P-05-24

Increasing salt impression due to pef-treatment of low salt-cured, cooked ham (#506)

Franziska Witte, Katrin Heinzelmann, Ernst Söhnel, Volker Heinz, Nino Terjung, This IGF project of the FEI is supported via AiF within the programme for promoting the Industrial Collective Research (IGF) of the German Ministry of Economics and Energy (BMWi), bases on a resolution of the German Parliament.

German Institute of Food Technologies, Quakenbrück, Germany

Introduction

Through the application of new technologies like PEF (pulsed electric fields), salt diffusion shall be improved to 1) reduce ham's salt content while ensuring same taste and salt impression such as in commonly cured, cooked ham, 2) to avoid damage of meat cells, which is caused due to brine injection and furthermore 3) to avoid microbiological contamination caused by injection needles. Generally, PEF opens cells due to electroporation, which, in this context, shall enable the reduction of total salt content while securing microbiological stability and familiar taste. Moreover, this exerts a positive effect on the nutritional value.

Methods

Raw top- and silverside of pork ham was treated in a PEF-pilot plant system with an electric field strength of 1 kV/cm and an energy input of 10 kJ/kg. Control hams were not PEF-treated. Thereupon, control and PEF-treated hams were rubbed with a mixture of 0.05 % ascorbic acid and 1.6 % curing salt (therein 0.9 % sodium-nitrite), tumbled for 16 hours and cooked until 70 °C core temperature. After tumbling and before cooking, half of the samples were stored for 96 hours at 2 °C to let salt diffuse and also to examine differences due to PEF-treatment.

Since hams were produced without phosphate, cooking loss was determined before (after PEF-treatment) and after cooking. pH of raw top- and silverside was determined via testo 480 (Lenzkirch, Germany) and results were pooled. Firmness of ham (20 x 20 mm stripes) was determined via TA-XT2 (Stable Micro Systems Ltd. (Guildford, UK) with a 2,0 mm/s accelerated/speeded blade and measurement distance of 30 mm. Water holding capacity (WHC) was analyzed from ham samples with a geometry of 10 x 10 x 2 mm and placed between filter paper. After that a 5,000 g stamp was load for 5 minutes on each sample. WHC was determined by calculating the differences before and after pressure. Colour of samples was analyzed via L*a*b* measurement with CM-600d from Konica Minolta Sensing Inc. (Marunouchi, Japan), whereas in this abstract only brightness (L*-value) is considered. For determining sensory attributes, an evaluating test with a 10-point-scale was conducted from 8 trained panelists, whereby 10 means firm, juicy, bright or salty.

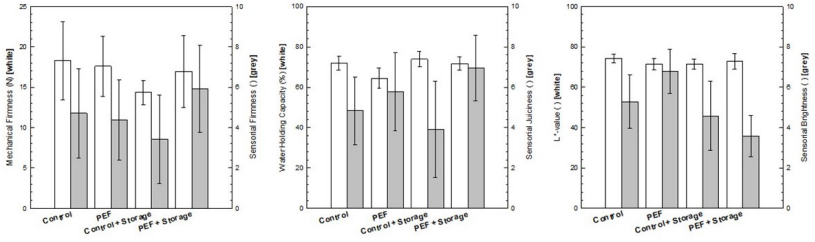
Results

Figure 1 emphasizes differences between pH-values of raw, untreated hams and illustrates differences in cooking loss with no dependency to pH. After storage of tumbled control hams, a tendency to a softening in terms of mechanical and sensorial firmness was measured, whereas PEF-treated and stored samples are firmer (Fig. 2). Interestingly, the firmer samples were scored as more juicier, although WHC is not affected by treatment (Fig. 3). Mechanical brightness is also not affected by treatment, although PEF-treated samples were scored brighter (Fig. 4).

Furthermore, saltiness was recognized most intensive for PEF-treated samples (5.09 ± 1.75), followed by control + storage (4.76 ± 2.39), control (4.58 ± 1.36) and lastly PEF-treated and stored samples (3.72 ± 1.97) in sensorial evaluation. Storage time between tumbling and cooking seems to reduce PEFs influence on salt reduction. In addition to that, a visual greyish spot was obvious in one of the PEF-treated and directly cooked hams, which could be due to insufficient diffusion time or is animal-dependent. However, reasons for un-fully reddening are currently examined.

Conclusion

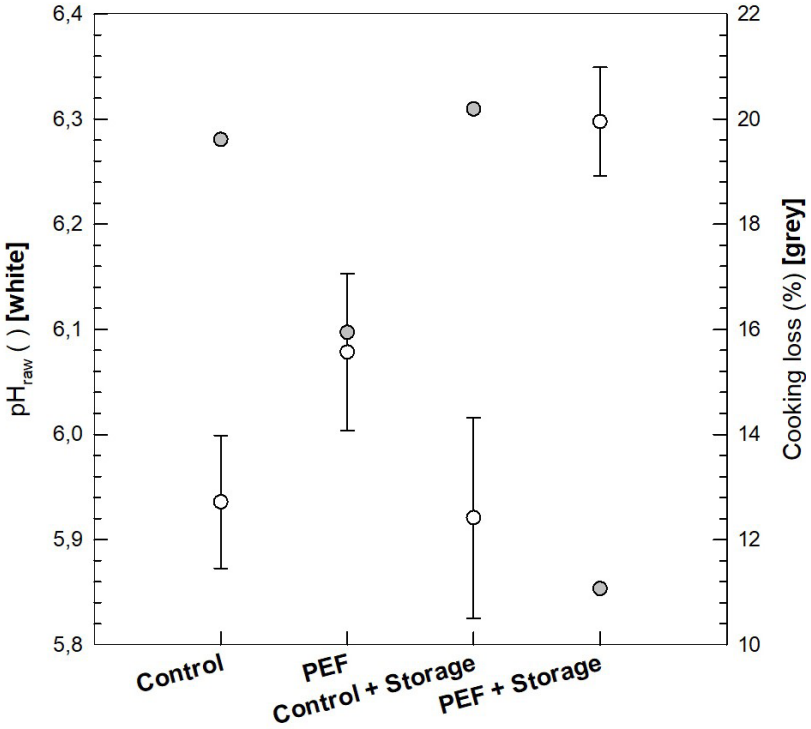
Salt content could be reduced since 10 kJ PEF treated samples were described as saltier. Furthermore, by applying more energy (> 10 kJ) this influence should be more pronounced. How PEF-treatment influences meat cells and thus salt diffusion and how much additional low-pressure application of nitrogen contributes to salt reduction, needs to be determined in follow up trials.



Mechanical determined firmness, juiciness and brightness in comparison to sensorial results Figure 2: Left: mechanical (N) [white] (n=16) and sensorial (score) [grey] (n=16) determined firmness; Middle: mechanical (%) [white] (n=12) and sensorial (score) [grey] (n=16) determined juiciness; Right: mechanical ( ) [white] (n=20) and sensorial (score) [grey] (n=16) determined brightness for control, PEF-treat-

Notes

ed, control and stored as well as PEF-treated and stored samples.



pH-value ( ) and cooking loss (%) for control and PEF-treated samples

Figure 1: pH-value ( ) [white] (n=12) and cooking loss (%) [grey] (n=2) for control, PEF-treated, control + stored as well as PEF-treated + stored samples.

Notes