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COMPARISON BETWEEN COFFEE AND COMMON LIGNOCELLULOSIC BIOMASS FOR ENERGETIC POTENTIAL PREDICTION

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Abstract

Energy production from renewable and waste materials is an attractive alternative to conventional production chains that involve agricultural products. Residual biomass from cultivars and coffee production chain, despite their widespread availability, aren't enough considered in energy models and economic development. In addition to lignocellulosic biomass, coffee can be considered as a new material usable in such processes. ICO (International Coffee Organization) data showed that the Spent Coffee Grounds (SCG) production worldwide is about 6 million of tons per year. In the work presented, calorific value, ash content, and elemental analysis of lignocellulosic biomass and SCG pellets, were firstly examined. The aim was to compare SCG with conventional lignocellulosic biomass already used in thermal production. Compositional and energetic analysis permit to fix linear models for biomass energetic yield prediction. Models that relate the higher heating value (HHV) to the compositional analysis mostly date to the late 19th century. Estimation of HHV from the elemental composition of fuel is one of the basic steps in performance modelling and calculation for thermal systems. The possibility to perform statistical analysis on data collected in the same laboratory gave the opportunity to reliably compare conventional and unconventional biomass. The linear regression model fitted on the whole dataset had an R Squared of 0.85 showing a good HHV prediction from elemental analysis. Coffee appeared as a feedstock with peculiar characteristics that differentiate it from the others, while herbaceous and arboreal biomass mostly differentiated for ash and moisture content.
SCG showed an HHV higher than any other woody and herbaceous plant, manifesting a great potential from an energetic point of view. According to the concept of circular economy, coffee companies, in their waste, have already a valid resource usable in a heat generator for the roasting process.

Key words: biomass, modelling, spent coffee grounds (SCG), ultimate analysis

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