3.I - P1

FAT- AND WATER-HOLDING IN LOW-FAT MECHANICALLY DEBONED POULTRY SYSTEMS AS INFLUENCED BY THE DIFFERENT VEGETABLE AND NON-MEAT PROTEIN ADDED

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BACKGROUND

Vegetables are natural ingredient of low-fat meat products high in fibres, vitamins and minerals. (Simkeviciene & Kazemekaityte, 1996). One of the most important features in the production of comminuted meat products is the achievement of high thermal stability – to prevent fat and water separation from the product during heating or after heating (Olsson & Tornberg, 1991). That is especially important for the meat products with the reduced content of meat. Functionality of a variety of fibres has been studied in the low-fat meat products (Todd et al., 1989, Claus & Hunt, 1991, Troutt et al., 1992, Fernandez et al., 1996, Grigelmo-Miguel et al., 1999). However, little has been reported on the formulation of the low-fat meat products with vegetables.

The soya proteins are used in the meat systems due to their good water- and fat-binding. Latter functional properties of comminuted meat products can be influenced by the formation of gelatine from collagen upon cooking, also (Olsson & Tornberg, 1991). There comparable studies of influence of animal and plant protein on fat- and water-holding capacity in meat-vegetables emulsion should be interesting.

OBJECTIVES

The objective of this study was to investigate the fat- and water-holding capacity of comminuted and emulsified systems based on mechanically deboned poultry (MDP) with vegetables, estimate the cook losses of that systems and evaluate an influence of non-meat protein on the above mentioned functional properties of MDP-vegetables emulsions.

MATERIAL AND METHODS

Fresh (0-6°C) mechanically deboned poultry was obtained 48h *post mortem*. The roots of dried and milled till the particle size 1 mm vegetables were rehydrated for approx. 30 min. in the next proportions: leek 1:6; celery 1:5,5; parsnip 1:4,5; parsley 1:4,5; topinambur 1:4. The comminuted samples (CS) from MDP and rehydrated vegetables at 5 levels (10, 15, 20, 25, 30%) were mixed with 1,2% nitrite salt in laboratorial mixer for 2 min. The emulsified simples (ES) from MDP and rehydrated celery at 3 levels (20, 25, 30%) and 4% (calculated on the total weight of rehydrated celery) non-meat proteins were made in 20 l Laska bowl chopper with six knives at a speed 1400/2800 rpm. Four functional non-meat proteins, namely: soya isolate Profam 974, soya concentrate Arcon S (ADM, USA), pork protein Drinde 1015/A, Scanpro T95 (Danexport, Denmark) powders were hydrated together with celery. The ingredients were added and disintegrated at low speed in the chopper in the following order: MDP and rehydrated celery (40s), nitrite salt (10s), water /ice (60s). The emulsion then comminuted at high speed to a temperature of 11-14°C. Total time of comminution – 9 min. The net test (Hermansson & Lucisano, 1982) was used to determine the water- and fat-holding properties of the MDP-vegetables systems by heating samples (n=6) in the tubes in a water bath according to a time-temperature programme: for the CS at 77°C for 35 min. and of the ES - 55°C, 25 min. and during 40 min. to rise the temperature until 75°C, respectively. The samples were centrifuged for 20 min at a speed of 2400 rpm after heat treatment. The content of protein of MDP and water content of all samples were analysed (AOAC). The CS and ES samples have been analysed by light microscopy.

RESULTS AND DISCUSSION

Fat distribution of the two model systems can be seen in Figure 1. In CS the fat mainly exist as single fat cells and their aggregates, in ES the fat is squeezed out of the cells and dispersed in the form of small droplets or larger fat pools. The same result have been reported by Tornberg et al. (1989). The meat protein matrix contribute to the fat-holding as well as to the water-holding properties in meat system. Due to the reduced content of meat in the formulations the meat protein matrix is less dense. However, as can be seen from the Figure 2, water and fat loss in the CS significantly ($p < 0.05$) decrease with added amount of rehydrated vegetables for 5-20% and 20-32%, respectively, depending on the kind of vegetables. Cook losses were significantly ($p < 0.05$) reduced, also. Best results were obtained with addition of celery. The dietary fibre in the vegetables added consist mainly cellulose, hemicelluses and pectin. The above mentioned dietary fibre forms dispersed in the water produce a gel network that modify texture, increase viscosity of the MDP-vegetables CS (Giese, 1996). The fibres bind water as well as fat (Backers & Noll, 1997). Figure 3 shows dietary fibre network distribution in the CS.

The water loss of ES was significantly ($p < 0.05$) reduced and fat loss significantly ($p < 0.05$) stabilised by addition of non-meat proteins in MDP emulsions with all levels of rehydrated celery (Figure 4). Water holding capacity was greater with Drinde 1015/A, while fat-holding – with soya isolate Profam 974. Water-holding in the ES were better comparing to CS with the same amount of added vegetables, while fat-holding were similar.

CONCLUSION

With the addition of rehydrated vegetables can be improved the fat- and water-holding capacity and reduced cook losses of comminuted and emulsified low-fat meat systems. Results showed that the addition of both kind of non-meat proteins in MDP-vegetables emulsions significantly reduced cook losses.

PERTINENT LITERATURE

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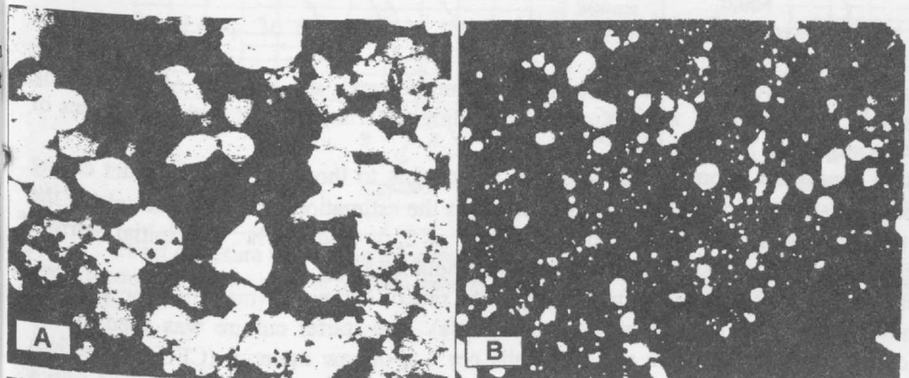

Figure 1. Light microscopy (× 35) of CS (A) and ES (B)

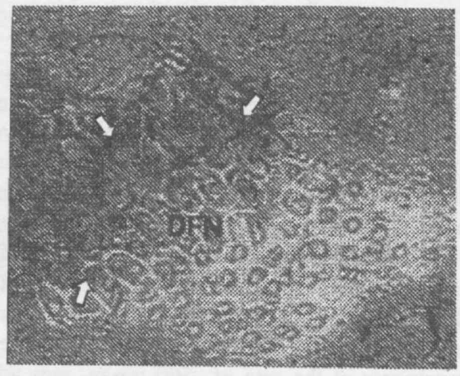

Figure 3. Light microscopy (× 125) of ES
DFN- dietary fibre network