

MODIFICATION OF COOKED SAUSAGES FATTY ACID CONTENT

K.VASILEV, K.VALKOVA, ST.DANCHEV

Higher Institute of Food and Flavour Industries,
26 "Maritza" boul., 4002 Plovdiv, Bulgaria

ABSTRACT

This study searches for the possibility for modification of cooked sausages fatty acid content, by means of an input of a certain quantity of sunflower-seeds to the meat raw materials before they have been processed in the cutter. Because the latter also contain a considerable quantity of proteins, we have investigated what is their influence upon the finished product amino-acid content.

The studies have been carried out with cooked sausages, by adding -5 and 10 % of whole sunflower-seeds to the meat raw materials, in order to prepare the experimental samples.

The total quantity of the unsaturated fatty acids in one of the samples investigated grows with the increase of the quantity of the input additive to 61,01 %, at 5 % sun flower-seeds utilized and 62,63 %, at 10 % sunflower-seeds, in comparison with the control samples - 3,87%. For example, the quantity of oleic acid in the control samples of sausages "Prague" is 2,78 %, while in 5 % and 10 % of sunflower-seeds input is increases to 44,01 and 45,86 %, respectively. The linolic acid in the sausages with 10 % of seeds is 12,47 %, while in the control samples only traces are seen.

The total aminoacids quantity, as well as the quantity of the separate aminoacids in the sausages increases with increasing the quantity of the input additive.

INTRODUCTION

The existing tendency for decreasing the consumption of animal fats explains the tend for seeking suitable ways for their replacement in certain meat products (sausages) with vegetative origin fats.

The utilization of sunflower-seeds in the production of meat products can help on the one side for the improvement of lipid fraction composition and more concretely of their fatty acid composition. The utilization of vegetative fats, however, almost always is connected with the appearance of some technological nature problems. It is known that the heat treatment of meat products leads to a change in the nutritious and biological value of lipids which is connected with quality changes of the fatty acid compositions (Levachev, 1980; Baltes, 1976). Besides that, the aminoacid mastionin limiting in meat passes into an unabsorbable form - methylsulphone, at which the assimilation of meat protein is decreased (Hoffman, 1977; Stiebing, 1978).

In connection with this, this study investigates the influence of the utilized for this purpose sunflower-seeds upon the fatty acid and aminoacid composition of the finished product in cooked sausages.

MATERIALS AND METHODS

The investigations have been carried out with whole sunflower-seeds, preliminarily taken out of the husks. The sunflower-seeds are utilized in quantities of 3,5 and 10 % as regards the quantity of meat raw materials in two assortments of cooked sausages. The following sausages have been produced, having the composition of : lean pork - 50 %, half-lean pork - 50 %, table-salt - 2,2 %, nitrite - 0,0007 %, sugar - 0,1 %, garlic - 0,1 %, black pepper - 0,3 % and known under the name of "Kamchia", and sausage "Prague" having the following composition : beef, I-st grade - 40 %, half-lean pork - 60 %, table-salt - 2,2 %, nitrite - 0,01 %, sugar - 0,1 %, black pepper - 0,2 %, nutmeg - 0,05 %. The sausages have been produced after the traditional technology for the production of cooked sausages. Analogically control samples have been also produced with no sunflower-seeds utilization.

In order to determine the influence of the whole sunflower-seeds upon the fatty acid composition of cooked sausages, the fats should be extracted after the method of Bligh and Dyer with a mixture of polar and unpolar solvent (Bligh et al., 1959). The solvent has been separated by means of a rotary vacuum-evaporator, at a temperature of max 40°C. The esterification has been executed by sodium methylate after the method of Smith and De Mau (De Mau, 1964; Smith, 1961). The methyl esters of the separate fatty acids have been separated after the method of gas chromatography of the gas chromatograph "Fractovap 2407-T", company Carlo Erba, at the following conditions. The column LAC 886, with a length of 2 m and a diameter of 2 mm (ethyleneglycolsuccinate upon a chromosorb G 60-80 mesh silanized), initial temperature 140°C, temperature final 210°C, injector temperature 5°C/min., 18 min., isotherm $P_{N_2} = 1,3 \text{ kg/cm}^2$. The determination of the sausages aminoacid composition has been done on an automatic amino-analyzer AAA 881. For this purpose we have weighed about 0,1 g of the mean sample (accuracy of max 0,001 g), in special flasks we have added 6 n HCL and welded the flasks. After the hydrolysis is over in the drying cabinet, at 105°C for 24 h, we have cut out the flasks and their contents has been filtered through a filter G₄. The filter rinsing has been done with hot water, the filtrate has been collected in a glass dish and has been evaporated in a water bath. We have added 5-6 cm³ more distilled water to the remainder obtained, and the liquid portion has been evaporated for a second time. The rinsing and the evaporating has been done once more. We have dissolved the remainder in 0,125 n HCL (max pH = 2,0), in a measuring flask of 25 cm³ and filled up to the mark. In order to chromatograph in the aminoanalyzer column we atomized 0,1 cm³ from the flask content. The quality calculation of aminoacid composition, we have done a calculation of the area on the very top of the chromatograms after the well-known method HW.

