POLISH JOURNAL OF FOOD AND NUTRITION SCIENCES
Pol. J. Food Nutr. Sci. 2005, Vol. 14/55, No 3, pp. 309–314

EFFECT OF PARTIAL FAT SUBSTITUTION WITH DIETARY FIBER ON SENSORY PROPERTIES OF FINELY COMMINUTED SAUSAGES
PART I. WHEAT AND OAT FIBER

Barbara Szczepaniak[1], Elżbieta Piotrowska[2], Włodzimierz Dolata[2], Renata Zawirska-Wojtasiak[3]

[1]Department of Human Nutrition, [2]Institute of Meat Technology, [3]Institute of Food Technology of Plant Origin, the August Cieszkowski Agricultural University, Poznań

Key words: finely comminuted sausages, wheat and oat fiber, lowered fat content, texture, profile analysis, consumer traits

The study aimed at investigating the effect of the partial replacement of fat (7.5% and 10%) in finely comminuted sausages with rehydrated wheat and oat fiber on the texture of these sausages and their sensory quality. The contents of water, fat and protein were determined in the end products. The texture of the sausages was determined (using a testing machine) through shear force and work, compressive force at the first compression – hardness I, compressive force at the second compression – hardness II, cohesiveness and elasticity. The sensory quality of the processed meat products was investigated using the quantitative descriptive analysis and the simultaneous evaluation of consumer liking. In the dietary fiber-supplemented sausages, fat content was observed to decrease significantly (from 24% in the control sausage to approx. 18% in the products with the 10% addition of fiber). Statistically significant changes were observed in the investigated texture parameters, except for shear work, which were however not detectable either in the profile analysis or in the evaluation of consumer degree of liking replaced with wheat fiber was confirmed in the profile analysis, which was manifested in the increased watery texture of these samples. Profile analysis included the evaluation of 16 selected attributes concerning the colour, texture, aroma and taste of the sausages. It was found that fat substitution with wheat fiber affected the intensity of the meaty, spicy, salty and hot taste, and resulted in the increased watery texture of the sausages. Sausages with the 7.5% fat replacement exhibited also increased springiness. The application of oat fiber caused an increase in the intensity and uniformity of colour, and a decrease in the intensity of taste and fatty aroma of the meat products. The degree of consumer liking of these sausages, despite the above-mentioned qualitative changes, was not lower than that of the traditional products.

INTRODUCTION

Health disorders resulting from improper diet constitute a serious socio-economic problem. In accordance with the current recommendations of the FAO/WHO, eating habits of the Polish population need to be changed, and alterations should aim especially at reducing fat intake [Gawęcki & Czarnocińska, 1997; Przysławski & Gertig, 1997; Ziemlański, 1998; Gulbicka, 2000]. The so-called invisible fat, occurring in a number foodstuffs, such as meat, processed meats, milk and dairy products or sweets, poses a certain problem as consumers are often unaware of its presence. Finely comminuted sausages of the wiener type, in which fat content may even exceed 30%, are very popular in Poland. It results from their relatively low price, easy and fast preparation for consumption, no fat visible at the cross-section, as well as the unjustified conviction that they are dietetic products [Urban & Szymańczuk, 1998]. For these reasons, the meat industry faces the demand to extend their offer with products with a lowered caloric value, thanks to which the amount of fat consumed in the daily diet could be reduced. In addition, it should be pointed out that the awareness of the necessity of limiting the consumption of foodstuffs with a high fat content for health reasons is constantly increasing. Polish consumers tend to search for low-fat products with an increasing frequency, as is already observed in all developed countries, where the number and assortment of such products are being steadily extended [Matuszewska, 1997; Duda, 1998; Adamczak, 1999; Zaborowska & Bilska, 2001]. However, the elaboration of novel formulations of new assortments of processed meats with a lowered caloric value is not an easy task [Mandigo & Eilert, 1992; Zaborowska & Bilska, 2001; Dolata *et al.*, 2002]. It results from the fact that fat – apart from determining the proper texture and juiciness of the product – has a decisive effect on the sensory attributes of the product and the stability of emulsion in finely comminuted sausages [Mandigo & Eilert, 1992; Gawęcki & Czarnocińska, 1997; Dolata *et al.*, 2002]. At present, many types of fat substitutes are used in the meat industry, one of them being dietary fiber. The production of processed meats rich in dietary fiber is now one of the most dynamically developing branches of the production of low-calorie foodstuffs [Gawęcki *et al.*, 1994; Bilska *et al.*, 2002]. Dietary fiber exhibits very good water binding

