Produção de Biochar a partir de Ossos de Suínos

Corrêa, JC[a]*; Novotny, EH[b]; Madari, BE[c]; Higarashi, MM[a]

[a]Embrapa Suínos e Aves, Brazil; [b]Embrapa Solos, Brazil; [c]Embrapa Arroz e Feijão

*E-mail: juliano@cnpsa.embrapa.br

A carne suína é a fonte de proteína animal mais importante no mundo, sendo o Brasil o quarto maior produtor em termos absolutos, resultados obtidos pelo abate de 36.819.000 cabeças em 2008. Sabendo que o peso médio de animais abatidos é de 110 kg, e que 12 % deste valor corresponde a ossos, é possível estimar a quantidade de ossos produzidos anualmente no Brasil é de 486.010.800 kg. Vale ressaltar na composição química dos ossos de suínos, estão presentes, aproximadamente, cerca de 18% de P e 27,68 % de Ca, permitindo inferir que a cadeia de suínos pode contribuir com 203.152.514 kg de P_2O_5 e com 134.527.789 kg de Ca por ano.

No entanto, o destino final para estes resíduos da agroindústria ao longo do tempo vem sendo a produção de farinha de osso para alimentação animal, em razão do alto teor de nutrientes, fator que, também, lhe confere excelência como fertilizante. Porém, no futuro próximo o consumo deste tipo de matéria prima poderá ser restringido das formulações de rações devido às restrições sanitárias, a exemplo de países europeus onde esta prática já é proibida.

A proposta deste trabalho é dar um novo destino à utilização dos ossos de suínos, através da inovação tecnológica do biochar, tratando agora este resíduo como fertilizante de liberação lenta e não mais como ração. O processo de produção do biochar pelo processo de carbonização no equipamento preconizado pelo trabalho não gera gases tóxicos ou de efeito estufa (GEE). Desta forma, este trabalho mostra a possibilidade de manter estes mesmos teores nutricionais de P e Ca, entre outros nutrientes, somado ao fato de preservar o C no processo de produção, fator que, possivelmente, conferirá melhor ajuste do fornecimento dos nutrientes, o que permitirá melhor demanda às plantas nos diferentes estádios de desenvolvimento, além do diferencial da maior economia de demanda de energia durante o processo de produção, somado a não emissão de GEE.

Portanto, esta demanda de pesquisa visa alcançar a hipótese da International Biochar Initiative - 2010 que traz a idéia de otimizar a geração de energia e/ou químicos através de métodos modernos de pirólise e reciclagem de resíduos ou subprodutos e transformá-los em fertilizantes ou condicionadores do solo. Fator que confere ao biochar a responsabilidade de ser uma alternativa para mitigação e adaptação das alterações climáticas globais e, talvez, poder gerar outra renda ao produtor através dos mercados voluntários de carbono.

O experimento foi conduzido em novembro de 2009 no município de Concórdia em parceria entre as Embrapas: Suínos e Aves (CNPSA), Solos (CNPS) e Arroz e Feijão (CNPAF). Os experimentos foram desenvolvidos nas instalações da empresa Perozin Indústria Metalurgica Limitada, onde se encontra o protótipo do carbonizador para transformação de ossos em biochar, o qual foi adaptado do incinerador de animais produzido por esta mesma empresa em parceria com a Embrapa.

O carbonizador é desenvolvido em estrutura metálica com revestimento interno de material refratário, possuindo duas câmaras de queima. A primeira câmara serve para a queima primária e a segunda para a queima dos resíduos voláteis e particulados, gerados na primeira câmara. As câmaras possuem queimadores com capacidade para geração de calor de 60.000 a 200.000 Kcal/h, utilizando como combustível o gás liquefeito de petróleo (GLP). A temperatura no interior de ambas as câmaras é regulável e superior à 800ºC, atendendo a Resolução CONAMA Nº 316/2002.

Os parâmetros operacionais do processo de incineração como capacidade, tempo de carbonização, temperatura das câmaras de combustão, qualidade dos resíduos sólidos foram otimizados e padronizados com base em resultados neste prévio estudo científico. Para se chegar a estes valores de temperatura e tempo de exposição para pirólise dos ossos de suínos foram realizados testes preliminares.

Durante estes testes foi possível notar que em alguns casos a temperatura subia rapidamente, passando dos 700ºC, o que possibilita inferir que existia a combustão da própria matéria premia, fato que possibilita ter noção de que o material já se encontrava como carvão e, assim quando se atingia esta situação o equipamento era desligado e a tampa era aberta a fim de terminar o processo em condições ambientais.

Assim, com base neste testes, foi possível estabelecer parâmetros para o experimento que constou dos seguintes modelos de simulação de tempos e temperaturas para carbonização: a) exposição dos ossos de suínos a 930ºC por 10 minutos (rápida); b) exposição a 300ºC por 45 minutos mais 500ºC por 7 minutos (lenta); c) exposição a 300ºC por 25 minutos mais 500ºC por 10 minutos (intermediária).

