

EFFECT OF SAVORY ON SOME CHANGES OF RAW SAUSAGE RIPENING

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Taste and aroma of the raw sausages are formed during the process of ripening, where the spices have the important role (Vuković, 1992). The spices, also, have the effect on the microorganisms growth and as well as antioxidants effect (Gerhard, 1984). Some spices stimulate fermentation of the carbohydrates up to the lactic acid and reduce the period of sausage ripening (Vandenriessche et al., 1980). Zaika and al. (1983) established that the spices of the moderate climate area from the *Labiata* family stimulate the growth of *L.plantarum* and *P.acidilactici* when their concentration in liquid medium is increased from 0.5 to 8.0 g/l. Yugoslavia is known by quality herbs which belong to the *Labiata* family (Rosengarten, 1969), but until nowadays they haven't been used in raw sausage production. Traditionally, in our country, pepper, red pepper and garlic are added in this type of sausage. Due to the content of the ethereal oils and antioxidant effect, the spice herbs, become interesting not only for the science but for the practice as well. However, it is not known in what extent the chlorophyll pigment in this herbs, can effect the oxidation of fats and colour of products during the raw sausage ripening. The effect of savory (*Satureja hortensis* L.) on the technological microflora, lipid oxidation as well the effect on flavour and the colour of the sausage are presented in this paper.

Materials and methods

The raw sausages were prepared of pork (35%) and beef (35%), well trimmed from the intramuscular fatty and connective tissue, and solid fatty tissue of pigs (30%), which have been frozen up to -18°C 3 days before usage. 26g of the nitrite salt, 3g of dextrose and 3g of saccharose has been added to 1kg of this mass. The experimental group of sausages were produced with the addition of 0.1%, 0.3% and 0.5% of savory, and the control group without spices. Savory has been finely grinded before use and the content of the etheric oils has been analysed by water steam destillation. Upon the filling of the colagene casing ($\phi = 50\text{mm}$), the sausages stored for 12 hours at 15°C . and after that, 7 days at 18° to 20°C , and then dried 21 day at 14°C . During the period from the second to the fifth day, the sausages have been smoking 10 hours a day. During the ripening (fermentation and drying) the sausages have been analysed microbiologically, physically and chemically and sensoric certian intervals (1, 7, 14, 21 and 28 days). The lactic acid bacteria count expressed in number of lactobacillus has been determined on MRS-agar (De Man et al., 1960) at 30°C and the number of micrococcus on meat-pepton agar with 10% of NaCl at 30°C . pH has been measured with the device "Iskra MA-5730" with the piercing combine glass electrode. The changes on fats were controlled by determining of the peroxide number ($\text{mmol } 1/2 \text{ O}_2/\text{kg}$) using iodum-metric procedure (YUS E.K8.034, 1991), TBA - number (Tarladgis, 1964) and the content of free fatty acids, expressed as oleic acid, by neutralization using 0.1 mol/l of natriumhydroxide (YUS E.K8.026, 1991). The acceptance of flavour and colour of the sausages at the end of ripening has been estimated by five experts using quantitative descriptive test (Baltić, 1992).

Results and discussion

The savory used in this work contained 1.6 ml of ethereal oils/100g of spice; water 9.78%, and ash 8.35%. The adding of such savory in the quantity of 0.1% up to 0.5% to the raw sausages did not have significant effects on growth of lactobacillus and micrococcus growth during the ripening (Fig 1 and 2). The differences in the number of these bacteria are within the same exponent from which it may be concluded that in the given concentration the savory neither stimulates nor inhibits the technologically important bacteria growth.

Fig 1 Effect of savory on lactobacillus growth in raw sausage

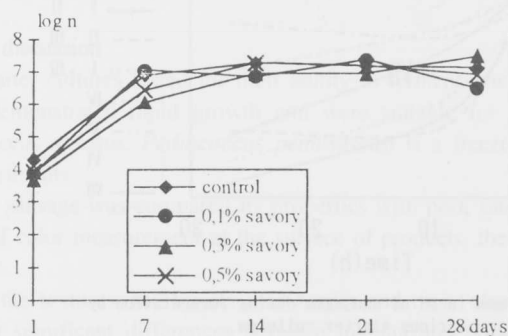
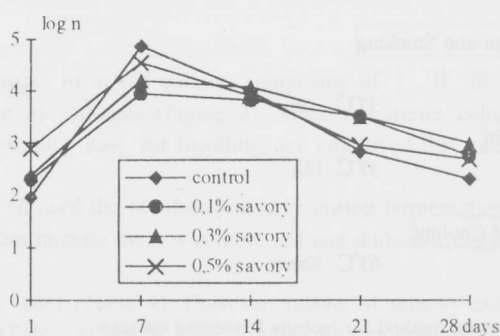


Fig 2 Effect of savory on micrococcus growth in raw sausage



However, it is noticeable that in the sausages with more savory the lower pH values have been measured (Fig 3), that probably indicates the possibility that savory stimulates the lactic acid bacteria activities. Zaika and al. (1984) established that the spices rich in manganese stimulate these bacteria to produce lactic acid. Herbs of the *Labiata* family contain 22 to 62 ppm manganese.

