Dr. Touchton

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submerged soil, but the latter provided additional information on the P release and diffusion kinetics. Resin capsules were also sensitive tools to identify treatment effects on soil fertility in long-term fertilizer experiments.

A. Dobermann (63-2) 818-1926, Ext. 648

Evaluation of Industrial Wood Ash as a Liming Source. D.L. RABAS and R.D. MATHISON*, MN Agric. Exp. Stn.

Many wood-based industries burn waste wood to produce steam or electricity. The resultant ashes are high in pH and may have potential as a lime source to neutralize acidic soils for production of pH sensitive crops, such as alfalfa (Medicago sativa). Research was conducted at Grand Rapids, MN to investigate liming value of industrial wood ash. Soil was a coarse-loamy, mixed, nonacid, frigid Aeric Haplaquepts (Cownhorn very fine sand) with a pH of 5.7. Treatments were hand applied into 10x20 ft plots in a randomized complete block design with four replicates. 'Oneida' alfalfa was seeded at 16.8 kg ha^{-1}. Herbage yields, plant tissue and soil elemental analysis data were collected for three years. Ash proved to be an effective liming material. Maximum soil pH increase was reached with application of 44.8 Mg ha^{-1} of ash; however, the 67.2 and 89.6 Mg ha^{-1} application rates maintained higher soil pH levels longer and resulted in highest DM yields. Comparison of soil and plant tissue elemental analysis suggests differences in soil K levels may have been partially responsible for the observed yield differences.

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Application of EPIC Model to Nitrogen Cycling in Irrigated Processing Tomatoes. J. CAVERO*, C. SHENNAN and R.E. PLANT, Univ. of California, Davis.

Accurate predictions of soil inorganic nitrogen, nitrate leaching and nitrogen uptake by crops are needed to optimize crop growth and to avoid groundwater pollution. Numerous models have been developed to accomplish those goals but few of them have been tested in irrigated vegetables, where usually nitrogen-related processes are quantitatively more important. Soil NO3-N and plant nitrogen uptake in irrigated processing tomatoes were monitored in California during 1994 and 1995. The EPIC model was calibrated for this crop with 1994 data. In this paper validation of the model with 1995 data is discussed.

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Leachate from Soil Amended with Coal Combustion Gypsum and FBC Residue. K.D. RITCHEY*, M. ZAIFNEJAD, R.B. CLARK, V.C. BALIGAR, and D.C. MARTENS. USDA-ARS, Beckley, WV and Virginia Tech.

High-Ca, high-S byproducts leach below the plow layer and reduce Al toxicity in acidic subsoils. To study leachate composition we amended the top 15 cm of columns of acidic Lily loam (Typic Hapludult), 105 cm in height with (in g/kg soil) no amendment (Check), dolomitic limestone (Aglime) at 3.98, high-gypsum flue-gas desulfurization byproduct (FGD) at 15.88, a combination of Aglime+FGD at rates given, a high-gypsum FGD with 6% $Mg(OH)_2$ (FGD+Mg) at 15.88, and a fluidized bed combustion (FBC) byproduct at 6.45, then leached with 138 cm of water. Over half the Ca added in the three FGD treatments moved below the incorporation zone, with 12 to 17% of the added Ca found in leachate. About 75% of the 3.81 $cmol_c/kg$ Mg added in the Aglime+FGD treatment moved below 15 cm and over half of this was found in leachate. Almost all the 2.91 $cmol_c/kg$ Mg added in the FGD+Mg treatment moved below 15 cm, and 75% of this was found in the leachate. KCl-extractable Al below 15 cm was decreased by the FGD materials by about 0.6 $cmol_c/kg$ (compared to Check), and pH increased about 0.3 units. From 10 to 15% of the Al decrease was due to Al in the leachate, where levels reached 10 mg/L. Leachate S, Al, Fe, Co, P, Mn, Na, K, Si, Zn, Mg, and Sr concentrations were increased by the byproducts. FGD residues raised levels more than FBC residue.

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Response of Pearl Millet and White Lupin to Soil pH and Residual Phosphorus. G.L. MULLINS* and D.W. REEVES, Auburn University and USDA-ARS National Soil Dynamics Laboratory.