Author 's address for correspondence: Barbara Szczepaniak, Department of Human Nutrition, August Cieszkowski Agricultural University, ul. Wojska Polskiego 31, 60-624 Poznań; Poland; tel.: (48 61) 848 73 31; fax: (48 61) 848 72 54; e-mail: elkapio@poczta.fm

and fat emulsifying abilities, thanks to which – as a result of reduced losses during smoking and cooking – the production yield of the end products increases. Moreover, fiber preparations are stable both at high and low temperatures. Fat substitution with this replacer not only lowers the calorie content but also significantly fortifies the product with bulk substances, whose amount in the daily diet is insufficient [Ziemlański, 1998]. For the sausages with a lowered caloric value to be accepted and readily purchased by consumers, they have to exhibit proper sensory attributes, corresponding to the requirements of the consumers [Matuszewska, 1997; Duda, 1998; Li *et al.*, 1999].

The aim of this study was to assess the effect of fat substitution with varying amounts of wheat and oat fiber in finely comminuted sausages on their texture measured instrumentally, and on the sensory qualitative attributes and consumer acceptance of these processed meat products.

MATERIAL AND METHODS

The experimental material consisted of finely comminuted sausages of the wiener type produced at the semi-commercial scale. The composition of the control sausage was as follows: 48.0% pork class III, 20.8% fine fat from ham, 2.2% curing mixture, spices and water, constituting 29.0% of the weight of raw meat and fat materials. In the experimental sausages fat was partially replaced with selected types of dietary fiber, wheat fiber (VITACEL WF 200) or oat fiber (VITACEL HF), rehydrated at the 1:5 ratio. The commercially available preparation called VITACEL WF 200 contained 97% fiber, whereas VITACEL HF – 90% fiber. Both preparations come in the form of white powder with neutral taste and aroma. Fiber was introduced to sausage batter to replace fat in the amounts of 7.5% and 10%. Meat and fat after being ground in a grinder through a grinder plate with the mesh diameter of 3 mm were cured for 24 h at a temperature of 2–4°C. Next, the raw materials were chopped for 10 min, adding in turn meat, water with ice and spices, and fat. The 2/3 of fiber were added to the chopper after 2 min, whereas the rest was added after 8 min of chopping. The batter obtained, whose temperature did not exceed 12°C, was stuffed in natural casings with the diameter of 28–30 mm, and subsequently set, hot-smoked and cooked in a smoking scalding chamber. After cooling, the end products were placed in a cooler at a temperature of 4–6°C. Samples were collected for testing after 24 h of cold storage.

The sausages produced were determined for the proximate chemical composition, *i.e.* the contents of water [Polish Standard PN-73/A-82110], protein [PN-75/A-04018], and fat [PN-73/A-82111]. The texture of the sausages was investigated using a universal testing machine Instron 1140. The samples were compressed twice to 50% of their original height (the TPA test) and the shear test was applied using a Warner-Bratzler knife. The compression test was performed on samples with the diameter of 2.5×10^{-2} m and height of 2×10^{-2} m. The velocity of the compressing head during the TPA test was 5×10^{-2} m/min. From the obtained graph of the overall texture profile its parameters were determined according to Bourne [1978], including: maximum compressive force at the first compression (hardness I (N)) and maximum force at the second compression (hardness II (N)), cohesiveness (cohesion) and elasticity (mm). While the samples were cut using the Warner-Bratzler knife the maximum shear force (N) was determined along with the shear work (J). The velocity of the knife was 0.5 m/min [Voisey & Hansen, 1967].

