

VALUE IN THE PRODUCTION OF CANNED MEATS

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INTRODUCTION

Sterilization value F in each sterilization regime represents its quantitative expression. A number of authors (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22) study its dependence on various factors, including the individual components of canned products and their physical properties. Some authors (12, 18, 20) prove that heat penetration is different in various product brands and depends on water and fat content which, too, determines the different possibilities for creating heat fluxes in the cans during sterilization.

In the present investigations our aim was to:

(1) Study and determine the effect of the type of meat (beef, veal, pork, and mutton) on sterilization value in the production of sterilized canned meats;

(2) Study and determine the effect of meat particle size on heat penetration into the geometrical centre of canned product and on sterilization value.

MATERIAL AND METHODS

Beef, veal, pork, and mutton from the same muscle groups (Gluteus), cooled in the same conditions and trimmed from visible fat, were used as material. The meat was ground with a 16 mm plate and filled into round cans of the capacity of 220 g. Filled cans were sealed at a vacuum sealing machine and sterilized ac-

cording to the formula $\frac{20 - 50 - 20}{120^{\circ}\text{C}}$.

To determine the effect of particle size of meat, we made use of pork from m. Gluteus again, which was cut into particles of three sizes: big (4 x 4 cm), medium (2,5 x 2,5 cm), and small (1 x 1 cm). A portion of the same meat was ground with a 5 mm plate. Round cans again, of the capacity of 220.g, were filled with meat of the four particle sizes without further additives, and sealed at a vacuum sealing machine. They were sterilized according to the same formula: $\frac{20 - 50 - 20}{120^{\circ}\text{C}}$.

The experimental cans, arranged side by side, were sterilized in a static autoclave in water medium. Temperature in the geometrical centre of the canned products was followed using a multipoint thermograph. Prior to filling the meat into cans we determined pH and water and fat content. The amount of broth and melted fat was determined after sterilization. Data obtained from the thermograms were produced using the graphical-analytical method (2, 3), by which we found the reading for the sterilization value.

RESULTS AND DISCUSSION

(1) Effect of meat type on sterilization value.

In the sterilization of cans of beef, veal, pork, and mutton from the same muscles, with all other conditions equal (particle size, packing, sterilization regime, etc.), heat penetration to the geometrical centre is different. The results are shown in Graph 1.

Data indicate that heat penetration to the geometrical centre is the fastest in the experimental cans of veal, followed by that in mutton and beef cans, and the slowest in canned pork.

Such a succession can be observed also in respect of sterilization value of the experimental cans of different meats. These results are given in Fig.1.

It is obvious from the figure, that one and the same sterilization regime, experimental cans of veal have the highest sterilization value, $F=12,9$; in the case of canned mutton, $F=12,4$; in that of beef, $F=12,0$; and in the case of canned pork, $F=11,1$ min. Expressed in per cent relationships, F -values of cans of pork are lower than F -values of cans of beef, mutton and veal, respectively, by 7,50%, 10,48%, and 13,95%.

In order to determine the interdependence among sterilization value and fat and water contents of the meat from the different types of animals, pH, and the amount of broth and fat released after sterilization, analyses were carried out, the means from which are shown in Table 1.

Results in the table show that, with an equal sterilization regime and pH in the normal range, sterilization value is the highest in veal, which has the highest water content and the lowest fat content, while the amount of broth released is the greatest, and that of melted fat, insignificant. In pork, which has the lowest water content and the highest fat content, the amount of broth released is the smallest, that of melted fat, the greatest, and sterilization value is the lowest.

(2) Effect of meat particle size on sterilization value.

In the sterilization of experimental cans of pork of different particle sizes, with sterilization regime and all other conditions equal, heat penetration to the geometrical centre is different. The results are shown in Graph 2.

It is evident from the data, that heat penetration is the fastest in experimental canned products with medium particle size (2,5 x 2,5 cm), followed by that in big particles (4 x 4 cm), small particles (1 x 1 cm) and lastly by heat penetration in meat ground with a 5 mm plate.

These data correspond also to sterilization values of the different types of experimental cans and are presented in Fig. 2. The results point to the highest sterilization value, with sterilization regime and all other conditions equal, in experimental cans of pork of medium particle size ($F=10,7$), followed by the sterilization values of canned pork of big particles ($F=9,7$) and small particles ($F=8,9$) and by that of canned finely ground pork ($F=7,7$). Sterilization values of experimental cans expressed in percentage in relation to that of canned finely ground pork, are the following: sterilization values of canned pork of small, medium and big particle sizes, respectively, are higher by 13,4%, 28% and 20,6%.

