Effect of high pressure processing on selected quality properties of marinated pork chops

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Objectives: The aim of the study was to determine the efficacy of high pressure processing (HPP; 100, 300, and 500 MPa/5 min/10°C) to accelerate the marinade absorption in meat and investigate the effect on the lipid oxidation, texture and color of marinated pork chops. High pressure processing is an effective method to extend the shelf life of food, however, pressure levels > 300 MPa can negatively affect some important product qualities, such as color, tenderness and lipid oxidation. This is important especially for raw/uncooked meat products (Bolumar et al. 2021). The use of combination of pressure and marination treatment may be able not only to mask color changes and improve tenderness but also increase sensory acceptability of marinated meat products (Uyarcan and Kayaardi 2019).

Materials and Methods: The study material were pork loins obtained directly from the meat processing plant in three experimental series. The meat was cut into 2.5 cm thick slices, weighed and placed in polyethylene bags. The meat was marinated with rapeseed oil and a ready-made mixture of Prymat concern spices (salt, sweet pepper, garlic, onion, white mustard, coriander, chili, sugar, marjoram, acidity regulator: citric acid, juniper fruit, black pepper, rosemary). After the marinade was added to the meat (in a weight ratio of 4:1 - pork chop:marinade), it was vacuum packed using a MULTIVAC packaging machine and then subjected to high pressure - 100, 300 and 500 MPa for 5 min at 10°C in the U5000/120 high pressure processor using water as pressure-trans- mitting medium. The control sample was marinated pork that was not subjected to HPP. After 24 h of storage at 4-6°C untreated and HPP samples were placed on an stainless steel wire rack for 5 min to allow dripping of the excess marinade and then re- weighed, to determine the absorption of the marinade. Then, the L*, a* and b* color parameters were measured on the cross-section of the meat. A slice weighing about 40 g was cut from the meat, then was ground and mixed. The prepared meat sample was used to determine the TBARS index. The remaining meat was weighed and heat-treated in the steam convection RATIONAL oven

- at 80°C with 100% humidity of air, until the temperature of 72°C in the geometric center of meat was reached. After cooling, the meat was re-weighed to determine the thermal drip. The L*, a* and b* color components measurement on the cross-section of heat- treated meat, the shear force as well as the sensory evaluation (on a scale from 0 to 10) were carried out. The absolute color difference (ΔE) between the control product and the products subjected to HPP was also calculated. The One-Way ANOVA analysis of variance was used to determine the influence of HPP treatment on the pork chops quality. The detailed testing was conducted using Tukey's HSD test (significance level α=0.05).

Results and Discussion: The use of high pressure processing with 100, 300 and 500 MPa contributed to an increase of absorption of the marinade in pork (by about 25, 40 and 70%, respectively). In marinated meat, which was subjected to HPP lipid oxidation was slightly faster, as evidenced by higher values of TBARS index (0.39-0.45 mg MAD/kg) than in the control product (0.32 mg MAD/ kg), but the differences were not significant ($p > 0.05$). The use of high pressure ≥ 300 MPa had a significant ($p < 0.05$) effect on the lightening of the color on the cross-section of marinated meat products ($\Delta E > 5$). In meat products subjected to high pressure ≥ 300 MPa, higher thermal drip was also found (19.5-21.5%) than in control products and those subjected to pressure of 100 MPa (16.5-16.9%). The use of HPP resulted in an increase in the value of the shear force of marinated meat products, but significant ($p < 0.05$) differences compared to the control product (51.2 N) were found only in meat treated by 500 MPa (70.5 N). In sensory evaluation meat subjected to the pressure of 500 MPa obtained significantly ($p < 0.05$) lower marks for general desirability (4.79) compared to other meat products (7.07-7.57). In heat-treated meat products, color changes due to HPP treatment were less visible ($\Delta E < 2$) than in raw products, which indicates the possibility of using high pressure of ≤ 300 MPa in the production of marinated meat products, which should be heat treated before consumption.

References:

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