A sensory analysis of the sausages included a detailed qualitative evaluation conducted using the quantitative descriptive analysis (QDA), *i.e.* the profile method, and the simultaneous semi-consumer hedonic evaluation [PN-ISO 11035; Baryłko-Pikielna, 1995; Matuszewska *et al.*, 1998]. Profile evaluation was performed by an adequately trained panel consisting of 8 persons, whereas 40 people participated each time in the semi-consumer evaluation. All the evaluations were performed at a sensory laboratory, meeting all the requirements of the relevant standard [PN-ISO 8589]. The profile method, consisting in several stages, required a preliminary selection and defining the attributes, expressing in the best possible way characteristic quality factors of the sausages analysed. Finally 16 attributes, concerning the colour, texture, aroma and taste were selected and defined, and the boundary descriptors were determined. For the intensity and uniformity of colour these descriptors were "pale" and "pink", and "non-uniform" and "uniform". Texture was described by four notes: binding – "poor" and "strong", hardness – "soft" and "hard", watery texture – "considerable" and "slight", and elasticity – "low" and "high". The aroma of the sausages was characterized by three descriptors: fatty, meaty and off-flavour. Taste was defined with seven descriptors: fatty, meaty, salty, sour, bitter, spicy and hot. For the taste and aroma attributes the boundary descriptors were identical, *i.e.* "undetectable" and "intensive". After the panel members got acquainted with the scope of the selected attributes found in the investigated samples and after preliminary appraisal was conducted, the proper examination was performed.

The intensity of each attribute was evaluated using a 10 cm unstructured graphic scale with the boundary descriptors given above, each time testing the samples in two independent replications. Each mean score was the average of 48 individual results (8 panel members × 2 sessions × 3 production runs).

Consumer evaluation consisted in the determination of the degree of liking of the experimental sausages. In this evaluation, the 10 cm graphic scale was used with the following boundary descriptors: "I do not find it good at all" – "I find it very good".

The sausages were evaluated warm after being heated in water until a temperature of 70°C was reached inside the link. Samples prepared in such a way with the unitary weight of approx. 100 g in the profile analysis and approx. 70 g in the analysis of consumer traits, after having been coded, were given at random to the panel members. Wheat bread was used to neutralize the taste. The testing results obtained were converted into numerical values by measuring the distance from the left end of the scale to the point marked by the panel members. The whole range of the scale consisted of 10 arbitrary units. The mean values calculated for each of the evaluated quality factors were the basis for the polar

diagrams and statistical interpretation. A statistical analysis concerning the chemical composition and texture of the experimental sausages was performed using the bivariate analysis of variance (ANOVA) at the level of significance α=0.05. Tukey's multiple comparison test was conducted in the case of differences. In contrast, the effect of the type and amount of fiber introduced to the sausage batter on the sensory quality of the end products was interpreted using a multivariate analysis of data in the version of principal component analysis (PCA). This made it possible to conduct a comprehensive evaluation of the similarities and differences between the obtained sensory profiles of individual sausages, and thus a precise determination of the effect of the introduced fiber on the changes in the intensity of the indicators analyzed.

A comparative analysis of this detailed qualitative-quantitative characteristics of the investigated sausages with the results of their consumer evaluation enabled defining the quality attributes of the finely comminuted sausages – both advantageous and disadvantageous – having a decisive effect on consumer liking of the finished products.

RESULTS AND DISCUSSION

The results concerning the proximate chemical composition of the experimental sausages are presented in Table 1. Sausages with different levels of fat substitution with the investigated fibers showed statistically lower fat contents in comparison to the control sausage, which was consistent with the assumptions of the experiment. Fat content decreased from 24% in the control sausage to approx. 18% in the sausage with fat replacement at the level of 10%. Moreover, significant differences were also found between sausages with the 7.5% and 10% fat substitutions. Protein content in all the sausage variants did not differ in a statistically significant manner. It was approx. 10%, which is in accordance with the Polish Standard. However, the amount of water in the produced sausages was found to increase along with the increasing level of fat replacement. It resulted from the introduction of an additional amount of water required to rehydrate fiber in the experimental batters.

TABLE 1. Proximate chemical composition (%) of model sausages.

