SENSORY AND COLOUR CHARACTERISTICS OF BULGARIAN DRY-FERMENTED SAUSAGES WITH ADDITION OF NATURAL ANTIOXIDANTS

S. Dragoev* and D. Balev

University of food technologies – Plovdiv, Department "Meat and Fish Technology", 26 Maritza blvd., Plovdiv, 4002, Bulgaria, E-mail: stefan_dragoev@yahoo.co.uk

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Introduction

The typical taste and flavour of dry-fermented sausages is due to the production materials, derivatives from carbohydrate fermentation, lipid hydrolysis and oxidation, proteolysis and spices and salts, used as preservatives (Demeyer *et al.,* 1986). The protein dissociation in the dry-fermented sausages has partially microbial and endogen origin (Igene and Pearson, 1979). The production of free amino acids and short-chain peptides is significant for dry fermented sausage flavour improvement, however their role in the flavour formation seems to be limited in comparison with lipid hydrolysis and oxidation (Berdague *et al.,* 1991).

The objective of this study was to estimate the efficiency of natural antioxidants, on the sensory and colour characteristics of Bulgarian dry-fermented "lukanka" sausages.

Materials and Methods

The experiments were carried out using "Monastery's lukanka". The model system "lukanka" was prepared from:

a) Product produced from meat raw materials chilled at 0 – 4°C: 1) beef type CL 95 stored 72 h *post mortem* and frozen to minus 5°C 6 h prior to mincing; 2) pork - sort 50/50, stored 72 h *post mortem* and frozen to minus 10°C 6 h prior to cutting; 3) and back bacon stored for 24 h *post mortem* frozen to -10°C, prior to use. Parallel samples were produced: **Control sample** –without antioxidants; **Sample No 1** – with the addition of 1,124 g/kg natural antioxidants composition (Liquid form No 1), liquid rosemary extract in combination with 35.48% rutine and 16.13 % sodium erythrobate. **Sample No 2** – with the addition of 1,112 g/kg natural antioxidants composition (Dry form No 2), dry rosemary extract in combination with 78.57% dry extract of Japanese acacia (*Sophora japonica*) flower bud (containing 53.33% quercetin – aglicon of the natural glycoside rutine) and 17.85% sodium erythrobate.

b) Product produced from meat raw materials stored for three months at minus 18°C: 1) beef type CL 95; 2) pork – sort 50/50 and back bacon. Parallel samples were produced: **Control sample** – without antioxidants; **Sample No 1** – with the addition of 1,124 g/kg natural antioxidants composition (Liquid form No 1), liquid rosemary extract in combination with 35,48 % rutine and 16,13 % sodium erythrobate. **Sample No 2** – with the addition of 1,112 g/kg natural antioxidants composition (Dry form No 2), dry rosemary extract in combination with 78,57 % dry extract of Japanese acacia (*Sophora japonica*) flower bud (containing 53,33 % quercetin – quercetin – aglicon of the natural glycoside rutine) and 17,85 % sodium erythrobate.

The sensory characteristics of the "lukanka" samples were assessed using the nine point examination scale developed by Higher Scientific Research Institute of Meat Processing Industry, Moscow, Russia and adapted to traditional Bulgarian meat products.

Instrumental colour properties of the "lukanka" cross-section surface were estimated according to the CYELAB system using a PAY UNICAM spectrophotometer (Model 8800, Perkin Elmer, UK). Brightness - L*, red colour component - a*, yellow colour component - b*, colour tone - C and colour saturation – H were recorded on days 0, 15 and 30 after production.

Results and Discussion

The sensory characteristics of the experimental samples were rated higher than the control samples (table. 1). Statistically significant differences were recorded between sensory texture of the control sample and sample No 2. Sensory evaluation scores of "lukanka" produced from chilled meat raw materials, with the addition of blend of antioxidants in liquid and dry form were not significantly different. In the control samples the appearance and colour, cross-section surface colour, taste and flavour were all rated lower than experimental samples. In samples containing liquid antioxidants uncharacteristic flavour was detected. In samples prepared using frozen meat raw materials a slight flavour and precursor of rancidity was detected. This is referred to as "WOF" (Mottram and Whitfield, 1995). The taste of samples produced from chilled raw materials and dry blend antioxidants scored the highest. The texture of the product was not influenced by the addition of antioxidants (P > 0,05).

The appearance of the experimental samples scored higher than the control sample (P < 0,05), which possessed darker colour surface and had a greater presence of "white noble mould". This result indicates that the addition of natural antioxidant blends, irrespective of the raw material state (frozen or chilled) or form of the blend (dry or liquid), improves the product appearance.

Surface section colour rated higher in samples produced from chilled meat raw materials. Therefore, it can be concluded that the addition of antioxidants improves surface section colour as evaluated by sensory panellists.

Table 1: Sensory characteristics of "lukanka".

