THE INFLUENCE OF WHEAT AND SOYA PROTEINS ON THE TEXTURE PROFILE OF FINELY COMMINUTED MEAT PRODUCT

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Introduction

The application of plant proteins to the finely comminuted meat products may affect positively their sensorial features like consistency, bar binding, juiciness and taste. The plant proteins intensify water binding and gel formation in the product stuffing. The said features are decisive in the creation and stabilisation of the texture in a finished meat product (Rutkowski, Gwiazda 1986; Dąbrowski, Gwiazda, Rutkowski 1992; Weber 1992). In meat processing technologies, non-meat proteins are widely applied for production of highly efficient products; these are mainly soya proteins of water absorption capacity and speed as well as gelling capacity higher than those of meat proteins (Hoogenkamp 1994; Tyszkiewicz I., Makała 1994).

Other non-meat proteins may be applied to the production of meat products as well. The research works on suitability of various plant isolates for the production of finely comminuted scalded (parboiled) sausages confirmed that the protein preparations made of peas, wheat or lupine are relatively neutral in taste, they have a positive influence on reduction of thermal leakage from the finished products and their functional properties are comparable to those of soya protein preparation ones (Müller 1998).

Objective

The objective of the present report is investigation of the influence of wheat and soya proteins on the texture profile of finely comminuted meat products has been tested.

Material and methods

The finely comminuted, highly efficient pasteurised canned meat composed of fatty pork meat (60%) and tendoneous pork meat (40%) have been applied as a tested material. To the stuffing, during the production process, the technological water of 50% of the mass of meat material, in the form of cover brine containing the curing mixture with the addition of wheat or soya protein preparations in the following quantities: 0%, 1,0%, 1,5%, 2,0%, 2,5% and 3,0% of meat mass was added.

The meat raw material of 0 – 2 ^{0}C was comminuted in grinder: fatty pork meat through the mesh of Ø 4 and tendoneous pork meat - of Ø 3. Then the brine was added together with the dissolved wheat protein preparation or digested soya protein preparation and tumbled in a high-speed tumbler at 20 rpm at 80 % vacuum and 4 – 6 ^{0}C.

The resulting stuffing was applied for filling cylindrical cans of 420 g capacity. The cans were pasteurised at 75 ^{0}C till the temperature of 72 ^{0}C in the centre of the product was reached. Then the cans were cooled with cold water and stored in a cold store at 2-4 ^{0}C. In the tests the wheat protein preparation „SWP 100" as well as soya protein isolate „SUPRO Ex 33" assigned for finely comminuted meat products were applied.

In the product a profile texture analysis (TPA) has been done taking into consideration the following texture discriminants: fracturability-stress [N] - level of stress in fracturability point, fracturability-deformation [%] - level of deformation in fracturability point, hardness [N], cohesiveness (dimensionless), gumminess [N], springiness [mm] and chewiness [Nmm] (Bourne *et al.* 1966) at the following test parameters: deformation – 80 %, test speed – 60 mm/min, sample slice thickness – 20 mm, diameter – ϕ 25,4. In each test variant 3 objects were tested and the test results have been subject to the Multifactor ANOVA analysis and linear regression analysis with Statgraphics for Windows ver. 3.1 package.

Results and discussion

In the Table 1 the results of difference significance calculated with the Multifactor ANOVA analysis method have been presented. The influence of the type of protein preparation (wheat or soya) as well as the volume of additives (0,0 - 3,0 %) on the change of specific texture profile discriminants of finely comminuted meat preserve have been analysed.

It has been stated that the products containing wheat protein additive were much more fracturability-deformation, cohesiveness, springiness and chewiness than those containing soya protein. No substantial influence of the type of protein on fracturability-stress, hardness and gumminess has, however, been stated.

Following the increasing level of protein in the tested products, the discriminants increased as follows: fracturability-stress from the level 40 N to the level of 50 N, hardness from 88,5 N to 106,5 N and gumminess from the 14,6 N to 16,6 N. Fracturability-deformation decreased from 44 % to 41 %. The chewiness showed the maximum much higher than those of other factors (71,33 Nmm) at 2,5 % addition of the protein preparation. The springiness, however, was not considerably affected by the increase of protein concentration (see Table).

In general, the products with the wheat protein addition were more consistent and more resistant to deformation, of similar hardness but of higher springiness and chewiness.

The influence of the type of protein and the level of its addition on the fracturability-stress has been shown in the fig. 1. Following the protein addition to the stuffing the value of this factor increased, reaching - at the addition level of 2,5% - the maximum values higher for the products with wheat protein (52,19 N) and lower for those with soya protein (48,53 N).

