

Influence of acid whey addition on physicochemical properties in the production of organic raw maturing beef ham

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Introduction: Nitrite is considered a multifunctional food additive in meat curing. Several studies have indicated that nitrite intake should be limited owing to its potential carcinogenic effect in humans [Alahakoon et al., 2015]. Whey over the years has become a valuable raw material for the food industry [Rocha-Mendoza et al., 2021; Wójciak et al., 2015; Wójciak et al., 2018]. The research carried out so far at IBPRS-PIB has shown that acid whey may be added to the technological process using shaping the colour and quality of meat products and the appropriate storage stability of meat products [Okoń et al., 2019]. It has been shown that acid whey can affect the colour of meat products as a result of the use of natural NO present in each biological cell [Wójciak et al., 2015]. The aim of the research was to evaluate the influence of acid whey on the physicochemical properties of raw maturing beef.

Materials and methods: The raw material for the production of ripening beef was cooled (24 h, 2-4°C), semimembranosus muscle from Limousine cattle with a live weight of approx. 400 - 450 kg reared in the organic system. After 48 h of slaughter, the muscle was subjected to various technological treatments. Then, the meat was salted with sea salt in the amount of 3.0% in relation to the meat weight and left for 24 h at 4°C. The products were matured for 21 d at 16°C and 75-85% relative humidity. After maturation, the beef was smoked with cold smoke then vacuum-packed and stored at 4°C. The products were tested after the maturation process (21 d) and storage period (52 d). The following experimental variants were prepared: C - beef with the addition of 3.0% sea salt, 0.8% glucose; S1 - the beef was kept in acid whey for 48 h, then 3.0% sea salt, 0.8% glucose; S2 - beef kept in acid whey for 24 h, then added 3.0% sea salt, 0.8% glucose. All trial was repeated two times (two independent production batches) with three replicates each (n = 6). The following determinations were carried out: pH value, oxidation-reduction potential, TBARS index, and colour parameters in the CIE L * a * b * system.

Results: Extending the marinating time of beef to 48 h (S1) caused a decrease in the pH value to 5.52 after maturation. The lowest pH value after 52 d of cold storage was found in test S1 (5.09). The values of the redox potential for the product ranged from 252.03 mV to 240.90 mV. In all analyzed samples, the redox potential value increased by approx. 50 mV after 52 d of storage. The highest value of the TBARS index was observed in the control sample (2.35 mg/kg), the lowest value in S1 (1.93 mg/kg). In all analyzed samples of raw maturing beef, a decrease in TBARS index was observed after 52 d of storage. A clear increase in the L * value was observed in the case of marinating beef in acid whey. The a * value showed that marinating beef in acid whey increased the share of red in the total colour tone by approx. 1 unit compared to the control sample. An increase in the value of the b * parameter was observed in the samples marinated in acid whey (S1, S2) compared to the control sample (C). A significant decrease in the L * value of the colour was observed in all research trials after 52 d of storage.

Conclusion: The obtained results indicate the desirability of continuing model research to demonstrate the inhibitory effect of whey on the development of pathogens and the shaping of the physical and chemical properties of the product. It would be a confirmation of the health-promoting quality during the shelf life of new beef products without the addition of nitrogen compounds. The proposed technological solution of production would be interesting for the majority of producers of meat products, for which saltpeter and nitrite replacement with the addition of other substances is sought. Extending the marinating time of beef ham in acid whey to 48 h reduced the content of secondary oxidation products and increased the share of red in the overall colour tone.

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