STARTER CULTURE INFLUENCE ON SOME CHANGES OF MUSCLE PROTEINS DURING PORK FILLET DRYING

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INTRODUCTION

It is known that starter cultures accelerate the maturing processes with formation of typical colour, flavour, taste, and consistency of the finished products (15, 16).

However, there is not sufficient data available about the protein destruction and maturing processes, being of fundamental importances for the shortened technological cycle of raw-dried meat production.

The aim of this study was to investigate the influence of some freeze-dried starter cultures (*Lactobacillus and Micrococcus*) on the proteins during the maturing process and drying of meat products prepared out of not-comminuted pork.

MATERIALS AND METHODS

In our study we used fresh cooled meat *m.longissimus dorsi* 24 hour after slaughtering.

Three versions were developed according to the following scheme:
No.1 control group: salted meat in 3.5% water solution of NaCl.
No.2 sample group: salted meat as for the control group with addition of starter preparation *Lactobacillus plantarum*, containing strain L4.
No.3 sample group: salted meat as for the control group with addition of starter preparation *Lactobacillus plantarum* and *Micrococcus varians*, containing strain L4 and M115 in ratio 2:1.

The samples were left at 4°C for 24 hours after salting. Than freeze-dried starter cultures were added trough rubbing to the preparations of sample groups (2 and 3) in quantity of 0.05 kg per 100 kg meat. Following analysis were carried out during the maturing process:
-pH value measurements using "Radiometer PHM28".
-water content determination according to the method of constant weight.
-water holding capacity determination according to the weight-analytical method of Hamm, modified by Pinkas (4).
-accessible SH-groups determination following Sedlak and Lindsay (13) method.
-extractable proteins determination following Soloviov method (6).
-determination of sarcoplasmic proteins of cellogel electrophoresis according to the Balado et al. method (7).

The samples intended for analysis were taken in the following succession:
-24 hours after salting - second day.
-48 hours after fillet treatment with starter culture - forth day.
-7th, 10th, 14th and 16th day of the maturing process.

The results were mathematically processed using Snedecore (5) dispersion method, and the results for the sarcoplasmic proteins are presented as mean values.