We have processed the results obtained after the methods of mathematical statistics (Georgieva, et al., 1989).

RESULTS AND DISCUSSION

The data from the separate types of sausages produced with a different quantity of sunflower-seeds show qualitative difference in their fatty acid composition (Table 1). The highest content of saturated fatty acids has been determined in the controls, in the sausage "Kamchia", and in the sausage "Prague", too.

The total quantity of the unsaturated fatty acids in the sausages increases with the increase of the additive input quantity. In the experimental samples of sausages "Prague" with 5 and 10 % of seeds, it is 61,01 % and 62,63 %, respectively, in comparison with the control - 3,87 %. As regards the controls of the sausage "Kamchia", with 5 and 10 % of input seeds, the total quantity of the unsaturated fatty acids is respectively 61,05 % and 56,73 %, in comparison with the control ones - 7,7 %. The results from the investigations show an increase in the unsaturated fatty acids content, with the increase in the quantity of the input sunflower-seeds. The increase in the essential linolic acid content makes an impression, which in the utilization of 10 % of seeds in the sausage "Kamchia" reaches 16,89 %. In the experimental samples with 3 % and 5 % of seeds input, certain quantities of linolic acid can be determined (Table 1). The total aminoacid quantity in the sausages increases with increasing the quantity of the additive used. In the experimental samples with 5 and 10 % of sunflower-seeds, the total quantity of aminoacids increase respectively to 10,54 % and 16,06 %, while in the control it is 6,85 %. The results from the aminoacid sausages composition, produced with using of sunflower-seeds have shown that the quantity of aminoacids lysine, threonine, serine, alanine, valine, isoleucine, leucine, phenylalanine is considerably higher in comparison with the control samples. Such a tendency has been determined also as regards the aminoacid cystine, whose quantity is 0,07 % in the sausage "Kamchia" and 0,09 % in the sausage "Prague", while in the control samples only traces of it can be noticed.

The results have shown that the utilization of sunflower-seeds in the production of cooked sausages can improve the fatty acid composition of the finished product. This allows us to increase

TABLE 1.

Fatty acid composition of cooked sausages produced with different quantities of sunflower-seeds (% regarding fat)

FATTY ACIDS	Sausage "Prague"				Sausage "Kamchia"			
	control samples	experimental s a m p l e s			control samples	experimental s a m p l e s		
		with 3% seeds	with 5% seeds	with 10% seeds		with 3% seeds	with 5% seeds	with 10% seeds
Caprillic C _{8:0}	8,54±0,06	0,73±0,02	1,73±0,02	1,78±0,04	1,75±0,01	5,76±0,03	2,99±0,08	2,51±0,07
Caprinic C _{10:0}	traces	traces	traces	traces	0,60±0,01	0,19±0,01	traces	traces
Lauric C _{12:0}	8,68±0,05	traces	traces	traces	4,75±0,08	traces	traces	traces
Myristic C _{14:0}	2,00±0,06	1,57±0,05	2,49±0,07	traces	1,99±0,03	2,21±0,04	2,53±0,03	1,80±0,04
Myristo- oleinic C _{14:1}	1,09±0,02	traces	0,41±0,01	traces	1,85±0,04	0,52±0,01	0,83±0,02	1,44±0,03
Palmiti- nic C _{16:0}	35,60±0,15	26,95±0,11	26,55±0,10	25,18±0,16	41,24±0,17	24,28±0,09	26,20±0,10	17,24±0,11
Palmito- leine C _{16:1}	traces	3,45±0,02	4,05±0,08	4,30±0,10	traces	5,48±0,03	5,59±0,03	5,93±0,05
Marga- rine C _{17:0}	-	-	-	-	-	1,47±0,02	-	-
Stearic C _{18:0}	16,84±0,12	12,88±0,10	8,22±0,05	10,40±0,10	21,58±0,15	7,22±0,04	7,23±0,02	13,63±0,10
Oleic C _{18:1}	2,78±0,01	44,01±0,17	41,38±0,15	45,86±0,14	5,85±0,09	38,45±0,13	40,36±0,15	32,47±0,14
Linolic C _{18:2}	traces	9,49±0,08	15,09±0,11	12,47±0,11	traces	13,45±0,10	13,20±0,11	16,89±0,12
Linole- nic C _{18:3}	-	0,91±0,01	0,08±0,00	traces	-	0,96±0,03	1,07±0,02	traces
Saturated	71,66±1,10	42,13±1,10	38,99±0,93	37,36±0,85	72,11±1,13	41,13±1,00	38,95±0,96	35,18±0,90
Unsaturated	3,87±0,10	57,86±1,10	61,01±1,12	62,63±1,11	7,70±0,10	58,86±1,10	61,05±1,33	56,73±1,12
Ratio								
Unsaturated:Saturated	0,05	1,37	1,56	1,68	0,11	1,43	1,57	1,61

TABLE 2.

