

Antioxidant and other activities of peptides from canned meat fortified with willow herb (*Epilobium angustifolium* L.)

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Introduction: The addition of nitrite allows to protect meat products not only from the negative effects of the oxidation process but also from microbial spoilage. Following the approach used in this study, reducing the content of nitrite in canned pork by 50% is expected to have a direct effect on the protein oxidation processes (and consequently, on the antioxidant potential of biomolecules, e.g., peptides) in canned meat. To enhance the antioxidant potential of the product during its long-term storage, the addition of *Epilobium angustifolium* L. extracts (WH) rich in various bioactive secondary metabolites was proposed. The present study aimed to evaluate the effect of the addition of various amounts (50 (W_005), 100 (W_010), 150 (W_015) and 1000 (W_1) mg/kg) of *E. angustifolium* L. extracts on the biological activity of peptides in canned meat with reduced amount of sodium nitrite and their stability during 180 days of storage (4 °C).

Materials and methods: The initial peptide data were collected by LC/MS. Antioxidant activities of peptide extracts were detected on the basis of ABTS•⁺, FRAP, and iron(II) chelating activity in in vitro tests. A computational study (based on the BIOPEP-UWM database and INNOVAGEN and PROTPARAM tools) was also performed to assist in the interpretation of results.

Results: A total of 2581 identified peptide sequences appearing as single (sample specific) or in multiple samples simultaneously (common to samples) were analyzed. The highest content of peptides was found in the control samples (W_C), which confirms the effect of the addition of extract and its concentration on the peptide profile. After 180 days of storage, the number of peptides decreased, and only 99 peptide sequences typical for all research batches remained. Among all the peptide sequences, only 74 (2.87%) fragments were identified in all analyzed samples, regardless of the time criterion, i.e., they were present both immediately after production and after 180 days of storage. The obtained sequences therefore showed stability during six-months of storage (4 °C). The sequences showed 24 different biological activities, among which the most frequently identified were angiotensin-converting enzyme inhibition (ACE-I; 74 sequences; 100%), inhibition of dipeptidyl peptidase IV (DPP_IV; 71 sequences; 96%), and antioxidant activity (49 sequences; 66%). A relationship was observed between the dose of freeze-dried addition of WH extract and the antiradical activity of the analyzed samples: W_005 < W_010 < W_015 < W_1 < W_C.

Conclusions: The addition of *E. angustifolium* L. extracts has a positive effect on the peptide profile and various biological activities, the results of which depend on the amount of the extract added to the meat product. However, it should be remembered that the differences between in silico and in vitro experimental environments necessitate further research to confirm the antioxidant behavior of canned meat products supplemented with *E. angustifolium* L. extract under physiological conditions. Other interactions between the peptide and the food matrix should also be considered as these can lead to chemical and structural modifications that can affect the bioavailability of the bioactive peptides

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