

The effects of altitude on the chemical composition of *Populus* type propolis

D Gođevac¹, B Anđelković², V Vajs¹, V Tešević²

¹Institute of Chemistry, Technology and Metallurgy, University of Belgrade, Studentski trg 12 – 16, 11000 Belgrade, Serbia

²Faculty of Chemistry, University of Belgrade, Studentski trg 12 – 16, 11000 Belgrade, Serbia

Keywords: Propolis, *Populus*, NMR, OPLS.

The buds of *Populus* species are the main source of propolis from temperate climate, including Europe, North America, Asia, South America, and New Zealand [1]. The composition of propolis is of great importance for quality control of propolis-based preparations because corresponding biological effects are strongly dependent on the type of compounds present therein. In this study, we propose NMR spectroscopy methods for determination of chemical composition of propolis derived from various *Populus* species. The samples were collected from February 2008 to October 2014, from hives located in Serbia, Macedonia, Bulgaria, and Bosnia and Herzegovina, varied in the elevation from 100 to 1000 m. The ¹H and 2D J-resolved NMR spectral data have been subjected to multivariate analysis. Orthogonal projections to latent structures (OPLS) were applied to correlate the NMR data with the altitude of propolis collection, as indicated in the figure below. Two main types of propolis from *Populus* species has been revealed, varying considerably in chemical composition: the one from lower altitude, containing flavonoids, originating from buds of black poplar (*P. nigra* L., section *Aigeiros*), and the other from higher altitude containing phenolic glycerides characteristic for buds of aspen (*P. tremula* L., section *Leuce*).

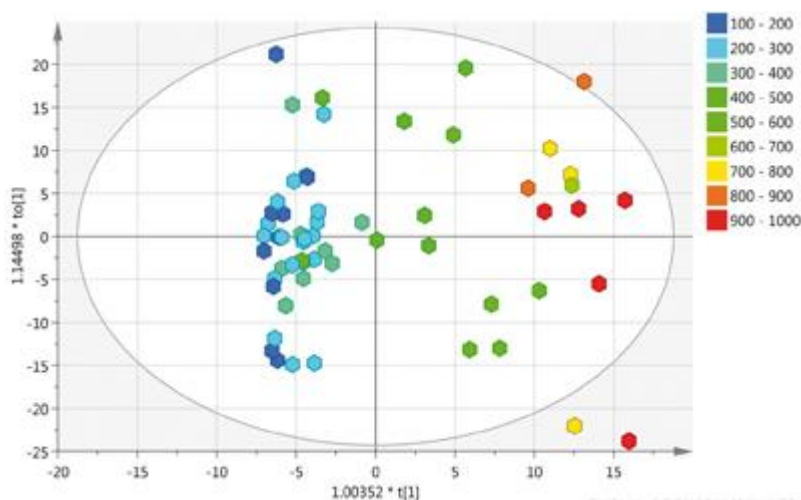


Fig. 1: OPLS score plot of the 1D projections of the 2D J-resolved NMR spectral data. The scores are colored according to altitude of propolis collection (in meters)

Acknowledgements: This study is financially supported by the Serbian Ministry of Education and Science, Project No. 172053.

References:

[1] Bankova V, Trusheva B, Popova M. New developments in propolis chemical diversity studies (since 2000). In: Orsolich N, Basic I, editors. *Scientific Evidence of The Use of Propolis in Ethnomedicine*. Trivandrum: Transworld Research Network; 2008: 1 – 13