SUBSTITUTION OF GLUCONO-DELTA-LACTONE IN FERMENTED SAUSAGE PRODUCTION*

Polić Milica, Djordjević M.
Institute of Meat Hygiene and Technology, 11000 Belgrade, Kaćanskog 13

Keywords: "čajna" sausage, GDL, vinegar, maltodextrine, glucose, quality

Leistner: "*The desired ripening flora will prevail, e... if only few Lactobacilli and micrococci a... present in the raw material*"

INTRODUCTION

From 1961 up to this date, numerous works have been published, less in domestic and more in foreign literature, with the basic aim to pro... all technological and quality advantages of using GDL in dry sausages. In addition, a great number of works studied the optimum quantity ... this additive and defined faults in the production being the consequence of its excessive dosing (1, 2).
Summerizing the literature data, it can be concluded that the basic characteristics of GDL application are the following: quick lowering of p... of the stuff resulting in the inhibition of undesirable microflora, positive influence on sensory properties (firmness, colour and sliceability) ... influence on quicker dehydration, namely shortening of the production process (3-5). In other words, GDL accelerates the ageing process ... and improves the quality of dry sausages.
Starting from these facts, we set the task to examine the effects of individual additives as a possibility of GDL substitution and to define the ... applicability in "čajna" sausage production.

MATERIALS AND METHODS

Experimental sausages were made in production conditions, in the quantity of 150 kg and by using raw material of the same quality.
Composition of "čajna" sausages: cooled pork of category I-25%; frozen pork of category II-60%; firm fatty tissue-15% and usual additives ... ingredients and spices.
The following mixtures were used for the production of "čajna" sausages: 1. 0.5% GDL + 0.5% glucose (control); 2. 1.0% vinegar + 0.6... maltodextrine + 0.6% glucose; 3. 0.6% maltodextrine + 0.6% glucose; 4. 1.0% vinegar + 1.0% maltodextrine + 0.6% glucose.
Raw material for experimental groups was comminuted in the cutter up to the size of 3-5 mm. The stuff was filled in artificial collage... casings of 35 mm in diameter. At the moment of filling the stuff temperature was -3°C. After draining for 24 h at 14 - 15°C and at relativ... air humidity of 70%, without air circulation, the sausages were smoked with cold smoke for 4 days at intervals of 4-5 h per day, at th... temperature of 16 -18°C, relative humidity of 70% and air circulation speed of 0.3 m/sec. Drying and fermentation were continued in th... ageing room at the same microclimatic conditions. The production process lasted 18 days.
During the production process and storage of sausages, the following was examined: chemical composition, pH (AOAC method 1980), a_w, ... sensory properties, mass loss, microbiological changes, and for the proof of the presence of *Lactobacillus* kinds - M.R.S. - agar.

RESULTS AND DISCUSSION

On the basis of the examination results it can be concluded that differences in chemical composition of experimental and control sausages ... during ageing, at the end of the production process and during storage are not significant.

* The work was financed by the Federal Ministry for Development, Science and Enwironment, Belgrade (TSI 257).

Regardless of the used additives, water content was permanently decreased. Higher differences among the tests regarding water content were ... noticed on the 9th day of production, whereas at the end of the production and storage water content was practically the same in all sausages.
The decrease of water content in "čajna" sausages caused the increase of "dry matter" components - proteins, fats, NaCl and other mineral ... matters - during ageing and storage. Changes in protein content were practically identical for all sausages. At the end of the production ... "čajna"sausages contained about 20% of proteins (Graph 1., Graph 2., Graph 3.).
Changes of pH are presented on the Graph 4. At the end of the production and during storage, there were not more significant differences in ... the pH value of sausages made with or without GDL. At the beginning of the production and during ageing of sausages, certain differences in ... the pH value were observed. In that period, the highest pH value showed sausages with the addition of 0.6% of maltodextrine and 0.6% of ... glucose, because their addition did not influence quick lowering of pH value as in the case of GDL and direct addition of vinegar.
During the examination period, acid value of sausages was constantly increased; the increase was more intensive from the 9th day of ... production. At the end of the examination period, the highest acid value was shown by "čajna" sausages produced with GDL, being ... organoleptically registered as well (Graph 5.).
In the examined sausages, regardless of whether GDL, vinegar or only a sugar combination was added, there was a regular development of ... lactic acid bacteria which, by intensive reproduction and by the products of their biochemical activity, acted antagonistically on undesirable ... bacteria kinds. The presence of pathogenic bacteria kinds was not proved during the whole examination period, neither in control nor in ... experimental sausages. The ageing process of all sausages was regular and on the 7th day of ageing dominant presence of *Lactobacillus ... plantarum* was established, and from the 14th day - *Lactobacillus lactis*. This means that the chosen additives did not influence the change of ... "čajna" sausage microflora nor the rhythm of microflora change during ageing.
"Čajna" sausages did not differ significantly regarding sensory quality. There were not observed any technological disadvantages, were ... characteristic during production and short storage. There was not established any statistically significant difference in the surface colour ... ($p < 0.05$ and $p < 0.01$). After smoking, in the stage of ageing and short storage, colour of the cutting surface of "čajna" sausages was ... practically equalised, regardless of the used additive kind. Statistically significant differences at the level of $p < 0.05$ and $p < 0.01$ were not ... established. Differences in the sausage consistency were not observed. Flavour and odour were characteristic, whereby at the end of the ... examination period the flavour of sausages with GDL was somewhat more acid.