Parameter	Control sample	With wheat fiber		With oat fiber	
		7.5%	10%	7.5%	10%
Water	63.48^a	65.92^b	67.98^b	66.40^b	67.83^b
Fat	24.05^a	20.81^b	18.49^c	20.00^b	18.11^c
Protein	10.08^a	10.01^a	9.98^a	10.00^a	10.04^a

a, b, c – means with different letters in rows differ statistically significantly at $p<0.05$.

The results of profile analysis obtained from all the variants of the experimental sausages are presented in the form of polar diagrams Nos. 1 and 2. Mean values calculated for the 16 selected attributes characterizing individual sausages, after being marked on the vectors, were connected, thus forming the sensory profile of each of the investigated products. These profiles distinctly show the dominant notes of aroma, colour, texture and taste of the investigated sausages. A comparative analysis of the sensory profile of the control sausage with those of the sausages with reduced fat contents enabled determining precisely the range of variability for the sensory attributes determined by the content of each investigated fiber type in the formulation of the sausages.

The results of the profile evaluation of the sausages having their fat replaced with wheat fiber are presented in Figure 1. These data indicate differences in the intensity of some quality attributes in sausages produced with fat replacement and the control sausage. First of all, the sausage with wheat fiber introduced in the amounts of both 7.5% and 10% showed an increased intensity of the meaty, spicy, salty and hot taste, as well as the meaty aroma in the sample with the 10% fat replacement. It could have been caused by the fibers of the dietary fiber retaining aromatic substances. The intensity of the meaty, hot and spicy taste in the sausages with dietary fiber addition was also observed in other studies [Tyszkiewicz *et al.*, 1997; Adamczak *et al.*, 2001]. Numerous authors reported also on the improved binding of experimental sausages and reduced thermal drip [Bilska *et al.*, 2002]. In contrast, sausages with wheat fiber showed an increased watery texture, in comparison to the control sample, which was due to fiber rehydration (1:5). The intensity of the other investigated descriptors practically did not differ from their intensity in the control sausage. Taking into consideration the data presented above, it may be assumed that fat substitution with wheat fiber even in the amount of 10% resulted in the improvement of some taste and aroma features of the experimental sausages.

Figure 2 presents the profilograms of sausages produced with oat fiber. The application of this fat replacement also did not produce any significant disadvantageous changes in the quality attributes of the sausages, compared to the control sausage. Sausages containing oat fiber demonstrated a lower intensity of both fatty taste and aroma, as well as an

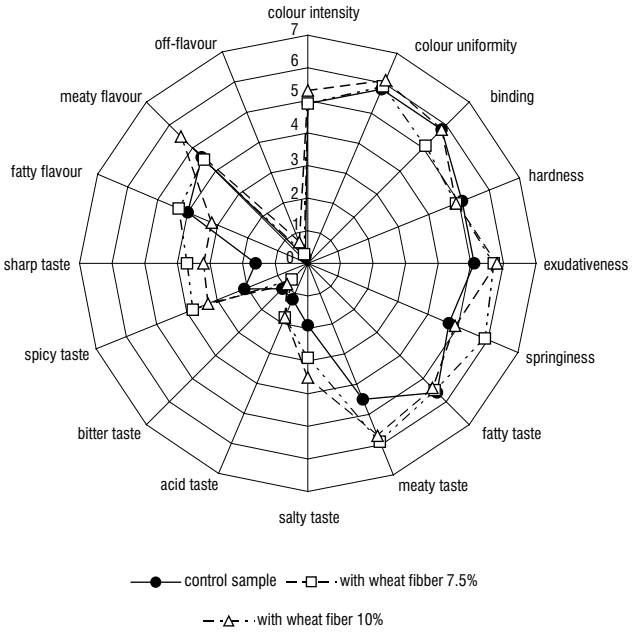


FIGURE 1. Profile descriptive analysis of sausages with fat replaced with wheat fiber.

