

Proof of concept for using banana waste based binders in sawdust briquetting: Comparative studies between raw and carbonized sawdust

Charis Gratitude, Bilal Patel, Marko Chigondo, Morgen Rusere and Munashe Maposa

Abstract

A comparative study of carbonized versus raw sawdust briquettes production using a banana waste based binder was conducted. The binder was formulated from banana pseudo stem, pith, ripe banana, green banana in the ratio 2:2:1:1. Sawdust was pyrolyzed at temperature ranges of 300-350°C, 370-470°C and 600-700°C. Briquettes were produced using a gravity aided press (GAP). The mechanical and combustion properties of the briquettes were compared to assess binder effectiveness on both feedstocks as well as the extent of improvement introduced by carbonization. Comparable shatter indices of 0.96 and 0.95 and densities of 425 kg/m³ and 685 kg/m³ for carbonized and raw sawdust-based briquettes respectively indicated that the binder performs well with both feedstocks. Proximate analysis indicated that carbonization increased the solid fuel quality through a 39%, 16% and 41% decrease in moisture content, volatile matter and ash content respectively, and a 35% increase in fixed carbon. Carbonized briquettes demonstrated shorter ignition time, a steadier burn rate, shorter time to boil and higher calorific value by factors of 53%, 47%, 32% and 15% respectively compared to raw sawdust briquettes. Conclusively, banana waste-based binders can be used with carbonized sawdust to produce higher fuel quality briquettes for grilling and space heating.