Effects of buckwheat hull extracts on lipid oxidation, color and sensory characteristics of chicken meatballs during refrigerated storage

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Introduction: Cereals and pseudo-cereals are an important source of bioactive substances with antioxidative activities and can be added to meat products as an alternative to synthetic antioxidants commonly used in the meat industry (Munekata, 2020). Buckwheat (Fagopyrum esculentum) is the most widely cultivated plant species in the world. Its production provides a large amount of by-products, mainly buckwheat hulls. In comparison to grains, buckwheat hulls contain more flavonoids such as rutin, vitexin, isoorientin and hyperoside, which exhibit strong antioxidant properties (Dziadek et al., 2016, Hęś et al., 2017, Zhang, at al., 2017). The aim of this study was to show whether the addition of buckwheat hulls in the form of water (EC) and ethanol (EE) extract to poultry meatballs would reduce the adverse changes in fat during refrigerated storage.

Material and methods: The experimental material consisted of meatballs prepared from meat from chicken thighs that were roasted in combi oven at 180°C (dry air, without streaming) until 80°C was obtained in the geometric center of meatballs. In three experimental series three treatments of the meatballs were prepared: MBC – control, MBWE – with the addition of WE of buckwheat hulls, MBEE – with the addition of EE of buckwheat hulls (70:30 v/v). WE and EE were used in the amount of 1.2 g/100 g of total amount of meat batter which was established at the maximum level that did not result in the deterioration of the sensory quality of the product. The meatballs were vacuum-packed and tested for TBARS, fat oxidation induction time (PDSC – pressure differential scanning calorimetry), L*a*b* color parameters and sensory quality after 1, 7, and 14 days of refrigerated storage (4 °C ± 2 °C).

Results: The addition of buckwheat hulls extracts (WE and EE) slowed down the fat oxidation process in vacuum-packed chicken meatballs during storage, as indicated by lower TBARS values and a longer fat induction time. After 14 days of storage the TBARS value in MBC was of 0.88 mg MDA/kg, being significantly ($p < 0.05$) higher than in the meatballs with extracts: 0.64 mg MDA/kg (MBWE) and 0.56 mg MDA/kg (MBEE). In the fat extracted from MBEE and MBWE, the induction times were in the range of 12.43-12.74 min, while in the fat extracted from MBC it was 11.22 min. The addition of extracts did not affect the color of meatballs ($\Delta E < 2$). There was no effect ($p > 0.05$) of WE and EE from the buckwheat hulls on the sensory descriptors assessed, including the overall sensory quality of meatballs.

Conclusions: Buckwheat hulls extracts can be used to prolong shelf-life of chicken meatballs by protecting them against lipid oxidation and deterioration of their nutritional quality. The results indicate the potential application of both water and ethanol extracts of buckwheat hulls in this type of meat products made of minced poultry meat subjected to thermal processing and stored under refrigerated conditions in vacuum.

Literature:

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