

EFFECT OF SUNFLOWER-PROTEIN BASED PRODUCTS ON THE  
PROPERTIES OF GROUND-MEAT PRODUCTS

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The meat packing industry has been using for quite a number of years now the protein-based additives obtained from the material remaining after extraction of oil from soybean. Their use in the preparation of meat products is justified in the first place by reduced cooking loss, prevented separation of fats and jelly, improved organoleptic properties and, in some cases, improved nutritional value.

The success achieved in using soybean protein additives in the meat packing industry, as well as in other branches of the food industry, aroused the interest of scientists in the possibility of making protein-based additives suitable for human food from other oleaceous crops, with particular reference to sunflower seeds. The data in available literature are indicative of success in this respect (2, 4, 7, 9, 10).

The available literature contains data on functional properties of sunflower-protein products. They show that sunflower proteins have a somewhat lower water absorption rate, higher fat absorption rate and better emulsifying properties than the soybean proteins (1, 5, 6, 8). The emulsions prepared with proteins contained in sunflower meal are very stable on exposure to heat.

It has been established that sunflower-protein products can be used in making meat products (3, 6, 9, 11). However, problems may arise with regard to the colour and taste of such meat products.

The purpose of this work was to investigate the possibility of using sunflower-protein based additives in making ground-meat products.

#### Materials and Work Methods

The investigation was carried out at the Food Technology Research Institute of the Faculty of Agriculture in Zemun, and the subject of investigation were ground-meat products of the "pljeskavica" and "ćevapčići" type.\* These products were made using lean baby-beef (75%) and fat pork (25%). Fresh meat was used (chilled in the duration of 24 hours), which on grinding was pushed through grinding-machine strainer with dia. 5 mm holes. The appropriately weighed meat mixtures were seasoned as follows: pljeskavice - 0.6% sweet paprika, 0.15% powdered onions and 1.8% salt; ćevapčići - only 2% salt.

Low oil-content sunflower meal obtained from consumer sunflower was used in the investigation. The extraction of fats and separation of undesirable compounds were carried out under laboratory conditions. The protein content in the sunflower meal amounted to approximately 54%. Prior to use, the meal was hydrated with water at the ratio of 1:2 and added in the form of paste as substitute for meat in the quantity of 6, 12 and 18% (2, 4 and 6% in substance). The control samples were pljeskavice and ćevapčići containing no sunflower meal.

Pljeskavice and ćevapčići were made from the mentioned

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\* The terms "pljeskavica" and "ćevapčići" (pronounced pljeskavitsa and chehvapchichi respectively) are local specialties and have no English equivalent. They are prepared by shaping seasoned ground meat into cakes resembling hamburgers (former) and small cylinders (latter) and grilling.

ground-meat mixtures. A part of the pljeskavice and ćevapčići was exposed to heat treatment immediately, while the other part was frozen and then stored at  $-20^{\circ}\text{C}$  in the duration of 30 days. The pljeskavice weighed 60 g each and ćevapčići 17 g. The number of samples in one experimental group amounted to 50 ćevapčići or 5 pljeskavice. The heat treatment was carried out on a heated grill under absolutely the same conditions for all products. The ćevapčići were grilled 5 minutes on one side and 3 minutes on the other, and pljeskavice 4 and 3 minutes respectively. The weighing was carried out 5 minutes after the samples were taken off the grill. The pljeskavice were weighed individually and ćevapčići in lots of 10 pieces. The individual and average cooking losses were calculated on the basis of the difference in weight measured prior and after heat treatment.

The quality of finished products was appraised by a jury consisting of 6 experienced specialists. Appraisal was made of: colour, taste, odour, consistency and juiciness, and the marks given ranged from 1 to 5. The average marks for individual features, as well as the sum of average marks for individual features, were worked out at the end.

The following methods were applied in testing the basic chemical composition: water content - by drying the samples until constant weight at  $105^{\circ}\text{C}$ ; protein content - by Kjeldahl method; and fat content - by Soxhlet extraction method.

### Results and Discussion

The results of investigating the effect of sunflower meal on cooking loss with ground-meat products (ćevapčići and pljeskavice) are presented on Table 1.

Table 1 - Average cooking loss, as %

	Ć e v a p ĉ i ć i				P l j e s k a v i c e			
	K	I	II	III	K	I	II	III
A	33.59	33.19	32.73	31.11	30.50	30.62	29.93	30.30
B	35.19	35.23	34.75	33.46	32.39	32.97	31.03	31.42

K - control samples; I - samples with 2% meal content;

II - samples with 4% meal content; III - samples with 6% meal content;

A - previously non-frozen samples; B - previously frozen samples

It can be immediately seen that the cooking loss decreases with the growth of percentage share of sunflower meal in pljeskavice and ćevapčići in most cases. Namely, if the previously non-frozen ćevapčići are involved, the difference in cooking loss between control samples and experimental ones containing 2% of sunflower meal amounts to 0.4%, while the difference in cooking loss between control samples and experimental ones containing 4 and 6% amounts to 1.14% and 2.48% respectively.

