Analysis of mechanically deboned meat /MDM/. Effect of microwave treatment on meat paste parameters.

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The application of microwaves in the foodstuffs industry is a potential possibility for the thermal treatment of foodstuffs, and also for extraction, sterilization and dehydration. The treatment of meats with microwaves was first reported in the literature by Apgar et al. in 1959. The traditional means of preparing meats /roasting, braising/ were compared with microwave treatment. The bulk of the publications that have since appeared in connection with the microwave treatment of meats analyze the losses in bulk and water, the transformation of the B vitamins, and the organoleptic properties.
In their survey of the literature to date, in 1983 Bognár and Püchner concluded that the microwave treatment of meats causes the same losses as in the traditional cooking procedures at the same temperature, and that the loss in bulk of meat on application of the microwave technique increases in proportion to the rise in temperature.

We have made use of the literature findings to examine the changes brought about when microwaves are used to treat and thaw frozen MDM. As there is no concrete literature experience relating to this subject, we measured the effects of microwave treatment on the biological value, sensoric properties and microbiological parameters of MDM. Mainly the following quality characterestics were determined in the experimental work:

1/ Sensoric factors /colour, smell, taste, texture/; 2/ Water content; 3/ Water activity /a_w/; 4/ pH; 5/ Total water content /N x 6.25/; 6/ Connective tissue protein content; 7/ Lipid content; 8/ Total carbohydrate content; 9/ Ash content; 1o/ Calcium content; 11/ Phosporus content; 12/ Total germ count;

MDM obtained from mixed bone /rib + backbone + shank/ was used in the experiments. The methods and instruments employed in the analyses were as follows: for pH measurement: a Radelkisz Digital pH-meter; for a_w: a Rotronic Hygroskop DT; for total protein content determination: the TiO_2 method /see Table 1/; for connective tissue protein content: the ISO procedure; for carbohydrate determination: the Schoorl method; for lipid determination: the Soxhlet procedure; for calcium: complexometric titration; and for phosphorus content:

photometric analysis. A Sharp Model R-9600 E instrument was used for microwave treatment.

Table 1. Comparative measurements for determinations of raw protein content of MDM

	No. of measurements, n	Mean protein content, % /N x 6.25/ average	Standard deviation
1/ TiO_2 procedure	5	8,71	0,19
2/ ZrO_2 procedure	5	8,71	0,12
3/ Kjeldahl method /$CuSO_4$/	5	8,78	0,30

The experimental results are given in Table 2.

Table 2. Effects of microwave treatment on frozen MDM

	Thawing with microwaves /2.3 min/	Thawing with air at 25°C	Control
1/ Water content, %	39,4	37,0	38,6
2/ Protein content, % /Nx6.25/	8,8	8,5	8,7
3/ Connective tissue protein content, %	1,8	1,7	1,7
4/ Lipid content, %	51,0	54,0	50,5
5/ Total carbohydrate content,%	0,1	0,1	0,1
6/ Ash content, %	0,7	0,6	0,7
7/ Calcium content, %	0,19	0,19	0,21
8/ Phosphorus content, mg/100 g	131,9	120,5	125,7
9/ pH	6,72	6,75	6,72
10/ a_w	0,981	0,979	0,972
11/ Total germ count	$3,6 \cdot 10^3$	$1,1 \cdot 10^4$	-
12/ Sensoric classification	satisfactory	satisfactory	satisfactory

From the results it may be stated that the freezing of the MDM did not result in large changes in the biological value, pH and a_w. The frozen MDM was thawed in two ways: by keeping it at room temperature, and by microwave treatment; the two procedures resulted in slight differences in a_w and the lipid, water, protein and phosphorus contents. The higher a_w and water content on microwave treatment, and hence the difference in lipid content, are easily understood: during thawing at room temperature, the evaporation of the water at 25°C on the surface of the sample is faster than at 4°C in the closed volume in the microwave apparatus. The greatest difference in favour ot the microwave technique was observed in

the total germ count. The sensoric properties were unchanged for the two thawing methods, and were satisfactory.

To summarize, it may be stated that the microwave technique appears to be advantageous for the thawing of frozen MDM, as the microwave treatment of frozen MDM does not give rise to physical, chemical or biological changes influencing the biological value and utilizability of MDM in industry.

References:

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