ABSTRACT

Biocomposting has the potential to provide an environmentally acceptable and cost-effective solution to various environmental issues associated with agroindustrial waste. The purpose of this research is to evaluate the efficiency of biocomposted cocoa shell waste (CSW) and jack fruit peel waste (JFPW), as well as its influence on certain crop plants and soil fertility. *Pleurotus eous, Pleurotus florida,* and *Eudrilus eugenia* were employed in biocomposting procedures that lasted 90 days. The results of the microbial population study revealed that the maximum increase in bacterial (4.84×10^7 CFU g^{-1},6.33×10^7 CFU g^{-1} & 4.77×10^7 CFU g^{-1}), fungal (0.92×10^4 CFU g^{-1},1.38×10^4 CFU g^{-1}& 0.78×10^4 CFU g^{-1}) and actinomycetes (0.50×10^2 CFU g^{-1},0.61×10^2 CFU g^{-1} & 0.42×10^2 CFU g^{-1}) population was noted in C_8 (Raw JFPW+10 g *P. eous* + 10 g *P. florida*+ *E. eugeniae* 5 t/ha^{-1} (T_8)) and closely followed by C_4 (CSW+10 g *P. eous* + 10 g *P. florida*+ *E. eugeniae* 5 t/ha^{-1} (T_4)) at 30, 60 and 90 days. Physical and chemical characteristics of raw and biocomposted CSW and JFPW showed that, among the eight different biocompost, C_8 (T_8) had the lowest levels of lignin (13.00%), cellulose (11.24%), pH (6.71), EC (2.26), organic carbon (9.80%), C: N (6:1) ratio and a considerable rise in N (1.62%), P (1.40 %), K(3.27%), Ca (4.80%) and Mg (3.81%) as compared to the other treatments and control. FTIR results revealed significant functional groups in both the raw and biocomposed CSW and JFPW, while SEM findings revealed that C_8 has the highest surface alterations, followed by C_4. The SEM micrographs showed biodegradation and mineralization occurring after the composting of CSW and JFPW.

A control with eight different treatments (T_1, T_2, T_3, T_4, T_5, T_6, T_7 and T_8) was used for the pot culture experiments of cowpea, yardlong bean, shankhpushpi and red amaranth. At various development stages of pot culture experiments in test crops, T_8 was shown to have increased vegetative and yield attributes as well as biochemical characteristics (protein, carbohydrate, crude protein, chlorophyll ‘a’, chlorophyll ‘b’, and ‘total’ chlorophyll and leghaemoglobin). Pre and post-harvest nutrient assessments in soil showed the maximum increase when comparing T_8 treatment of test crops to other treatments. In all the four plants, methanol seed and leaf extracts showed stronger antibacterial activity. Red amaranth leaf extracts in methanol provided the largest zone of inhibition (15mm) against *Staphylococcus aureus*, followed by the aqueous extract. The

methanol seed extracts of cowpea, yardlong bean, shankhpushpi, and red amaranth showed promising antioxidant activity in T_8. The current study examined the phytochemical screening of shankhpushpi and red amaranth leaves grown in the best treatment (T_8 - Raw JFPW+10 g *P. eous* + 10 g *P. florida*+ *E. eugeniae* 5 t/ha^{-1}). Aqueous, methanol, and ethyl acetate leaf extracts of Shankhpushpi and red amaranth showed a variety of phytochemicals, such as alkaloids, anthraquinones, amino acids, flavonoids, glycosides, phenols, steroids and saponins. The mineral composition of test crop leaves showed that T_8 (best treatment) had higher levels of macroelements (Ca, P, K, and Mg) and microelements (Na, Fe, and Zn) than the control. Thus, it was concluded that the combined application of *P. eous, P. florida* and *E. eugeniae* Kinberg were discovered to be the primary decomposers of CSW and JFPW, may be used as efficient organic manure to provide the safe cultivation of plants in soils. The current study not only offers an alternative method for getting rid of agro-industrial waste like cocoa shells and jackfruit peels, but it also reduces the use of chemical fertilizers that are applied to food crops and medicinal plants and promotes organic farming for sustainable crop production.