In the case of previously frozen ćevapčići, the cooking loss difference between control and experimental samples containing sunflower meal is smaller. Moreover, there is practically no cooking loss difference between control samples and experimental samples containing 2% of sunflower meal.

The pljeskavice containing 4% and 6% of sunflower meal have somewhat lower cooking loss than the control samples. However, the cooking loss difference is considerably smaller than that established for ćevapčići. Irrespective of whether previously frozen or not, the experimental samples containing 2% of sunflower meal show a greater weight loss than the control ones.

It would be necessary to stress that cooking loss with previously frozen samples of *ćevapčići* and *pljeskavice* (experimental and control) is somewhat higher in relation to those that were not previously frozen.

Table 2 - Appraisal of organoleptic properties of *ćevapčići*

Property	A				B			
	K	I	II	III	K	I	II	III
Colour	4.31	4.25	4.17	4.08	4.08	4.08	3.88	3.75
Taste	4.25	4.50	4.31	3.75	3.95	4.33	4.00	3.58
Odour	4.19	4.37	4.31	4.00	3.92	4.25	4.00	3.83
Consistency	3.94	4.25	4.00	3.80	3.75	4.17	3.91	3.58
Juiciness	4.00	4.42	4.33	4.17	3.80	4.25	4.31	4.00
Aggregate mark	20.69	21.79	21.12	19.80	19.50	21.00	20.00	18.74

K - control samples; I - samples containing 2% of meal;

II - samples containing 4% of meal; III - samples containing 6% of meal;

A - previously non-frozen samples; B - previously frozen samples.

The results obtained in appraising the organoleptic properties (Tables 2 and 3) show that higher aggregate marks were given to the samples containing 2 and 4% of sunflower meal than to the control ones. The experimental samples have better taste, odour, consistency and juiciness. However, in all cases, the samples containing 6% of sunflower meal were given lower marks for organoleptic properties than the control ones. Only juiciness of these samples was given somewhat better marks.

The experimental samples of *ćevapčići* and *pljeskavice* containing 2, 4 and 6% of sunflower meal have a somewhat poorer

colour than the control ones, while it is quite the opposite in the case of juiciness.

Table 3 - Appraisal of organoleptic properties of pljeskavice

Property	A				B			
	K	I	II	III	K	I	II	III
Colour	4.31	4.25	4.13	4.00	4.08	4.00	3.91	3.83
Taste	4.08	4.31	4.19	3.70	3.91	4.19	4.00	3.51
Odour	4.31	4.44	4.25	4.19	4.00	4.19	4.06	3.91
Consistency	4.06	4.56	4.19	3.88	3.67	4.08	4.08	3.58
Juiciness	3.94	4.35	4.48	4.06	3.75	4.25	4.17	4.00
Aggregate mark	20.70	21.91	21.24	19.83	19.41	20.71	20.22	18.82

K - control samples; I - samples containing 2% of sunflower meal;  
 II - samples containing 4% of meal; III - samples containing 6% of meal  
 A - previously non-frozen samples; B - previously frozen samples.

The organoleptic properties of the previously frozen samples of čevapčići and pljeskavice were given somewhat lower marks than those given to the previously non-frozen ones. However, there was no substantial change in the quality-difference between the control and experimental samples.

Table 4 - Basic chemical composition of čevapčići and pljeskavice

	Water content, %		Protein content, %		Fat content, %	
	A	B	A	B	A	B
K	53.40	53.80	21.72	21.65	22.90	22.43
I	53.85	54.00	22.00	22.51	22.72	21.54
II	54.50	55.21	22.38	21.71	22.64	22.38
III	54.17	54.23	21.75	21.81	22.10	21.65

K - control samples; I - samples containing 2% of meal;

II - samples containing 4% of meal; III - samples containing 6% of meal

A - čevapčići; B - pljeskavice

The chemical-composition tests (Table 4) show that ground-meat products (čevapčići and pljeskavice) containing 2, 4 and 6% of sunflower meal have a somewhat lower water and fat content and a somewhat higher protein content in relation to the control samples.

Evidently, our results are indicative of real usefulness of using sunflower meal in making ground-meat products, in the concentration of 2 and 4%. Namely, at these concentrations, the sunflower meal can even reduce the cooking loss and improve the organoleptic properties of the product. Only the colour was given somewhat lower marks. However, the addition of 6% of sunflower meal mostly results in somewhat poorer organoleptic properties of finished products. The established difference in properties between the products with and without added sunflower meal is encouraging and calling for further investigation.

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