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# SENSORY EVALUATION AS TOOL IN QUALITY IMPROVEMENT OF BOILED CHICKEN SAUSAGE

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**ABSTRACT:** Food product quality and stability during storage is very important for the successful manufacturing. It is known that different factors during processing have impact on quality characteristics of final product. The aim of the study was to investigate influence of selected food additives with antioxidant and stabilising functional characteristics on quality of finely comminuted boiled chicken sausages “parizer” type, during storage. Samples were produced in industrial conditions, five experimental model samples with selected additive blends added separately to each: (a) 0.04% GUARDIAN Rosemary Extract 08 (Natural rosemary extract, E471, E472a, E1520); (b) 0.10% (based on the fat content) GRINDOX 539 Antioxidant (E304, E306, E322, rapeseed oil); (c) 0.30% GRINDSTED Carrageenan CC 310 (E407, E410); (d) 0.30% GRINDSTED MEATLINE 345 A Emulsifier and Stabiliser System (E401, E516, E470a, E450); (e) 0.30% GRINDSTED MEATLINE 333 Stabiliser System (Carob germ flour, E466) and (f) control sample, according to the producer’s specification. The samples had adequate chemical composition. Sensory evaluation of selected sensory characteristics was done 7 days and 35 days after samples production: (1) by the descriptive sensory analysis - scoring method, and (2) by discriminatory sensory analysis - ranking method, after assessment and comparison of the overall quality of sausages model samples. The results of the sensory analysis indicated differences between model samples dependent on added additives. On the basis of descriptive sensory evaluation results, it was found that the best quality of compared had sausage sample produced with addition 0.30% GRINDSTED MEATLINE 345 A Emulsifier and Stabiliser System (E401, E516, E470a, E450). Discriminatory sensory analysis – ranking confirmed that finding.

**Key words:** *sensory analysis, chicken sausages, quality*

## INTRODUCTION

Food industry has an important position in the processing industry, especially when we talk on the manufacturing of meat products. Meat and meat products are very important ingredients in human nutrition because they are an excellent source of protein with a well-balanced composition of amino acids, B vitamins and mineral components (Borowski, 2007). The most important tasks of meat industry include the development of products that identify and satisfy consumer needs and expectations and have relatively long shelf life.

Quality control is an essential component of any food processing business. Accurate and objective chemical and physical methods should be used in the food quality control, but despite of progress in this area, the human senses are still more efficient than instrumental methods in evaluation of flavour and texture, and provide more rapid responses. The reliability of information obtained through the human senses can be increased by selection and training of assessors, providing suitable environment for evaluation, and using appropriate testing procedures. Therefore, sensory evaluation should be an integral part of product quality defining and controlling process (Krysztofiak, 2005; Savanović and Grujić, 2008; Vasilev et al, 2011). The importance of sensory analysis is great and it is applicable in different areas: for improve quality of the products throughout the development process, for describe products sensory characteristics and for comparing products with competitors’ products (Leppard et al., 2004; Živković et al, 2011; Maughan et al., 2012). Methods of sensory evaluation are unavoidable and applied for development of meat products and as tool for detailed sensory characteristics describing. Assessors have to be tested and trained

according to the standard methods (ISO 8586-1:1993). In such cases, during realisation of sausages quality improvement process, different aspects of sensory evaluations are considered, using visual, olfactory, gustatory and palpatory techniques that enable detailed judgment of particular quality characteristics (Leppard et al., 2004; Giboreau et al., 2007; Savanović and Grujić, 2008). That approach could create a base for designing of model for products quality improvement in the meat industry.

Today the market offers a large number of meat products from the category of boiled sausages. All generations of consumers like to eat and appreciate quality of finely comminuted boiled chicken sausages "parizer" type as they have pleasant and mild flavour. It is known that different factors during processing have impact on quality characteristics of final product. Product quality could be defined in many ways. For sensory quality of parizer, important attributes are: outside appearance, cross section appearance, colour of cross section, smell, aroma and taste, and consistency (Savanović and Grujić, 2008). Sensory characteristics of sausages depend on the type of meat, ways and length of storage of meat, then the aroma and chemical composition of meats, as well as used additives and spices (Bilska, 2007; Grujić et al., 2008). In aim to improve the quality of meat products various food additives can be used (Serdaroglu and Yildiz-Turp, 2004; Bilska, 2007; Hong et al., 2008; Garcia-Garcia and Totosaus, 2008).

The aim of the study was to investigate influence of selected food additives with antioxidant and stabilising functional characteristics on quality of finely comminuted boiled chicken sausages "parizer" type, during storage.