Sample	Appearance and colour	Surface section colour	Taste	Flavour	Consistence
		Frozen meat is used as starting raw material			
Control sample	6,84 ± 0,11	6,91 ± 0,15	6,45 ± 0,11	6,52 ± 0,15	7,61 ± 0,08
Sample No 1	7,41 ± 0,14	7,32 ± 0,11	7,12 ± 0,10	7,08 ± 0,12	7,74 ± 0,12
Sample No 2	7,20 ± 0,14	7,48 ± 0,12	7,62 ± 0,11	7,71 ± 0,14	7,65 ± 0,10
		Chilled meat is used as starting raw material			
Control sample	7,95 ± 0,11	7,62 ± 0,14	7,48 ± 0,11	7,81 ± 0,12	8,04 ± 0,10
Sample No 1	8,81 ± 0,14	8,31 ± 0,15	8,12 ± 0,10	8,05 ± 0,11	8,14 ± 0,16
Sample No 2	8,76 ± 0,11	8,40 ± 0,11	8,61 ± 0,10	8,64 ± 0,13	8,18 ± 0,12

Table 2: Instrumental colour properties of "lukanka" cross-section surface.

Sample	Day d	Brightness (L*)	Red colour component (a*)	Yellow colour component (b*)	Colour tone (C)	Colour saturation (H)
			Frozen meat is used as starting raw material			
Control sample	0	38,93 ± 0,25	9,61 ± 0,12	12,46 ± 0,11	19,20 ± 0,32	40,46 ± 0,38
	15	37,71 ± 0,22	10,52 ± 0,37	9,64 ± 0,11	14,96 ± 0,29	39,71 ± 0,34
	30	33,84 ± 0,17	11,54 ± 0,41	9,12 ± 0,25	14,05 ± 0,31	38,72 ± 0,56
Sample No 1	0	38,93 ± 0,25	9,61 ± 0,12	12,46 ± 0,11	19,20 ± 0,32	40,46 ± 0,38
	15	37,98 ± 0,22	12,86 ± 0,16	11,47 ± 0,19	$17,23^{b}$ ± 0,21	$39,75^{c}$ ± 0,27
	30	35,12 ± 0,11	13,30 ± 0,21	10,87 ± 0,14	$17,17^{b}$ ± 0,13	$39,27^{c}$ ± 0,22
Sample No 2	0	38,93 ± 0,25	9,61 ± 0,12	12,46 ± 0,11	19,20 ± 0,32	40,46 ± 0,38
	15	37,28 ± 0,16	$13,00^{a}$ ± 0,20	16,23 ± 0,21	18,80 ± 0,19	$39,31^{d}$ ± 0,27
	30	33,47 ± 0,24	$13,76^{a}$ ± 0,17	11,15 ± 0,20	17,70 ± 0,24	$39,02^{d}$ ± 0,31
			Chilled meat is used as starting raw material			
Control sample	0	48,21 ± 0,19	10,54 ± 0,14	13,65 ± 0,21	18,56 ± 0,22	51,21 ± 0,29
	15	47,31 ± 0,25	12,31 ± 0,26	10,23 ± 0,18	15,21 ± 0,19	40,95 ± 0,23
	30	43,57 ± 0,27	13,78 ± 0,21	11,04 ± 0,22	14,98 ± 0,23	32,14 ± 0,20
Sample No 1	0	48,21 ± 0,19	10,54 ± 0,14	13,65 ± 0,21	$18,56^{b}$ ± 0,22	51,21 ± 0,29
	15	47,92 ± 0,22	11,95 ± 0,19	10,89 ± 0,17	$18,25^{b}$ ± 0,21	42,84 ± 0,17
	30	46,12 ± 0,11	13,65 ± 0,19	11,24 ± 0,24	17,41 ± 0,20	38,51 ± 0,26
Sample No 2	0	48,21 ± 0,19	10,54 ± 0,14	13,65 ± 0,21	18,56 ± 0,22	51,21 ± 0,29
	15	47,01 ± 0,26	12,85 ± 0,21	$11,65^{a}$ ± 0,24	$17,21^{c}$ ± 0,19	46,28 ± 0,21
	30	45,51 ± 0,24	13,21 ± 0,18	$11,24^{a}$ ± 0,20	$17,02^{c}$ ± 0,26	39,51 ± 0,21

Statistically significant differences are estimated between the samples, marked with letter index.

The L* value or brightness of the samples produced from frozen meat raw materials differed significantly ($P < 0.05$) from samples produced using chilled meat raw materials. A trend towards colour brightness reduction was detected irrespective of the type of the blend used (table.2). Similar trends occurred in values recorded for yellow colour component b*, colour tone C and colour saturation H. The red colour a* of products increased, and this increase was statistically significant in samples produced from chilled raw materials. The same trend in colour changes was observed for all experimental samples whether chilled or frozen meat raw material was used.

Conclusion

The addition of natural antioxidant blends, in both dry and liquid form led to more acceptable taste and flavour development and preserved the preferred colour properties of the dry-fermented sausages.

References

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