BUDAPEST 1963 319 (22)

A STUDY ON THE WHITE MOULD UPON THE LUKANKA

BY

PROF. DR. Ivan Zlatev and Margaret Litvinenko, Biologist

MEAT TECHNOLOGY RESEARCH INSTITUDE, SOFIA

Lukanka is a typical Bulgarian dry sausage. Its quality and durability depends on the processing which is conducted in strictly determined conditions of aging and drying.

This processing is carried out in terms of natural atmospheric conditions using chiefly the dry and cool seasons. The best optimal temperatures are found to be in the range 12-16 C and in the first 10 to 15 days strong drafts of air should be avoided.

Often in the course of aging and drying especially when there is a sudden rise of temperature and humidity on the casing surface appaered a slime or a colouring resultant of divers harmful substanees. These changes inhibited the moisture extraction and in some case damaged the Lukanka or at best the harmful moulds penetrated under the casing injuring the taste and odour of the finished product.

Toneliminate these undesirable changes some measures are taken for acceleration of the aging-drying process i.e. rolling and pressing the sausages in precisely determined intervals. The rolling is takeng place between 3-4 days and the pressing between 10-12 days, the number of pressings being usually 3. In case of unfavourable atmospheric conditions these intervals are shortened.

The development of a grey whitish mould on the surface is of great significance during the aging and drying. It is known as a "white mould" and appeared

between 12-14 days of aging at relative humidity 75-80 %.

At the beginning tiny grey whitish spots appeared here and there on the Lukanka casing and gradually they spread all over the surface. Towards the end of the aging period the casing is looking like powdered with flour. The producers found that the grouth of the grey whitish mould protected Lukanka against the development of a slime. On the other hand it assisted the process of correct drying and increased the durability keeping the taste and aroma of the finished product.

The producers had known for a long time the significance of the "white mould"; therefore Lukanka without a grey whitish mould is considered improperly produced.

Literary data are limited. Experimental studies on the grey whitish mould of the dry sausages have been few.

Bezděk, Nachmülner and Maeyr gave instructions for accelerating the grouth of the "white mould" in the process of aging and drying.

According to Brodský /3/ and Jeřabek /2/ the grey whitish mould on the dry sausages is due to Penicillinum Candidum. Shlemner, Zalesák and Babička /4/ are on the same opinion.

Kardos /5/ reported, however, that the white mould on the Hungarian Salami is caused by a certain strain of Penicillinum or by Aspergillus strain-according to Vás /6/.

Funfalek /1/ has conducted a practical test for artificial development of a white mould on the "Tourist" Salami casing.

It is evident therefore that the causers of the grey whitish mould are not thoroughly investigated. This problem is interesting not only from a scientific point of view; it has a practical significance as well.

The examination of microorganisms causing this mould as well as the investigation of their biochemical characteristics and the conditions of grouth will make possible the development of a new technology enabling an artificial microbial contamination of the Lukanka in order to protect it from the undesi-

rable moulds. Thus the aging and drying could be even regulated to a certain extent.

Methods and Materials

Samples of the Lukanka, first quality and such with an initial grouth of grey whitish mould, perfectly aged and dried were taken from different districts of the country.

Material from the very surface of the Lukanka was diluted in physiological solution and plated on Sabouraud's agar. The plates were cultivated at 25-30°C and then individual strains were isolated. We studied these strains for:

1/ Spore production on the medium of Gorodkova.

2/ Production of hyphae on potato and corn agar.

3/ Sugars' fermentation and assimilation on the medium of Langeron.

4/ Utilization of different nitrogen sources on the medium of Lodder with adequate nitrogen compounds.

Simultaneously a malt broth was examined for a development of film, rings and sediments.

We prepared some pure cultures from the isolated strains and used them for microbial contamination of the Lukanka in the process of aging. The microbial contamination was done in the following manner: the sausages were rubbed with a sterile piece of cloth preliminary immersed in a culture suspension.

The controls were left non-contaminated.

Results

Thirteen samples of the Lukanka were totally examined out of which 14 strains were isolated. The isolated strains presented the following cultural and morphological caracteristics:

Six /1, 5, 8, 10, 12/ of the examined samples produced on Sabouraud's agar milk white, smooth, glossy, faintly swollen in the centre colonies. The cells of these microorganisms were circular and budding. More than one bud could be formed upon the mother bud. In a tube with malt broth they gave thin ring on the walls and small flocks of precipitate. They produced neither pseudo - mycelium

nor spores. Cultures of these strains when not fresh obtained creamy-yellow to brown colour. /Table 1/

Four out of the isolated strains /2, 4, 11a, 13/ produced whitish, not glossy colonies. The cells were oval, some - prolonged. They had polygonal budding and produced pseudo-mycelium. In malt bouillon theyp produced thick film, ring and thick layer of precipitate. The film often sank on the tube bottom. They did not produced spores. /Table 1/

Four of the strains /3, 6, 7, 11b/ on Sabouraud's agar produced faintly visible colonies. These microorganisms were in coccoid forms and in malt broth gave indistinctly outlined ring and flocky

They were not separataly isolated. /Table 1/

All isolated strains were classified into 3 groups after their morphological, cultural and biochemical characteristics.