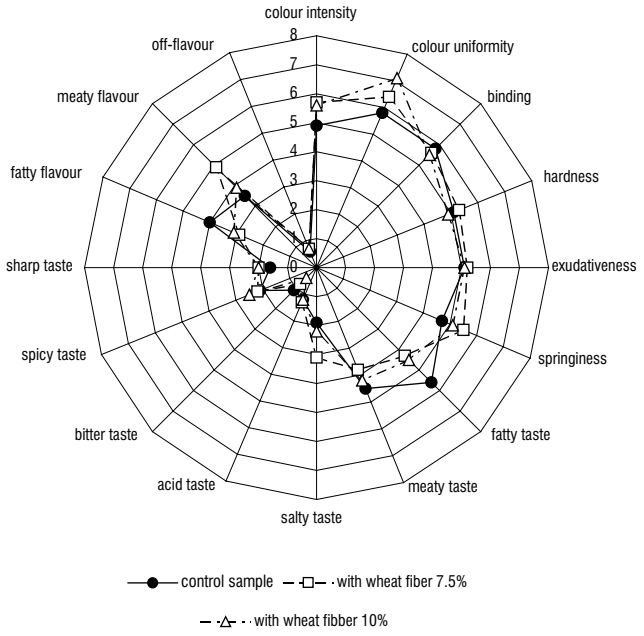
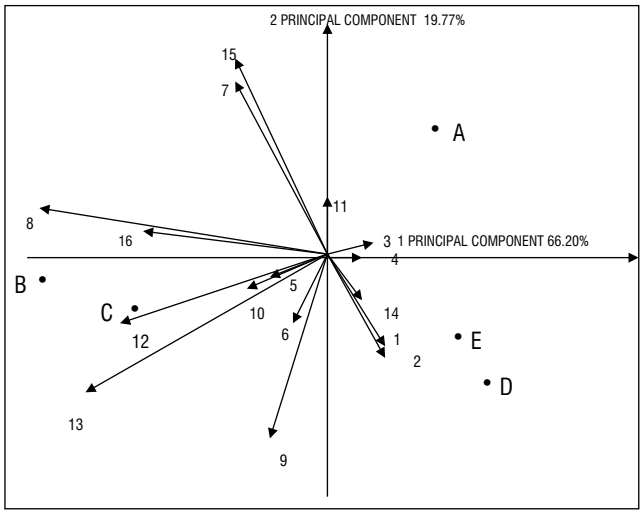


FIGURE 2. Profile descriptive analysis of sausages with fat replaced with oat fiber.

increased intensity and uniformity of pink colour. The other attributes, especially those concerning texture, were similar to those for the control sample.

The PCA projection of the profile analysis results for sausages with varying fat replacement with wheat and oat fiber is presented in Figure 3. The results shown in this graph enable the interpretation of the similarities and differences presented above, observed in the sensory quality of individual variants of the experimental sausage. Principal components 1 and 2 covered jointly 86% of the total variability of the investigated material. The studied sausages, depending on their formulation, formed distinct clusters along the first principal component (horizontal), indicating that the variability in sensory attributes was connected primarily with the type of the dietary fiber applied. Moreover, fat replacement with oat fiber – to a lesser degree than in the case of wheat fiber – affected the variability of the investigated quality attributes in comparison to the control sausage. On the other hand, varying amounts (7.5% and 10%) of both investigated types of dietary fiber introduced to the formulation of the batters did not result in any considerable changes in the quality characteristics of the end products (the samples located very close to one another). The attributes determining to the highest degree the sensory profiles of the investigated sausages turned out to be taste and aroma notes. These were especially the fatty taste (attribute 7) and aroma (attribute15) found at the highest intensity in the control sausage, and the smallest – in the samples with oat fiber. In contrast, a significant intensity of meaty taste (attribute 8) and aroma (attribute 16), as well as the spicy taste (attribute 13), and hot (attribute 12) and salty taste (attribute 9) was found in the sausages with fat substituted with wheat fiber. A rather significant role in the quality characteristics of sausages with oat fiber was observed for the intensity of pink colour (attribute 1) and its uniformity (attribute 2). The other indicators differentiated the investigated material to a small degree, as indicated by the small length of the vectors and their location close to the center of the system.



A – Control sausage; B – Sausage with 7.5% wheat fiber; C – Sausage with 10% wheat fiber; D – Sausage with 7.5% oat fiber; E – Sausage with 10% oat fiber. Parameters for characterization of sausage quality: 1 – colour intensity, 2 – colour uniformity, 3 – binding, 4 – hardness, 5 – exudativeness, 6 – springness, 7 – fatty taste, 8 – meaty taste, 9 – salty taste, 10 – acid taste, 11 – bitter taste, 12 – sharp taste, 13 – spicy taste, 14 – off–flavour, 15 – fatty flavour, 16 – meaty flavour.

FIGURE 3. Principal Component Analysis (PCA) projection of sensory profiling results of fine comminuted sausages.

The results of the simultaneous consumer evaluation of the produced sausage variants are presented in Figure 4. None of the sausages with lowered fat contents received a higher note than the control sausage. It needs to be stressed, however, that the samples containing differing amounts of both wheat and oat fiber showed similar degree of liking, not different from that reported for the control sausage. Thus, the differentiation in the intensity of taste and aroma attributes determined in the profile analysis of the sausages with fat replaced with the investigated fibers was not manifested in the consumer degree of liking evaluation of these sausages. The sensory quality of the sausages with lowered fat contents, despite some differences in comparison to the control sample, was fully accepted by the consumers.

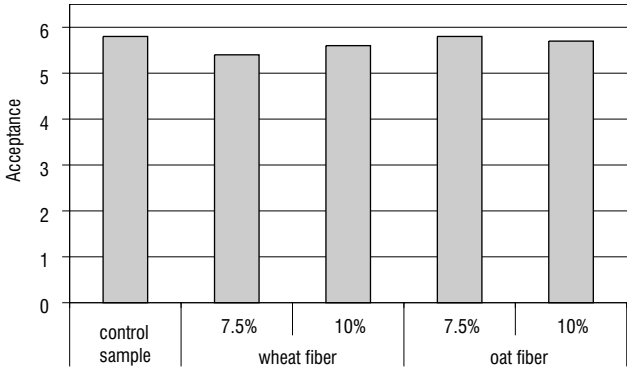


FIGURE 4. Consumer acceptance of sausages with a lowered fat content (points).

The results of the instrumental texture evaluation were presented in Table 2. Fat substitution with both types of fiber caused a differentiation in all the determined texture parameters, except for shear work. This difference was statistically significant in comparison to the control sample. However, it turned out that the range of this variability was insufficient to be reflected in the results of sensory examination. Only the decreasing cohesiveness of the sausages with fat substituted with wheat fiber was confirmed in the profile analysis, as it was manifested in the increased watery texture of these samples.

TABLE 2. Parameters characterizing texture of sausages.

Parameter	Control sample	With wheat fiber		With oat fiber	
		7.5%	10%	7.5%	10%
Shear force (N)	2.80[a]	3.06[a]	3.55[b]	3.16[a]	3.50[b]
Shear work (J)	0.076[a]	0.077[a]	0.091[a]	0.085[a]	0.093[a]
Hardness 1 (N)	27.35[a]	23.17[b]	20.80[b]	22.54[b]	22.65[b]
Hardness 2 (N)	22.63[a]	17.10[b]	15.86[b]	18.50[b]	18.15[b]
Cohesion	0.64[a]	0.51[b]	0.49[b]	0.54[b]	0.56[b]
Elasticity (mm)	7.16[a]	6.65[b]	6.55[b]	6.82[b]	6.68[b]

a, b, c – means with different letters in rows differ statistically significantly at $p<0.05$.

CONCLUSIONS

1. Fat substitution in finely comminuted sausages with dietary fiber at the 10% level lowered their fat content from 24% to approx. 18%.

2. In the sausages with fat replaced using wheat and oat fiber in the amounts of 7.5% and 10%, changes were observed in the texture parameters examined instrumentally, except for shear work, which however was in the most part undetectable sensorically. Only the cohesiveness of sausages with wheat fiber, decreasing significantly, was confirmed in the profile analysis as the increased watery texture of the samples.

3. The application of wheat fiber increased the intensity of the meaty, hot, spicy and salty taste, as well as the watery texture of the sausages. In contrast, oat fiber resulted in reduced intensity of the fatty taste and aroma, and an increase in the intensity and uniformity of the sausage colour in comparison to the control sample.