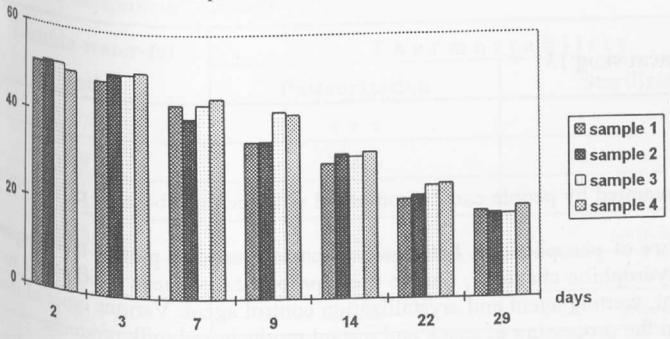
CONCLUSION

1. GDL is not necessary additive for the formation of desired microflora during fermentation of "čajna" sausages.
2. Vinegar in the combination with glucose and maltodextrine, and by the application of the corresponding technological procedure, can ... replace GDL successfully.

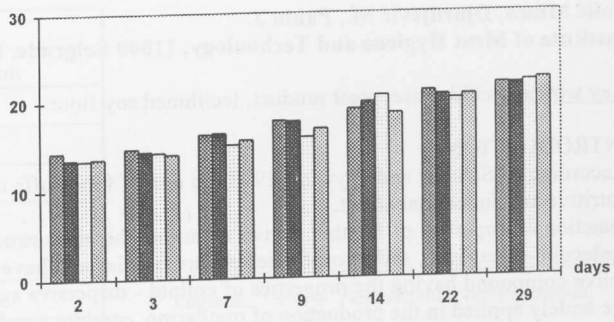
LITERATURE

1. Coretti, k., (1971), Rohwurstreifung und Fehlererzeugnisse bei der Rohwursttherstellung, Verlag der Reinhessichen Druckwerksttate, Aen... **2.** Coretti, K., (1975), Rohwurst und Rohfleischwaren, I Teil, Rohwurst 55, 174; **3.** Oluški, V., Miloševski, V., Ćirić M., Marinković, S., ... (1974), Uticaj sastava sirovine i dodataka glukono-delta-laktona na brzinu zrenja i kvalitet trajnih kobasica, Tehnologija mesa, 5, 177... **4.** Leistner, L., (1986), Allgemaines uber Rohwurst, Fleischwirtschaft, 66, 290; **5.** Lucke, F. K., (1985), Fermented sausage, in: Microbiology ... of Fermented Foods (B.JB. Wood ed), Vol. 2, Elsevier Applied Publishers, London.

