A NEW TYPE OF STARTER CULTURE FOR FERMENTED SAUSAGES

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INTRODUCTION

Results of investigations carried out to date have shown that an own starter culture for fermented meat products and particularly dry sausages, featuring exellent characteristics has been obtained. The new starter culture combination includes Lactobacillus casei subsp. rhamnosus and Micrococcus luteus (Milovanović, 1987). In order to be able to propose this own starter culture to sausage producers it was necessary to compare its traits with some other well-known starter culture. The starter culture of the R. Müller & Co. (FR Germany) used in Europe was employed for these purposes.

MATERIAL AND METHODS

Dry sausages were produced in four variants in the "Crvena Zvezda" of Kragujevac canning plant. 100 kgs of filling was used per variant:

I. with 1% of own starter culture and 250 g of Tari S 77;
II. only with the starter culture;
III. with Müller's starter culture and
IV. control variant - without any cultures, but with 500 g of Tari S 77.

The working L. casei subsp. rhamnosus and M. luteus culture was multiplied on pasteurized minced beef meat with the addition of 1 % saccharose (Joksimović et al. 1978). Müller's starter culture - duploferment 66 a combination S. carnosus M III and L. plantarum L 74 in liophilized form was used as such. Experiments were carried out with three replication. Samples for analysis were taken prior to filling, following drying and on the 7th, 12th and 21st day following preparation.

The dynamics of the total bacterial count was monitored on yeast dextrose agar (YDA), lactobacilli count on Rogosa (1951) substrate, streptococci count on Barnes medium (1956), micrococci count on nutritive agar with 10% NaCl and Coli-titar on Mac Conkey broth.

The sausage pH values were determined with the MA 5705 pH-metar. Sausage weight loss in the technological production process was calculated in compa-

rison with the initial material. The organoleptic product evaluation was performed according to the point system in the 1 to 5 point range and the results were used as significance coefficients. The evaluation was performed by a 5-member panel.

RESULTS

For the preparation of own starter culture for fermented sausage production 108 strains of the Lactobacillus, 9 strains of the Streptococcus and 10 strains of the Micrococcus genera were isolated from highquality fermented meat products.

On the basis of stimulative biocenotic relationships among separated bacteria, isolates were selected and identified for dry sausage production, and thus L. casei subsp. casei (2 strains), L. casei subsp. rhamnosus (2 strains) and one strain per following species: L. casei subsp. alactosus, L. plantarum, S. lactis, S. bovis, M. luteus, M. ureae and M. candidus (Milovanović and Šutić, 1985)

A total of 49 variants of dry sausages was prepared with pure and conjoint bacterial cultures and organoleptic evaluation proved that the best sausages were obtained with a combination of the Lactobacillus casei subsp. rhamnosus and Micrococcus luteus cultures. All sausage variants with these cultures were better than the control variant and featured a better flavour, colour and in most cases also consistency.

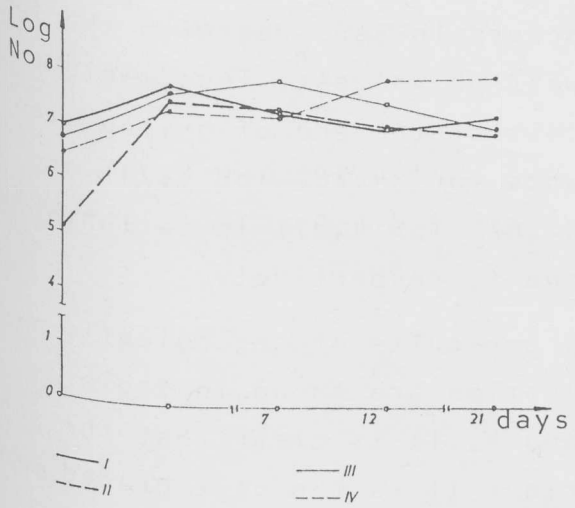
The results of these experiments should prove whether this starter culture is suitable for industrial dry sausage production.

