

TECHNOFUNCTIONALITY OF REPROCESSED PORK COLLAGEN AS MEAT REPLACER IN EMULSIFIED SAUSAGES

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I. INTRODUCTION

Collagenous proteins are a side stream product of gelatin processing, which are reprocessed after extraction of high quality gelatin. The obtained jellylike proteins (pH 5.5) were used for replacement of lean meat in emulsified sausages to save costs. The aim of the study was to determine the influence of these collagenous proteins on the technofunctionality of sausages. Therefore, various parameters in sausages were investigated by replacing meat (10%, 20%) and adding collagenous protein. The water binding capacity, texture, and microstructure were examined to indicate the influences on product quality. Sensory tests were carried out to evaluate the consumer acceptance of the meat-reduced sausages.

II. MATERIALS AND METHODS

Raw material: Lean pork and pork fat were obtained from Mega AG (Stuttgart, DE) and the reprocessed collagenous proteins from Gelita AG (Eberbach, DE). The collagenous proteins (pH 5.5) have the following composition: dry matter 29.93 ± 0.22 , total protein 27.68 ± 0.42 , fat 0.63 ± 0.03 . They contain connective tissue protein of 20.42 ± 0.16 g/100 g.

Preparation of emulsified sausages: Table 1 shows the recipes of the different batches. The addition is calculated to the protein content of the collagenous proteins. Additionally, each batch contains 18 g/kg curing salt with 0.5 % sodium nitrite (Zentrag eG, Frankfurt, DE), 2 g/kg sodium diphosphate, 0.5 g/kg ascorbic acid and 5 g/kg seasonings (Frutarom Savory Solutions, Korntal-Münchingen, DE). The manufacturing process was based on the standard process of Lyoner-type sausages (core temperature of 72°C) [2].

Methods: Water binding capacity [1, 2], texture profile analyses [2], sensory evaluation (rank sum test), confocal laser scanning microscopy (CLSM) after staining with Calcofluor White (protein) and Nile Red (fat) [2].

Table 1. Raw material of the different treatments (T 1-4) without (control) or with 1.5 or 3.0% total protein (5.42 or 10.84% collagenous protein with moisture content of ~70.1%)

Material	Control (50/0)	T 1 (40/1.5)	T 2 (40/3)	T 3 (30/1.5)	T 4 (30/3)
Lean pork (%)	50	40	40	30	30
Pork fat (%)	25	25	25	25	25
Ice (%)	25	25	25	25	25
Protein (collagenous protein) (%)	-	1.5 (5.42)	3 (10.84)	1.5 (5.42)	3 (10.84)
Water (%)	-	8.5	7	18.5	17

III. RESULTS AND DISCUSSION

The results showed that it is possible to replace certain percentages of meat with collagenous protein. Collagenous protein stabilized the protein network of the emulsified sausages. This could be proven by the outcome of the texture analysis (similar firmness >1210 N/100g of the control sample and the sample with 10% meat replaced with 3% protein) and water binding capacity (only 5% higher loss of weight of the samples with 10% meat replaced with 3% protein compared to the control) (Fig. 1). Confocal microscopic images show a similarly tight protein network of the sample with 10% meat replaced with 1.5 or 3% protein based on Table 1 (Fig. 2). The sausages had protein contents between 9.1 and 11.7 g/100 g. Due to less fibrillary muscle protein, a reduction of the meat amount led to a lower water binding capacity (higher weight loss), and a softer texture. The sensory test showed that an addition of collagenous protein up to 3% did not produce off-flavors in the products (Fig. 1A). However, the sensory test panel determined a lower meat flavor in the attribute taste, mainly for treatment 3 with 30% and 1.5%.