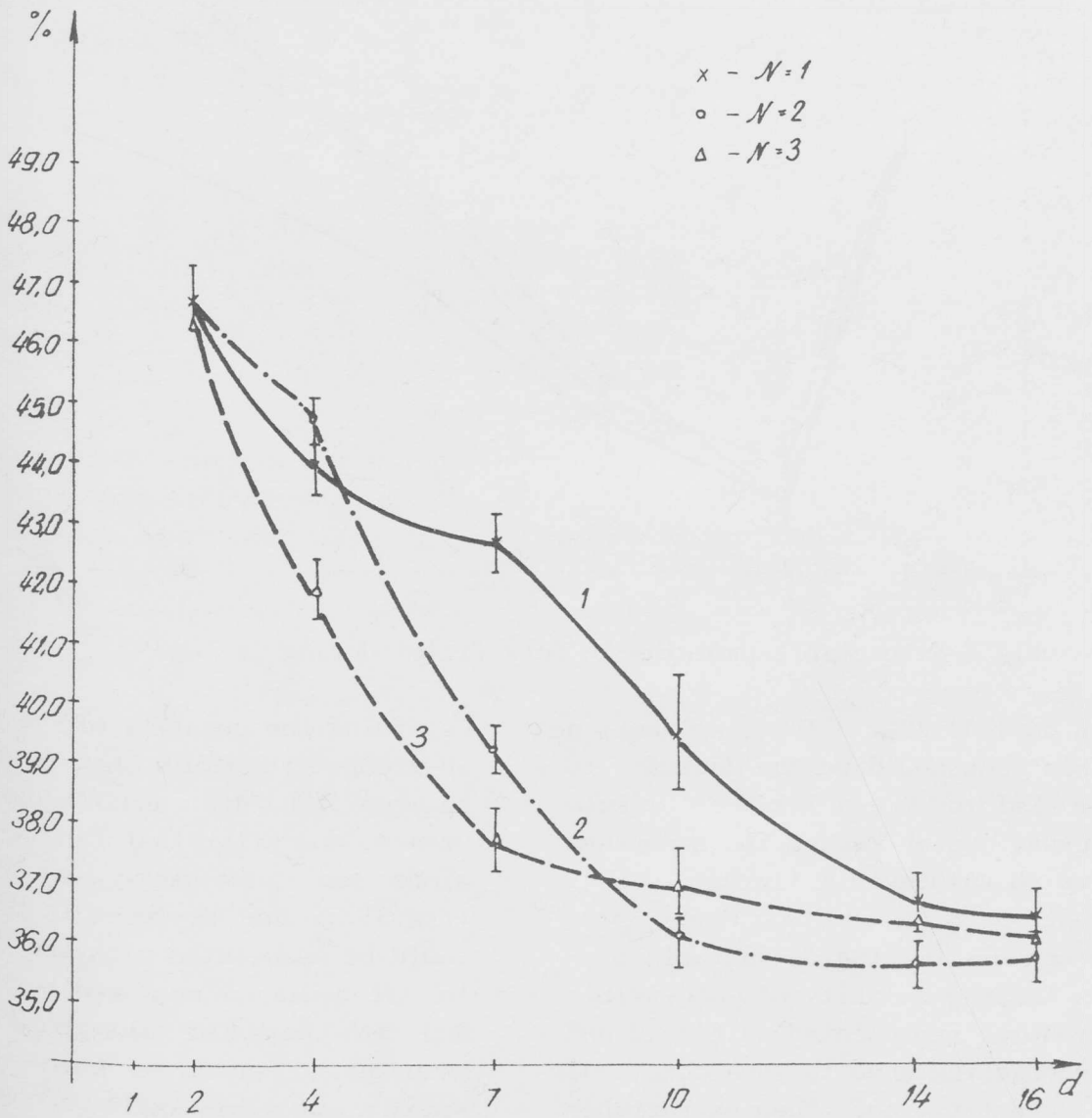

fig.1 Water holding capacity of pork fillet during drying

RESULTS AND DISCUSSION

According to the pH values measured there was a trend to a marked decrease, as for in the beginning of the study it was 5.90 and by the 7th day reached the value of 5.40 in every of the sample groups. In the end of drying the pH value slightly increased to 5.65 for all versions. That could be associated with the ability of homofermentative lactobacillus to decompose sugars to lactate and pH decrease rapidly. In this respect our results are consistent with the investigations of a number of authors using starter cultures (1, 2, 9, 11, 17).

It should be noted that the pH value decrease influences the water holding capacity of the product, as on the 16th day the water content in the

sample groups reached mean value of 46.80% and in the end of the drying

peptide chains, which results in extraction of more salt soluble proteins.