Hydrolytic changes of fat in raw sausages became more distinct during the ripening. At the end of ripening the content of the free fatty acids was 2.8-3.4%. The sausages with savory had the lower content of free fatty acid then the control (Fig.4). During the period of ripening, the raw sausages with more savory had the greater values of peroxid number (Fig.5). It should be stated, however, that the values of the peroxide number in the tested sausages are very low (max 0.4 $\text{mmol } 1/2 \text{ O}_2/\text{kg}$), as well as that the content of malonaldehyd in sausages was below the detection limit (0.02 mg/kg), which indicates that savory in raw sausages does not influence prooxidative. In this work, the antioxidative effect of savory did not notice as well as which observed by some authors (Palić et al., 1993).

Fig. 3 Effect of savory on pH changes during the raw sausages ripening

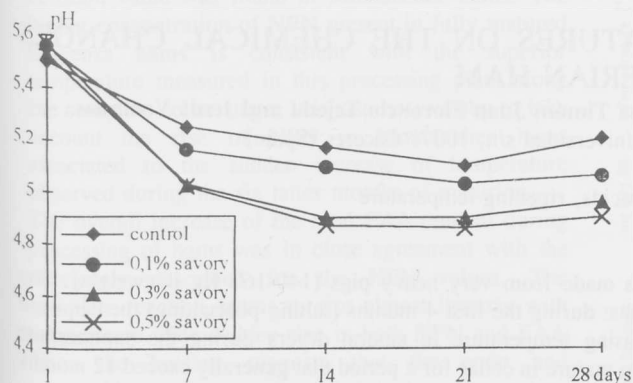


Fig. 5 Effect of savory on peroxide number changes during the raw sausages ripening

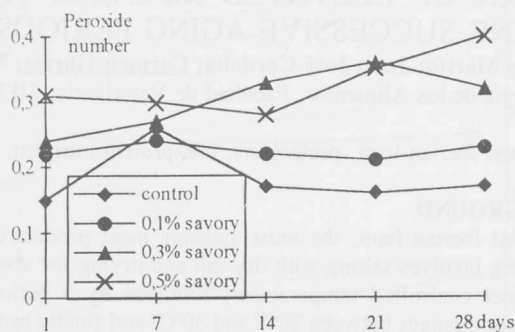
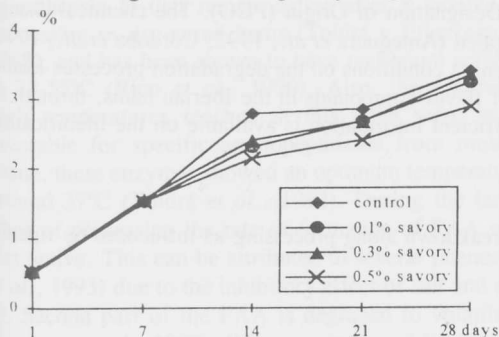


Fig. 4. Effect of savory on the free fatty acids content during the raw sausages ripening



Sensorial test results showed that savory had favorable effects on flavor of raw sausages (Fig 6). The best acceptance of flavor had the sausage with 0.3% of savory ("very pleasant"), and the lowest mark had the sausage with 0.5% of savory (between "pleasant" and "neither pleasant nor unpleasant"). The sausage with 0.1% of savory and the sausage without spices have been similarly estimated. However, by increasing the savory content in raw sausages the acceptance of the colour of the product is reduced. The colour of the sausage with 0.5% of savory is estimated as "poorly acceptable" while the colour of the sausage with 0.3% of savory was between "acceptable" and "good". Probably the present herbal chlorophyll pigment has the negative effect on the sausage colour, which is remarkable when more of savory is used.

Fig. 6 Effect of savory on acceptance of the row sausage flavour

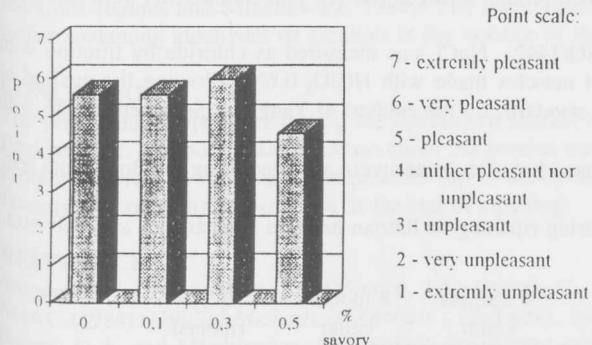
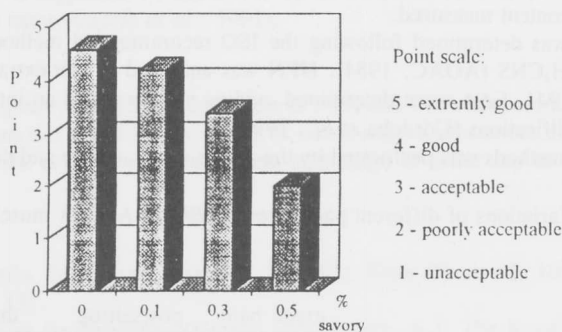


Fig. 7 Effect of savory on acceptance of the raw sausage colour



Conclusion

The quantities of 0.1 to 0.5% of savory has not significant influence on the growth of the natural raw sausages micro flora during the ripening, but it seems that it stimulates the acids production by this bacteria. The savory has not prooxidative effect on fats. Savory has very favorable effects on flavor and does not have negative effects on the colour of the raw sausages in quantities up to 0.3%. The greater savory quantity has the negative effects on the flavor and, specially, on the colour of the raw sausages.

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