The influence of the basil on colour, odour and taste of frankfurters

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Abstract. Plants from the moderate climate zone are rarely used as seasoning in pasteurised sausages. Seasoning plants of the family Lamiaceae belong to this group (marjoram, basil, savory, sage, thyme). One of the reasons these herbs are rarely used to season meat products is the presence of the plant pigment, chlorophyll that can have undesirable influence on colour, odour and taste of meat products. The aim of this paper was to assess the influence of basil on colour, odour and taste of vacuum-packed frankfurters during 28 days of storage. Powdered, dried basil (0.1%, 0.3% and 0.5%) was added to frankfurters while control frankfurters were produced without herbs or spices. Assessment of colour, odour and taste acceptability of the frankfurters was performed by a panel of five assessors using a quantitative descriptive test, and the results of the ranking test were analysed statistically. When used at the level of 0.1% in the sausages, basil did not have negative influence on frankfurter colour, while larger quantities 0.3% and 0.5% adversely affected frankfurter colour. Basil in the smaller amounts of 0.1% and 0.3% stimulated development of a pleasant odour and taste in the frankfurters, while 0.5% basil had an undesirable effect on these sensory attributes.

1. Introduction

In the production of meat products, tropical spices rich in essential oils are most commonly used. Herbal plants from moderate climate zones, of which the leaves and parts of the stem plants are used, contain slightly less essential oil than tropical spices. Herbs of the family Lamiaceae (basil, savory, sage, thyme, marjoram, etc.) that contain essential oils and other active substances are grown in Serbia. Dried and finely chopped, these plants have intensive aromatic odours and similar colours – green to grey-green. Their taste ranges from slightly to strongly “burning”, and some of them have a bitter taste. One of the reasons these herbs are uncommon as seasonings in meat products is their content of the plant pigment chlorophyll, which can have undesirable influences on colour, odour and taste of the meat products [1].

Basil (Ocimum basilicum L.) has a pleasant, aromatic odour. The flavour is aromatic, salty and warm, with a bitter taste. Carriers of the characteristic odour and taste of basil are essential oils, tannins, flavonoids, saponins, etc. Basil contains from 0.3% to 0.8% essential oil, of which the main ingredients are carvacrol and linalool [2]. In Mediterranean countries, basil is used for making sauces, marinades, tomato dishes and for seasoning sheep meat and pork, etc.
In Germany, sausages made with herbs from the family *Lamiaceae* (basil, thyme, marjoram) are called “*Kräuterwürste*”. Basil and thyme are most often used in the production of cooked sausages, rarely in pasteurised sausages, and are the least common in fermented dried sausages. Basil (0.01%) is added to two types of liver sausage, while basil and thyme (0.5%) are added to one type of pasteurised sausage [3].

According to the literature data and our knowledge of current industry practice, basil is very little used in the Serbian meat industry, especially in pasteurised sausages. The aim of this study was to assess the influence of basil on colour, odour and taste of vacuum-packed frankfurters during 28 days of storage.

2. Materials and methods

2.1. Raw material composition

Frankfurters were produced from beef meat (50%), pork fat (25%) and ice (25%). To 1 kg of stuffing, 18 g of nitrite salts and 3 g of polyphosphate were added. Powdered, dried basil was added to the experimental frankfurters (0.1%, 0.3% and 0.5%), while the control frankfurters were produced without any herbs or spices. The frankfurter stuffing was filled in artificial cellulose casings. Frankfurters were thermally processed (72°C in the centre of the product) and then cooled. After cooling, frankfurters were vacuum packed. All packages of frankfurters were stored in the same conditions at 4 °C and on days 1, 7, 14, 21 and 28 of storage, sensory testing was performed.

2.2. Chemical analysis

The content of essential oils in the dried herb was analysed according to [4].

2.3. Sensory analysis

Sensory evaluations were performed by five trained panellists. Frankfurter colour was analysed using a quantitative descriptive test [5], with grading scale from one to five (1 – unacceptable colour; 2 – very low level of acceptability of colour; 3 – acceptable colour; 4 – good colour; 5 – exceptionally good colour).

Using quantitative descriptive test [5], with grading scale from one to seven, the frankfurters’ sensory properties of odour and taste were analysed (1 – extremely unpleasant odour and taste; 2 – unpleasant odour and taste; 3 – unpleasant odour and taste; 4 – neutral odour and taste; 5 – pleasant odour and taste; 6 – very pleasant odour and taste; 7 – exceptionally pleasant odour and taste).

2.4. Statistical analysis

Results of the sensory evaluation ranking tests [6] were analysed statistically [7].