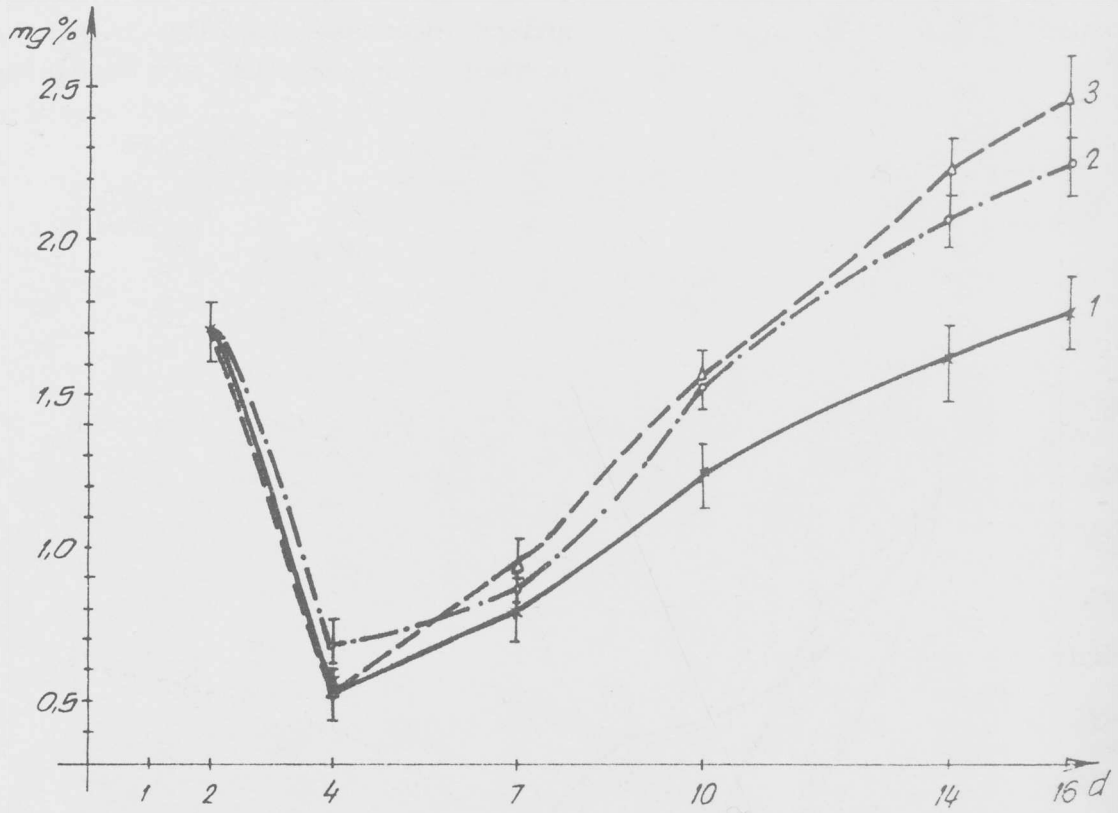

Fig.2 Extractable proteins in pork fillet during drying

(21th day) 44.38%. The explanation of this fact could be the decrease in water holding capacity of muscle proteins, which packed its structure at low pH values (fig.1).

In respect to the extractable proteins and the quantity of accessible SH-groups, represented in figs.2 and 3, interesting results were obtained. The quantity of the extractable proteins was apparently increased after 4th day of investigation, and on the 16th day reached 1.78 mg% for the control group and 2.20 and 2.50 mg% for the sample groups No.2 and No.3 (fig.2) respectively. Reliably higher results for the sample group could be explained with starter culture presence in the salt mixtures. Accelerating the mature processes they provoke decomposition of poli-

Regarding the quantity of accessible SH-groups it could be noted that between the 4th and 7th days a decrease, and after that in all versions an increase was observed (fig.3). The decrease in SH-groups could be associated with the decrease in pH values, measured between 4th and 7th days of the pork fillet maturing. For that case we could speak about a partially accomplished acid denaturation, accompanied by packing of the protein chains, and also their participation in number of reductive reactions. The recorded increase after the 7th day of investigation is in direct correlation with increased quantity of extractable proteins. The explanation again is the maturing of meat, accompanied by "dissolution" of protein chain and liberation of new thiol groups. Some

discrepancy found between SH-groups and the other parameters, characterizing the maturing process could be explained by the reaction ability of these functional groups and their inclusion in to the redoks potential of the meat system.

cause for the changes in protein fraction configurations. Similar observations were reported by Pavlovskij and Golovkin (3) when meat salted above 3%.

