IPNI INSIGHTS
INTERNATIONAL PLANT NUTRITION INSTITUTE

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Northcentral Research Update Report

AGRICULTURE is being asked to solve monumental problems — global warming, hypoxia, eutrophication, food security, and sustainable energy to name a few. The research of soil fertility and plant nutrition is as important as ever as we strive to better understand the elements of sustainable nutrient management. The studies contained in this publication are efforts to that end, and represent continued efforts to help agriculture meet the growing number of demands placed upon it.

This issue of *INSIGHTS* features the brief Interpretive Summaries related to research projects partially supported by IPNI and the Foundation for Agronomic Research (FAR) in the Northcentral Region. This information and more detail on each project can be found at the research database at our website: >**www.ipni.net/research**<.

Iowa

Variability in Soil Test Potassium and Crop Yield in Iowa

Project Leader: Antonio Mallarino, Iowa State University Department of Agronomy, Ames, IA. E-mail: apmallar@iastate.edu

We advanced at summarizing, for publication, a project to study the impact of genetic rootworm resistance on corn response to K. Work also continued on five long-term trials with corn-soybean rotations managed with and without tillage to understand soil-test K (STK) temporal variability and relationships among K rates, placement, STK, and grain yield. A summary was completed of 16 years for the no-till treatment, which included measuring removed K.

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Potassium had inconsistent or small effects on grain K concentration (means of 0.32% for corn and 1.63% for soybean), but increased yield and K removal with STK less than 150 to 180 ppm. Yield was poorly correlated with grain K concentration, but was linearly correlated with removal. STK decreased 2.5 to 3.8 ppm per yr. STK and K removal were well correlated only over the long term. There was a large stratification of STK and non-exchangeable K, and non-exchangeable K partially explained STK variation across K rates and years.

Work was also completed for a third year of two trials that evaluated interactions among hybrid (rootworm susceptible or resistant) and N-K fertilization in corn. Analysis completed for one site showed a positive N-K-hybrid interaction (higher yield and response to N with adequate K for the resistant hybrid). Results of tissue tests for grain and leaves are being studied.

Finally, progress was made on the study of K recycling with corn residue at seven trials. We observed significant K loss from standing plants or residue from physiological maturity until the following spring. About 70% of the plant K was lost by late March, and precipitation increased K loss. *IA-09F*

Global Maize Project in the United States: Ames, Iowa

Project Leader: Roger Elmore, Iowa State University Agronomy Department Ames, IA. E-mail: relmore@iastate.edu

Project Cooperator: John Sawyer

The objective of this study is to determine whether or not an ecological intensification approach can increase yields more quickly over time than current farmer practice. The study design is a split plot. The main plot is management system: 1) farmer practice (FP), and 2) ecological intensification (EI). The split plot is: 1) N application according to the management system, and 2) no N. The treatments are in a randomized complete block, with four replications.

In 2011, there were no soybean grain yield differences between the systems (58.8 and 60.8 bu/A for FP and EI, respectively). For corn grain yield, the N application was

Notes and Abbreviations: N = nitrogen; P = phosphorus; K = potassium.

significant between without and with N (138 and 221 bu/A, respectively). There was no effect of management system nor was there an interaction between management system and N application. Therefore, the site was highly N responsive in both systems, but systems or differences in N source and application rate had no effect on corn yield (FP with N was 220 bu/A and EI with N was 222 bu/A). *IPNI-26*

Indiana

Comparative Nutrient Use Efficiency by Candidate Biofuel Crops

Project Leader: Jeffrey Volenec, Purdue University Department of Agronomy, Lafayette, IN. E-mail: jvolenec@purdue.edu

Project Cooperators: Sylvie Brouder, Keith Johnson, and Brad Joern

Maximizing biomass yield while minimizing nutrient input represents a new challenge for bioenergy cropping systems. Our objective in this study initiated in 2007 was to determine if nutrient use by perennial and annual bioenergy crops was fundamentally different from well-characterized cropping systems. Using meta-analysis and field experimentation, we studied the relationships between N, P, and K uptake, biomass yield, and composition of sorghum, miscanthus, and switchgrass. Maize was included as a control.

Meta-analyses revealed that nutrient uptake scaled with biomass production across species. Nutrient losses to the environment occurred when senescent biomass was harvested in winter. Miscanthus and switchgrass biomass yields often were not increased with N, P, and K fertilization. High yields of switchgrass were possible with low tissue K concentrations that favor pyrolytic conversion processes. Under low N, yield of sorghum lines exceeded that of maize. Photoperiod-sensitive and sweet sorghum lines produced nearly twice the dry matter of maize at 67 kg N/ha. System differences in nutrient responses should be exploited when deploying candidate biomass species onto marginal soils. *IN-25F* ■

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Nutrient Deficiency Photo Application for iPhone/iPad Released

IPNI has released a new Crop Nutrient Deficiency Photo Library app for your iPhone or iPad (see http://info.ipni.net/ndapp). The app contains key photos of classic nutrient deficiency documented from research plots and farm fields for 14 common crops. It also provides supporting text and illustrations of nutrient deficiencies. This mobile app will be a great tool for crop advisers, consultants, farmers, and anyone wanting help in identifying nutrient deficiency symptoms in common crops. BC