4. Sausages produced with the 7.5 and 10% addition of both types of dietary fiber in the case of most evaluated sensory attributes did not show significant differences.

5. The degree of consumer liking of the sausages with fat substitution with both wheat and oat fiber was similar to that for the control sausage.

6. Further studies should be conducted to determine the maximum level of fat substitution with rehydrated wheat and oat fiber, not resulting in an adverse effect on the sensory attributes of low-fat meat products of the frankfurter type.

REFERENCES

1. Adamczak L., Low-fat meat products. Mięso i Wędliny, 1999, 1, 26–29 (in Polish).
2. Adamczak L., Słowiński M., Plewnicka M., The effect of selected functional additives on the quality of low-fat finely comminuted sausages. Mięso i Wędliny, 2001, 2, 36–44 (in Polish).
3. Baryłko-Pikielna N., Sensory profile and consumer trait analysis in the development of novel foodstuffs. 1995, *in*: Proceedings of the Conference on Food Product Development, Akademia Rolnicza, 26–29 September 1995, Poznań, pp. 207–220 (in Polish).
4. Bilska A., Krysztofiak K., Sęk P., Uchman W., The effect of the addition of Vitacel preparation on the quality of luncheon meat products. Acta Sci. Pol., Technologia Alimentaria, 2002, 1, 47–53 (in Polish).
5. Bourne M., Texture profile analysis. Food Technol., 1978, 32, 62.
6. Dolata W., Piotrowska E., Makała H., Krzywdzińska-Bartkowiak M., Olkiewicz M., The effect of partial fat substitution with potato starch on the quality of batters and finely comminuted meat products. Acta Sci. Pol., Technologia Alimentaria, 2002, 1, 5–12 (in Polish).
7. Duda Z., Fat replacers used in meat processing. Gosp. Mięsna, 1998, 2, 22–26 (in Polish).
8. Gawęcki J., Czarnocińska J., Wróblewska D., Dietary preferences and fiber consumption in case of healthy individuals, obese and atheriosclerosis patients. Żyw. Człow. Met., 1994, 21, 117–123 (in Polish).
9. Gawęcki J., Czarnocińska J., Role of fat in nutrition and health protection. 1997, *in*: Truth abouth Fats (ed. J. Gawęcki). Instytut Danone – Fundacja Promocji Zdrowego Żywienia, Warszawa, pp. 58–73 (in Polish).
10. Gulbicka B., Diet of the Polish population in the last decade of the 20th century. 2000, Wyd. IERiGŻ, Studia i Monografie, 96, Warszawa, pp. 109–148 (in Polish).
11. Li J., Tan J., Martz F.A., Heymann H., Imane texture as indicators of beef tenderness. Meat Sci., 1999, 53, 17–22.
12. Mandigo R.W., Eilert S.J., Developments in restructured and low-fat processed products. 1992, *in*: Abstracts and Reviev Papers, 39 ICoMST, Session 7, 1–6 August 1992, Calgary, pp. 305–316.
13. Matuszewska I., Consumer acceptance in case of products with lowered fat content – methodology and directions of studies. Żyw. Człow. Met., 1997, 24, 91–102 (in Polish).
14. Matuszewska I., Szczecińska A., Baryłko-Pikielna N., Usefulness of sensory profile method in the interpretation of consumer preference for selected products. Żywn., Techn., Jakość, 1998, 1, 5–21 (in Polish; English abstract).
15. Polish Standard PN-73/ A-82110: Determination of water content.
16. Polish Strandard PN-73/A-82111: Determination of fat content.
17. Polish Standard PN-75/A-04018: Determination of nitrogen content according to Kjeldahl and protein conversion.

