Wisconsin- MCCC State Report 2014 & NCCC 211 Report

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RESEARCH PROJECTS

Quantifying the benefits of radish as a cover crop

The objective of this project was to determine the effects of radish as a cover crop, specifically quantifying the uptake and release of nitrogen, as well as soil compaction and nematode suppression. Radish cover crops were planted in mid-August in three field sites located in Southern and Northeast Wisconsin in 2011, 2012, and 2013. Each radish treatment was accompanied by a no cover crop treatment, and all treatments were split into increasing amounts of nitrogen fertilizer. Soil samples (0-1' and 1-2') were collected within each plot and analyzed for extractable nitrate to calculate an N credit based on PPNT or PSNT. Radish biomass (above ground and root) and winter wheat (above ground) was collected from a 4 ft^2 area within each whole plot prior to winterkill and analyzed for total dry matter production and total nitrogen uptake. Soil samples (0-1') were collected for each plot and analyzed for nematodes. The nematodes were isolated from the soil through a series of washings through increasingly smaller sized sieves. The samples were then examined under a microscope to identify and quantify both root lesion nematodes and soybean cyst nematodes. Soil compaction was measured in each plot using a portable constant-rate cone penetrometer. Soil moisture was determined as gravimetric soil moisture with a soil moisture probe. Results from the 2012 growing season indicated that radish increased soil nitrate early in the growing season, but dry growing conditions limited corn yield and response to N. In the 2013 growing season the radish did take up a considerable amount of N, but there was no N credit for either PPNT or PSNT, most likely due to the slow decomposition of radish during the wet and cold spring. In addition, the yield data from all three years (nine site-years) did not confirm the fall N credit from the radish, most likely because that N had already been leached from the field. Seasonal variation in soil compaction, soil moisture, and nematode populations will also be presented.

Preliminary results indicate that: (1) the N in radish biomass (above ground biomass and tap root) ranged between 40 and 180 lb-N/ac, (2) radish does appear to release N early – will influence the PPNT and PSNT, (3) yield data has not confirmed the N credit, but in 2013 greater yields detected with Radish+60, and (4) when the soil dries quickly in the spring, radish desiccates in place and N isn't released quickly. Thus, we still have no definitive proof of N credit for radish.

Determining the nitrogen credit from berseem and crimson clover

In summer of 2013, three cover crop species were planted after winter wheat harvest: oat, berseem clover, and crimson clover. This is a replicated study on a farmer field. Oat produced the most biomass, but crimson clover produced significantly greater N in the above ground biomass (~170 lb-N/ac) compared to berseem (~110 lb-N/ac). An N rate study was planned in 2014, but poor stand establishement of the corn caused us to abandon the study. The trial was replicated again in a different field in the summer of 2014, with an N rate study planned for 2015.

Assessing the impact of fall grass cover crops in dairy production systems

A three-year research project was conducted to assess the effect of growing rye as a cover crop or as a silage crop on the subsequent year's corn silage yield. The system is a continuous corn silage rotation with fall liquid dairy manure application (10,000 gal/ac). Biomass samples were

collected in the spring prior to killing of cover crop and harvest of the silage crop. Soil nitrate samples were collected pre-plant and at sidedress. Results from 2012 indicate that cover crops significantly reduced soil nitrate concentrations, but did not affect the optimum N rate. The only drawback is when less than optimal N rates were applied; corn silage yields following cover crops had a greater decline compared to no cover crop. In 2012, corn silage yields following rye silage were significantly reduced (~7 ton/ac on a 65% moisture basis). Results from 2013 show that rye cover crop or rye silage did not significantly reduce corn silage yields compared to no cover crop. Results from 2014 showed a significant reduction in corn silage yield following ryelage, but a slight yield increase from following rye cover crop compared to no cover crop. In two of three years, the total silage produced was the greatest from the double–cropped system and in one year all treatments were the same.

Spring-seeded cover crops on sandy soil for in-season N supply or control

The objective of this study was to determine the effect of spring seeded oat, berseem clover, or chickling vetch on sweet corn yield and N dynamics on an irrigated sand. Cool spring conditions hindered cover crop growth in 2014, but produced 10-40 lb-N/ac in the above ground biomass. Soil samples were collected every 10 days and analyzed for nitrate and ammonium to evaluate N dynamics. In situ mineralization columns (i.e. PVC columns with anion/cation resins placed at the bottom) were used to quantify mineralization rates in 30 day intervals. Results are currently being analyzed.

Herbicide and Cover Crop Interactions in Corn, Soybean, and Wheat Cropping Systems
Graduate student research project, Dan Smith, full project description at
http://wcws.cals.wisc.edu/research/projectprofileherbicideandcovercropinteractions/

Objective 1: To determine whether common soil applied herbicides with residual weed control properties applied during the establishment of corn, soybean, and wheat crops affect the subsequent establishment of cover crops in the fall.

Objective 2: To determine the best spring termination method for overwintering cover crops grown in Wisconsin. Results: Two years of the herbicide carryover in corn and soybean have been completed. One of the two years of the winter wheat carryover study and the termination study have been completed.