Aminoacid composition of "Kamchia" and "Prague" sausages produced with different quantities of sunflower-seeds (g/100 g product)

AMINOACIDS	Sausage "Kamchia"				Sausage "Prague"			
	control samples	e x p e r i m e n t a l s a m p l e s			control samples	e x p e r i m e n t a l s a m p l e s		
		with 3% seeds	with 5% seeds	with 10% seeds		with 3% seeds	with 5% seeds	with 10% seeds
Lysine								
Histidine	0,81±0,04	0,94±0,03	1,17±0,06	1,29±0,06	0,71±0,06	1,11±0,09	1,02±0,10	1,36±0,05
Arginine	0,33±0,01	0,40±0,02	0,49±0,02	0,51±0,03	0,30±0,04	0,47±0,03	0,41±0,02	0,50±0,04
Aspartic acid	0,55±0,01	0,67±0,04	0,79±0,06	0,92±0,10	0,47±0,03	0,72±0,03	0,79±0,03	0,88±0,05
Threonine	0,74±0,05	0,80±0,04	0,85±0,04	0,84±0,05	0,85±0,03	0,96±0,04	0,99±0,04	1,00±0,04
Serine	0,28±0,02	0,32±0,01	0,39±0,02	0,69±0,06	0,22±0,01	0,40±0,04	0,40±0,03	0,38±0,03
Glutamic acid	0,31±0,01	0,37±0,02	0,42±0,02	0,52±0,05	0,25±0,01	0,42±0,03	0,43±0,03	0,49±0,02
Proline	1,06±0,04	1,20±0,07	1,45±0,09	2,98±0,15	0,84±0,07	1,46±0,10	1,56±0,11	1,62±0,10
Glycine	0,40±0,01	0,48±0,02	2,42±0,13	1,18±0,10	0,36±0,02	0,51±0,04	0,52±0,03	0,86±0,07
Alanine	0,49±0,02	0,59±0,01	0,68±0,02	1,27±0,12	0,37±0,03	0,37±0,03	0,58±0,04	0,79±0,05
Cystine	0,50±0,03	0,58±0,02	0,70±0,07	1,19±0,13	0,41±0,02	0,66±0,05	0,65±0,04	0,76±0,05
Valine	traces	0,05±0,01	0,07±0,01	-	traces	0,09±0,01	0,09±0,01	-
Methionine	0,19±0,01	0,27±0,02	0,31±0,01	0,20±0,01	0,29±0,02	0,32±0,02	0,29±0,02	0,58±0,05
Isoleucine	0,07±0,01	0,14±0,02	0,14±0,01	0,18±0,02	0,04±0,01	0,14±0,01	0,10±0,01	0,13±0,01
Leucine	0,17±0,01	0,22±0,02	0,24±0,02	0,87±0,06	0,14±0,01	0,26±0,02	0,25±0,01	0,49±0,01
Thyrosine	0,48±0,02	0,55±0,02	0,65±0,04	1,43±0,19	0,38±0,03	0,72±0,05	0,68±0,04	0,70±0,05
Phenylalanine	0,24±0,01	0,28±0,01	0,33±0,02	0,40±0,02	0,27±0,02	0,35±0,03	0,39±0,03	0,32±0,03
TOTAL	0,23±0,01	0,29±0,02	0,34±0,03	0,88±0,05	0,36±0,01	0,38±0,02	0,40±0,02	0,42±0,03
	6,85±0,13	8,15±0,15	10,54±0,19	16,06±0,14	5,97±0,10	9,52±0,10	9,65±0,10	11,28±0,15

se the content of unsaturated fatty acids, and of certain essential aminoacids, as well.

CONCLUSIONS

1. The utilization of whole sunflower-seeds in cooked sausages increases the quantity of unsaturated fatty acids in the finished product.
2. By increasing the quantity of the input whole sunflower-seeds from 3 % to 10 %, the total quantity of the aminoacids, as well as the quantity of the separate individually determined aminoacids increases.

REFERENCES

- BALTES W., 1976. *Die Fleischwirtschaft*, 57, 3, 298-309 p.
- BLIGH E.G., DYER W.I., 1959. *Can J. of Biochem. Physiol.*, 37, 4, 911-921 p.
- DE MAU J., 1964. "*Dairy Sci.*", 47, 5, 546 p.
- GEORGIEVA P., TODORINOV S., TANCHEV ST., 1989. *Hranitel'no-promishlena nauka*, 1, 100-109 p.
- LEVACHE M.M., 1980. *Voprosii pitaniia*, 4, 50, 2-3 p.
- HOFFMAN K., 1977. *Die Fleischwirtschaft*, 57, 10, 1818-1825 p.
- SMITH L.M., 1961. "*Dairy Sci.*", 44-607 p.
- STIEBING I., 1978. *Die Fleischwirtschaft*, 58, 8, 1306-1312 p.