



## **Effect of bone on the pyrolysis product distribution and composition in a fixed bed reactor**

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### **ABSTRACT**

Co-pyrolysis of Biomass including Pistachio shell (PS), Pine wood (PW) and Wheat Straw (WS) with Bone matter (BM) have been investigated to determine the effect of bone on the quality of bio-char and bio-oil produced. The aim of this study is to generate stable and nitrogen enriched bio-char that can act as fertilizer while at the same time optimizes the chemical stability of the char to act as a Carbon Capture and Storage system (CCS) and co-produce high quality oils for renewable energy generation. To achieve this, the present study has focused on the influence of bone matter addition from 0wt% to 25wt% to the biomasses in a fixed bed pyrolysis reactor at 3000C. The analysis of the char products shows that the addition of bone to the biomass increased their char yields up to 10wt% addition. Higher addition was found to reduce the overall char yield from the biomass. At 10wt% bone addition, the carbon, hydrogen, and nitrogen content, and the gross calorific value of the chars were increased by 7wt%, 29wt%, 163wt% and 19Mj/kg, for Wheat straw, 62wt%, 46wt%, 135wt%, 110Mj/kg for Pine wood and 7wt%, 76wt%, 42wt% and 33Mj/kg for Pistachio shells. The oxygen content of the Wheat straw, Pistachio shells and pine wood mixed with 10wt% BM decreased by 28wt%, 21wt%, and 93wt%, respectively. The bio-oil yield increased for the bone addition up to 5%wt% for all the samples, its energy value and concentration of its major chemical components was improved for fuel and pharmaceutical use. Port experiment has shown that plant grown on soil amended with the bio-char produced gave higher yield as compared to that from un-amended soil. Comparison between the three biomasses investigated showed similar pattern of change. Hence it can be concluded that at optimum addition of bone to the biomass, bio-chars and oil yield could be optimized for soil amendment, energy production, while retaining carbon for sequestration.