On 16th day of the study slight fusion of the myogen fractions was

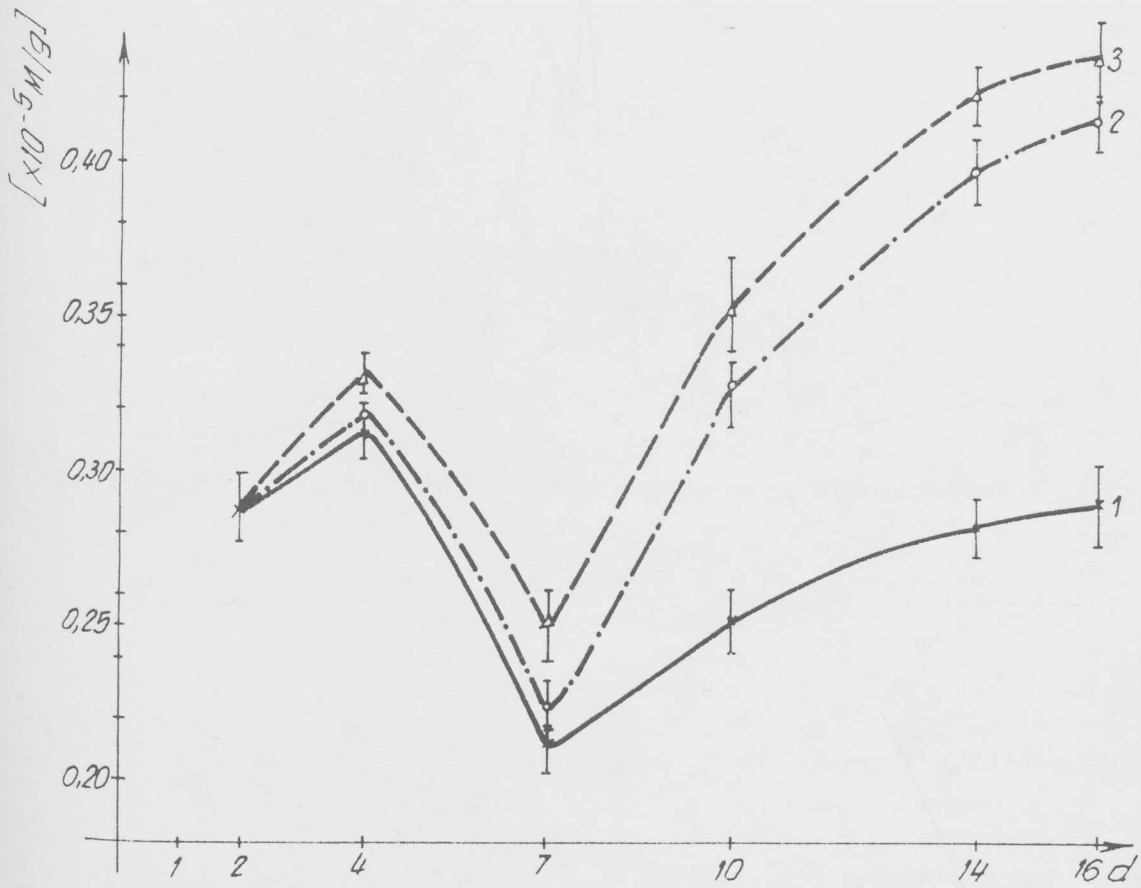

Fig.3 Accessible SH-groups in pork fillet during drying

In order to characterize better muscle proteins during the maturing process we have studied the sarcoplasmic proteins as well.The electropherogramms(figs.4 and 5) show 8 protein fractions as follows:
1 and 2 - myoalbumin; 3 and 4 - globulin X;5,6 and 7 - myogen fractions; and 8 - high molecular proteins. During the period of the study no changes in their number were not observed. Just after salting we found a slight decrease in globulin fraction X for all groups. This could be explained with the high salt concentration which is the possible

observed, evidence for certain intrastructural changes of the sarcoplasmic proteins during maturing process. It should be noted that according to Goll et al.(8) inside the sarcoplasmic proteins all enzymes are concentrated, which is in connection with the postmortem changes during maturing of the meat. It could be the explanation of the structural changes found in the present study.

The mathematical interpretation of the experimental data revealed that the investigated factors in all versions are statistically proven at

F_X>99.9% and strength of influence η_X from 78.81 to 97.17%. About the sample groups the experimental data were interpreted using two-way analysis of variance. The predominant influence was for the factor "maturing period" F_A with the strength of influence η_A from 71.85 to 86.81%. The strength of influence of the factor "starter culture" F_B was also statistically proven with strength of influence η_B from 8.58 to 16.90%.

