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Production of bio energy briquettes using underutilized local forages

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Abstract

In the last few decades, world research has been focused on improving the utilization of alternate energy sources to meet the ever increasing energy demand and to avoid dependence on crude oil. In countries like Sri Lanka use of alternate, renewable energy sources are utmost important especially at rural level, but no systematic approaches have been focused to introduce easy to use, environmental friendly appropriate technologies. In the present era many developed countries have given attention to produce bio-energy using underutilized forages such as switch grass, canary grass etc, due to their easy renewability, abundance and environmental friendliness etc. Therefore in the present study bio-energy briquettes were formed using locally available four forages namely, wild Guinea grass (*Panicum maximum*), Mana *(Symbopogon confertiflorus*), Illuk (*Imperata cylindrica*) and Tikiya (*Aleocharis dulcis*). All of these forages are abundantly available in many areas of the country, but due to their fibrous nature only a small proportion can be utilized as a livestock feed and major proportion (non- edible) is wasted.

Initially non-edible portion of each forage species (F) were separated and chopped into 1-1.5 cm pieces, sundried for few days. Dried samples were combined with conventional binding agents cow dung (CD) and clay (CL) at four ratios (F: CL 75:25, F: CD 75:25, F: CL: CD 60: 30: 10 and F: CL: CD 60: 10: 30). There were 16 treatments (4 forages x 4 ratios of binding agents) x 4 replicates. Energy briquettes were formed using self produced manual machine and sun dried for 3-4 days until they could store without any damage. Samples were taken randomly from each treatment to determine dry matter % (DM), calorific value, Flame characteristics. The time taken to boil 150ml water and for complete combustion were also determined and the results were analyzed using factorial CRD test.

The results revealed that Tikiya contained lowest ($P<0.05$) DM content (88.5%) compared with other forage species may be due to its growth under water logged conditions. In contrast, briquettes of Guinea grass contained significantly higher DM content (92.39 %) due to its growth under harsh environment conditions. The calorific value (CV) was highest ($P<0.05$) in Mana briquettes formed with 75% forage: 25% cow dung while it contained citronella oil as well as due to higher burning properties of cow dung. Forage: cow dung 75%:25% briquettes had higher ($P<0.05$) calorific value (62.44 MJ/Kg) with all forages compared to the CV of (F): (CL): (CD) 60:10:30 briquettes (25.76 MJ/Kg). Mana briquettes with F: CD 75:25 has taken least time ($P<0.05$) to boil 250 ml water, but when it contained clay F: CL (75:25) the time drastically increased. Moreover Mana briquettes took lowest time ($P<0.05$) for its complete combustion. When the briquettes contained CL it took significantly longer time for complete combustion than only CD was presented as a binging agent. The flame characteristics were bluish yellow for the all treatment combinations. In contrast the forage: cow dung 75%:25% combination showed best burning characteristics especially with the Mana grass.

It was concluded that among the four tested underutilized forages, Mana (*Symbopogon confertiflorus*) was the most suitable forage to produce bio energy briquettes. Cow dung could be considered as the best binding agent and clay is not suitable to form briquettes. Further investigations are necessary to identify the best combinations of forage and binding material (cow dung) to produce efficient energy briquettes.

Key words: Bio energy, briquettes, underutilized forages