

Study on the use of horseradish as a natural source of antioxidants in the technology of obtaining liver sausage

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Abstract

The paper aims as main objective the study of benefits characteristics of natural antioxidants in the meat industry. Also, the physico-chemical characteristics of horseradish, a natural product, which is founded in Romania market were highlighted. The meat product chosen for the main was liver sausage. Sensory examination was performed by analysing the taste, appearance, smell and content of the product.

The studied processed samples were analysed in terms of physical-chemical parameters: moisture content, fat, sodium chloride, protein, ash, carbohydrates, nitrites, energy value, Kreiss reaction and oxidative capacity.

Keywords: natural antioxidants, horseradish, liver sausage

1.Introduction

Antioxidants are added to fresh and processed meat and meat products to prevent lipid oxidation, retard development of off-flavors, and improve color stability. These natural antioxidants contain some active compounds, which exert antioxidant potential in meat and meat products by different mechanisms of action. The efficient extraction of these antioxidants from their natural sources, along with establishing their in vitro and in product antioxidant activity, has been a great challenge for researchers engaged in this field. The quality attributes of meat products deteriorate due to the lipid oxidation during processing and storage. Lipid oxidation is responsible for development of primary and secondary oxidation products, reduction in nutritional quality, as well as changes in flavor, which can precipitate health hazards and economic losses in terms of inferior product quality. [1]

Lipid oxidation is a rather complex process whereby the unsaturated fatty acid fraction of membrane phospholipids is oxidized, and hydroperoxides are formed which are further susceptible to oxidation or decomposition to secondary oxidation products, such as short-chain aldehydes, ketones, and other oxidized compounds that may adversely affect the overall quality and acceptability of meat and meat products.

Antioxidants are compounds that are capable of donating hydrogen (H·) radicals for pairing with other available free radicals to prevent the propagation reaction during the oxidation process. This effectively minimizes rancidity, retards lipid oxidation, without any damage to the sensory or nutritional properties, resulting in maintaining quality and shelf-life of meat products. [2].

Materials and method

Materials: Have been analyzed six sample of liver sausage with horseradish.

Methods: Samples were analyzed by assessing sensory appearance, texture, smell and taste and physical- chemical properties by determining moisture content, fat, sodium chloride, protein, ash, carbohydrates, nitrites, energy value, Kreiss reaction and oxidative capacity.

Measurements were carried out according to the following standard:

- Water determination according to SR ISO17025 / 2005; ISO 1442/1997; [3]
- Determination of fat according to SR ISO 1444/2008; [4]
- Determination of protein substances according to SR ISO 937: 2007; [5]

- Determination of sodium chloride - Mohr method according to STAS 9065 / 5-1973; [6]
- Determining freshness. Griess Method According to STAS 9065 / 7-1974; [7]
- Determination of oxidative activity by the thiobarbituric acid (TBA) method. [8]

For the evaluation of the oxidation degree of the sample analyzed as a result of the addition of horseradish, this determination has been made in comparison with a control sample obtained after the same recipe and technology but without the addition of horseradish. The TBA value was expressed as mg malonaldehyde / kg sample.

Thus, the fat was extracted from the sample to be analyzed using Soxhlett's equipment. 2 g of the extracted fat was weighed, plus 5 ml of benzene and 4 ml of thiobarbituric acid (0.67% aqueous soil) were added. The samples thus prepared were stirred for 30 minutes with the aid of a mechanical stirrer.

After the expiration of 30 minutes the samples were left to stand for 10 minutes for phase separation. The supernatant was taken in tubes and then heated on the water bath at 80 ° C for 45 minutes. After cooling, the absorbance of the supernatant was measured using the Specord 210 Analytik Jena spectrophotometer at 540 nm.

