Ripening and water content of "sremska" sausage - a dry sausage of a diameter 28 - 36 mm

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"Sremska" sausage is a typical national meat product in Yugoslavia. It is a dry sausage made of pork and a smaller quantity of beef, with the addition of salt, pepper, garlic and paprika. The way of production is different and so is the name depending on the production region. Because of the differences in the production "sremska" sausage may be of excellent, but also of poor quality.

About two decades ago, the industrial production of "sremska" sausage has begun, but the difference in quality are present.

There are very few data on the production of "sremska" sausage, especially on the factors of quality. Rašeta (1957) was the only one who investigated this kind of sausage a little bit more. This author cites that the ripening of "sremska" sausage is finished at the end of the third week, and the water content dicreased to approximately 25 to 30%. He points out that sometimes the aroma of paprika may be felt and that pH is varying from 6,2 to 5,5. However, there are considerably more data in the literature on other kinds of dry sausages. The ripening of dry sausages lasts from about 5 weeks (Maillet, 1964; Langner, 1969) to over 100 days (Rašeta, 1961; Takàcs et al., 1963; Ćirić et al., 1963; Stanculescu and Sanculescu, 1970). During this time, there is a considerable loss of water content, which decreases to even about 15 to 21% (Körmendy and Gantner, 1962; Takàcs et al., 1963; Cantoni et al., 1965; Ćirić et al., 1969; Langner, 1969). Bianchi et al. (1974) report that more characteristic changes of sausages appear only after the "21st day of ripening" and from that day on "the period of real ripening" begins.

INVESTIGATION

As the quality of the industrially produced "sremska" sausage of different production varies a lot, and is poorer than of the good sausage made in farmer households, it was decided to find a technology for industrial production of high quality "sremska" sausage. 25 batches of this sausage were produced in industrial conditions. After that, their quality was determined by laboratory and sensory investigations, and the best one was chosen. Each sample was made of 100 kg of fundamental constituents- meat and fatty tissue. The amount of these constituents varied in different batches in the following ranges:

- pork
- beef 55 to 80 kg
- solid fatty tissue 0 to 10 kg
- 20 to 40 kg.

The following additives were added to 100 kg of fundamental constituents:

a) always the same quantity:
- salt 2,8 kg and
- white pepper 0,2 kg

b) in different quantities, in the ranges:
- Na-nitrit 0 to 0,05 kg
- dextrose 0 to 0,3 kg
- hot red pepper 0,5 to 0,6 kg
- red pepper 0,4 to 0,5 kg and
- dried garlic 0,04 to 0,08 kg.

MATERIAL AND PROCESSING OF SAUSAGES

For the production of the batches, meat and fatty tissue were prepared and minced in the usual way. Immediately after the preparing, the stuffing was filled into thin casings, of a diameter of 28 to 36 mm. The sausages were smoked for 48 hours at the temperature of 14

to 20°C, and relative humidity of 80%. After smoking, they were transferred to another room where - at the temperature of 12 to 14°C and relative humidity of 75 to 90%, they were ripening for 51 days. In the meantime, they were investigated several times in the laboratory and scored sensory.