The quantitative analyses of experimental cans of pork of different particle sizes are reflected in Table 2.

The mean values in the table indicate, that in one and the same sterilization regime, the amount of broth and fat released is the greatest for pork, ground finely in a meat grinder. With the increase of particle size, the amount of broth and fat released decreases. Sterilization value, however, does not show the same relationship, but its highest reading, $F=10,7$, is for the medium particle size (2,5 x 2,5 cm).

CONCLUSIONS

- (1) The type of meat influences heat penetration to the geo-

metrical centre of canned products and their sterilization value.

(2) With sterilization regime and all other conditions equal, heat penetration is the fastest in canned veal, where sterilization value is the highest. The cans of mutton, beef and pork come in succession, having respectively lower sterilization values.

(3) Sterilization value is influenced by the water and fat contents of the individual types of meat and is in relation with the amount of broth and fat released in the cans during sterilization.

(4) Meat particle size influences heat penetration to the geometrical centre of cans and their sterilization value.

(5) Heat penetration is the fastest, and the highest sterilization value is established in canned product of medium particle size (2,5 x 2,5 cm), and in those of bigger and smaller particle sizes sterilization values decrease.

(6) With the increase of particle size, a diminution of the amounts of broth and fat released during sterilization is observed.

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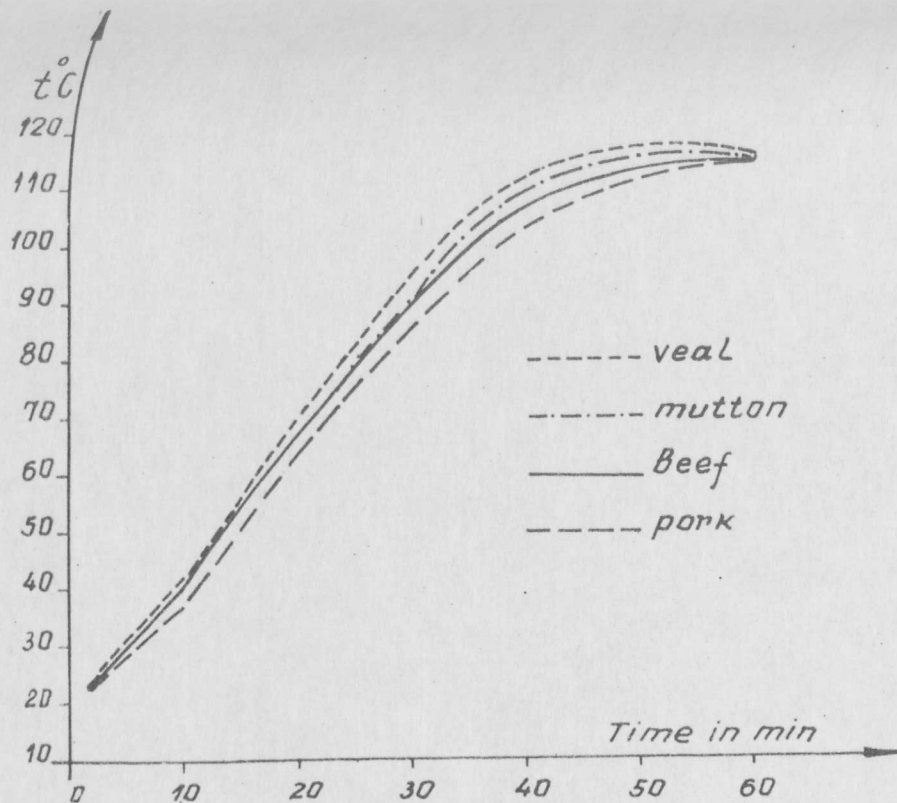
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Table 1.

