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MANUFACTURE OF COARSE-GROUND DRIED MEAT PRODUCTS OF A PROGRAMMED COMPOSITION

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SUMMARY

Experiments were made, under industrial conditions, to manufacture a coarse-ground dried smoked-and-cooked sausage, cervelat. In experimental samples, the initial raw materials were pre-simulated using a computer programme, and controls were manufactured by the conventional technology.

In experimental samples, the raw materials for the structure-forming elements were preground using a grinder with a 30-32 mm plate, then blended; determinations were made of water content, fat content, and total protein using a rapid chemical analyzer and, after estimating correction ingredients, were allowed to stand at a temperature of -8°C to -10°C for 10-16 hours to freeze.

During the mechanical treatment correction ingredients and curing materials were added in accordance with a relevant formula.

Upon comparative studies, significant differences were found between experimental samples and controls for $P > 0{,}001$ in the index of fat content in dry substance, and for $P > 0{,}01$ in the index of total protein.

INTRODUCTION

An important task of meat industry is to increase the output of meat products at the expense of the improvement of current technologies and the development of new ones with a view to stabilizing produce quality and automating and mechanizing processes (1, 2, 4, 5).

It is well known that, at the present moment, in many of the developed countries, technologies have been introduced for the manufacture of cooked sausages with the programming of initial raw materials (3, 5, 6). This technology is a perspective one and has a number of advantages which range it high in the manufacture of that kind of meat products. One of the specific stages of technological treatment in this case is the grinding of raw meat materials to definite sizes and their blending in large capacity blenders in view of making heterogenous in-coming mixtures of an average composition (3, 4, 7). This blending, especially in high fat meats, brings about a partial smearing which, on its part, is unfavourable in forming the structure of the sausage meat. This method of treating raw materials appears inapplicable to the manufacture of coarse-ground dried meat products. In those products having a higher nutritive value, one of the basic requirements is that cut surface be uniformly and clearly marbled and stress the quality and the appearance of the individual brand.

Since in the literature examined we came across no data on the manufacture of coarse-ground dried sausages of a programmed composition, in this work of ours we aimed to develop a technology and organization for the manufacture of coarse-ground dried meat products with a pre-modelling of initial raw materials.

MATERIALS AND METHODS

Experiments were conducted under laboratory conditions in the experimental technological workshop at the Institute of Meat Industry, Sofia, and under industrial conditions at the Rodopa plant in the town of Tolbukhin. The Cervelat sausage which belongs to the group of dried smoked and cooked sausages was used as experimental material.

Control samples were manufactured by the conventional technology, and in experimental ones, the following technological operations and analyses were made: Beef was ground using a plate with 4-6 mm openings, transfered into a blender of a capacity of 800 l and blended for 1 minute. Semi-fat pork (up to 45% fat) and lean pork (up to 10% fat) were ground using a plate with 30-32 mm openings and were also blended for 1 minute each separately. A mean sample was taken from the three types of raw materials and water content, fat content and total protein were determined using the Technicon InfraAlyzer 400 rapid chemical analyzer. The data from the analysis were introduced into a model programme of a microcomputer, where the optimum formulation was computed, and the variants of the possible correction ingredients were given, with a view to the production of a standard finished product.

To facilitate the weighing of curing materials and spices provided for the sausage meat after the correction, the quantity of the raw material to be equalized was calculated in accordance with the size of the cutter by the formula we found:

$$m = \frac{f \times R}{n + f} - R, \quad \text{where}$$

f - the quantity of the meat added for equalization from the microcomputer programme, kg;
n - the weight of the lot to be equalized, kg;
m - the accurate weight of the cutter lot, which should substitute n, kg;
R - the capacity of the cutter used, l.

Semi-fat pork and half the lean pork and the correction ingredients (if they were raw materials of a high content of adipose tissue) were frozen at a temperature of -8°C to -10°C for 10-16 hours, and beef and the remainder of the lean pork were kept at a temperature of 0+2°C.

Mechanical treatment was performed in the following way: out of the chilled beef and half the lean pork, we prepared a 'dry' sausage meat together with the curing materials and the spices. Semi-fat pork and the remainder of the lean pork, together with correction ingredients (if they were meats of a high fat content) were added directly in the frozen state and ground to a particle size of 3-5 mm. If correction ingredients were raw materials of a high protein content, they were only chilled to a temperature of 0+2°C.