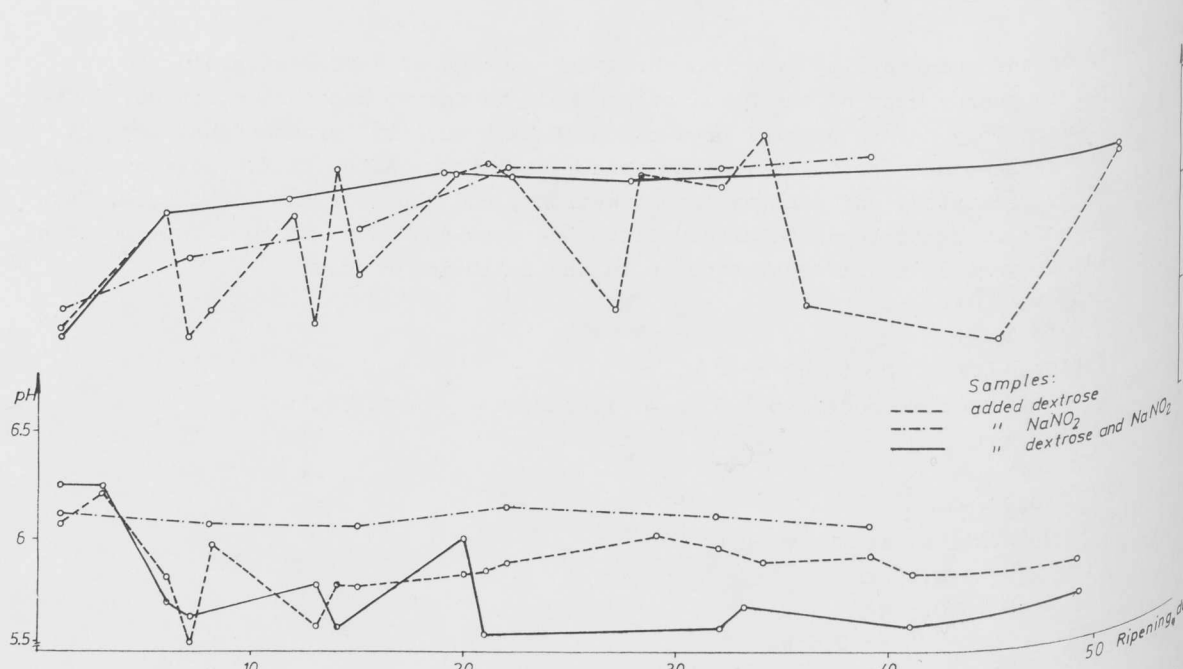
METHODS

The following methods were used for the investigations:

1. pH was determined by pH-meter METROHM1, in the water extract,
2. the alfa-amino N content was determined by the method of Sörensen, modified by Petrov (Džamić, 1969),
3. the content of NPN was determined so that the proteins were settled using 10% solution of trichlor acetic acid, and the N content was determined in the filtrate using macro method according to Kjeldahl,
4. the amino-acid composition was determined by Beckman amino-analysator, model 120 B,
5. the colour was measured with the Göfo photometer,
6. the sausage quality was sensorily evaluated according to the modified "Karlsruhe" method (Reuter, 1974).

RESULTS

As the presented results (graph.1) show, pH is, mostly, mildly decreasing but more in the batches produced with the addition of nitrit and sugar. As it can be seen in the same graph, the colour of the samples produced with the addition of nitrit, is evenly darker being from approximately 63 units on the first day of investigation to approximately 92 units on the last day, while in the ones made with the addition of sugar it varies in the range from approximately 57 to cca 95 units and is mostly darker than in the samples made with the addition of only nitrit (the colour was determined with the Göfo photometer). However, the



Graph.1. pH AND COLOUR (Göfo units) OF „SREMSKA" SAUSAGE DURING RIPENING

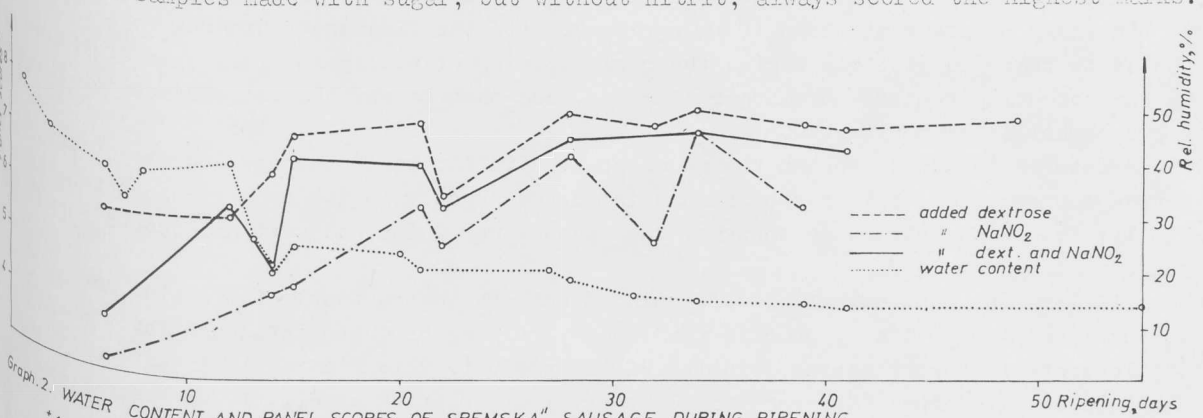
colour of the samples made with the addition of both sugar and nitrit is similar to the colour of samples made with the addition of only nitrit.

By determining the content of alfa-amino N and NPN it was found that the content of both compounds is constantly increasing during the whole period - 51 days - of investigation of samples. The alfa-amino N content is increasing from cca 80 to approximately 200 mg%, and

the NPN content from cca 0,25 to cca 0,70%.

The results presented in graph.2 show that the water content is decreasing from the first day of production, relatively more significantly to about the fourteenth day, when it is 20%. After that, it decreases slowly but constantly, till the 42nd day when it reaches the value of cca 15%. From that time on it remains at the approximately same value till the end of the investigation.

With the sensory evaluation of these sausages (graph. 2) it was found that the quality is improving till the 34th day, mainly in all samples. After that, it is not changing significantly. The samples made with sugar, but without nitrit, always scored the highest marks.



Graph.2. WATER CONTENT AND PANEL SCORES OF „SREMSKA" SAUSAGE DURING RIPENING
*1 the lowest, 9 the highest score

DISCUSSION

The analysis of pH values shows that the acidity of the samples produced with the addition of only nitrit is almost constant while in the ones made with sugar as well as with the combination of sugar and nitrit it decreases a little (graph.1). This is quite clear, because with the decomposition of the added sugar, more lactic acid is being produced, and so the pH of the samples with sugar decreases more. This finding is basicaly in agreement with the ones of other authors (Niinivaara, 1955; ten Cate, 1960; Ćirić et al., 1963; Murray et al., 1966; Tjaberg et al., 1969; De Katelaere et al., 1973).

The colour of sausages, measured with Göfo photometer, is during the ripening getting constantly darker as the content is constantly drying up. Besides, the pigment is oxidating. It is very noticeable that the difference in the colour of sausages produced with the addition of nitrit and the ones with the addition of both sugar and nitrit is minimal, whereas in the samples produced with the addition of sugar the colour is pronouncedly brighter, but is varying very much.

The data presented in graph. 2 show that the water content is constantly decreasing during the first part of ripening. After the 22nd day, this process is considerably slowing down and is almost coming to an end after approximately 40 days of ripening. Just at this time, that is to say, when drying stops, the sausage reach the optimally developed sensory characteristics. Namely, the characteristics of the sausage are constantly improving while ripening and already after the 15th i.d. 20th day, they score the mark 7, i.d. "good" or even higher. That means, the sensoric characteristics of all samples are improving, but there are considerable differences between sausage made only with sugar or only with nitrit, as well as with sugar and nitrit.

It is characteristic that the batches with the addition of sugar, and without nitrit, scored the highest marks. After the 15th day these samples always scored the highest mark. The added amount of sugar is very small (0,1%) so while scoring, the acidity of these samples couldn't be felt. On the other hand, the samples made with addition of nitrit always scored the lowest marks. On the basis of this, it may be concluded that the addition of nitrit didn't influence the forming of taste and aroma of the sausage. This finding is in

agreement with the one of Eakers et al. (1975) who didn't establish that nitrit influenc considerably the flavour.

The finding that the characteristics of the sausage are improving up to approximately 30th day of ripening is in agreement with the findings of authors who report that the ripening process of dry sausages lasts for about 5 weeks or longer (Maillet, 1964; Langner, 1969; Rašeta, 1961; Takàcs et al., 1963; Ćirić et al., 1963; Stanculescu and Sandulescu, 1970). Namely, "sremska" sausage is a product of smaller diameter so the ripening comes to an end earlier, mainly in the fifth week. The finding that after 15th, i.d. 20th day begins the more intensive improvement of the sensoric characteristics of "sremska" sausage, must be particularly pointed out. This is in agreement with the finding of Bianchi et al. (1974) who state that "on 21st day begins the real ripening of sausages". They have stated this by investigating sausages of larger diameter, and that is why the consequences of ripening are somewhat later manifested.

It is interesting that, though the water content in "sremska" sausage decreased during ripening to about 15%, this factor didn't influence negatively its sensory characteristics. Namely, even with this water content, the sausage was juicy and soft and scored a high sensory mark.

The finding that the content of alfa-amino N and NPN is constantly increasing during ripening gives way to the hypothesis that the hydrolysis products influence favourably the development of sensory characteristics of the product. This finding is in agreement with the data in literature (Körmendy and Gantner, 1962; Dierick et al., 1974; Pezacki and Duda, 1962).

In this work it was proved that the "sremska" sausage made with small amount of dextrose (0,1%) and without addition of nitrit was of best sensory characteristics and this is significant. The best flavour may be explained by the influence of added spices, i.d. garlic and paprika, which have "optimaly corrected" the ophthalmo-gustatoric characteristics of the sausage. The colour of the meat in the stuffing, the meat being not cured, but dried, was "corrected" by the coloured component of the paprika, and so it remained pleasant red.

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