3. Results and Discussions

3.1. Organoleptic analysis

From the sensory point of view, all the analyzed samples were in accordance with the accepted legal norms:

- Shape - strips with pieces each 10-12 cm in length, obtained by twisting the pigs in turns.
- Exterior appearance - clean, non-slippery surface, with a continuous, undamaged coating, yellowish-white with a gray hue, without stains of mold;
- Appearance by section - marble table on a gray-brown background, with chunks of fat, organs, rinds and rice. Compact composition, well bound, without air voids, water or melted grease;
- Taste and smell - pleasant, characteristic of the product; no foreign taste or smell (salty, ranced, hot, moldy or bitter, etc.).
- Consistency - semimones.

Regarding the project presented, it is necessary to use a liver sausage treat in care and add to because of antioxidant properties.

The finished product was characterized from an organoleptic, physico-chemical point of view, and the antioxidant effect of horseradish was also highlighted by determining the oxidative capacity.

The results of the physical and chemical analyzes were compared with the maximum and minimum values regulated by Order no. 210 of August 30, 2006 on the physico-chemical properties of meat products for the approval of the Norms regarding the marketing of meat products (table 1.) [9].

Table 1. Physico-chemical properties regulated by Order 210/2006, for cooked meat products [9].

Road sign	Conditions of admissibility
Water, (% max.)	72
Fat substances, (% max.)	27
NaCl, (% max.)	3
Total protein, (% minim)	8
Nitrites (mg NO ₂ /100 g) max Kreiss Reaction	7 Negative

Determination of water content: The water content of meat and meat products is inversely proportional to the fat content.

In pig meat the water content is between 51-73% [10]. The maximum water content in seaweed is 72%, according to Order 210/2006 [9].

Following the analyzes performed, the water content recorded for the sample of snails was 57.16% (figure 1.) below the maximum allowed limit of 72%, being in accordance with the data from the literature which shows a water content in snails of maximum 65% [11,12].

Determination of protein content: In the studied sausage, a protein content of 18.41% was registered, which is above the minimum level allowed for 8% sausage established by Order 210/2006 [11] for cooked meat products (figure 2.) can consider that, this product can have great nutritional benefits.

Determination of fat content: Figure 3. shows the fat content of the liver sausage sample analyzed. Thus, following the extraction with the help of the Soxhlett extractor, a content of 20.37% was obtained for the analyzed slug sample, this value being below the maximum allowed limit of 27%. The determined value is consistent with other

studies that show a fat content in liver sausage of 25%. [10].

Determination of NaCl content: The NaCl content (%) of the analyzed sample was 2.84% (figure 4.). The maximum limit of 3% established by Order 210/2006 [9] regarding the admissibility conditions of the cooked meat products, not being exceeded.

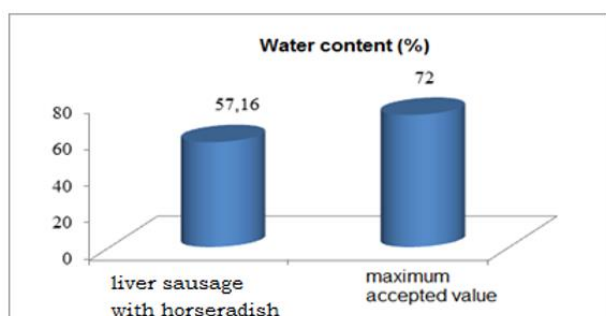


Figure 1. Water content (%) of the liver sausage sample compared to the maximum accepted value

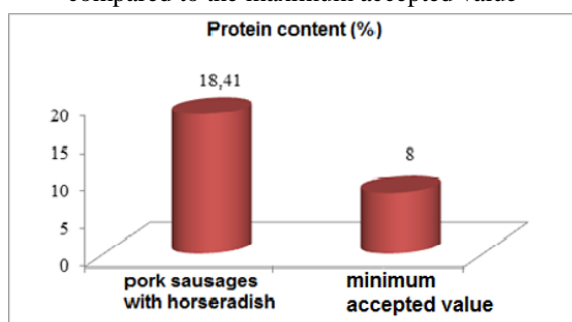


Figure 2. The protein content (%) of the liver sausage with horseradish compared to the minimum accepted value

