

nativas. O objetivo deste estudo foi testar a eficiência do Biochar como condicionante de substrato para a germinação de sementes e desenvolvimento de mudas de carvoeiro (*Tachigali paniculata* Aubl.), espécie de grande importância para RAD. O experimento foi realizado no Viveiro da Universidade do Estado de Mato Grosso, Campus de Nova Xavantina. Foram testadas quatro concentrações de Biochar em pó e um controle: 5%, 12,5%, 25% e 50% e 0% do volume total do substrato base. Foram plantadas 60 sementes em cada tratamento e no controle. A semeadura foi diretamente em sacos de polietileno de 10×20 cm em casa de vegetação. A cada 30 dias, durante sete meses, foram tomadas as medidas do diâmetro do coleto, altura total e número de folhas. No final do experimento foi determinada também a biomassa seca da raiz e da parte aérea. Adicionalmente, foi testada a relação entre concentração de Biochar e umidade do substrato através de reflectômetro por domínio de tempo (TDR). Os tratamentos foram comparados pelo teste Kruskal-Wallis, regressão linear e teste qui-quadrado com correção de Yates. Os valores de altura total, o número de folhas, diâmetro do coleto, biomassa radicular e parte aérea mostraram-se positivamente correlacionados com as concentrações de Biochar (regressão linear simples, $r^2 > 0,9$; $p < 0,01$). Todos esses parâmetros foram significativamente maiores no tratamento com a maior concentração de Biochar (50%) (ANOVA, $p < 0,01$), indicando eficácia do produto para a produção de mudas em viveiro. Não foram verificadas diferenças significativas no teor de umidade do substrato entre os tratamentos, indicando não haver influência do Biochar nestes parâmetros. O Biochar pode ser recomendado como condicionante do substrato para a produção de mudas de *T. paniculata* em viveiro na concentração de 50%, assegurando melhor desempenho da espécie na recomposição de áreas degradadas ou mesmo outras finalidades.

Palavras-chave: Terra Preta de Índio, recuperação de áreas degradadas, carvão pirogênico, produção de mudas.

Effect of Charcoal And Nitrogen on Soil Arthropods Associated to Common Beans and Upland Rice

Souza, R^{a,b*}; Machado, CS^{a,b}; Alves, TM^{a,b}; Barrigossi, JAF^a; Madari, BE

^aEmbrapa Rice and Beans, ^bUFG, Brazil

*E-mail: raphaelsouza@cnpaf.embrapa.br

Incorporating carbon in the form of carbonized biomass into the soil is an agricultural practice known thousands of years ago by Amazonian Indians. Nowadays it is being rescued and evaluated as an alternative to dealing with global warming. Nevertheless, the effect of modern charcoal application on soil biota must be evaluated. The effects of carbon and nitrogen fertilization on population of soil arthropods were assessed in common beans (*Phaseolus vulgaris* L) and rice (*Oryza sativa* L). The study was conducted at Embrapa Rice and Beans, Santo Antônio de Goiás, GO, from August, 26 to September, 11 2009 for common beans and from January, 07 to February 12 2010 for upland rice. The treatments were: 1. Charcoal (32 Mg / ha) + nitrogen (90 Mg / ha); 2. Charcoal (32 Mg / ha) + nitrogen (0 Mg / ha); 3. Charcoal (0 Mg / ha) + nitrogen (90 Mg / ha); 4. Charcoal (0 Mg / ha) + nitrogen (0 Mg / ha). For comparison, the same evaluations were made in plots at four sites in native cerrado forest. The experimental design was a randomized complete block with four replications. Plots were 4m wide and 10m long.

Evaluations were performed weekly, using pitfall traps per plot installed between plants, standing for 72 hours. The containers with the arthropods were removed, labeled and taken to the laboratory for sorting and identification of species. All arthropods collected were sorted and packed in bottles containing 70% alcohol or pinned and stored in entomological boxes for later identification of species. The data were processed in and submitted to analysis of variance. Means were compared by LSD test ($\alpha = 0.05$). For beans, 85 morphospecies were collected, predominating ants, beetles and spiders. The total number of ant and spiders species were greater under native forest than in the crop, regardless of treatment ($P < 0.05$). The number of beetles was higher in treatments receiving nitrogen, regardless of charcoal. In rice, 42 morphospecies were collected, mainly ants and collembolans. The collembolans predominated in cultivated environment ($P < 0.05$) in plots with nitrogen. The total number of ants was significantly higher in the native forest. In the cultivated environment, arthropod populations were higher in plots treated with charcoal. Although the treatments had not provided significant changes in the populations of most species sampled, further analysis of species richness and abundance should be correlated with environmental variables for further inferences.