Potential for Cover Crop Weed Suppression of Pigweeds, Amaranthus spp.
This is a collaborative project funded by the United Soybean Board led by the Ohio State University with collaborators at the University of Wisconsin, Southern Illinois University, Purdue University, University of Arkansas, University of Tennessee, University of Missouri, and University of Nebraska.

Objective: To establish the value of cover crops for suppressing pigweed populations in Roundup Ready and Liberty Link soybeans. Results: The first of two years of this study is completed. We will be assessing cover crop biomass, weed densities, and soybean yield again in 2015.

On-Farm Evaluation of Eleven Cover Crops in a Winter Wheat-Corn-Soybean Rotation
Full project description at
http://fyi.uwex.edu/badgerplots/files/2013/03/badger_plot_report_dodge_county_2013_revised_WEB.pdf

Objective: To assess corn grain yield and weed populations following eleven single and two species cover crop treatments planted after winter wheat. Results: Only corn grain yield from frostseeded red clover plots was significantly different from the control plots, where no cover crop

was planted. Cover crop treatments that contained a legume ranged from 152 to 167 corn grain bushels per acre compared to grass species at 141 to 143. The control plots averaged 148 corn grain bushels per acre. Overall weed populations were low and effectively controlled with established farm herbicide programs. The full report will be posted on the http://fyi.uwex.edu/badgerplots website at the end of January 2015.

Evaluation of Overwintering Success of Several Annual Ryegrass Varieties

Objective: To evaluate several annual ryegrass varieties for their ability to overwinter in Wisconsin. Results: This study was just initiated in the Fall of 2014.

Extension Materials for Cover Crops and Emergency Forage Use

Objective: To produce extension materials that address emergency forage use of cover crops and termination strategies. Results: Over 750 copies of all four extension publications have been distributed to farmers, crop consultants, government agency personnel, and Extension professionals in Wisconsin. The "Herbicide Rotational Restrictions in Forage and Cover Cropping Systems" has been posted on several websites. Website visits to the blog post discussing the fact sheet exceed all other pages on the wcws.cals.wisc.edu website except for the home page, 540 versus 1670 views as of January 23, 2015.

Extension Materials:

Herbicide Rotational Restrictions in Forage and Cover Cropping Systems
http://wcws.cals.wisc.edu/wpcontent/uploads/sites/4/2013/03/WCWS_201_Herbicide_Rotation_Restrictions_WEB.pdf

Forage Herbicide Quick Sheet: Spring Seeded Forages after Corn
https://host.cals.wisc.edu/wcws/wpcontent/uploads/sites/4/2013/03/WCWS_202_spring_seeded_forages_WEB.pdf

Forage Herbicide Quick Sheet: Cereal Rye Forage after Corn Silage
https://host.cals.wisc.edu/wcws/wpcontent/uploads/sites/4/2013/03/WCWS_203_forage_cereal_rye_WEB.pdf

Cover Crop Termination
https://host.cals.wisc.edu/wcws/wpcontent/uploads/sites/4/2013/03/WCWS_204_cover_crop_termination_WEB.pdf

RESEARCH GRANTS

(1) "Preserving water resources in Wisconsin." USDA-NRCS Conservation Innovation Grant, 2012-2014. ($1,400,051)
(2) "Building market foundations for sustainable vegetable production and processing." USDA-SCRI, 2012-2016. ($2,523,336)
(3) "Quantifying benefits of radish as a cover crop in Wisconsin cropping systems." Wisconsin Fertilizer Research Council, 2012-2015. ($77,693)
(4) "Assessing the benefits of radish as a cover crop." SARE-Graduate Student Program, 2013-2014. ($9,484)
(5) "Understanding cover crop use in soybean production systems." North Central Soybean Research Program, 2013-2014. ($7,500)
(6) "Cover crops in Wisconsin: Measureable benefits to yield, residual nitrogen, and soil test P." Wisconsin Fertilizer Research Council, 2014-2017. ($114,207)

ABSTRACTS AND PROCEEDINGS PAPERS

Ruark, M., K. Shelley, R. Proost, J. Stute, M. Ballweg, and B. Halfman. 2014. On-farm cover crop trials: Clover, Rye, and Radish. *In* Proceedings of the 2014 Wisconsin Crop Management Conference. 14-16 Jan., Madison, WI.

West, J., M.D. Ruark, and K. Shelley. 2014. Winter rey cover crop and forage comparison following corn silage in south central Wisconsin. ASA, CSSA, & SSSA International Annual Meeting, 2-5 Nov., Long Beach, CA.

Chawner, M., M.D. Ruark, J. Stute, M. Ballweg, and R. Proost. 2014. Assessing the benefits of radish as a cover crop. ASA, CSSA, & SSSA International Annual Meeting, 2-5 Nov., Long Beach, CA.

Bietilla, E., E. Silva, A. Pfeiffer, and J. Colquhoun. 2015. Implementing cover crop-based reduced tillage in small scale organic vegetable production. ASA, CSSA, & SSSA International Annual Meeting, 2-5 Nov., Long Beach, CA.