

The possibility of using the Baikal skullcap as a natural antioxidant in meat products with a reduced addition of nitrate (III)

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Objectives: The aim of the study was to determine the antioxidant effect of Baikal skullcap addition in cured meatballs with a halved addition of sodium nitrate (III).

Materials and Methods: The raw materials consisted of chicken thigh meat (75%), pork jowl (10%), egg mass (5%) and a hydrated (1:1) wheat bun (10%). Meat and fat raw materials were grinded on a mesh of 5 mm holes and then mixed with other ingredients in a Kenwood Major laboratory mixer for 5 minutes. The prepared meat batter was the basis for the production of individual variants of the product. The control variant (C1) was produced with the addition of 1.8% of the curing mixture. The second control variant (C2) was a product in which the addition of curing mixture was reduced by half (0.9%), and the remaining part was replaced with the addition of table salt. To the meat batter made according to the C2 recipe, powdered Baikal skullcap root was added in the amount of 0.5% (B0.5) or 1% (B1.0). Meat batters with additives were mixed for another 5 minutes. Before starting the studies, the content of nitrates (III) in the curing mixture was determined at the level of 555 mg NaNO₂/1000 g. The prepared meat batters were stored in a cold room at 4±2°C for about 20 hours in order to ensure the proper course of the curing process. After this time, meat- balls weighing about 40 g were formed and baked in the steam convection RATIONAL oven at 180°C for 6-8 minutes until the temperature of 75-78°C in the geometric center was reached. Some of the meatballs were used for tests after 24 hours of refrigerated (4±2°C) storage. The remaining part was divided into two parts, vacuum packed and used for tests after 7 and 14 days of storage. The production process was carried out in three independent research series. The following determinations were made: yield of thermal treatment, amount of drip loss during storage, pH level, TBARS index, and color parameters on the crosssection of meatballs.

Results and Discussion: The addition of curing mixture at the level of 1.8% resulted in the nitrates (III) application into the product in the amount of 99.9 mg NaNO₂/kg of the product, while the addition of 0.9% resulted in nitrates (III) level at 49.9 mg/kg of the product. The minimum addition of nitrates (III) to obtain the proper color of meat products is about 25 mg NaNO₂/kg (MacDougall and Hetherington 1992), and for oxidative stability it is at least 50 mg NaNO₂/kg (Sidelar and Milkowski 2012). There was no significant effect of the reduction of nitrates (III) level and the addition of Baikal skullcap on the yield of thermal treatment, the amount of drip loss during storage and the pH of cured meatballs. In the case of the above-mentioned quality characteristics, no significant effect of storage time was also found. After 24 hours of storage, higher values of the TBARS index were found in all variants of the product compared to the C1 variant (0.43 mg MAD/kg of the product), but only in the case of the product B0.5 (0.64 mg MAD/kg of the product) the differentiation was significant. Both after 7 and 14 days of storage, the level of TBARS index in products C1 (0.64 and 0.80 mg MAD/kg of product, respectively) and C2 (0.77 and 0.99 MAD/kg of product, respectively) was significantly higher than in products with Baikal skullcap (from 0.48 to 0.62 mg MAD/kg product). This demonstrates the strong antioxidant properties of this additive to counterbalance the reduced addition of NaNO₂ as an antioxidant. The addition of Baikal skullcap caused a significant decrease in the L* and a* color values (regardless of the used addition level) in relation to the values determined for the C1 meatballs. The effect of the addition of Baikal skullcap on these color parameters was observed both after 24 hours and 7 and 14 days of storage. In case of the b* parameter, regardless of the storage time, higher values were found in meat- balls produced with Baikal skullcap compared to the control products (C1 and C2). Increased to 1% (B1.0) addition of powdered Baikal skullcap root caused a significant increase in the value of this parameter in relation to the values observed for product with the addition of 0.5% (B0.5). The differentiation of color parameters due to the addition of Baikal skullcap may be due to the yellow color of this additive. However, no significant influence of the storage time on the color parameters of individual variants of meat- balls was found.

References:

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