

## Energy value of Eucalyptus cultivated in Tunisia



Mohamed Larbi Khouja

### Keywords

Eucalyptus sp.

Wood

Biomass

Bioenergy

Calorific Value

aromatics

### NWFP

Aromatic & Medicinal Plants

### Scale

National



### Context

The biomass produced by the Eucalyptus trees is used in the bioenergy field. The experimental material consists of wood taken from 11 species of Eucalyptus planted in the arboretum of Choucha. These species are *E citriodora*, *E maculata*, *E paniculata*, *E astringens*, *E pileata*, *E robusta*, *E striatocalyx*, *E botryoides*, *E alba*, *E rudis* and *E sideroxylon*. To evaluate the energy performances of the studied species, various parameters were selected: the higher calorific value (HCV), the degree of humidity and the basal density of the wood, the rates of gases released during combustion.



### Objective

In rural areas of Tunisia, the average wood consumption per household and per year is between 1.8 and 5.9 tones. The highest consumption was noted in the forest regions of Sejnane, Boussalem and Jendouba. Results show that traditional bread baking represents 60 to 70% of the percentage of wood consumed in households. With a view to satisfying the increasingly growing needs for firewood and charcoal in rural areas, we have initiated a selection research program oriented towards more intensive wood production including wood that can be used for energy purposes. In this work, we propose to compare the energy performance of 11 species of Eucalyptus.

## ✓ Results

There is an important variability among different woods from an energy point of view. The values of the quantitative and qualitative parameters studied have shown that the higher calorific value (HCV) varies from 15299 to 17564 kJ / kg for sapwood and from 16118 to 1883 kJ / kg for heartwood (Table). As for the ignition temperature, it ranges from 256 to 296 °C for sapwood and from 268 to 308 °C for heartwood. Then regarding the temperature of the hearth in combustion, it goes from 446 to 528 °C depending on the type of wood and the percentage of ash is between 2.6 and 20%. And apropos of the gases released from the combustion of wood (CO<sub>2</sub> and CO), the rates range from 4 to 7.5% for CO<sub>2</sub> and from 0.5 to 2% for CO.

## 💡 Recommendations

A notable difference of the energetic yield was perceived between the species of Eucalyptus tested. In practice, it leads to the possibility of making a selection for the benefit of the best performing species. Therefore Eucalyptus astringens, Eucalyptus maculata et Eucalyptus robusta, which not only offer a good biomass production, but also a good quality of combustible products (fuelwood and charcoal). Consequently, such species can be selected for intensive reforestation purpose especially oriented towards an energy objective, preferably conducted in short rotation (6-7 years in good edapho-climatic conditions).

## ⚠️ Impacts and weaknesses

The demographic changes and the overexploitation of forest resources, which supplied wood, spawned a strong imbalance between consumption and availability of raw materials. The situation was considered critical, which required a quick solution. The use of the most performing eucalyptus (from the point of view of biomass production and energy yield) is a solution to satisfy the increasingly growing needs in fuelwood or charcoal.

## ➔ Future developments

An effort should be made by researchers and forest technicians to vulgarize research results concerning the choice of bioenergetic eucalyptus species, ensure their production in nurseries and their planting, especially in available land similarly in rural and suburban areas. Raising awareness among GDAs and involving them directly in this effort is an asset in guaranteeing the success of plantations and ensuring their direct management by the beneficiary populations.

Higher Calorific Value (HCV) of heartwood and sapwood of 11 species of Eucalyptus

Species	HCV Sapwood (kJ/kg)	HCV Heartwood (kJ/kg)	HCV Average (kJ/kg)
<i>Eucalyptus pileata</i>	15299	16118	15709
<i>Eucalyptus rudis</i>	15667	16553	16110
<i>Eucalyptus citriodora</i>	15704	16762	16233
<i>Eucalyptus botryoides</i>	15805	17803	16804
<i>Eucalyptus sideroxylon</i>	15662	18597	17130
<i>Eucalyptus striatocalyx</i>	17013	17585	17299
<i>Eucalyptus paniculata</i>	17213	17711	17462
<i>Eucalyptus alba</i>	16448	18743	17596
<i>Eucalyptus robusta</i>	16971	18237	17604
<i>Eucalyptus maculata</i>	17435	18053	17744
<i>Eucalyptus astringens</i>	17564	18831	18198
<b>Average</b>	<b>16435</b>	<b>17727</b>	<b>17081</b>

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## Further information

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Author	Rapporteur	Published on
Contact <b>Mohamed Larbi Khouja :</b> <a href="mailto:khouja.larbi15@gmail.com">khouja.larbi15@gmail.com</a> , <a href="http://www.inrgref.agrinet.tn">www.inrgref.agrinet.tn</a> <b>Elaieb Mohamed Taher:</b> <a href="mailto:ayeb2002@yahoo.fr">ayeb2002@yahoo.fr</a> , <a href="http://www.inrgref.agrinet.tn">www.inrgref.agrinet.tn</a> <b>Ibtissem Taghouti :</b> <a href="mailto:ibtissem.taghouti@gmail.com">ibtissem.taghouti@gmail.com</a> , <a href="http://www.inrgref.agrinet.tn">www.inrgref.agrinet.tn</a> <b>Amor Mlaouhi :</b> <a href="mailto:mlaouhi.amor@iresa.agrinet.tn">mlaouhi.amor@iresa.agrinet.tn</a>  Organisation <b>INRGREF</b>  Country and region <b>Tunisia, North-West (Sejnene)</b>	Name <b>Ibtissem Taghouti</b>  Organisation <b>National Research Institute of Rural Engineering, Water and Forestry</b>  Email <b>(hidden)</b>	<b>1 May 2020</b>

### About INCREDIBLE Project

INCREDIBLE project aims to show how Non-Wood Forest Products (NWFP) can play an important role in supporting sustainable forest management and rural development, by creating networks to share and exchange knowledge and expertise. 'Innovation Networks of Cork, Resins and Edibles in the Mediterranean basin' (INCREDIBLE) promotes cross-sectoral collaboration and innovation to highlight the value and potential of NWFPs in the region.



### Funding

'Innovation Networks of Cork, Resins and Edibles in the Mediterranean basin' (INCREDIBLE) project receives funding from the European Commission's Horizon 2020 programme under grant agreement N° 774632.