



**Universitatea  
Transilvania  
din Braşov**

## **HABILITATION THESIS**

### **SUMMARY**

**Title: The quality of turkey oak (*Quercus cerris L.*) and of resources with a sanogenic character from an intensively polluted area**

**Domain: Forestry**

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The habilitation thesis synthetically presents the scientific and professional achievements of Associate Professor eng. Szilárd BARTHA, PhD after obtaining the title of doctor, on topics related to the frequency and impact of frost-crack on the quality of the wood of turkey oak, to the determination of the content in heavy metals (Pb, Cd, Cu and Zn) of the different organs of the blackberry used as a sanogenic, honeydew or nutraceutical resource from one of the most multi-decade polluted areas in Romania (Copșa Mică), the monitoring of polyfloral honey in an intensely polluted area (Copșa Mică) in terms of content in heavy metals (Pb, Cd, Cu and Zn) with a risk to the health of consumers, as well as the perspectives and directions in which the personal research and didactic activity is expected to evolve, in accordance with the doctoral activity of the Forestry field.

At the present time, there is an alarming decrease in the surfaces with oak, consequently the increase in interest in the turkey oak with a wood that possesses special physical-mechanical and technological qualities is fully justified.

From a forestry point of view, the turkey oak has a special value, because it succeeds in enhancing sites unsuitable for other species. It tolerates drought and dryness well (it is a relatively thermophilic and xerophilic species), it prefers warm climates with a long growing season. Severe winter frosts cause frost-cracks.

Incidentally, splits (radial and ring shake) and frost-cracks are the most common defects of trees and rough round turkey oak wood, which drastically limit the intensification and widening of its scope of use.

In the first part of the first chapter, I present an introduction of the author's current scientific concerns in the context of studying the quality of tree wood and forest resources with nutraceutical properties from a historically polluted area, on research directions. The first chapter ends with the enumeration of the scientific works on the basis of which the habilitation thesis was developed.

Knowing the proportion of working wood in the total of a tree is of utmost importance in the context of the increase in demand for working wood with various technological properties.

The author of the habilitation thesis in chapter 2 reproduces the impact of frost-crack on the quality of the wood of turkey oak trees. After a short introduction, the author highlights: the influence of the biological origin of the trees of turkey oak on the frequency of frost-crack, the influence of the diameter of the trees on the frequency of frost-crack and the influence of the cardinal direction on the frequency of frost-crack. It also analyses the frequency of frost-cracks by intensity classes, cardinal points and biological origins. In the 23 experimental surfaces, it analyses the influence of the land's exposure (3 categories) on the frequency of frost-crack on biological origins.

It distributes the types of frost-cracks (straight and helical) by biological origins and finally reproduces the axial development of frost-crack on the trunk of turkey oak trees (by biological origins).

The chapter ends with some conclusions and recommendations for forestry practice.

Chapter three presents the wild blackberry (*Rubus fruticosus L.*) which is a multipurpose resource for both humans and forest fauna. Humans benefit from blackberries directly from nutraceutical properties and indirectly from high melliferous potency. The object of this study is the assessment of the load with potentially toxic heavy metals of the different organs of the blackberry in the historically polluted area Copșa Mică in the period immediately after the cessation of the major activity of the main polluter. Pb, Cd, Zn and Cu in leaves, flowers and fruits were quantified by FAAS flame atomic absorption spectrometry method. The results show that the studied blackberry accumulates Pb in 71% of cases, Cd in all cases and Cu in 83% of cases above the maximum limit allowed by WHO. Organographically, blackberry leaves accumulate the most Pb and Zn and flowers Cu and Cd. Spatially, the

concentration of Pb decreases with the distance from the main polluting source, the terrain orography and microclimate of the area play a favourable role in the dispersion of pollutants.

Chapter four deals with honey, which is both a complex food and medicine, representing a healthy alternative to refined sugar. The research aimed to quantify the degree of contamination with potentially toxic heavy metals of polyflora honey from private apiaries located in one of the most polluted areas in Eastern Europe - Copșa Mică and neighbouring localities. The content in Pb, Cd, Cu and Zn was analytically determined by the atomic absorption spectrometry (AAS) method. Honey from apiaries located in the main valley channelling pollutants from the industrial platform accumulates more Pb than apiaries on side valleys. The honey from the apiaries in Șeica Mică and Valea Viilor, respectively Șeica Mică and Micăsasa I concentrates Pb and Cd below the maximum permitted limits. The average values of Pb in the honey from this research exceed 14.9 times, of Cd 44 times the maximum limits allowed in food laws issued by the European Commission (EC No. 1881/2006, amended by Commission Regulation (EU) 2015/1005). The maximum and average concentrations of Zn and Cu are without risk of toxicity for the body. Among the examined metals, only the Cd content decreases exponentially with the distance from the pollution source. Checking the quality of polyfloral honey from local producers is imperative because in most cases it is intended for family consumption or in the local community without being sold to an authorized processor. The results of the study may contribute to the establishment of a unitary limit threshold for the concentrations of Pb and Cd in honey marketed in the European Union.

In the last two chapters (5 and 6), the author briefly presents the career evolution and development plan, which includes the main directions and themes that will be addressed in the research, didactic and doctoral school plans.