

# Energetic valorization of branch dendromass from sweet chestnut (*Castanea sativa*)

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## INTRODUCTION

**Sweet chestnut** (*Castanea sativa* Mill.) is **one of the oldest non-native woody plant species in Slovakia**. It is supposed that chestnut was brought for the first time to the area of current Slovakia by **ancient Romans**.

The last most important introduction of chestnut to the territory of the present Slovakia is dated back to **16<sup>th</sup> and 17<sup>th</sup> centuries** to the period of **Ottoman invasions**. Sweet chestnut reaches heights of 20–35 m and produces **moderately hard wood** with an oven-dry density of 440–610 kg·m<sup>-3</sup>. According to EN 350:1994, it belongs to durability class 2 due to its **tannin content**. Often called the **“bread tree,”** its nuts historically substituted cereals during poor harvests. In Slovakia, chestnut orchards produce both **nuts** and **pruning biomass**, which can be utilized as biofuel in the form of **wood chips**.

This contribution presents the results of analyses, carried out for the purpose of assessing the following **energetic properties** of the dendromass of the sweet chestnut branches: **density, rate of bark, content of the basic chemical elements** in the combustible matter of wood and bark, **content of ash** in the dry mass and **heating value** of the dendromass of branches in dry state.



## RESULTS

The mean dry **density** of **sweet chestnut trunk wood** with bark ( $\rho_0 = 550 \text{ kg}\cdot\text{m}^{-3}$ ) corresponds to previously published values ranging from 444 to 610 kg·m<sup>-3</sup>. The **dry density** of **branch dendromass** ( $\rho_0 = 703.1 \text{ kg}\cdot\text{m}^{-3}$ ) is 21.8 % higher than that of trunk wood with bark.

The higher ash content in bark compared to wood is consistent with published findings and contributes to changes in fuel quality parameters. The calculated **heating value** of **dry sweet chestnut branch chips** ( $Q_n = 17,245 \text{ kJ}\cdot\text{kg}^{-1}$ ), determined using Mendeleev's equation, is 7.3 % lower than the value specified for broadleaved wood in EN 14961. This reduction is mainly caused by the increased proportion of **inorganic substances (ash)** and **nitrogen content** in the branch dendromass.

## CONCLUSION

- The dry dendromass of sweet chestnut branches has a mean density of 703.1 kg·m<sup>-3</sup>
- The bark content in the dry dendromass is 29.72 %, representing the upper limit of suitability for energy woodchip production
- Its chemical composition is similar to that of other broadleaved species, except for nitrogen content, which is 2.62 times higher
- The mean ash content is 2.26 %
- The heating value of the dry dendromass is 17,245 kJ·kg<sup>-1</sup>



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