

## Fuel Bark Quality Evaluation of Commercial Tropical Tree Species: An Approach to Waste Utilization

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### 1. Introduction

The removal of bark from logs is creating major residue problem in wood-based industries. It contains high amount of lignin, extractives, ash & moisture and low amount of polysaccharides than wood (Harkin and Rowe 1971). The most desirable properties for an optimal fuel quality of a lignocellulosic material are its high calorific value, high density, low ash and moisture content (Puri et al 1994). Keeping in view of these points, a research study was carried out to evaluate the fuel value index of bark from ten commercially important tropical tree species for their efficient utilization.

### 2. Material and methods

A total of ten different tree species planted in NAU campus were selected for determination of calorific value, basic density, moisture and ash content of bark. The moisture content of the collected bark was determined by oven-dry method, while basic density was determined by water displacement method. The bark sample was pelleted and burnt in an oxygen bomb calorimeter to determine the calorific value. However, ash content was determined by burning one gram of powdered bark sample in the muffle furnace at temperature of 600°C.

### 3. Results and discussion

Among the tree bark of selected ten species, the lowest and the highest moisture content was recorded in *Acacia nilotica* (58.30%) and *Albizia procera* (298.02%), respectively. The highest basic density was found in *Casuarina equisetifolia* (0.600 g/cm<sup>3</sup>), while lowest basic density was found in *Albizia procera* (0.277 g/cm<sup>3</sup>). Highest ash content was reported in *Tectona grandis* (13%), whereas lowest ash content

**Table 1.** Fuel value ranking of bark of the ten commercially important tree species using calorific value, density, ash, moisture and fuel value index (FVI). The ranking ranges from 1 (best) to 10 (worst)

Tree species	Moisture content (%)	Basic density (g/cm <sup>3</sup> )	Ash content (%)	Calorific value (cal/g)	FVI	Total	Rank
<i>Tectona grandis</i>	8	8	10	9	10	45	10
<i>Gmelina arborea</i>	9	7	2	3	6	27	6
<i>Casuarina equisetifolia</i>	2	1	3	8	1	15	1
<i>Eucalyptus</i> spp.	7	9	8	10	9	43	9
<i>Mangifera indica</i>	3	3	7	6	5	24	5
<i>Albizia procera</i>	10	10	5	1	8	34	8
<i>Acacia nilotica</i>	1	2	9	4	2	18	3
<i>Acacia auriculiformis</i>	4	4	4	5	4	21	4
<i>Adina cordifolia</i>	5	6	1	2	3	17	2
<i>Leucena leucocephala</i>	6	5	6	7	7	31	7

in *Adina cordifolia* (5.30 %). The highest and the lowest calorific value was recorded in *A. procera* (17.66 MJ/kg) and *Eucalyptus* spp. (14.97 MJ/kg), respectively. The highest fuel value index (FVI) was assessed in *Casuarina equisetifolia* (156.80) and lowest in *Tectona grandis* (18.53). Based on the ranking of the tree species with respect to their fuel value characteristics of bark, the highest fuel bark quality was found in *C. equisetifolia* followed by *Adina cordifolia* and *Acacia nilotica*, while the lowest fuel bark quality was found in *Tectona grandis*. It is concluded that the maximum fuel bark quality was evaluated in *C. equisetifolia*, followed by *Adina cordifolia*, *A. nilotica*. However, *Acacia auriculiformis* and *Mangifera indica* also recorded topper rank other five species. Therefore, the waste bark of these tree species could be further utilized into the value-added products like briquettes.

### References

- Harkin JM and Rowe JW 1971. *Bark and its possible uses*. Research Note. USDA, Forest Products Laboratory, Madison, pp.1-56.
- Puri S, Singh S, and Bhushan B 1994. Fuelwood value index in components of ten tree species of arid region in India. *Industrial Crops and Products* 3:69-74.