Humanure-based Biochar

DeCandia, D

Farmer, United States

E-mail: dougdecandia@gmail.com

Biochar, when used as a soil amendment, can increase soil organic matter, ease water pollution and erosion, as well as sequester carbon from the atmosphere. By using humanure as the base for biochar, additional benefits can be achieved. These include the diversion of a potentially harmful substance from entering waterways, the conservation of water, and the creation of a carbon-rich soil amendment. The objectives were to, 1) make biochar with humanure as biological material base, 2) to test the sterility of the biochar through comparing average bacterial colonies found in the biochar and in the raw compost samples, and 3) to test for heavy metal concentration levels in the final biochar product. Partially composted humanure was collected from the two Clivus Multrum composting toilets in the Ecodorm on the Warren Wilson College campus, and dried for three weeks. Samples of the dried compost were taken and half were pyrolyzed to make biochar, and the other half were kept as raw compost samples. The samples of biochar and raw compost were then taken to the Warren Wilson biology lab, where one gram of each were diluted in 100 ml of sterilized water and then diluted to different concentrations, and plated on one of three agar-based growing mediums. A total of 12 samples of biochar and 28 samples of raw compost were plated. In total, the average number of bacteria colonies found from the biochar samples was 4.7 x 103 colonies/gram and the average number of bacteria colonies found from the raw compost sample was 3 x 1010 colonies/gram. The raw compost was found to contain approximately 6 x 106 times as many bacteria colonies than the biochar. In addition to the sterility tests, a heavy metal analysis was done on the final biochar sample. A sample of the humanure-based biochar was sent to the North Carolina Department of Agriculture and Consumer Services where it was tested for heavy metal concentrations of the nine heavy metals under regulation by the United States Environmental Protection Agency for biosolids. All nine of the required heavy metal concentrations found in the humanure biochar were below the ceiling concentrations for EPA standards. The results suggest that 1) the humanure-based biochar is more sterile than raw compost, 2) pyrolysis can be used to recycle humanure, and 3) the humanure-based biochar has the potential to be used as a soil amendment.

Affordable Biochar Furnace Producing Heat Energy and Biochar for the Small Farm and Nursery with Inoculation System

Du Plessis, C

Rainbow´s End Biochar, United States

E-mail: katnip827@gmail.com

The author, C.J. du Plessis, holds 8 patents on process and equipment to produce activated carbon from agricultural wastes. I have owned and operated activated carbon producing factories in South Africa, Mexico and the United States. I currently own and operate a butterfly farm and nursery with my wife in New York State. (See article by D.Yarrow at www.RainbowsEndBiochar.com).
I got interested in producing heat energy for nurseries utilizing wood chips as a heat source and at the same time producing high-grade biochar. The research and development to produce this unit was done in the farm workshop. A prototype was built and tested, normal R & D procedures were followed, concentration was on feedstock, particle size range distribution, moisture content and flow properties. Flow obstacles of wood chips were overcome and a continuous flow process was developed. The unit was specifically built and designed to be affordable, supply heat energy and produce a high-grade biochar from a readily available waste product on the northeast and northwest coasts of the US. These goals have been achieved.
The second phase was to produce an active biochar activated with biology! For this a vermicompost and garden compost extract was developed and used to impregnate the biochar produced by the unit. \Test work and verification were done by an outside laboratory, Soilfoodweb, internationally known as the people for biology identification. The produced active biochar is currently being used in the greenhouses of Rainbow’s End Butterfly Farm & Nursery for plant growth evaluation.
This is not a presentation of what “could” be done. This is a presentation of what has been done. As we say in South Africa, “talk is cheap…money buys the whiskey”. Presentation will consist of power point and video clips.
For references, please consult our homepage www.RainbowsEndBiochar.com or contact me at katnip827@gmail.com or (845) 832-6749.

Bamboo Charcoal and Biochar

Fu, J

International Network for Bamboo and Rattan, China

E-mail: jfu@inbar.int

There are 1500 woody bamboo species and 27 mil ha bamboo forest around the world. Bamboo is a widely distributed sustainable natural resource in Asia, America and Africa and has more than 2000 uses in the world. Bamboo is playing more and more important role in the changing world to environment, livelihood and economy. One of the important uses of bamboo is bamboo charcoal. Bamboo charcoal specific area can be up to 300-500 m^2/g compared to less than 30 m^2/g of most wood charcoal. Because of its outstanding absorption capacity, bamboo charcoal is used as deodorants and many other uses.
Bamboo charcoal has a good market in Japan and China due to a felling ban in natural forests and the good character of bamboo charcoal. In addition to bamboo charcoal being used for fuel, there are several other uses:
Agriculture: As a carrier of organic manure and micro-organism in the soil, bamboo charcoal can improve the vigour of the soil, so people use it as a good soil enhancer. Bamboo charcoal is a kind of biochar, it contributes also to carbon sequestration besides as fertilizer.
Chemicals: Bamboo charcoal can be used as the raw materials of bamboo active carbon.
Medicine and health care: Pillows and mats made of bamboo charcoal can soothe the nerves, relax backaches, and control snoring. Bamboo charcoal also has the functions of deodorization, dehumidifier and fungicide.
Environment protection: Bamboo charcoal can be used as a water clarifier, shield off electromagnetic waves and absorber of poisonous gases.
Other fields: Bamboo charcoal can be made into many kinds of compound materials in the material industry. It also can be made into handicrafts, feed additives and high capacity rechargeable storage batteries, textile added with bamboo charcoal etc.
Annually over 100,000 tons bamboo charcoal is been produced. These bamboo charcoal is used as above mentioned purposes and can sequestrate and store almost 400,000 CO_2 annually. The annual production of bamboo charcoal is increasing very fast, hence bamboo charcoal is playing a more and more role to mitigate climate change as well other benefits on economy.
We are implementing an EC bamboo biomass energy project -- Bamboo as sustainable biomass energy: A suitable alternative for firewood and charcoal production in Africa.

Preliminary Evaluation of Biochar Production for Oil Palm Trunks by Using a Batch Reactor

García-Núñez, JA*; Yáñez-Angarita, EE

CENIPALMA, Colombia

*E-mail: jgarcia@cenipalma.org

During oil palm crop renovation around 80 tones /ha of dry biomass are produced, thus oil palm is one of the species that adds more organic matter into the soil where it is grown. In Colombia, there are more than 60.000 hectares of oil palm that are going to be replanted during the next 5 years. Additionally, the bud rot disease has destroyed more than 25.000 ha of oil palm plantations in the western