Pyrolysis tests on agro-forestry biomass

Andrea Colantoni of the University of Tuscia in Viterbo, Italy visited BIOENERGY 2020+ in Graz, Austria. Here is a summary of the experiments he conducted during his visit. His study was able to demonstrate the capacity to produce biochar using the residual biomass derived from agro-forestry biomass.

Andrea Colantoni graduated in Forestry MSc at the University of Tuscia, Italy in 2000. He then became Doctor of Philosophy in Agricultural Mechanization with the thesis: 'Study and development of innovative technologies for small and medium companies for the use of renewable energy sources'. In 2010, he became a researcher at Tuscia University in the Department of Agricultural and Forestry scieNcEs (D.A.F.N.E.) – Tuscia University.

Conducting pyrolysis tests on batches of agro-forestry biomass enables studies of the components produced and the variables that influence the biochar production. During the pyrolysis process, part of the biomass is converted into pyrolysis gas, and other part into solid charcoal residues (biochar). The potential benefits for the environment are the reduction and sequestration of CO2 emission. It also provides farmers additional income through the generation of electric power. Biochar is produced in higher yields by pyrolysis compared to gasification. Biochar is a 'porous carbonaceous solid' produced by thermochemical conversion of organic materials in an oxygen depleted atmosphere, which has physiochemical properties suitable for the safe and long-term storage of carbon in the environment and, potentially, soil improvement.

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Figure 1: Batch pyrolysis reactor.

Figure 2: Sample of GVP (a) and SFH pellets (b).

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Figure 3: Grape vine sample used for tests.

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The objective of my BRISK visit to BIOENERGY 2020+ in Graz, Austria was to improve the acknowledgment that biochar gained from agro-forestry biomass residual (like grape vine, sunflower husks) has alternative uses, through chemical characterizations. Our study was able to demonstrate the capacity to produce biochar using the residual biomass derived from agro-forestry biomass. Results of this experiment have shown that the biochar obtained is characterized by good chemical and physical characteristics for an agronomic use or an energetic use. Regarding this last mentioned aspect it is important to underline that the lower heating value and carbon content are similar to lignite's values and it means that biochar can be used, as a coal, in thermo-chemical processes to energy production.

Regarding its use as a fertilizer it is important to highlight that this biochar has a good impact on soil characteristics with an increase in the soil's water retention capacity and a reduction of soil acidity in consequence of the alkaline pH value. In addition the agronomic-use tests of biochar have shown an absence of negative impact on crop growth. With other specific analysis it will be possible to determine the additional characteristics necessary for the insertion of biochar into the list of soil amendment for agricultural use.

I would like to thank the BRISK team for making my visit so fruitful and pleasant, especially Nikola Evic for the time and effort dedicated to help me with queries I had during my work and my stay at TU Graz. I would also like to thank Stefan Retschitzegger for his administrative support and coordination. My experience of the BRISK project was certainly an inspiring one, as it was the trigger that convinced me to continue in the research field and to carry on my studies of biochar and thermo-chemical processes.

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