The enhance of soil cation exchange capacity by using charcoal in an Typic clayey Acrothoxl in the Central Amazon – Brazil

Souza, TT^{a*}; Teixeira, WG^b; Steiner, C. C; Lima, A^d; Arruda, M^a; Moreira, A^e

^aEmbrapa Amazônia Ocidental, Brazil; ^bEmbrapa Solos, Brazil; ^cBiochar, Austria; ^dEsalq, Brazil;

Brazil; ^eEmbrapa Pecuaria Sudeste, Brazil

*Email: tatic_souza@hotmail.com

The cation exchange capacity (CEC) of a soil is a key factor to keep soil productive capacity and to hold the cations added by fertility management in tropical soils. In the clayey oxisols in the Central Amazon the CEC is originally low and is basically due the organic matter charges. The CEC is reduced as consequence of organic matter degradation by inadequate land use systems. The objective of this study was to evaluate the application of different charcoal levels in the CEC in the clayey yellow latossol cultivated with banana. The experiment was carried out at the Research Station of Embrapa Amazônia Ocidental in Manaus – AM. The soil was classified as an clayey Typic Acrothox. The experiment was done using a design with completely randomized blocks with in a confounded factorial (3x3) scheme with 27 treatments. The factors tested were charcoal levels (0, ~13 and ~26T ha⁻¹), phosphorus (167, 334 e 668 kg P₂O₅ ha⁻¹) and nitrogen (0, 90e 180 kg N ha⁻¹). The source of charcoal used were fine residues produced by canonization of local trees (~700 g C kg⁻¹), super phosphate simple (20% de P₂O₅) and urea (42% de N). Soil samples were collected in triplicate at each treatment in the depth of 0 - 10 cm. The CEC was determinate using an indirect methods, in which the exchangeable bases were added to the exchange acidity extracted from soils samples. The results shows significance effects ($p < 0.05$ - Tukey Test) between the level 0 (without charcoal application) and level (13336 and 26672 L ha⁻¹) and those levels do not shows differences between them. Those results shows the potential to use charcoal as soil conditioner to enhance CEC and soil fertility quality in the Oxisols. Another results about the

possible influences of the enhance of CEC in the banana nutrition and production will be presented.

Black C contribution to nutrient retention and carbon sequestration in laboratory incubations

Stewart, C^{a*}; Zheng, J^b; Cotrufo, F^b

^aUSDA-Agricultural Research Service; ^bNatural Resource Ecology Laboratory, Colorado State University, Fort Collins, Colorado

*E-mail: cstewart@nrel.colostate.edu

Biochar is a high surface-area, variable-charge organic material that may improve nutrient retention and soil C sequestration but its general beneficial properties have yet to be quantified in many soil types. Biochar has the potential to increase soil water-holding capacity, cation exchange capacity (CEC) and surface sorption capacity which decrease the leaching losses of nitrate and ammonium, and reduce the emission of N₂O. Despite these properties, the magnitude of soil benefits will depend on the size, quantity, and individual characteristics of both the biochar and the amended soil. In order to determine the relative contribution of biochar to: 1) nutrient retention and 2) soil C stabilization versus losses through soil respiration, we established a relatively long-term (3 years) laboratory experiment. We added two sizes (>250 and <250 μm) of C3-derived biochar to two C4-soils (sandy, silty-clay loam) with and without fertilizer addition, and measured over time C and N losses through respiration and leaching, respectively. At occasional destructive harvests, the contribution of char to soil organic matter fractions, separated by size and density, is quantified, and the potential for biochar to contribute to long term soil C stabilization assessed. Stable C isotope mixing model is applied to partition SOC versus biochar C in the measured C pools. Data from this experiment will be reported and results discussed in the context of the potential for biochar to promote soil organic carbon sequestration.

