STUDY OF COMBINED STARTER CULTURE FOR ACCELERATED MATURING OF DRY FERMENTED SAUSAGES

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Introduction

The dry fermented meat products are the most popular and traditional products of the meat industry. This is the group of meat products which production is characterized with the longest technological treatment. The production cycle is still hard to be regulated and the quality of the final products to a great extent is dependent on the specific production conditions in the particular enterprises (Balev et al., 2005). During the entire technological treatment of these meat products different processes occur among which the drying and maturing processes are one of the most important ones. In order high quality dry fermented meat products to be manufactured it is necessary the current technologies to be perfected as well as new technologies to be developed. (Arihara, 2006).

Materials and methods

To ascertain the technological possibility the maturing process to be accelerated, lyophilized combined starter culture (LCSC) of Streptococcus thermophilus, Lactobacillus bulgaricus, Lactobacillus plantarum and Micrococcus v. strains produced by "Lactina" Ltd – Bankya, Bulgaria, is used. The preliminary conducted studies give us grounds to accept that the advisable concentration of the LCSC is 1 g/kg. The studies are conducted with dry fermented products of fragmented meat. For the purpose of the study sausages with the following composition were prepared: 3 kg veal I quality, 3 kg pork non-fatted, 4 kg pork half-fatted, 0.002 kg ascorbic acid, 0.010 kg sugar, 0.050 kg black pepper, 0.010 kg garlic, 0.005 kg nutmeg, 0.280 kg salt, 0.0014 kg sodium nitrite. The filling mass is prepared in cutter. It is filled in artificial polyethylene casings. The sausages then are put into climatic chamber with temperature 20 - 24°C and relative air humidity 96 % for 24 - 48 h. This process is followed by temperature decrease to 18 - 22°C and relative air humidity to 85 - 90 %. Further, by stages the temperature and the relative air humidity are decreased to 15°C and 85 – 75 %, respectively.

The pH indicator was measured by pH – meter Microsyst MS 2004. Water content was determined by drying of the samples in a dryer at 105°C till constant weight. Water holding capacity was determined by the method of Grau and Hamm.

The influence of LCSC used on the process implementation and on the final products quality was determined by filling mass examination right after its preparation and on the 1, 3, 5, 7, 9 and 12 d.

Results and discussion

The proper implementation of the biochemical changes in the filling mass carbohydrates during the entire technological process to a great extent is a certain pre-condition for high quality dry fermented sausages production pH values decrease during the initial period of salting and maturing substantially influence on a row other technological indicators such as water holding capacity, consistency, etc. The results obtained from the experiments for pH changes show that there are significant differences in these changes between experimental samples with LCSC put into in comparison with control samples (Table 1).

Table 1. pH changes in dry fermented sausages under LCSC influence: 1 – control sample; 2 – with 1 g/kg filling mass;

Time of analysis / Sample	Filling mass	1 d	3 d	5 d	7 d	9 d	12 d
1. Control sample	6.25 ± 0.24	6.17 ± 0 18	5.86 ± 0.10	5.81 ± 0.12	5.76 ± 0.10	5.82 ± 0.09	5.87 ± 0.08
2. Experimental sample	6.23 ± 0.22	5.92 ± 0.12	5.75 ± 0.10	5.64 ± 0.10	5.48 ± 0.06	5.53 ± 0.07	5.62 ± 0.04

It was estimated that pH values in control samples prepared with LCSC addition in quantity 1 g/kg filling mass yet on the 1st d after sausages preparation have decreased with 0.31 in comparison with filling mass pH values right after its preparation. This decrease in the dry fermented sausages control samples is with 0.18. This trend is retained in the first drying period as well. The experimental samples pH values decrease continues and on the 7th d reaches 5.48 in comparison with the control samples – 5.76 (Table 1). It is found out from the results that

pH values change both in experimental and control samples is carried out consequently at two stages: initial pH values decrease followed by pH values increase (Balev et al., 2005). It is estimated that statistically reliable differences exist ($p < 0.05$) in pH of the final products at the end of the technological treatment. In the samples prepared with LCSC addition the pH values are lower with 0.26 in comparison with the dry fermented sausages control samples (Table 1).

The rapid pH values decrease accelerates the water exude processes and contributes to the available water separation due to getting the meat proteins isoelectric point, which ensure the cutting surface solidity. (Klement and Cassens, 1974). The results from the LCSC influence on the meat mass hydrogenation ability studies show that the free water quantity decreases during the entire technological process both in experimental and control samples (Fig. 1). This trend is more clearly expressed in the sausages with addition of LCSC. It is estimated that statistically reliable differences ($p < 0.05$) exist between the free water quantity of experimental and control samples of dry fermented sausages.

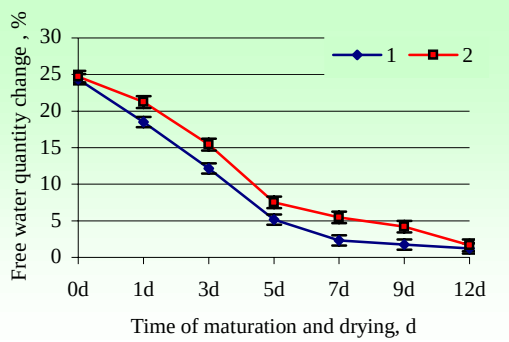

Figure 1. Free water quantity change (%): 1 – control sample; 2 – experimental sample

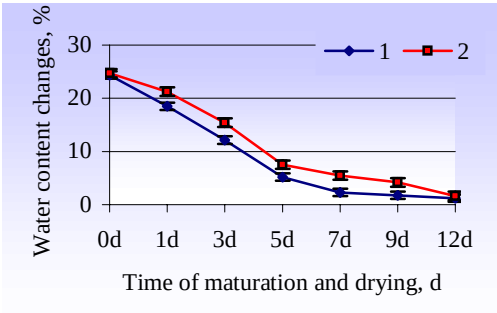

Figure 2. Water content changes (%): 1 – control sample; 2 – experimental sample

When LCSC is used it leads to faster water exude in the experimental samples in comparison with control ones (Fig. 2). The results analysis shows that statistically reliable differences ($p < 0.05$) exist between water content of sausages treated with LCSC and water content of the control samples. In the experimental samples the water content decreases to a greater extent and earlier.

Conclusions

The results analysis gives us a ground to make the following general conclusions. Under LCSC influence a well expressed trend of pH values decrease is observed, which is the most significant in the initial period of technological treatment and especially during the salting and maturing processes. The use of LCSC contributes to the water exude process acceleration and certainly influences on the dynamics of the dry fermented sausages maturing and drying processes.

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