistance management. Surface tillage is also increasingly recommended by CES to enable increased preplant incorporated and preemergence herbicide use and activity.

Rotational field experiment evaluating cereal rye (foreground) and crimson clover (background) cover crop planting and termination dates and effects on weed emergence and cotton and corn yield.

Researchers at NSDL first began studying the use of cover crops as a weed control option in the early 2000's. However, a major question concerning how much cover crop residue is needed to adequately suppress weeds remains. Field experiments were conducted from autumn of 2003 through cash crop harvest in 2006 at three locations (Figure 4). Treatments were five cover crop seeding dates each autumn and four cover crop termination dates each spring. The five crimson clover or cereal rye seeding dates were: on the first average 32°F temperature date, two and four weeks prior and two and four weeks after the average 32°F temperature date. Termination dates were four, three, two, and one week prior to the average cash crop establishment date.

Results showed winter cover biomass production by winter covers decreased with even a week's delay in winter cover crop seeding and resulted in a corresponding increase in summer annual weed biomass. More than ten times difference in biomass produced by clover was observed when clover was planted on the earliest date and terminated on last date compared to late planting and early termination; rye eight times. Correspondingly, weed biomass was 496 lb/ac in the treatment with least rye biomass, 8 times higher compared to the treatment with greatest rye biomass.



In this experiment, earlier cover crop planting and terminating up to one week before planting corn and cotton increased cover crop biomass accumulation compared with planting later and terminating the cover crop four weeks before planting. Increased cover crop biomass suppressed subsequent total weed dry biomass. These findings indicate that high residue cover crops have predictable potential for suppressing early season weeds in corn and cotton. For farmers utilizing a glyphosate-resistant corn-cotton rotation system, these findings hold particular importance with current glyphosate resistant weed control issues. Because corn and cotton yields were not negatively impacted, we can conclude that high residue obtained by planting crimson clover or rye cover crops timely and terminating at least two prior to cash crop planting is feasible. Ideal management will result in maximum cover crop biomass production and subsequent weed suppression. Additional information is available in *Price A. J. M. Saini, E. van Santen, and L. Sarunaite. 2016. Cover crop residue amount influences weed suppression in Abdurakhmanov (ed.) Cotton Research. Intech Press, Rijeka, Croatia. ISBN 978-953-51-4817-3.*