## MATERIAL AND METHODS

Boiled chicken sausages "parizer" type, were used as a model-product in the experiment. Samples were produced in industrial conditions according to the producer's specification. The following ingredients were used (percentage shown in descending order): mechanically deboned chicken meat (60%), lean chicken meat (15%), vegetable oil, water, salt, isolated soy protein, dextrose, spices, stabilizers, antioxidants, flavour enhancer, preservative. Five experimental samples were produced with selected additives added separately to each (Table 1). The sixth model-sample (P6) is produced according to the manufacturer's recipe and it was also used as a control sample. Sausages were packed in tight artificial casings (diameter 60 mm; average mass of sausage pieces was 500g) and after heat treatment were chilled and labelled appropriately. Until the moment of test samples were stored in a dark and cold place, at +4°C to +8°C.

Table 1. Selected additives blends used for producing of the boiled chicken sausages

Selected additives blends (and ingredients)	Sausage sample code and additives blends content (% w/w)					
	P1	P2	P3	P4	P5	P6
GUARDIAN Rosemary Extract 08 (Natural rosemary extract, E471, E472a, E1520)	0.04	-	-	-	-	-
GRINDOX 539 Antioxidant (E304, E306, E322, rapeseed oil)	-	0.10*	-	-	-	-
GRINDSTED Carrageenan CC 310 (E407, E410)	-	-	0.30	-	-	-
GRINDSTED MEATLINE 345 A Emulsifier and Stabiliser System (E401, E516, E470a, E450)	-	-	-	0.30	-	-
GRINDSTED MEATLINE 333 Stabiliser System (Carob germ flour, E466)	-	-	-	-	0.30	-

\* - quantity expressed based on the amount of fat in the finished product

Analysis of chemical composition was carried out in Laboratory for food analysis on Faculty of Technology, University of Banja Luka. The following parameters were determined according to AOAC (2006) procedures: moisture content (drying at 105 °C to constant mass), the fat content (according to the Soxhlet method), protein content (according to the Kjeldahl method), the content of sodium- chloride (according to the Mohr method), and the content of

nitrite (expressed as  $\text{NaNO}_2$ , according to the method ISO: 2918:1975), the content of phosphates (expressed as  $\text{P}_2\text{O}_5$ , according to the spectrophotometric method ISO: 13730:1996).

Individual sensory evaluation was carried out by 10 trained assessors (ISO 8586-1:1993), in the Laboratory for sensory analysis of food on Faculty of Technology, University of Banja Luka, 7 and 35 days after production. Six labelled different model samples (five samples in which selected additives were added and the sixth control sample) were twice delivered to assessors during the sensory analysis. Water and cubes of white bread were served to assessors for cleaning the mouth between samples evaluation. Descriptive sensory analysis - scoring method, and discriminatory sensory analysis - ranking method were used for evaluation of sausages quality.

In initial preparation of sausages sensory evaluation by the scoring method (ISO 4121:2003; Radovanović and Popov-Raljić, 2001), coefficient of significance (Cs) was determined for each selected sensory attribute (sum of them are 20). Appropriate Cs was multiplied with score given after sensory evaluation of each selected attribute (in scale from 5 for very good quality, to 1 for very bad quality). Addition of all results of evaluated sensory attributes multiplied with Cs, gives overall score, expressed as percentage of maximum possible products quality, or 100% for the best quality. For boiled sausages the most important sensory attributes were evaluated: odour, aroma and taste (Cs=6), colour of cross section and consistency (Cs=4), outside appearance and cross section appearance (Cs=3). The scoring forms with description of the sensory attributes and possible defects for each quality level were delivered to the assessors (Grujić et al., 2008; Savanović and Grujić, 2008).

Discriminatory sensory analysis – ranking of six model samples of sausages were realised on the basis of to the 20 judgements of overall acceptability: the most acceptable (on the first place), the least acceptable (on the last place). The rank sums were determined and statistical comparisons ( $\alpha=0.05$ ) were carried out by the Friedman test (ISO 8587:2006) for demonstrating and recognition by assessors differences among evaluated samples.

## RESULTS AND DISCUSSION

The average chemical composition of the tested sausage samples is shown in the Table 2. The content of the tested compounds in all samples were in accordance with the requirements defined by the Regulation on the quality of poultry meat products (Official Journal SFRJ No. 55/91), valid in Bosnia and Herzegovina, where production was realized.

