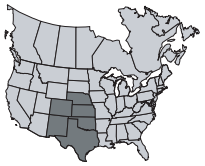
IPNI INSIGHTS
INTERNATIONAL PLANT NUTRITION INSTITUTE

Southern and Central Great Plains Region Research Report



September 2011

CONTINUING investigation into new technologies and improved efficiency is vital to any industry. Accordingly, IPNI continues a tradition of supporting agronomic research for the future of our industry.

This issue of *INSIGHTS* features the brief Interpretive Summaries related to research projects supported by IPNI in the Southern and Central Great Plains Region. This information and even more detail on each project can be found at the research database at our website: >**www.ipni.net/research**<.

Colorado

Contribution of Animal Feeding Operations and Synthetic Fertilizers to Ammonia Deposition in the Rocky Mountain National Park

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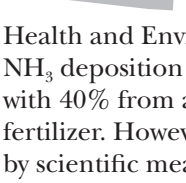
Project Cooperators: Thomas Borch and Jeffrey L. Collett, Jr.

Ammonia (NH_3) deposition has recently been targeted as a primary contributor to atmospheric and ecosystem changes in Rocky Mountain National Park (RMNP). The Colorado Department of Public Health and Environment has estimated that 60% of the NH_3 deposition in RMNP comes from agricultural activities with 40% from animal feeding operations and 20% from fertilizer. However, these estimates have not been verified by scientific measurement, and verification is especially important if future regulations require that agriculture be held accountable for NH_3-related ecosystem damage.

A major goal of this project is to assess the ability of isotopes as tracers, and in turn, to determine sources of NH_3 contributing to N deposition in RMNP.

The first year of this study was spent determining the best approach to isotope analysis. Progress over the past year includes completion of conditional samplers for field studies, some field sampling, and NH_3 studies from native soils in the RMNP. RMNP native soil studies have shown that NH_3 flux can vary greatly with sampling period. Additionally, grassland soils have higher NH_3 emissions than forest soils. Preliminary analysis of volatilized NH_3 shows that N deposited in RMNP via precipitation is retained by the soil. *CO-13F*



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Kansas

Effect of Long-Term Nitrogen, Phosphorus, and Potassium Fertilization of Irrigated Corn and Grain Sorghum

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This long-term western Kansas study was initiated in 1961 to evaluate responses of irrigated continuous corn and grain sorghum to N, P, and K fertilization. Furrow irrigation was used through 2000, and sprinkler irrigation since 2001. No yield benefit to corn from K fertilization was observed in the first 30 years and soil K levels remained high, thus the K treatment in the corn study was discontinued in 1992 and replaced with a higher P rate. Nitrogen treatments for corn and grain sorghum were 0, 40, 80, 120, 160, and 200 lb N/A. Phosphorus treatments for corn and grain sorghum were 0, 40, and 80 lb P_2O_5/A, and 0 and 40 lb P_2O_5/A, respectively. The K treatments for grain sorghum were 0 and 40 lb K_2O/A.

The 2010 results of this project were impacted by hail, thus yields of both crops were reduced compared to other years and caution should be used in interpreting 2010 data. Nevertheless, N alone increased corn yield by a factor of 3.3, while N and P applied together increased yield by about five fold. Averaged across the past ten years, N and P applied together increased irrigated corn yield by 140 bu/A. Application of 120 lb N/A (with P) has generally been sufficient to produce greater than 90% of maximum yield. Phosphorus fertilizer at the lowest P rate more than

tripled corn yield, and application of the highest P rate increased yield by a factor of 3.8. The no fertilizer treatment in the sorghum study produced 51 bu/A. Nitrogen fertilizer alone increased sorghum yield by about 25 bu/A, while N plus P increased yield by 35 bu/A. Application of 40 lb N/A (with P) was sufficient to produce about 85% of maximum yield in 2010. Potassium fertilization had no effect on sorghum yield. This is one of the few continuous, long-term crop nutrition studies in the U.S. *KS-23F*

Effect of Potassium, Chloride, and Nitrogen on Corn, Wheat, and Doublecropped Sunflower Grown on Southeastern Kansas Claypan Soil

