LIPID AND COLOUR STABILITY OF CURED COW BLOOD SAUSAGE

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I. INTRODUCTION

Blood sausages are ready to eat meat by-products consumed in many parts of the world. The traditional blood sausages contain common salt and are dark brown to black in colour, while modern blood sausages are known for their bright red shiny colour which is obtained by adding nitrite curing salt to the blood [1]. The natural colour of blood sausages comes from the heme pigment, myoglobin. These pigments becomes oxidized and denature causing the red colour to deteriorate or turn brown during storage, which is undesirable to consumers [2]. Hence the objective of this study was to assess the influence of common salt (sodium chloride (NaCl)) and Prague powder (sodium nitrate/nitrite salt) on lipid and colour stability of cow blood sausages over 60 days storage period.

II. MATERIALS AND METHODS

A total of 2 kg (1 kg/ treatment batch x 2 products) of cow blood sausages cured with either common salt (Sausage A) or sodium nitrites salt (Sausage B) were produced in six replicates. The mixture was filled in a synthetic casing. The sausages were cooked in a mini cooker, at an atmospheric temperature of 80 °C to an internal temperature of 75 °C. This was followed by cooling in an iced water bath and kept at 4°C and sampled the following day. All sausages were overwrapped and stored in a retail fridge-type (-10°C) to simulate home freezing. Sausages were evaluated for lipid and colour stability at day 0, 15, 30, 40 and 60 days. Lipid oxidation was assessed by the 2- thiobarbituric acid (TBA) method used by Zereian et al. [3]. Thiobarbituric Acid Reactive Substance (TBARS) values were expressed as malonaldehyde (MA) mg/kg meat product sample. Instrumental colour (L*, a* and b*) of the cooked sausages was measured according to the method described by King et al. [4]. All data were subjected to an analysis of variance (ANOVA) to test for significant treatment effects using GenStat for Windows 22nd Edition [5]. Fisher's protected t-LSD (Least Significant Difference) was calculated to compare means of significant effects at the 5% level. Ethical clearance was obtained for this project: Reference number, AIEC 21/19.

III. RESULTS AND DISCUSSION

Lipid oxidative stability of the cooked cow blood sausages are presented in figure 1. Significant effects on the TBARS of sausages were observed between salt treatments ($P=0.002$) and also over time ($P<0.001$). Sausage A exhibited significantly higher levels of malondialdehyde (MDA) compared to Sausage B, throughout the storage period. This might be due to the pro-oxidant effects of NaCl. Sodium chloride can increase the activity of ionic iron or decrease the activity of antioxidant enzymes [2,6].The lack of antioxidants in NaCl treated sausages allowed catalytic reactions to accelerate over time. The lower TBARS values of Sausage B, containing nitrites, were expected. