

Densification of Tea Fibrous Waste as a Renewable Biomass Fuel**Thathsarane W.T.R.* , Lakshitha W.M.R., Rupasinghe C.P., Bandara W.B.M.C.A.***Department of Agricultural Engineering, Faculty of Agriculture, University of Ruhuna,
Sri Lanka***rasangikathathsarani91@gmail.com***Abstract**

Currently fossil fuel often use for fulfilment of energy demand of the world. With the rising demand of energy, fossil fuel is at the risk of depletion within 40-50 years. With the environmental and health effects of burning fossil fuel, world is shifting to renewable energy sources. Hydro power, solar energy, wind energy, geothermal energy, biomass energy, dendro power, wave energy etc are considered as renewable energy sources which used all around the world including Sri Lanka. With reference to biomass all materials derived from living organisms, or recently living organisms (plants and animals) are considered as biomass such as rice husk, straw, paddy bran, wood chips, saw dust, pruned branches, leaves animal waste. This research was conducted with the objectives of to determine the suitable mixing ratio of binders with the tea fibrous waste and to test the physical properties of densified biomass. The process of compaction of residues into a product of higher bulk density than the original raw material is known as densification. Various types of binders can be used in densification process to enhance the ability of binding. Wheat flour and paper pulp used as binding agents with different mixing ratio of 2.5%, 5%, 7.5%, 10% and 12.5% (w/w) of each binder with 40 ml water and 40 g of tea fibrous material as base material. Considering the fuel quality, densification increases the calorific value and bulk density, densified biomass fuel with wheat flour binder shows a higher compressive strength (0.4246 MPa to 0.4564 MPa) and paper pulp binder has highest tensile strength. Highest calorific value, 22.65MJ/kg observed in 2.5% of wheat binder though it doesn't have favourable tensile strength value (10.02 MPa). Densified biomass, 7.5% of wheat binder has favourable calorific value 21.29 MJ/kg, compressive strength 0.4529 MPa and tensile strength 13.06 MPa. Considering paper pulp binder, 10% of paper pulp binder has favourable tensile strength 15.83 MPa, Calorific value 21.01 MJ/kg and compressive strength 0.4228 MPa. According to ranking index method, 7.5% of wheat binder and 10% of Paper pulp binder are most appropriate to produce biomass fuel as alternative to the fuel wood.

Keywords: Calorific value, Compressive strength, Densification, Tensile strength