The remaining technological operations: filling, binding, cooking and drying, were performed by the conventional technology.

The finished products (experimental and control samples), after having reached a water content of 42%, were subjected to analyses for chemical characteristics and to organoleptic analysis in accordance with Bulgarian State Standard.

Results were treated by statistical methods. We adopted a minimum significance of 95% by Student's table.

RESULTS AND DISCUSSION

Fig. 1 and 2 show the results of our studies for the index of fat content in dry matter in finished experimental and control samples.

From the data it is evident that, in controls, the said index is within a wide range, from 60,15% to 68,15%, while in experimental samples the range of all values is from 67,15% to 68,32%. Differences are significant ($P < 0,001$). It is clear that the preliminary interoperational control of raw meat materials and the corrections made have had a favourable effect on experimental samples which are grouped near the upper limit of the standard (70%). The experimental lots manufactured in this way have also got an advantage from the economic point of view, since in them, a larger amount of higher fat raw materials has been used.

Fig. 3 and 4 illustrate the data on the contents of total protein in the lots analyzed.

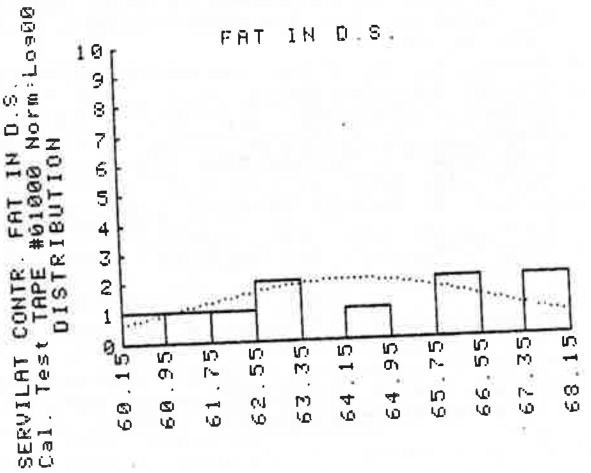

Fig. 1. Fat content in dry substance, controls.

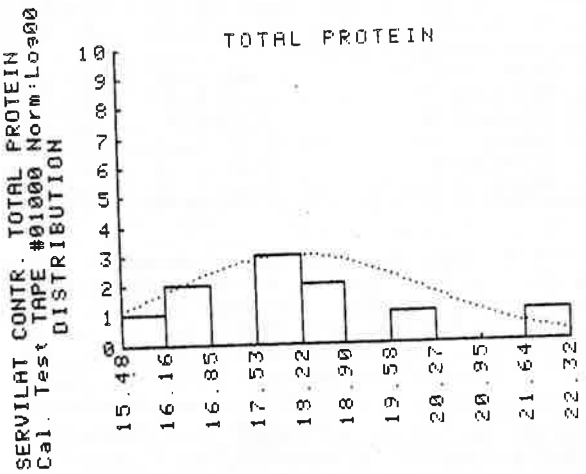

Fig. 3. Total protein content, controls.

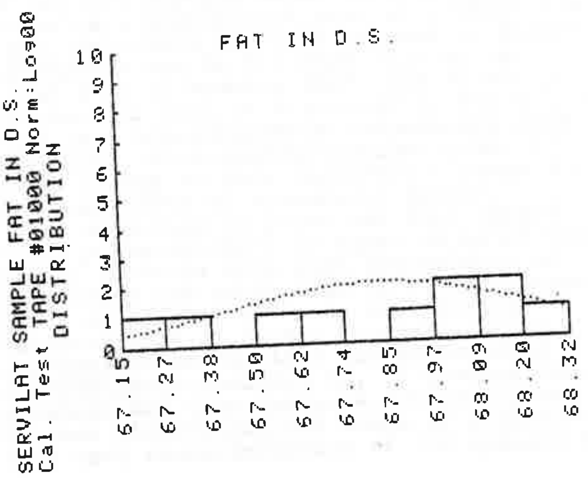

Fig. 2. Fat content in dry substance, experimental samples.

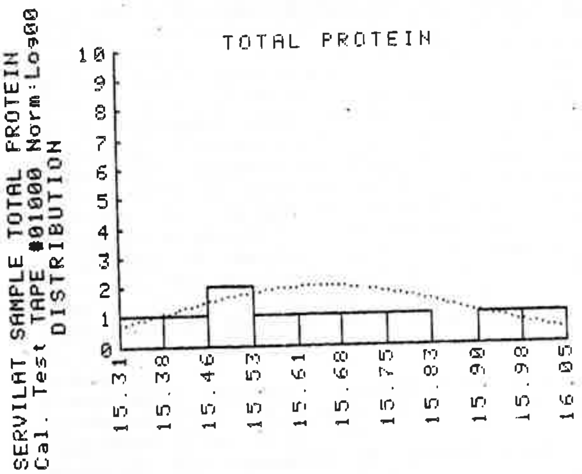

Fig.4.Total protein content,experim.samples.

The better distribution of values in experimental lots and their grouping a little above the standard requirement (15%) is impressive here. Controls vary from 15,48% to 22,32%, the differences between them being significant (P< 0,01). The equalizing of initial raw materials in experimental lots has contributed to the satisfaction of standard norms for both indices treated (fat content in the dry substance, and total protein), with a maximum economic efficiency and preservation of arganoleptic qualities.

This is well illustrated in Table 1, where the results of the sensory analysis of the sausages manufactured are shown.

Table 1. n = 10

Indices	Samples Control $\bar{x}$	$\pm S$	Experim. $\bar{x}$	$\pm S$
1. Cut surface colour	8,00	0,63	7,80	0,58
2. Cut surface structure	7,50	0,62	7,60	0,62
3. Texture	7,20	0,48	7,60	0,62
4. Aroma	7,50	0,58	7,60	0,62
5. Taste	7,60	0,45	7,60	0,62
6. Juiciness	7,30	0,42	7,70	0,55
7. Total score	7,40	0,36	7,70	0,55

The data indicate that no substantial differences can be observed between experimental and control samples, controls having a score higher by 0,2 only for the index of cut surface colour, which, however, is not significant ($P<0,05$). Cut surface structure shows no differences in the two cases, which is explained by the circumstance that frozen raw materials for structure-forming elements in experimental samples have contributed to the better and cleaner cutting during the mechanical treatment.

The trend towards better scores for the indices of texture, juiciness, aroma and total score are attributed to the fact that higher fat correction ingredients have been added in the experiments which on its part has affected the texture of the product. These differences in scores are insignificant ($P<0,05$).

CONCLUSIONS

1. Interoperational control and the modelling of initial raw materials have favourable effects on the indices of fat content in dry substance, and total protein, those varying in the range of 1-1,5%.

2. The grinding of the raw materials for structure-forming elements in dried smoked-and-cooked sausages to a particle size of 30-32 mm and their subsequent freezing does not deteriorate the cut surface structure and the organoleptic qualities of finished products.

3. The manufacture of dried coarse-ground smoked-and-cooked sausages of a programmed composition creates a possibility to improve the economic efficiency, along with a strict observation of technological discipline.

REFERENCES

1. Borck, D. Technologischer Fortschritt bei der Brühwurstbrät-Produktion durch das IGU-KR Verfahren. Die Fleischwirtschaft, 65, 1985, 8, 890-893.
2. Ehring, D., G. Linke. Anw ndungsmöglichkeiten der linearen Optimierung in der Fleischwirtschaft. Fleisch, 35, 1981, 1, 15-17.
3. Dóczi, I., M. Kóbor, Z. Erdős. Nagy térfogatú keverő a húskészitménygyártásban. Húsipar, 32, 1983, 4, 151-157.
4. Karmas, E. Sausage products technology, Park Ridge, 1977, New Jersey, USA.
5. KSI. Preblending and computer formulation. Canada, 1986, 67-83.
6. Werner, G., K. Lange. Simulation von Heissrauchverfahren mit Computer. Die Fleischerei, 33, 1982, 1, 37-40.
7. Wirth, F. Technologie der Verarbeitung von Fleisch mit ab eichender Beschaffenheit. Die Fleischwirtschaft, 65, 1985, 9, 998-1011.