Table 2. The average chemical composition of the boiled chicken sausages

	Sausages sample code					
	P1	P2	P3	P4	P5	P6
Moisture (%)	58.61	58.50	58.06	57.65	58.71	58.07
Fat (%)	20.12	21.03	18.49	17.87	17.36	19.23
Proteins (%)	16.09	15.51	15.89	15.40	15.66	15.71
NaCl (%)	2.64	2.45	2.49	2.31	2.43	2.57
Phosphate ( $\text{P}_2\text{O}_5$ ) (%)	0.29	0.27	0.29	0.28	0.29	0.27
Nitrite (mg/100g)	0.025	0.024	0.021	0.025	0.026	0.027

The results of the sensory analysis indicated differences between model samples depending on added additives. Outside appearance of all six chicken sausage samples were on acceptable quality level, without any noticeable defects (Table 3). Selected food additives with antioxidant functional characteristics had positive impact on colour of finely comminuted boiled chicken sausages “parizer” type during storage. After 7 days of storage it was found that between produced samples the most acceptable colour score (4.70) had sample P1, produced with addition of natural rosemary extract, and after 35 days of storage the most acceptable colour score (4.85) had sample P2, produced with addition of ascorbyl palmitate and tocopherols (Table 3). These results are in agreement with previously published papers,

confirming the positive effect of antioxidants on colour stability of meat products (Serdaroglu and Yildiz-Turp, 2004; Biliska, 2007; Mancini et al., 2007).

The scores for evaluation of the cross section appearance of sausage samples were relatively lower than expected. Partial annular layers of colour shade and larger pieces of ingredients were observed at the cross section of some sausage samples, and affected sensory scores, as shown in Table 3. That did not significantly affect on the overall acceptability of the product, but it is more pleasant to eat particles of sausages ingredients of uniform size. For cross section appearance, after 7 days of storage, scores were from 4.55 for P3 sample, to 3.85 for P5 sample. Similar average values of these quality characteristic were assigned after 35 days of storage (Table 3).

Table 3. Results of the descriptive sensory evaluation for the boiled chicken sausages

Sample code	Storage time (days)	Average scores for quality parameters (n=20 assessments)					Evaluated overall quality* (%)
		Outside appearance (Cs=3)	Cross section appearance (Cs=3)	Colour of cross section (Cs=4)	Odour, aroma and taste (Cs=6)	Consistency (Cs=4)	
P1	7	5.00	4.25	4.70	4.15	4.30	83.95
P2	7	5.00	3.95	4.45	4.05	3.85	84.75
P3	7	5.00	4.55	4.55	4.25	4.35	89.75
P4	7	5.00	4.30	4.50	4.45	4.70	91.40
P5	7	5.00	3.85	4.60	4.10	4.45	87.35
P6	7	5.00	4.40	4.30	4.05	4.10	86.10
P1	35	5.00	4.35	4.75	4.30	3.95	80.05
P2	35	5.00	3.90	4.85	4.30	4.00	87.90
P3	35	5.00	4.40	4.25	4.20	4.45	88.20
P4	35	5.00	4.25	4.70	4.40	4.85	92.50
P5	35	5.00	3.95	4.25	4.15	4.40	86.35
P6	35	5.00	4.65	4.45	4.20	3.90	87.55

Cs – coefficient of significance;

\* Evaluated quality – percent of maximum possible quality

Among the many sensory characteristics, the odour and taste sensations take particular place when eating food products. Manufacturing of model chicken sausages samples and a control sample were performed according to the same recipe, from identical basic ingredients, and that results in approximately uniform odour, aroma and taste of all samples (Table 3). Most samples were evaluated by score higher than 4 and with the comment that the aroma of the product were weaker than expected, and odour of fat and other ingredients were slightly more perceptible than it is desirable.

The consistency of processed meat products depends on the structure of the matrix formed by the proteins gel, the solutes and particles entrapped in the gel and the moisture content. Therefore, the matrix forming depends on factors such as protein water binding ability, salt content, pH, fat content and the addition of nonmeat ingredients (Flores et al., 2007). Comparing the consistency of the control sample, and produced models of chicken meat sausages, differences in the structure of the products after 7 days of storage were determined by sensory evaluation. Consistency of control sample was defined as mild finely granular, powdered, with gentle glimpses and hardly noticeable release of fat droplets. Compact mass and chewiness of the control sample were satisfactory. Consistency of samples P1, P2 and P3 were evaluated as appropriately and described as a persistent, slightly elastic-plastic and contents did not release water or fat under pressure (Table 3). The best scores for consistency were assigned to the samples P4 and P5 (Table 3). Consistency of these samples were described as elastic, sausages were sturdy and juicy, connectivity of components were good and compact, chewiness were satisfying, neither too hard nor too soft. Scores of consistency, after 35 days of storage, showed that the control sample P6 produced according to the producer's specification, had the lowest value of the mean score, followed by the sample P1, while samples P3, P4 and P5 produced with additives with of emulsifying and stabilizing functional properties, were evaluated with the highest scores