They are shown in the following tables:

Table 1

Strain N	Production of spores	Production of pseudo-mycelium	Production of		
			ring	film	precipitate
1, 5, 8, 9, 10, 12	-	-	+	-	+
2, 4; 11a, 13	-	+	+	+	+
3, 6, 7, 11b	-	-	indistinct	-	+

Table 2 Utilization of different sugars

Strain N	Glucose	Saccharose	Maltose	Levulose	Lactose	Mannite	Galactose	Raffinose
1, 5, 8 9, 10, 12	++++	++++	+++	+++	-	-	+++	-
2, 4, 11a, 13	++++	-	-	-	-	-	-	-

3, 6, 7, 11b	++++	++++	+++	+++	-	+++	+++	-

	xylose	arrabinose
1, 5, 8, 9, 10, 12	-	-
2, 4, 11a, 13	-	-
3, 6, 7, 11b	-	-

++++ best util. +++ good util.

Table 3 Utilization of nitrogen from different sources

Strain N	Controls without nitrogen	Peptone	Sodium nitrate	Ammonium sulfate	Glycocoll
1, 5, 8, 9, 10, 12	++	+++	-	-	-
2, 4, 11a, 13	++	+++++	+++++	+++++	+++++
3, 6, 7, 11b	++	-	+++	-	-

+++++ best util.

++ av. util.

++ extremely weak growth

Glucose was best utilized by strains 2, 4, 11a, 13. /Tables 2 and 3/ They did not utilize the other carbohydrates.

Mannite was assimilated only by strains 3, 6, 7, 11b; otherwise strains 3, 6, 7, 11b and 1, 5, 8, 9, 10, 12 were similar.These two groups exibit ed an equal action towards the remaining carbohydrates - they assimilated glucose and saccharose best but maltose, levulose and galactose were poorly accepted. They did not assimilate lactose, raffinose, xylose and arrabinosa.

With respect to utilisation of nitrogen from divers sources the condition is quite different. Strains 2, 4, 11a, 13 strongly utilized nitrogen from peptone,

sodium nitrate, ammonium sulfate and glycocll. Strains 3, 6, 7, 11b utilized in a lesser degree nitrogen from sodium nitrate only, while strains 1, 5, 8, 9, 10, 12 - nitrogen from peptone only.

On the basis of the exibited characteristics we considered strains 1, 5, 8, 9, 10, 12 to be of Torulopsis type and strains 2,4, 11a, 13 - of Candida type.

Strains 3, 6, 7, 11b were cocoi which were constantly isolated together with yeast similar fungi.

For identifying the isolated yeast similar fungi with the causers of the grey whitish mould we rubbed the Lukanka surface with cultures of isolated strains taken 48 hours before. All experiments were made with Lukanka in the 8-th day of aging before the development of the grey whitish mould. On the 8-th day we rubbed the casing of four groups of Lukanka. The first group was rubbed with a combined strain of Torulopsis type; the second - with a combined strain of Candida type; the third group - with Torulopsis plus micrococci /strain N 7/ and the fourth group - with Candida plus micrococci / the same strain /.

Fourty eigth hours after the rubbing on the experimental samples appeared some whitish spots. The same spots appeared on the controls 2 to 3 days after the rubbing.

The artificially produced spots in form, colour and structure /examined under a magnifying glass/ did not varied from the spots on the controls. The finished Lukanka sausages in appearance, taste and odour also were not different from the controls.

An interesting phenomenon was observed in the process of rubbing i.e. - the grey whitish mould upon the samples rubbed with mixed cultures /fungi plus micrococci/ developed beter and more quickly than the mould on the samples rubbed with pure cultures.

Our examinations, however, are insufficient in this respect and we could make any conclusions as to what an extent the addition of one or other of our isolated yeast similar fungi should encourage their growth and should thus accelerate the development of the grey whitish mould upon the Lukanka.

CONCLUSIONS

The grey whitish mould upon the Lukanka is caused by non-spore producing yeast similar fungi belonging to Torulopsis and Candida types. We have not yet differentiated their exact species.

Lukanka sausages in the process of aging could be artificially contaminated with cultured of these fungi in order to be protected against the development of undesirable moulds.

To create a technology for an artificial contamination, however, more continuous investigations are indispensable.

SUMMARY

A study was conducted on the white mould upon the Lukanka sausages. The total number of the isolated microorganism strains was 14. They were classified into 3 groups. In view of their morphological, cultural and biochemical characteristics we considered them to be yeast similar fungi i.e. six were of the type Totulopsis; four - Candida type and the remaining four were micrococci.

326

LITERATURE

1. Augustin Funfalek - Prumysl Potravin, 4, 1958

2. Nerabek J. - Studie microflory na obalu uherskych salami, Disertace V S Z VF, Brno 1944

3. Brodsky F. - Plisnovy pokryv na uberskych salamech vzhledem k vyrobnin okolnostem, Desertace V S Z VF Brno 1949

4. Babicka J. - Mikrobiologicke metody v potravinarskem prumyslu, Praha 1955

5. Kardos E. - Technologia konzervarenskeho a masneho priemyslu Bratislava, 1954

6. Vas Karoly - Tartosito - es husipari microbiologia, Budapest, 1952

7. Langeron M. - Precis de mycologie

8. Lodder J. and Kroger van Rij - The Yeasts