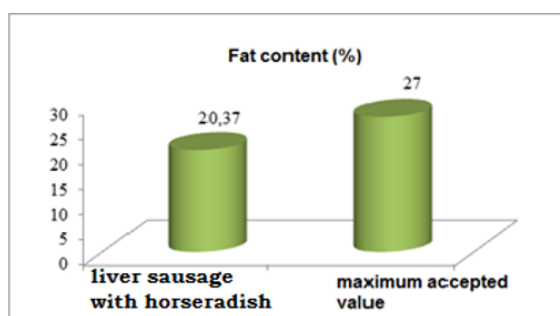


Figure 3. Fat content (%) of liver sausage with horseradish compared to the maximum accepted value

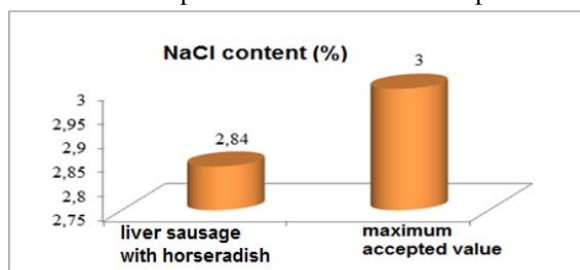


Figure 4. NaCl content (%) of the snail liver sausage sample compared to the maximum accepted value

Determining freshness: Following the determinations made for the liver sausage sample with the studied horseradish, the Kreiss reaction was negative, which means that the product was fresh. The results on the Kreiss reaction are in accordance with STAS 9065/10-75 Meat and meat preparations. Methods for assessing the oxidation stage of the fat (Kreiss reaction and peroxide index). [13].

Table 2. Kreiss reaction to liver sausages with horseradish

Sample	Kreiss Reaction
A	Negative
B	Negative
C	Negative
D	Negative
E	Negative
F	Negative

Oxidative activity testing: For the evaluation of the oxidation degree of the sample analyzed as a result of the addition of horseradish, this determination was made in comparison with a control sample obtained after the same recipe and technology but without the addition of horseradish. Thus, it was experimentally determined to determine the degree of oxidation of the fat from the samples of liver sausage and the influence of the addition of horseradish on the oxidation process.

For this purpose, the thiobarbituric acid (TBA) test was used, which is one of the most commonly used methods, based on the measurement of the absorbance of the TBA-malonaldehyde complex at 532-535nm [8].

The aim was to determine the amount of malondialdehyde formed in the process of oxidation of the fat under different conditions, depending on the calibration curve.

The thiobarbituric acid test gives satisfactory results, as the amount of malondialdehyde formed increases with the evolution of the oxidation process [14].

Following the tests carried out for the two liver sausage samples, an increase in the malondialdehyde content was found, due to the oxidation process that appeared over time. According to the obtained results it can be concluded that the process of lipid oxidation that occurs over time can be reduced by the addition of horseradish, and as a result it can be used as an

antioxidant in order to improve the oxidative stability of fats over time (figure 5).



Figure 5. TBA values of the liver sausage samples studied

4. Conclusion

Rules regarding the marketing of meat products. The results have led to the following conclusions:

- The water content registered for the liver sausage sample was 57.16%, below the maximum allowed limit of 72%;
- In the liver sausage sample studied there was a protein content of 18.41% value which is above the minimum allowed level, which can be considered that, this product can have special nutritional benefits;
- The registered fat content was 20.37% for the liver sausage sample analyzed;
- The NaCl content (%) in the analyzed sample was 2.84%, the maximum limit of 3% established by Order 210/2006 regarding the admissibility conditions of the cooked meat products, not being exceeded
- Following the analysis on the Kreiss Reaction for the liver sausage sample studied, this was negative;
- Regarding the evaluation of the antioxidant capacity, it can be concluded that the process of lipid oxidation that occurs over time can be reduced by the addition of horseradish, and as a result it can be used as an antioxidant in order to improve the oxidative stability of fats over time.;

Compliance with Ethics Requirements. Authors declare that they respect the journal's ethics requirements. Authors declare that they have no conflict of interest and all procedures involving human / or animal subjects (if exist) respect the specific regulation and standards.

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