USABILITY OF SOME STARTER MICROBIAL MIXTURES FOR IMPROVING THE QUALITY OF „POLISH" TYPE RAW SAUSAGES

Jan Pyrcz, Waldemar Uchman , Piotr Konieczny, Krystyna Krysztofiak

Institute of Meat Technology
University of Agriculture , Poznań , Poland

Keywords: meat technology, raw sausages, final quality , starter cultures

INTRODUCTION

The „Polish" sausage is of a raw type composed of pork and beef , stuffed into natural casings (∅ 28-32 mm) and finally smoked in cold smoke (20° C). The product is directed to the market having achieved it's proper eating quality and this takes place usually on the third day after the stuffing. Because this is a product of the raw type with a very short aging period, the parameters of processing are of significance with regard to consumers' quality and sometimes these are very difficult to keep within limits. The use of the starter culture could make the processing easier, but the cultures used for other sausages (e.g. the„Salami" type) (Pyrcz et al, 1994) can't be applied because of short time of aging of the „Polish" sausage. Therefore, this work was aimed to search for the optimal composition of microbial culture mixture for improvement the quality of „Polish" sausage and to extend the shelf-life of final product without worsening it's stability.

MATERIAL AND METHODS

First step of the study was the searching for the correlation between the quality of sausages as evaluated by the consumers and and the various parameters of processing and storage ,i.e. the lactic acid content , the volatile fatty acids content and the pH value.

During the second step the effect of several strains of lactic acid bacteria incubated in blood plasma modified by addition of NaCl (2 %) , lactose (2 %) and glucose (1 %), was studied . The rate of formation of lactic acid and volatiles and change of pH value were determined. The selected strains were also combined and the best combination was applied for technological experiments .

The production of experimental „Polish" sausages was the final step of this investigation.. The experimental sausages were composed of lean pork (40 %) and lean beef (30 %) and pork subcutaneous backfat (30 %) . The modified blood plasma was used as an additive (0, 5, 10 %).

The control samples were selected after 1, 3 and 5 days after stuffing and analysed for the following features: the content of lactic acid (by Dische-Laszlo method - Homolka, 1971) , the total amount of volatile low fatty acids expressed as acetic acid (Halvarson, 1973) and the pH - value.

Both , the consistency of sausages (measured by the INSTRON 1140 apparatus) and as the sensoric acceptance (using 5 point hedonic scale) (Baryłko-Pikielna, 1975) was evaluated . The experiment was made in 3 replicates, using always new batch of meat and the blood plasma prepared separately.

RESULTS AND DISCUSSION

All obtained results indicate a low but still significant correlation between the content of lactic acid or volatile fatty acids and taste of experimental sausages ($R^2 = 0.57$ and 0.56, respectivelly). Also the significant correlation between the content of lactic acid and volatile fatty acid and the odor of the sausages was observed ($R^2 = 0.57$ and 0.59, respectivelly). No significant correlation, however, between the content of these compounds and reological parameters as well as colour and appearance of products was observed.

The 23 various microbial strains were used for preliminary experiments (Krysztofiak, Uchman, 1994) for selection of a bacteria combination growing on modified blood plasma and producing significant amount of different metabolites (i.e. lactic acid, volatile fatty acids) . The pH - value changes of blood plasma incubated with some bacteria were particularly well correlated to amount of these metabolites (Table 1) . Finally , the following mixture was selected as the best one for the full-scale technological experiments: Lb.casei, Lb.fermentum , St cremoris, Lb. plantarum and, as the dominant ingredient : Lb. lactis. It was found that „Polish" sausages manufactured with the modified blood plasma demonstrate higher content of fermentation products during two days period after stuffing and keep this level on the stable niveau.

The use of selected microbiological starter culture improve all consumer attributes of final product. Remarkable improvement was observed for taste and odor , while no statistically significant influence was found for texture of the sausages. The amount of modified blood plasma added affected quantitative changes of analysed characteristcs.

The figures 1 ilustarates comprehensively the results obtained. The quality of sausages (Y) depends on the amount of plasma addition (A) and the time (T) after stuffing. For overall acceptability of the final products it can be described by the following equation:

$Y = 3.92 + 0.126 \cdot A + 0.329 \cdot T - 0.00860 \cdot A^2 - 0.0463 \cdot T^2 + 0.0025 \cdot A \cdot T$, where : $1 \leqslant Y \leqslant 5$; $0 < A \leqslant 12$, $0 < T \leqslant 7$

Similar equations were found for the taste and odor of experimental sausages.

In general , any addition of modified blood plasma improves the consumer quality of experimental products . For 8 % of blood plasma addition the best result was obtained. The most important fact was, however, that the high quality and consumer usability of experimental sausages can be reached quicker and can be kept for longer period in comparison to control (unmodified) products.

CONCLUSIONS

1. It is a significant correlation between some metabolites of fermentation (lactic acid and volatile fatty acids) and sensory scoring of taste, odor and overall acceptability of „Polish" sausages.

2. It is possible to prepare the microbial combination of bacteria producing in a short period a large amount of these metabolites in blood plasma medium In our experiment the best results were obtained for the mixture of the following strains: Lb.casei, Lb.fermentum , St cremoris, Lb. plantarum and, as the dominant ingredient : Lb. lactis.

3. The use of modified blood plasma (5 - 10%) improves both the concumer quality of final product as well as extend its usability.

REFERENCES

1. Baryłko - Pikielna N. (1975): „Zarys analizy sensorycznej" , WNT , Warszawa
2. Halvarson J. (1973): „A procedure for isolation and quantitative determination of volatile fatty acids from meat products" , J. Food Sci. 38, 310
3. Homolka J. (1971): „ Biochemia kliniczna" , PZWL, Warszawa
4. Pyrcz J, Uchman W., Konieczny P. (1994) :"Quality of raw sausages produced with the use of microbiological modified porcine blood plasma" , Proc. of 40th ICoMST , Session S-VIA.46, The Haque , The Netherlands
5. Krysztofiak K, Uchman W. (1994) , unpublished data

Table 1

Changes of pH-value of modified blood plasma incubated with some bacteria cultures

Strain	Time (h)		
	0.25	23	47
Leuconostoc dextranicum 146	8.35	6.93	5.48
Lactobacillus fermentum 53	8.81	6.67	5.45
Lactobacillus plantarum 44	8.48	6.69	5.31
Lactobacillus casei 18	8.52	6.71	5.49
Streptococcus lactis 116	8.48	6.63	5.38
Lactobacillus delbruckii 2	8.18	5.89	5.58
None	8.68	7.18	7.47

Fig.1

Overall acceptability of experimental sausages as a function of modified plasma addition and time after stuffing