Results of microbiological analysis are shown in Grafs. 1 to 4.

The dynamics of the total bacterial count presented in Graf. 1 shows that the highest total bacterial count in all variants and almost all replications is registed following drying. In one replication of variants II, III and IV the highest total bacterial count was registered on the 7th day followed by a constant decrease. The dynamics of the total lactobacilli count (Graf. 2) is more uneven, but in all variants with a greater number of replications the highest values are registered on the 7th day, and in some cases at the end of ripening period. There are no differences between Müller's and our starter cultures in this respect.

The Streptococci count (Graf. 3) is the highest following

Graf. 1. Dynamic of total bacterial count during the ripening of sausages.



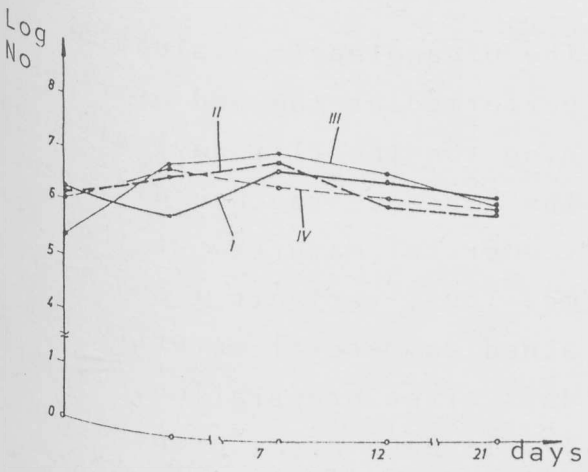
I . Own starter culture and 250 g Tari S 77.

II. Only Own starter culture

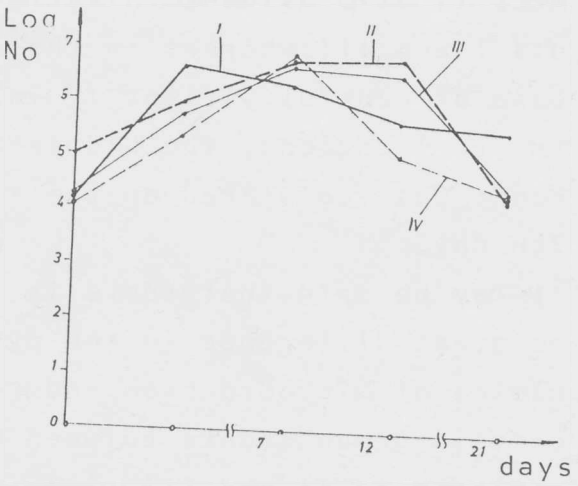
III. Müller's sarter culture

IV. Control variant - without any cultures with 500 g Tari S 77.

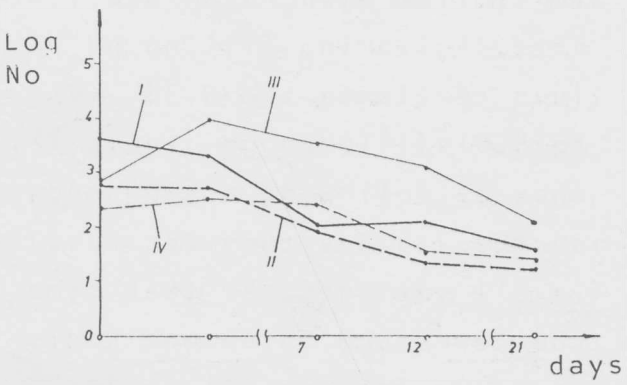
Graf. 2. Dynamic of lactobacilli count during the ripening of sausages



Graf. 3. Dynamic of streptococci count during the ripening of sausages.



Graf. 4. Dynamic of micrococci count during the ripening of sausages



drying or on the 7th day. The highest number is registered on the 7th day in variants II and III. Since no streptococci were added as starters, even a greater unevenness could have been expected.

