Energy potential of oil palm Empty Fruit Bunch (EFB) fiber from subsequent cultivation of Volvariella volvacea (Bull.) singer

ABSTRACT

EFB and EFB-based mushroom compost (SMC) from Volvariella volvacea cultivation is a promising energy feedstock because it has adequate nutrient quality. The biochemical methane potential (BMP) and calorific value (CV) of this biomass are investigated. Other analyses such as proximate, compositional, and final analysis; thermogravimetric analysis (TGA); and Fourier transform infrared spectroscopy (FTIR) are also performed. The biomass samples consist of two types of EFB, namely fibers (F) and pellets (P) and SMC from the subsequent cultivation of Volvariella volvacea, with samples FS and PS from the first cultivation and FS2 and PS2 from the second cultivation. P produces the highest biological efficiency (BE) of 28% compared to 9.83% for F. Subsequent cultivation with FS and PS then produces only 2.9 and 6.83% of BE. A higher amount of methane is measured in samples P and PS2, while better biodegradability is observed in PS2 and FS2, suggesting that subsequent cultivation is a good pretreatment of the substrate for anaerobic digestion (AD). CV is highest in F (20.57 MJ/kg), followed by P (19.06 MJ/kg), which is comparable to commercial wood pellet. Samples F, FS, and FS2 have higher ash content, which is due to higher mineral content. The cellulose composition is reduced to almost 50% during cultivation due to fungal metabolism, which is also evidenced by FTIR analysis. TGA analysis revealed that EFB-based SMC exhibits higher weight loss during combustion compared to EFB, which reduces its thermal properties. SMC of EFB is a high potential biomethane feedstock, but not recommended as a fuel pellet.

Keyword: Empty fruit bunch; Spent mushroom compost; Bioenergy; Biomass pellet; Biomethane