Field tests were conducted in the Coastal Plain of Alabama to evaluate pearl millet (*Pennisetum glaucum* (L.) R. Br.) response to soil pH and residual P in rotation with white lupin (*Lupinus albus* L.). The test was conducted on a Benndale sl (Typic Paleudults) and a Lucedale fsl (Rhodic Paleudults). Experimental sites had been in a long term study to evaluate crop response to soil pH and annual P rates for a number of crops. No P had been applied since 1980 and each site has a range in soil pH and soil test P. In 1992, the best treatments produced up to 1852 kg ha^{-1} lupin grain and 24.6 Mg ha^{-1} lupin silage. Millet grain yields in 1992 were low, ranging from 438 to 2109 kg ha^{-1}. Low yields were attributed in part to bird damage. In 1993 excellent grain yields were obtained with the better treatments yielding 3366 kg ha^{-1} on the Lucedale soil and 5926 kg ha^{-1} on the Benndale soil. The optimum pH for millet and lupin production was in the range of 6-6.5. Millet and lupin responded to soil test P up to a level that would be "high" based on the Auburn Univ. Soil Testing Laboratory.

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Corn Yield and Nitrogen Utilization as Influenced by Conventional, Low Input and Organic Cropping Systems in California. D.B. FRIEDMAN*, R.O. MILLER and C. SHENNAN, Univ. of Ca., Davis

The Sustainable Agriculture Farming Systems Project, initiated in 1989, is a 12 year research-station based experiment comparing organic, low-input and conventional farming systems in a four year, five crop rotation (tomato/safflower/corn/cereal/beans). The low input corn has outperformed both the conventional and organic corn for the last three years. Nitrogen use efficiency also appears to be the highest in the low input system. Yields in the organic system are heavily influenced by the carbon to nitrogen ratio and nitrogen content of the organic inputs, and have fluctuated considerably during the experiment. Conventional yields have been very consistent but have not reached their potential. Crop nitrogen tissue data indicates that conventional yields are limited by some factor other than fertility, possibly water stress associated with poor water infiltration. Further work is underway to evaluate soil physical properties among the systems.

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Sweet Corn Nitrogen Recommendations Based on the Presidedress Soil Nitrate Test. J.R. HECKMAN*, W.T. HLUBIK, D.J. PROSTAK, Rutgers University.

The presidedress soil nitrate test (PSNT) was evaluated for use on sweet corn. Sixty-one N-response experiments were conducted on a wide range of NJ soils. PSNT soil samples were collected to a 30-cm depth when plants were 30-cm tall. Soil NO_3-N concentrations reflected differences in N availability due to manure or preplant N application. The relationship between soil NO_3-N concentration and relative yield of marketable ears was examined using Cate-Nelson analysis to define the PSNT critical level. Soil NO_3-N concentrations > 25 mg kg^{-1} were associated with relative yields of 92% or higher. The success rate for the PSNT critical level was 85% for making the correct prediction as to whether sidedress N was needed. Although the PSNT is quite accurate in identifying N-sufficient sites, it appears to offer only limited guidance in making N-fertilizer rate predictions. The PSNT is most useful on manured soils which frequently have sufficient N.

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Comparison of methods for predicting nitrogen (N) uptake and grain yield by rice. S. NTAMATUNGIRO, B. R. WELLS*, R.J. NORMAN, Univ. of Arkansas.

Plant N status for flooded rice can be monitored from measurements of N concentration, chlorophyll content and plant area. No one has yet established valid comparisons among these measurements as methods for predicting N uptake, grain yield and need for topdressing N fertilizer at panicle differentiation (PD). A field study was conducted on a Crowley silt loam using combinations of five preflood and two midseason N application rates and two cultivars to obtain an array of growth responses. A good agreement (r^2>0.80) in estimating total N uptake near PD was found among the three measurements. Plant area at PD accounted for more variation in grain yield (r^2>0.60), total N uptake (r^2>0.70) and yield increase due to topdressing N at PD (r^2>0.50) than N concentration or chlorophyll content. The predictions were greatly improved by inclusion of plant area in the same model with N concentration or chlorophyll content.

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