Graf.4 shows that micrococci count was comparatively low in all variants, but nevertheless the greatest in the case of variant III (Müller's culture)

particularly following drying and decreased in the period to the end of ripening. Such dynamics is also evident in variants I and II, whereas in the case of control variant IV in two replications, the highest count was registered on the 7th day.

It may be said that there is no great difference in the dynamics of microorganism and certain group counts between variants I, II and III, i.e. sausages produced with starter cultures.

The pH value changes were quite similar among examined variants. Following filling pH values remain in the 5.38 (IV) to 5.61 (III) range (table 1), whereas following drying and on the 7th day they decrease in all variants. At that time the lowest pH value was registered in variant III (4.72). At the end of drying the sausage pH values ranged on average between 4.74 (III) and 4.87 (IV). The lowest pH value for sausages produced with Müller's culture may be explained with the highest lactobacilli count. In sausages produced with our culture pH value changes are somewhat less pronounced, which also depends on the lactobacilli count.

pH value changes in tested sausages also cause weight losses. Weighing results in Table 2 show that the greatest weight loss occurs in sausages with the lowest pH valuest. Thus, weight loss at the end of drying accounts for 34.28% (pH 4.74) and 32.62% (pH 4.87) in variants III and I, respectively.

The results of organoleptic evaluation are shown in table 3 and 4. It is clear that the variant II is the best graded, followed by variants I, III and finally IV.

This evaluation confirms prevеously obtained results (Milovanović, 1987) showing that this is an excellent starter culture for dry sausage production, which under our conditions yields somewhat better results than Müller's starter culture.

The organoleptic evaluation was performed at the end of ripening (on the 21st day) although the sausages reached different commercial maturity at that time. Thus, variants I and II reached commercial maturity 10 days after preparation, variant III 13 days after preparation and the control variant 17 days after preparation.

Table 1. Dynamic of pH value in the ripening of sausages

Variants	pH value after				
	filling	smoking	7	12	21 days
I	5.48	4.90	4.79	4.81	4.87
II	5.55	4.88	4.77	4.79	4.85
III	5.61	4.86	4.72	4.75	4.74
IV	5.38	4.92	4.77	4.77	4.82

Table 2. Weighting results of fermented sausages in percentage

Variants	Days of ripening			
	2	7	12	21
I	6.48	22.22	27.90	32.62
II	5.51	21.98	27.05	33.51
III	11.07	19.96	27.34	34.82
IV	7.17	22.11	26.73	33.29

Table 3. Organoleptic evaluation of dry sausages expressed in average points

Quality parameters	Variants			
	I	II	III	IV
External appearance	4.05	4.3	4.2	3.6
Cross cut appearance	4.05	4.05	3.95	3.8
Consistency	3.9	4.05	3.95	3.85
Aroma	4.15	4.35	4.15	3.7
Taste	4.4	4.65	4.1	3.5
Colour stability	4.1	4.15	3.85	3.65
Total points	24.65	25.55	24.2	22.1

Table 4. Organoleptic evaluation of fermented sausages as a general evaluation

General evaluation expressed in:	Variants			
	I	II	III	IV
Total points	24.65	25.55	24.2	22.1
Ponderated average	4.14	4.28	4.03	3.68
Total average evaluation	4.93	5.11	4.84	4.42
Percentage share in the best quality (total quality in percentage)	82.8	85.65	80.6	73.75

CONCLUSION

In order to assess the value of our own starter culture a comparison with Müller's starter culture well-known in sausage production in Europe was made. Four variants of dry sausages were prepared and on the basis of microbiological, chemical and organoleptic analyses performed it may be concluded that our own starter culture has a good quality and may be recommended for use in industrial dry sausage production.

This starter culture shortening the sausage ripening period and ensuring better sausage organoleptic feature includes Lactobacillus casei subsp. rhamnosus and Micrococcus luteus.

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