18. PN-ISO 8589: Sensory analysis. General guidelines on designing sensory analysis laboratory.
19. PN-ISO 11035, Sensory analysis. Identification and selection of descriptors to establish sensory profile using multidimensional methods.
20. Przysławski J., Gertig H., Nutritional factors of the development of selected civilization-related diseases. Żyw. Człow. Met., 1997, 24, 354–363 (in Polish).
21. Tyszkiewicz I., Senik I., Matuszewska I., Baryłko-Pikielna N., Protein and carbohydrate gels as fat replacers in comminuted meat products: effect on texture and consumer acceptance. 1997, *in*: Proceedings of the Conference on Food Ingredients Europe, November 1997, London, pp. 193–196.
22. Urban S., Szymańczuk S., Consumer preferences while purchasing processed meats as reflected in marketing studies. Gosp. Mięsna, 1998, 2, 44–47 (in Polish).
23. Voisey P., Hansen H., A shear apparatus for meat tenderness evaluation. Food Technol., 1967, 21, 21–26.
24. Zaborowska Z., Bilska A., Fat substitutes used in meat technology. 2001, *in*: Additives in Meat Processing (ed. W. Uchman). Akademia Rolnicza im. A. Cieszkowskiego, Poznań, pp. 169–191 (in Polish).
25. Ziemlański Ś., Principles of proper human nutrition. 1998, Instytut Danone – Fundacja Promocji Zdrowego Żywienia, Warszawa, pp. 8–17 (in Polish).

Received April 2004. Revision received September 2004 and accepted April 2005.

WPŁYW CZĘŚCIOWEJ WYMIANY TŁUSZCZU BŁONNIKIEM POKARMOWYM NA CECHY SENSORYCZNE WĘDLIN DROBNO ROZDROBNIONYCH CZĘŚĆ I. BŁONNIK PSZENNY I OWSIANY

Barbara Szczepaniak[1], Elżbieta Piotrowska[2] ,Włodzimierz Dolata[2], Renata Zawirska-Wojtasiak[3]

[1]Katedra Technologii Żywienia Człowieka, [2]Instytut Technologii Mięsa, [3]Instytut Technologii Żywności Pochodzenia Roślinnego Akademii Rolniczej im. A. Cieszkowskiego, Poznań

W pracy podjęto badania dotyczące wpływu zastąpienia części tłuszczu (7,5% i 10%) w wędlinach drobno rozdrobnionych uwodnionym błonnikiem pszennym i owsianym na teksturę wędlin oraz na ich jakość sensoryczną. W gotowych wyrobach oznaczono zawartość wody, tłuszczu i białka. Teksturę wędlin określono instrumentalnie poprzez: siłę oraz pracę cięcia, siłę pierwszego ściskania – twardość I, siłę drugiego ściskania – twardość II, spoistość i elastyczność. Jakość wędlin badano przy pomocy ilościowej analizy opisowej oraz równolegle prowadzonej oceny konsumenckiej. W wędlinach z wprowadzonym do składu surowcowego błonnikiem pokarmowym zmniejszyła się istotnie zawartość tłuszczu (z 24% w wędlinie kontrolnej do około 18% w wyrobach z 10% dodatkiem błonnika) (tab. 1). Wykazano statystycznie istotne zmiany w badanych parametrach tekstury z wyjątkiem pracy cięcia, które jednak nie były zauważalne zarówno w analizie profilowej, jak i w ocenie konsumenckiej wędlin doświadczalnych (tab. 2). Jedynie zmniejszająca się spoistość wędlin z wymianą tłuszczu błonnikiem pszennym została potwierdzona w analizie profilowej, co wyrażało się zwiększoną wodnistością tych prób (rys. 1). Analiza profilowa obejmowała ocenę 16 wybranych wyróżników dotyczących barwy, tekstury, zapachu i smaku wędlin. Stwierdzono, że substytucja tłuszczu błonnikiem pszennym wpłynęła na intensyfikację smaku mięsnego, przyprawowego, słonego i ostrego oraz na zwiększenie wodnistości wędlin. Wędliny z 7,5% wymianą tłuszczu charakteryzowały się również zwiększoną sprężystością. Zastosowanie błonnika owsianego spowodowało zwiększenie natężenia i jednolitości barwy oraz zmniejszenie intensywności smaku i zapachu tłuszczowego wyrobów. Stopień pożądalności konsumenckiej wędlin, mimo wymienionych zmian jakościowych nie uległ obniżeniu w stosunku do wyrobu tradycyjnego (rys. 4).