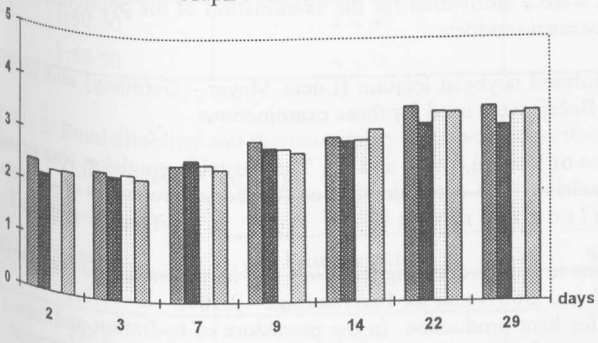
Graph 1. Water



Graph 2. Protein

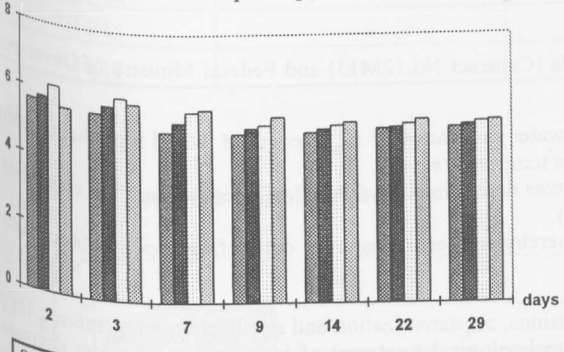


Graph 3. NaCl

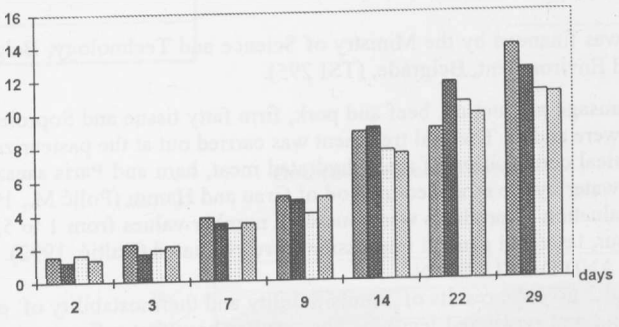


1. 0,5% GDL + 0,5% Glucose (control);
2. 1,0% Vineger + 0,6% Maltodextrine + 0,6% Glukose;
3. 0,6% Maltodextrine + 0,6% Glucose;
4. 1,0% Vinegar + 1% Maltodextrine + 0,6% Glucose

Graph 4. pH



Graph 5. Acid value



Sample		Days						
		0	1	6	9	13	19	27
1.	Total count/g	$5x10^4$	$3x10^4$	$1,1x10^6$	$3,2x10^5$	$1,2x10^5$	$3x10^{10}$	$8x10^7$
	Total count/g *Lactobacillus* spp.	$4,4x10^4$	$3,9x10^6$	$8x10^6$	$2x10^6$	$3x10^6$	$3x10^{11}$	$1,7x10^{12}$
	Total count/g *Micrococcae* spp.	$3x10^2$	$2x10^2$	$1x10^3$	$1x10^3$	$2,5x10^6$	$2x10^8$	$1x10^8$
	a_w	0,91	0,93	0,89	0,83	0,86	0,76	0,74
2.	Total count/g	$7x10^4$	$4x10^4$	$8x10^5$	$3,8x10^5$	$7x10^5$	$2x10^8$	$2,2x10^7$
	Total count/g *Lactobacillus* spp.	$1,4x10^4$	$3x10^4$	$9x10^7$	$3x10^4$	$2x10^6$	$2x10^{12}$	$2x10^{12}$
	Total count/g *Micrococcae* spp.	$2x10^2$	$1x10^2$	$2x10^3$	$1x10^3$	$1,9x10^6$	$1x10^8$	$3x10^8$
	a_w	0,91	0,93	0,92	0,84	0,87	0,79	0,75
3.	Total count/g	$3x10^4$	$4x10^3$	$4,2x10^6$	$5x10^5$	$9x10^5$	$1.2x10^{11}$	$2x10^7$
	Total count/g *Lactobacillus* spp.	$3x10^3$	$2x10^4$	$6x10^7$	$2,1x10^5$	$15x10^6$	$1x10^{12}$	$3x10^{12}$
	Total count/g *Micrococcae* spp.	$1x10^2$	$4x10^2$	$3,3x10^5$	$6x10^5$	$3x10^6$	$6x10^8$	$1,6x10^9$
	a_w	0,92	0,93	0,93	0,91	0,82	0,82	0,75
4.	Total count/g	$1,1x10^4$	$1,1x10^4$	$5x10^6$	$1,8x10^6$	$6x10^6$	$6x10^{11}$	$5,2x10^9$
	Total count/g *Lactobacillus* spp.	$1x10^4$	$2x10^4$	$9x10^8$	$2,5x10^6$	$2,3x10^6$	$2,2x10^{12}$	$2,5x10^{12}$
	Total count/g *Micrococcae* spp.	$2x10^2$	$1,2x10^2$	$5x10^3$	$8x10^4$	$2x10^6$	$3x10^8$	$1,6x10^9$
	a_w	0,92	0,94	0,93	0,92	0,84	0,82	0,77

Table 1. Microbiological changes during ripening of "čajna" sausage