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SUSTAINABLE ALTERNATIVES TO SEQUESTRATION
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THE UNIVERSITY OF GEORGIA • CENTER FOR CONTINUING EDUCATION • ATHENS, GEORGIA • USA

SESSION TWO
ORAL PRESENTATION B

Maize and weed flora dynamics on Amazonian Dark Earth and adjacent soils in the central Brazilian Amazon

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Abstract:

Pockets of very fertile Amazonian Dark Earth (DE) soils provide an interesting option for sustainable agriculture in the Amazon because these soils have maintained their high fertility for hundreds of years. The paucity of published data on the performance of crops on these organic matter-rich soils or even the composition of resident vegetation typically found on them stimulated this research. We conducted field trials on DE and adjacent soils (AS) in the region of Manaus, Amazonas, Brazil to assess the composition and impact of weedy vegetation on maize (*Zea mays* L.) yield. Maize was grown from January to May 2003 at four locations on swidden plots that had been under fallow for 3 to 16 years and, in one case, under mature forest. At each location, one plot was cleared on DE soil and one plot on AS. Soil fertility among the DE soils varied considerably, and differences were largely attributed to past-use histories. Maize yield and weed pressure varied significantly among field locations and correlated poorly with soil fertility indicators, illustrating the influence of weed reservoirs (e.g., seedbanks) on weed-crop dynamics. In general, highly fertile DE soils had greater maize yields and weed growth than their corresponding AS. For example, at one location, maize yield on DE was 3.15 Mg dry ear ha^{-1}, weed percentage ground cover was 77%, the average number of weed species was 7, and aboveground dry weed biomass was 237g, while on the AS 200m away these values were 0.08 Mg dry ear ha^{-1}, 27%, 4 species, and 60g, respectively. The relative proportion of annual and leguminous weeds was greater on DE soils than AS. In general, a similar weed community was observed on the different DE sites, including many species typically associated with environments that have been highly disturbed by human activities (e.g., *Cyperus* spp., *Phyllantus niuri* L., *Croton lobatus* L.). The percentage ground cover of weeds increased with the application of organic and synthetic soil amendments, and charcoal additions increased weed pressure when nutrients were supplied in an effort to recreate DE soils. We conclude that crops planted on highly fertile DE soils experience greater weed pressure compared with crops grown on adjacent, less fertile soils.

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SESSION ONE
ORAL PRESENTATION A

EFFECTS OF CHARCOAL AND ORGANIC FERTILIZER ON NUTRIENTS AVAILABILITY IN A CENTRAL AMAZON OXISOL

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INTRODUCTION

Positive effects of soil amendments such as wood ash and charcoal on soil properties and plant growth have been established (Naylor and Schmidt. 1986; Kishimoto and Sugiura. 1985). Charcoal applications directly increased nutrients availability such as P and K and additionally increased nutrients retention for ammonium (Lehmann et al., 2003). Very few information is available about the effects of charcoal and organic fertilizer on nutrient availability of highly weathered soils in the humid tropics. The objective of this study was evaluating the influence of the charcoal and organic fertilizers on the nutrients availability in Oxisol.

MATERIAL AND METHODS

A greenhouse study was carried out at the National Institute for Amazon Researcher (INPA) in Manaus, Brazil. in order to evaluate the influence of the charcoal and organic fertilizers on growth, nutrients uptake by corn (Zea maiz) and nutrients availability in central Amazon Oxisol. Pots with five kg of an Oxisol were mixed with charcoal, organic and chemical fertilizers. Samples of each treatment were collected for chemical analysis after two months incubated. The corn was cut at 45 days after planting and an additional soil samples were collected to chemical analysis. Dry matter stems were measured after dried at 70º for 48 hour. Leave samples also were collected for macronutrients and micronutrients analysis.

SCIENTIFIC INNOVATION AND RELEVANCE

Charcoal applications directly can be an efficient nutrient adsorber and, per gram of material, desorbs nutrients more efficiently than does the clay fraction of the Oxisols. Substancial amounts of ground charcoal and wood ash are discarded as a result of the charcoal market associated with shifting cultivation. Recycling these materials to improve the small farmer of tropical soil is environmentally and economically attractive.

RESULTS

Charcoal addition increased available P from 0,37 mg kg^{-1} in control treatment to 31,59 mg kg^{-1} found on soil with charcoal only. The pot that received only chemical fertilizer, the available P was 30,1 mg kg^{-1}, whereas the pot with chemical fertilizer and charcoal showed 69,44 mg kg^{-1} of available. Concerning the exchangeable K, the chemical fertilizer addition not showed a relevance increase comparing with control. On the other hand, the treatment that received charcoal increased the K from 65,20 mg kg^{-1} to 364 mg kg^{-1}. Charcoal additions increased shoot dry matter of a corn crop by 49% in comparison to a control on an Oxisol.

CONCLUSIONS

Preliminary results reveled that charcoal can be used as a valuable soil amendment having both liming effect and nutrient value. In this respect the long-term dynamics of soil fertility with charcoal application are very interesting in comparison to agricultural chemical, slash and burning or mulching in Central Amazon. However, it is seem necessary to develop more research to define the quantity and the best way of apply charcoal in soil avoiding the nutrients disequilibrium.