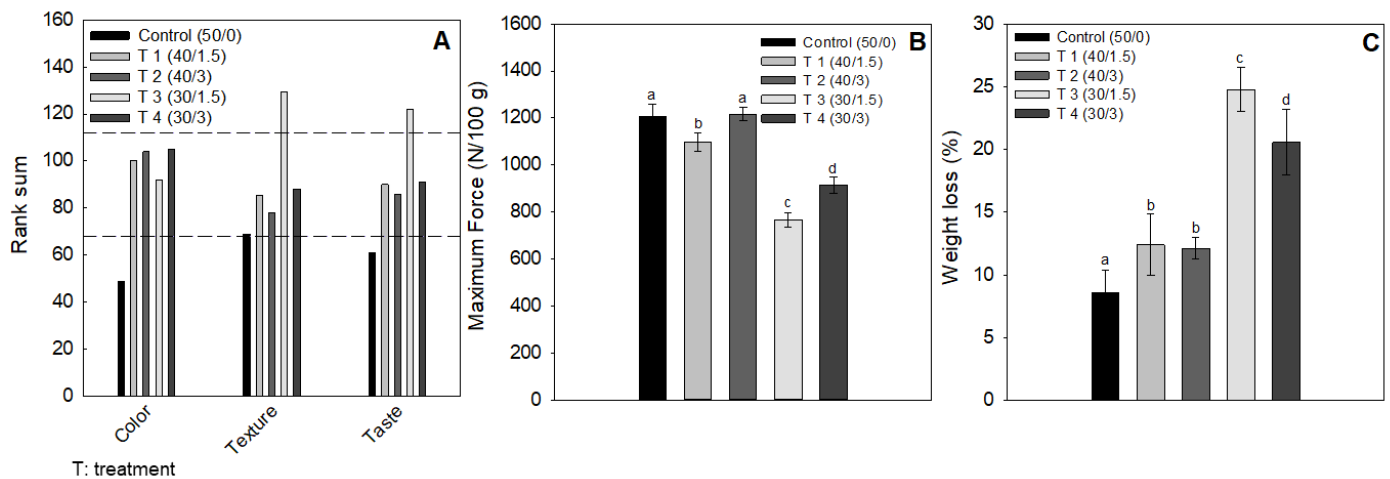


Fig 1. (A) Rank sum test (color 1(reddest)-5, texture or taste 1(best)-5), (B) texture profile (max. force) of emulsified sausages containing different amounts of lean pork (50, 40, and 30 %) and collagenous proteins (C) weight loss of sausage batter after heating; above or below the lines (A) or different letters indicate significant differences ($p < 0.05$)

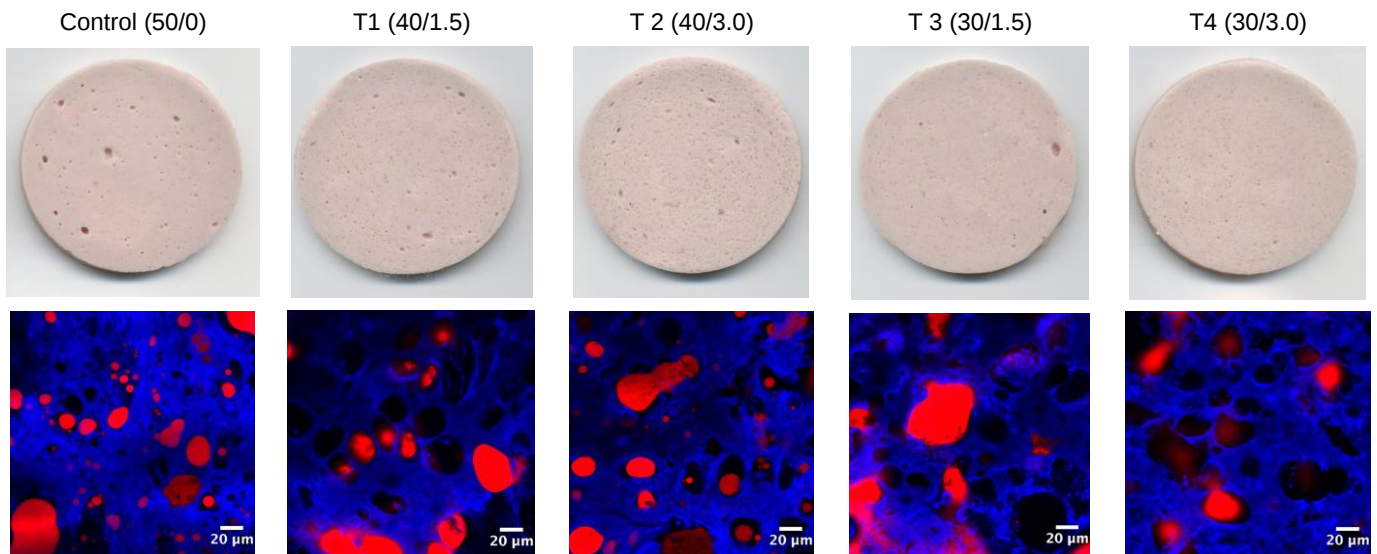


Fig 2. Images and CLSM images of emulsified sausages containing different amount of lean pork (50, 40, and 30 %) and added collagenous proteins calculated to the protein content (1.5 % ~5.42 % or 3 % ~10.84 %) (T: treatment)

IV. CONCLUSION

The replacement of meat by using collagenous proteins in emulsified sausages is possible without changes in microstructure and leads mostly to products with acceptable texture, water binding capacity, and taste.

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