3. Results and discussion

The dried basil used in the frankfurters contained essential oil (0.8ml/100g), a level in accordance with legal regulation in Serbia [8].

| Day | Percentage of basil in frankfurter | Sum of ranks | Differences in frankfurter colour according to percentage of basil |
|-----|-----------------------------------|--------------|---------------------------------------------------------------|
|     | 0                                 | 6            | 0                                                             |
|     | 0.1                               | 14           | 8                                                             |
|     | 0.3                               | 16.5         | 10.5                                                          |
|     | 0.5                               | 23.5         | 17.5**                                                        | 2.5 |
|     | 0.5                               | 23.5         | 17.5**                                                        | 9.5 |
| 7   | 0                                 | 6            | 2.5                                                           |
|     | 0.1                               | 12           | 6                                                             |
|     | 0.3                               | 19.5         | 13.5*                                                         | 7.5 |
There was a statistically significant difference (p < 0.05) between the colour of control frankfurters and frankfurters with 0.3% basil on days 7 and 28 of storage. The differences in colour on day 14 of storage were highly statistically significant (p < 0.01).

During storage, statistically significant differences (p < 0.01) were observed between the colour of control frankfurters and frankfurters with 0.5% basil. No statistically significant differences were detected between the other frankfurters studied.

Table 2. Sensory evaluation of the odour and taste of vacuum-packed frankfurters during storage

| Day | Percentage of basil in frankfurters | 0 | 0.1 | 0.3 | Sum of ranks | Differences in frankfurter odour and taste according to percentage of basil |
|-----|-----------------------------------|----|-----|-----|--------------|-------------------------------------------------|
| 1   | 0                                 | 12 | 1   | 1.5 |             | 5                                              |
|     | 0.1                               | 10.5| 1.5 |    | 4.5         | 7                                              |
|     | 0.3                               | 17.5| 4.5 |    | 8           | 9.5                                             |
|     | 0.5                               | 20  | 8   |    | 9.5         | 2.5                                             |
| 7   | 0                                 | 7   |     |    |             |                                                 |
|     | 0.1                               | 11  | 4   |    |             |                                                 |
|     | 0.3                               | 18.5| 11.5| 7.5|             |                                                 |
|     | 0.5                               | 23.5| 16.5**| 12.5*| 5          |                                                 |
| 14  | 0                                 | 17.5|     |    |             |                                                 |
|     | 0.1                               | 9   | 8.5 |    |             |                                                 |
|     | 0.3                               | 16  | 1.5 | 7   |             |                                                 |
|     | 0.5                               | 17.5| 0   | 8.8 | 1.5         |                                                 |
| 21  | 0                                 | 16  |     |    |             |                                                 |
|     | 0.1                               | 8   |     |    |             |                                                 |
|     | 0.3                               | 14.5| 1.5 | 6.5 |             |                                                 |
|     | 0.5                               | 21.5| 5.5 | 13.5*| 7          |                                                 |
| 28  | 0                                 | 24  |     |    |             |                                                 |
|     | 0.1                               | 10  | 14**|    |             |                                                 |
|     | 0.3                               | 13  | 11  | 3   |             |                                                 |
|     | 0.5                               | 13  | 11  | 3   | 0           |                                                 |

* p ≤ 0.05 – statistically significant difference; **p ≤ 0.01) – highly statistically significant difference
The odour and taste of frankfurters with 0.1% basil and frankfurters with 0.5% basil were statistically significantly different (p < 0.05) on days 7 and 21 of storage. On day 7, a statistically significant difference (p < 0.01) between the odour and taste of control frankfurters and those with 0.1% and 0.5% basil was detected. On day 28, the odour and taste of control frankfurters and the odour and taste of frankfurters with 0.1% basil were statistically significantly different (p < 0.01). No statistically significant differences were detected between other frankfurters on this day.

There is little data in the literature of the use of basil in pasteurised sausages. However, the results obtained are in accordance with [9], where basil (at different concentrations) was added to dry fermented sausage. Basil 0.1% did negatively influence the colour of dry fermented sausage, while 0.3% and 0.5% basil had a negative influence. According to the same author [9], basil at the levels of 0.1% and 0.3% stimulated development of a pleasant odour and taste in dry fermented sausage, while 0.5% basil had an undesirable effect. According to other authors [10], basil has a pleasant odour and taste, but more than 0.03% cannot be added to cooked sausages. Basil causes off-taste in poultry meat products that are thermally treated by pasteurization or sterilization processes [11].

4. Conclusion

Based on its content of essential oil, the basil used was of good quality, and was characteristic of the climate in Serbia. Basil 0.1% did not negatively influence the colour of frankfurters, while larger amounts 0.3% and 0.5% did adversely affect frankfurter colour. Basil at levels of 0.1% and 0.3% stimulated development of pleasant odour and taste of frankfurters, while 0.5% basil had an undesirable effect. In conclusion, frankfurter with 0.1% basil had the most desirable sensory attributes. The results show that there is a real possibility of using basil in spice mixtures for the production of frankfurters.

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