The results of statistical interpretation lead us to the conclusion that the maturing processes influenced by added starter cultures are due basically to the factor "maturing period" F_A. Even the influence of the factor "starter culture" F_B is less it possesses proven effect on the biochemical mechanism of maturing. Comparing the results between two sample groups, values for the extractable proteins and accessible SH-groups were distinctly higher for the version No.3. This comes to show that the combined action of the

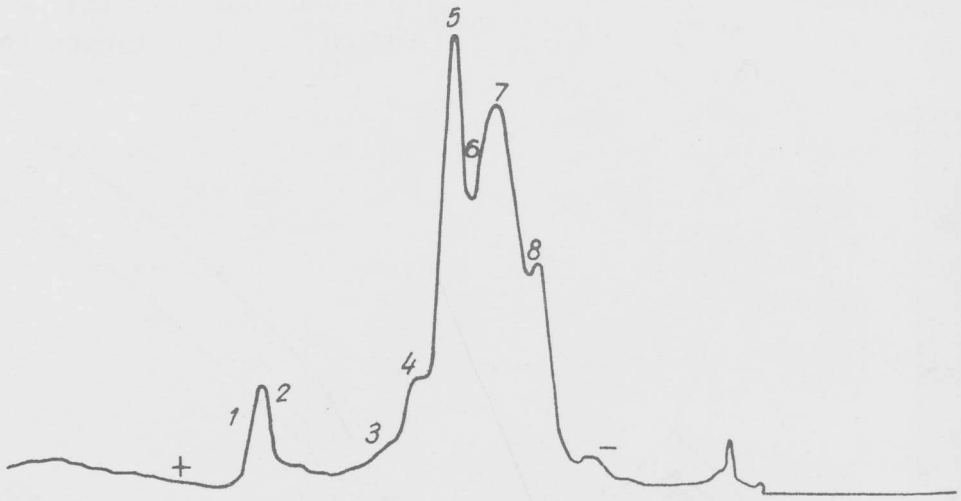

Fig.4 Sarcoplasmic protein spectrum: 1th day of study (raw material)

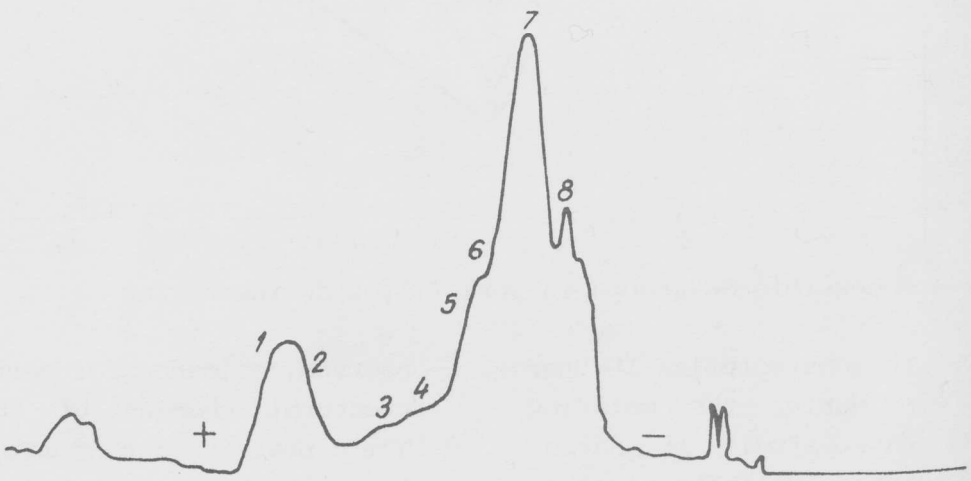

Fig.5 Sarcoplazmic protein spectrum: 16th day of study (sample group No.2)

starter cultures leads to a more favorable maturing process. The results of the mathematical interpretation of the experimental data support the latter. They show that the strength of influence η_{AB} of the interaction of the two factors reaches 45.0% versus 28.21% with version No.2. It is quite enough to point out the more favorable effect of *Lactobacillus* and *Micrococcus* combined action on the fermentative processes in raw-dried products. In this respect our conclusions coincide with that of Lücke and Hechelmann(10), and Rede and Lazić(12) about the favorable interaction of mixed bacterial cultures in production of fast maturing products.

This study of proteins during maturing and drying of pork fillet with addition of starter cultures leads to conclusions as follows:
1.The addition of starter cultures during production of raw-dried products leads to an acceleration of the maturing process, expressed in notable decrease of the water holding capacity,increase of the extractable proteins and higher values of accessible SH-group.
2.The application of combined microbial mixtures possesses more favorable affect on the maturing fermentative processes.

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