(Table 3). Hydrocolloids are currently added to meat products to improve cooking yields, increase moisture retention and modify consistency of product (Garcia-Garcia and Totosaus, 2008). Many studies have been carried out on these products and their application in comminuted food products. They are added as another gelling system to improve yield, textural properties and also reduce cost of the meat formulation. The addition of potato starch has a positive impact on the consistency, improvement the emulsion stability and reduction the jelly and fat separation in cooked meat products (Flores et al., 2007; Aktas and Genccelep, 2006). Hong et al. (2008) have found that carrageenan and glucono delta lactone (GDL) have high binding characteristics and minimal discoloration of restructured pork, even if a low salt concentration was used. Garcia-Garcia and Totosaus (2008) reported that carrageenan-locust bean gum interaction improved texture and water retention, with only a minor effect on sausage colour.

Comparing the overall quality of the produced sausages, expressed as a percentage of the maximum quality, after 7 days of storage was found that the sample P4 had the highest overall quality (91.40%), followed by the sample P3 (89.75%), and the samples P5, P6, P2 and P1 (Table 3). The similar quality of products was evaluated after 35 days of storage. Sausage P4 was the best with 92.50% of the expected overall quality, then the samples P3, P2, P6, P5 and sample P1 with relatively the lowest score (80.05%), as shown in Table 3. It should be noted that all samples had relatively high scores for overall quality and can be characterized as products with very good quality level.

Table 4. Rank sums calculated based on the overall acceptability of boiled chicken sausages

Sample code	Rank sums after 7 days storage	Rank sums after 35 days storage
P1	70	58
P2	85	79
P3	70	80
P4	58	47
P5	73	85
P6	64	71

Ranking is method for discriminatory sensory evaluation with the aim of placing a series of test samples in rank order. Based on the overall acceptability of the sausages model samples ranking were realised after 7 and 35 days of storage, for recognition by assessors of differences among the samples (Table 4). Critical table value for the Friedman test is 10.92, for the 6 samples and 20 judgments (significance level  $\alpha=0.05$ ). Calculation of the rank sums evaluated after 7 days of samples storage, results in value 5.91 for Friedman test ( $F_{test}<F$ ) and indicated that there are no statistically significant differences ( $\alpha=0.05$ ) between compared products. Comparing the rank sums obtained after 7 days of storage showed the lowest value of the rank sums (58) for the sample P4 and that it had the highest quality of compared sausages (Table 4). After 35 days of storage calculated value for Friedman test was 15.43 ( $F_{test}>F$ ), and it was concluded that there were statistically significant difference ( $\alpha=0.05$ ) in the quality between compared samples of sausages. After 35 days of storage sample P4 had the rank sums 47 and the best quality comparing to the other samples (Table 4). Sample P4 with modified composition by adding of 0.30% additives blend GRINDSTED MEATLINE 345 A Emulsifier and Stabiliser System (E401, E516, E470a, E450), could be characterised as sausage with the best improved sensory acceptability of the compared.

## CONCLUSIONS

Sensory quality characteristics of the finely comminuted boiled chicken sausages “parizer” type depends of method of manufacturing, quality, quantity, chemical composition and aroma of used meat, spices, other ingredients and functional property of food additives. The results of the sensory evaluation of sausages model samples indicated that addition of selected additives blends could impact on quality and improve overall acceptability of sausages. On the basis of descriptive sensory evaluation results, it was concluded that the best overall

quality of compared, had boiled chicken sausage sample produced with addition 0.30% additives blend GRINDSTED MEATLINE 345 A Emulsifier and Stabiliser System (E401, E516, E470a, E450). Discriminatory sensory analysis – ranking based on overall acceptability of the sausages, confirmed that finding.