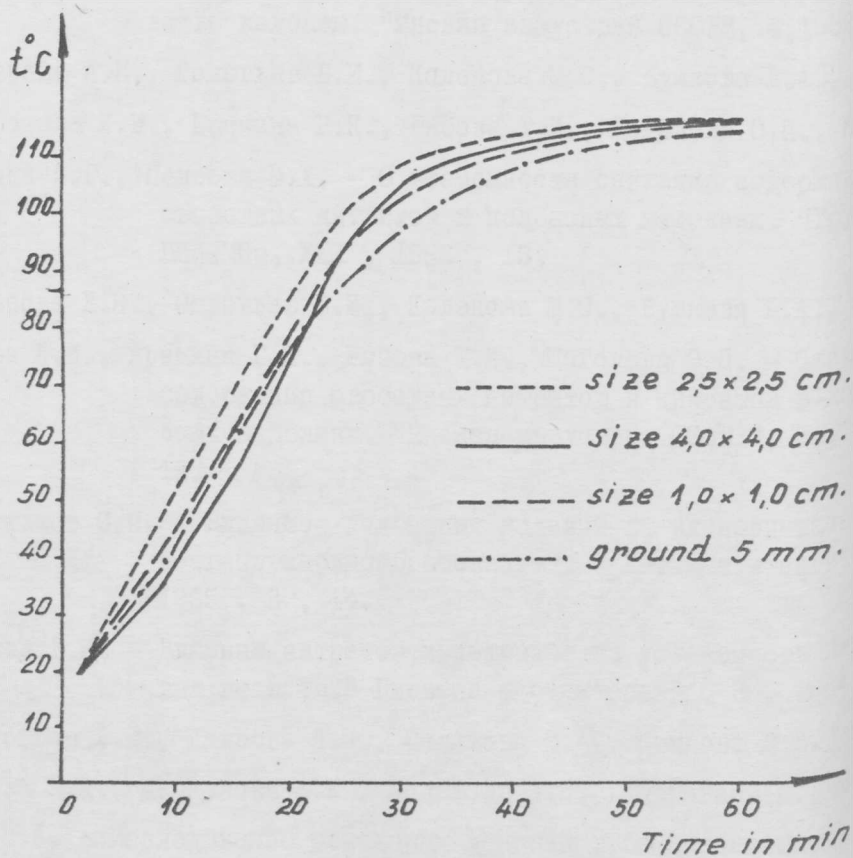
Type of canned product	F-value	Water Content %	Fat Content	Broth	Fats Released g	pH
Veal	12,9	74,5	1,46	96,2	0,2	6,22
Mutton	12,4	73,6	3,66	92,0	0,8	6,18
Beef	12,0	73,4	4,26	90,4	0,9	6,24
Pork	11,1	71,3	6,82	83,4	2,6	6,26

Table 2.

Meat Particle Size	Particle Dimensions cm	Nett Weight g	Broth g	Fat g	Broth & Fat g	F-value
Big particles	4 x 4	220	79,4	1,6	81,0	9,7
Medium "	2,5 x 2,5	221	82,5	2,5	84,0	10,7
Small "	1 x 1	219	85,0	3,0	88,0	8,9
Ground with a 5 mm plate	0,5	221	85,5	3,5	89,0	7,7



Graph 1



Graph 2



Fig. 1

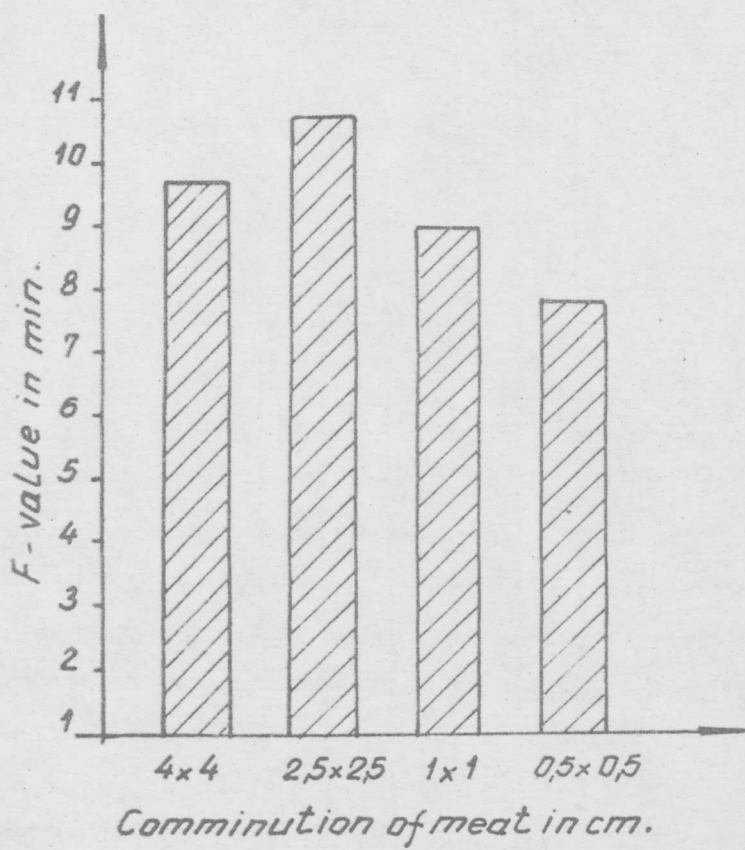


Fig. 2