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Project Cooperators: Douglas J. Jardine and Kenneth W. Kelley

Corn acreage has been increasing in southeastern Kansas in recent years because of the introduction of short-season cultivars that enable producers to partially avoid mid-summer droughts. Also, producing a crop after wheat and in rotation with corn may provide producers additional revenue by growing three crops in 2 years. Recent interest and developments in oil-type sunflower provide an alternative to soybeans for growers to doublecrop after wheat. The objective of this project is to determine the effect of N, K, and Cl^- fertilization on yield, yield components, and nutrient uptake of short-season corn, wheat, and double-crop sunflower grown in a 2-year rotation.

Corn yield, yield components, and stalk rot severity were unaffected by K or Cl^- fertilization (50 lb K_2O, 40 lb Cl^-) in 2010. Increasing N fertilizer rate (0, 50, 100, and 150 lb/A) increased corn yield primarily because of its impact on kernel weight and kernels per ear, but N rate had no effect on stand, ears per plant, or stalk rot severity. Dry matter production was significantly increased by K fertilization during vegetative and early reproductive growth stages; however, this response declined and was non-significant at the dough and physiological growth stages. Chloride had no effect on dry matter production at any growth stage. Nitrogen only significantly affected dry matter production in late reproductive growth stages. Wheat was planted in fall 2010 and after harvested in 2011 will be followed by doublecropped sunflower. *KS-38F*

Texas

Nutrient Uptake and Removal Dynamics in Muskmelon Grown in South Texas

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Fertilizer requirements for optimum yields may differ from the requirements for quality traits such as taste, flavor, texture, and shelf-life for certain high-value horticultural crops. Timing of fertilizer application is also critical. Currently, there are no nutrient management guidelines for optimizing produce quality even though certain nutrient elements, such as K, are known to influence quality development. The objective of this work is to evaluate nutrient removal and uptake dynamics of cantaloupe (muskmelon) in the Rio Grande Valley of Texas, and to ultimately improve nutrient recommendations.

Leaf, stem, and fruit tissues of muskmelons were sampled from fields with different soil types and analyzed to calculate nutrient removal amounts. Estimates of nutrient removal amounts in 2009 and 2010 ranged from 16 to 43 lb N/A, 3 to 8 lb P/A, and 33 to 98 lb K/A. There was significant variability among sites, with higher overall nutrient removal in clay textured soils than lighter, more sandy soils. Fruit soluble solids ranged from 9.8 to 12%, and were also higher in heavy soils. Observations from the region suggest that appropriate fertilizer input is important in improving both yield and quality of muskmelon, and is especially important under sandy soils. *TX-52F*

Potassium Fertilizer Management in Irrigated Cotton in West Texas

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Project Cooperator: Randal Boman

High soil K fertility in the western part of Texas is often taken for granted. Over 90% of the region's soils test high in extractable soil test K. However, cotton fields have been exhibiting pre-mature leaf drop recently, which may be linked to K deficiency. Growers are concerned that the traditional extractable K soil test does not reflect actual availability to cotton. Nevertheless, the typical practice of not applying K fertilizer, combined with high picker-type lint yields leads to "K mining" of west Texas soils. Fertilizer K source and rate trials were established in two furrow-irrigated west Texas locations in 2009 (Lubbock and Reeves counties). Specific objectives were to: 1) assess lint yield response to K fertilizer rates (0, 40, 80, 120, 160, 200 lb K_2O/A) 2) assess lint yield response to K fertilizer source (KCl and K thiosulfate); 3) assess different procedures for determining soil K availability; and 4) monitor leaf K between early bloom and first open boll as a function of K fertilizer rate.

Hail destroyed the Reeves site in 2010, so crop measurements came only from Lubbock. No yield response to K rate or source was observed. However, "dynamic" K soil testing using cation exchange resins did show net fixation in Reeves and net release in Lubbock County in both years. Water soluble K was lower at the Reeves site in both years. Salinity and sodicity reduced yields at Reeves. It appears that there was little benefit to K application over the course of this study. *TX-54F* ■