

DETERMINING ANTIOXIDANT MARKERS OF HONEY TO AUTHENTICATE *ELSHOLTZIA* HONEY - A GEOGRAPHICAL INDICATION PRODUCT OF DONG VAN KARST PLATEAU, HA GIANG PROVINCE

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Summary

Elsholtzia honey, a geographical indication product of Dong Van Karst Plateau, Hagiang province (MBH), has recently the highest price in the domestic market and is therefore at risk of frauding to such honey of high productivity and low price as *Acacia* honey (MOR2) in order to get higher benefits. For protection of the MBH brand, in this study, DL-3-phenyllactic acid (3-PA) amount determined with LC-MS/MS method, Fe^{+2} amount formed after FRAP assay and DPPH percentage reacted after DPPH assay in different types of honey sample were analyzed. Honey samples included pure MBH, pure MOR2 and 4 other types of mixture between MOR2 and MBH in weight ratios of 1: 9, 1: 4, 3: 7 and 1: 1. The values of 3-PA, Fe^{+2} , and DPPH in pure MBH were found significantly lower ($0.0001 < P < 0.05$) than those in MOR2 and in all 4 types of honey mixtures between MBH and MOR2 with different ratios. Analysis results of specificity, standard deviation and ranges of marker values indicated that 3-PA and Fe^{+2} amount between different honey types could be used as markers to discriminate the pure MBH and MBH mixed with $\geq 20\%$ MOR2, while % DPPH can be used to authenticate pure MBH from MBH mixed with $\geq 30\%$ MOR2. In details of markers, values of 3-PA, Fe^{+2} and DPPH in pure MBH were found to be ≤ 1.36 mg/kg, ≤ 263.09 mg/kg, and $\leq 16.54\%$, respectively, while pure MBH mixed with $\geq 20\%$ MOR2 has amount of 3-PA ≥ 1.64 mg/kg and $Fe^{2+} \geq 308.23$ mg/kg, and pure MBH mixed with $\geq 30\%$ MOR2 were tested with amount of 3-PA ≥ 2.10 mg/kg, $Fe^{2+} \geq 348.07$ mg/kg, và DPPH $\geq 18.03\%$. Results and used methods in this study is a scientific basis to be applied for honey authentication in order to minimize the fraud in Vietnamese honey, including the *Elsholtzia* honey.

Keywords: Authentication, DL-3-phenyllactic acid, DPPH, FRAP, *Elsholtzia* honey, Dong Van Karst Plateau, Ha Giang province.