Biochar in rice-based systems: Impact on paddy soil and yield

Wang, J^{*}; Wang, S

Key Laboratory of Ecosystem Network Observation and Modeling, Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences

*E-mail: wangjy@igsrr.ac.cn

To study the effect of biochar input paddy soil, biochar was added to cultivated field of Qianyanzhou ecological station, Southern China. We used 30 plots (3m×3m), in which we fertilized three plot replicates per treatment with control, biochar, straw, inorganic fertilizer, biochar plus inorganic fertilizer and biochar plus straw. The biochar and straw were used as two levels (3000kg ha⁻¹ a⁻¹ and 6000kg ha⁻¹ a⁻¹). After one growing season, soil carbon increased in the plot with straw and biochar, and pH of soil increased slightly with biochar and straw. The plot with biochar plus inorganic fertilizer got highest yield. The yield of plot with biochar was higher than that of control plot. Overall, our result shows that biochar can enhance the soil carbon content, the use of biochar can decrease the use of inorganic fertilizer.

Influência da incorporação de carvão nos atributos químicos e físicos do solo num plantio de *Eucalyptus benthamii*

Woiciechowski, T^{*}; Ferronato, MZ; Lombardi, KC^c

Departamento de Engenharia Florestal, Universidade Estadual do Centro-Oeste (UNICENTRO), Brazil

*E-mail: thiagowoi88@yahoo.com.br

A utilização de subprodutos florestais nos solos surge como alternativa para a minimização de custos, proporcionar altos rendimentos à produção e benefícios ao meio ambiente. O carvão pode melhorar a qualidade do solo, gerando aumentos significativos na produtividade e resolvendo o problema da destinação final desse produto. O objetivo desse trabalho foi verificar as mudanças iniciais ocorridas nos atributos do solo quarenta dias após a incorporação de finos de carvão, num plantio de *Eucalyptus benthamii*. O experimento sob delineamento em blocos ao acaso está instalado na Universidade Estadual do Centro-Oeste (UNICENTRO) em Irati – PR, Brasil. No preparo do solo foi realizada a limpeza da área, controle de formiga, calagem (2,5 t ha⁻¹) e incorporação de finos de carvão. O plantio foi manual num espaçamento 3 x 2 m. Quarenta dias após a incorporação de finos de carvão foram coletadas amostras de solo de 0-20 cm nos seguintes tratamentos: T1 = testemunha; T2 = 10 t ha⁻¹ de carvão; T3 = 20 t ha⁻¹ de carvão; T4 = 40 t ha⁻¹ de carvão; T5 = 200g/muda de NPK 4-14-8; T6 = 10 t ha⁻¹ de carvão + 200g/muda de NPK 4-14-8; T7 = 20 t ha⁻¹ de carvão + 200g/muda de NPK 4-14-8; T8 = 40 t ha⁻¹ de carvão + 200g/muda de NPK 4-14-8. Foram realizadas as análises químicas de pH, matéria orgânica, K⁺, Na⁺, Ca²⁺, Mg²⁺, P, Al³⁺, H⁺ e Al³⁺ e determinação da saturação por bases; e as análises físicas de granulometria, densidade real e aparente, umidade e porosidade. Para os atributos matéria orgânica, teor de Mg²⁺, granulometria, densidades real e aparente e porosidade não foram observadas diferenças estatísticas entre os tratamentos a um nível de 95% de probabilidade. Foram observadas diferenças estatísticas entre os tratamentos que receberam carvão e os que não receberam (testemunha e T5), quanto ao pH, teores de K⁺, Ca²⁺ e Al³⁺, V% e umidade. A adição de carvão aumentou o pH, os teores de K⁺ e Ca²⁺, a saturação por bases e a umidade, e diminuiu o teor de Al³⁺. Esses resultados sugerem que a aplicação e incorporação de finos de carvão ao solo promovem a melhoria de alguns atributos químicos e físicos, podendo favorecer a produção florestal.

Biochar properties and its influence on plant growth and GHG

Xie, Zubin^{*}; Xu, Yanping; Zhang, Hanzhi; Liu, Jinshan; Bei, Qicheng; Sun, Huifeng; Liu, Gang; Zhu, Jianguo

State Key laboratory of Soil and Sustainable Agriculture, Institute of Soil Science, Chinese Academy of Sciences

*E-mail: zbxie@issas.ac.cn

Properties of biochar pyrolyzed under various temperatures, plant growth and GHG mitigation effects were investigated. Results showed that biochar recovery rates decreased with rising temperature: $y = -0.0446T + 59.614$, $R^2 = 0.8927$. Similar water soluble P contents were found in biochar pyrolyzed under 250 as under 350, and under 400 as 450, respectively. Water soluble P in biochar under 400 and 450 was significantly 67% higher