The increase of hardness of the products with both proteins added in the range of 0 – 2,5% were observed. However slight decrease of hardness at 3% protein addition (Fig 2). At the level of 2,0 % protein addition for both proteins the minimum of springiness was observed. Simultaneously, the products with 2,0 % protein addition were characterised with the minimum of the chewiness (Fig. 3). The highest chewiness 78,92 Nmm was noted for the product of 2,5% wheat protein addition. The products with soya protein added, at all tested levels reached lower values of chewiness as compared to thé products with wheat protein added, at the same levels.

Conclusions

1. The products with wheat protein added were characterised with substantially higher values of the following discriminants: fracturability-deformation, cohesiveness, springiness and chewiness than those with soya protein added.
2. The type of protein added did not result in substantial differences in the following factors: fracturability-stress, hardness and gumminess.
3. The level of proteins added to the meat products affected all the discriminants, except elasticity, with the increasing texture discriminants of fracturability-stress, hardness and gumminess and with the decreasing factors of fracturability-deformation and cohesiveness. The chewiness, however, showed its maximum at 2,5 % addition of protein.
4. The products with wheat protein added were always characterised with slightly higher values of the tested discriminants than those with soya protein added.

Pertinent literature

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Table 1

Influence of protein type and addition level on TPA discriminants of model produkt

Factor		Fracturability [N]	Fracturability [%]	Hardness [N]	Cohesiveness	Gumminess [N]	Springiness [mm]	Chewiness [Nmm]
Protein	Wheat	46,40	43,17^{b}	100,15	0,159^{b}	15,91	4,35^{b}	69,37^{b}
	Soy	45,47	41,55^{a}	100,80	0,153^{a}	15,60	3,69^{a}	57,70^{a}
	LSD	1,75	0,81	2,75	0,0043	0,40	0,43	6,50
Protein addition [%]	0,0	39,89^{a}	43,99^{b}	88,52^{a}	0,163^{b}	14,61^{a}	4,31	63,42^{ab}
	1,0	42,99^{b}	42,25^{a}	98,37^{b}	0,157^{ab}	15,53^{b}	4,33	67,09^{ab}
	1,5	45,08^{bc}	42,62^{ab}	100,29^{b}	0,158^{ab}	15,83^{bc}	3,72	59,47^{a}
	2,0	47,04^{c}	41,72^{a}	103,09^{bc}	0,152^{a}	15,72^{bc}	3,63	57,12^{a}
	2,5	50,36^{d}	42,35^{a}	106,09^{c}	0,152^{a}	16,28^{cd}	4,36	71,33^{b}
	3,0	50.27^{d}	41,34^{a}	106,51^{c}	0,155^{a}	16,56^{d}	3,76	62,76^{ab}
	LSD	3,03	1,40	4,76	0,0076	0,69	0,75	11,26

Means in columns with diffrent superscript are significant diffrent (P<0,05)

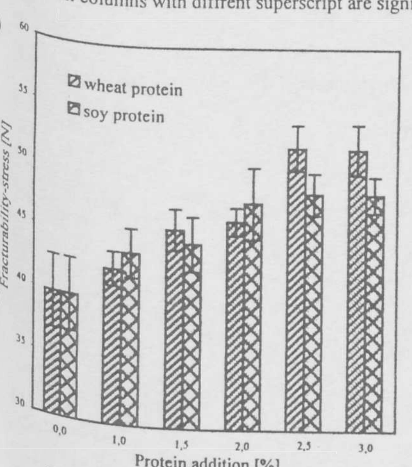

Fig.1 Influence of protein addition on TPA fracturability-stress of model produkt

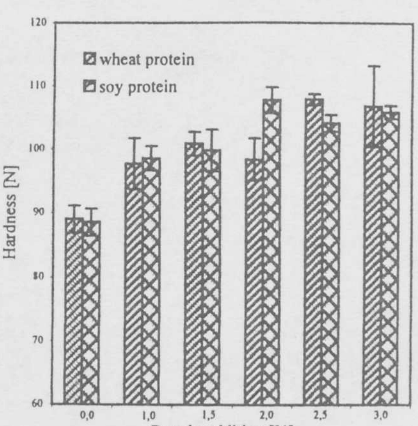

Fig. 2 Influence of protein addition on TPA hardness of model produkt

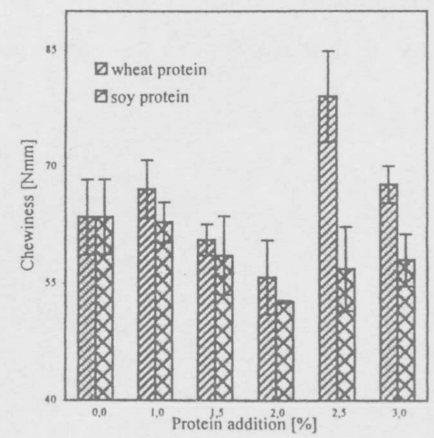

Fig. 3 Influence of protein addition on TPA chewiness of model produkt