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Energy Efficiency of Briquettes from Queen Pineapple (Ananas Comosus [Linn.] Merr.) Wastes Using Three Organic Binders

Abstract

Pineapple (Ananas comosus [Linn.] Merr.) farms generate a high volume of wastes composed of residual stalks, leaves, roots, and crowns including bruised butterballs which is equivalent to 70–80% of its production. Converting these wastes into biochar briquettes for bioenergy and biofuel application is needed to avoid water and soil contamination. In this work, we investigated the energy efficiency of Queen pineapple (QP) briquettes mixed with different starch binder's raw material, namely the sweet potato (Ipomoea batatas), cassava (Manihot esculenta), and nami (Dioscorea hispida). The pineapple wastes were dried and carbonized using a drum-type carbonizer, while the sun-dried starch was extracted from the grated raw binder materials. The dried pineapple wastes mixed with the gelatinized starch were molded using a ten-port manual briquetting machine to produce the briquettes. Each set of briquettes was used to boil 500 ml of water, and the following quantities were measured: Water boiling time, length of briquette consumption, and density. Afterwards, the burning efficiency and heat transfer rate per unit mass of briquettes were computed. The results revealed that QP briquettes with Dioscorea hispida binder have the highest energy efficiency based on the mass burning rate and heat transfer rate of 3.71 g min−1 of 40.4 Jg−1 min−1 followed by 3.45 g min−1 and 26.36 4 Jg−1 min−1 for Ipomoea batatas binder, and, lastly, 3.30 g min−1 and 25.68 Jg−1 min−1 for Manihot esculenta binder, respectively. Dioscorea hispida is found to be the best starch binder source among the three crops for producing briquettes from QP wastes.

Keywords

Binder; Biofuel; Energy efficiency; Green energy