## REFERENCES

1. Association of Official Analytical Chemistry (A.O.A.C.) (2006). Official Methods of Analysis. 18<sup>th</sup> ed., Washington, DC.
2. Aktas, N., Genccelep, H. (2006). Effect of starch type and its modifications on physicochemical properties of bologna-type sausage produced with sheep tail fat, *Meat Science*, 74, 404–408.
3. Bilska, A. (2007). Optimization of the composition of a mixture of selected additives in the production of raw sausages, *Electronic Journal of Polish Agricultural Universities, Food Science and Technology*, 10 (1). Available Online: <http://www.ejpau.media.pl/volume10/issue1/art-12.html>
4. Borowski, J. (2007). Meat in human nutrition, *Electronic Journal of Polish Agricultural Universities, Food Science and Technology*, 10 (4). Available Online: <http://www.ejpau.media.pl/volume10/issue4/art-02.pdf>.
5. Flores, M., Giner, E., Fiszman, S.M., Salvador, A., Flores, J. (2007). Effect of a new emulsifier containing sodium stearoyl-2-lactylate and carrageenan on the functionality of meat emulsion systems, *Meat Science*, 76, 9–18.
6. Garcia-Garcia, E., Totosaus, A. (2008). Low-fat sodium-reduced sausages: Effect of the interaction between locust bean gum, potato starch and j-carrageenan by a mixture design approach, *Meat Science*, 78, 406–413.
7. Giboreau, A., Dacremont, C., Egoroff, C., Guerrand, S., Urdapilleta, I., Candel, D., Dubois, D. (2007). Defining sensory descriptors: Towards writing guidelines based on terminology, *Food Quality and Preference*, 18, 265–274.
8. Grujić, S., Grujić, R., Savanović, D., Odžaković B., Glavaš D. (2008). Unapređenje kvaliteta namirnica rangiranjem senzornih svojstava. *Zbornik radova. VIII Savjetovanje hemičara i tehnologa Republike Srpske, Banja Luka, Bosna i Hercegovina*, 303-310.
9. Hong, G.-P., Ko, S.-H., Choi, M.-J., Min, S.-G. (2008). Effect of glucono-d-lactone and j-carrageenan combined with high pressure treatment on the physico-chemical properties of restructured pork, *Meat Science*, 79, 236–243.
10. ISO 8586-1:1993. (2008). Sensory analysis - General guidance for the selection, training and monitoring of assessors - Part 1: Selected assessors.
11. ISO 4121:2003. (2008). Sensory analysis - Guidelines for the use of quantitative response scales.
12. ISO:8587:2006 (E). (2008). Sensory Analysis-Methodology-Ranking.
13. Krysztofciak, K. (2005). Feasibility study of quality improvement of wiener type sausages produced with blood plasma, *Electronic Journal of Polish Agricultural Universities, Food Science and Technology*, 8 (4).
14. Leppard, P., Russell, C.G., Cox, D.N. (2004). Improving means-end-chain studies by using a ranking method to construct hierarchical value maps, *Food Quality and Preference*, 15, 489-497.
15. Mancini, R.A., Hunt, M.C., Seyfert, M., Kropf, D.H., Hachmeister, K.A., Herald, T.J., Johnson, D.E. (2007). Effects of ascorbic and citric acid on beef lumbar vertebrae marrow colour, *Meat Science*, 76, 568–573.
16. Maughan, C., Tansawat, R., Cornforth, D., Ward, R., Martini, S. (2012). Development of a beef flavor lexicon and its application to compare the flavor profile and consumer acceptance of rib steaks from grass- or grain-fed cattle, *Meat Science*, 90, 116–121.
17. Regulation on the quality of poultry meat products. Official Journal SFRJ No. 55/91 (*In Serbian*).
18. Radovanović, R., Popov-Raljić, J. (2001). Senzorna analiza prehranbenih proizvoda, Poljoprivredni fakultet, Beograd i Tehnološki fakultet, Novi Sad.
19. Savanović, D., Grujić, S. (2008). Deskriptivna senzorna analiza fino usitnjenih kobasica sa svinjskim mesom tipa „Parizer”. *Zbornik radova. Drugi međunarodni kongres “Ekologija, zdravlje, rad, sport”, Banja Luka, Bosna i Hercegovina*, 2, 142-147.
20. Serdaroglu, M., Yildiz-Turp, G. (2004). The effects of ascorbic acid, rosemary extract and tocopherol/ascorbic acid on some quality characteristics of frozen chicken patties. *Electronic Journal of Polish Agricultural Universities, Food Science and Technology*, 7 (1), 1–6.
21. Vasilev, D., Vuković, I., Saičić, S. (2011). Važniji parametri kvaliteta funkcionalnih fermentisanih, barenih i jetrenih kobasica, *Tehnologija mesa*, 52 (1), 141–153.
22. Živković, D., Tomović, V., Perunović, M., Stajić, S., Stanišić, N., Bogićević, N. (2011). Senzorna prihvatljivost sremske kobasice izrađene od mesa svinja različite starosti, *Tehnologija mesa*, 52 (2), 252–261.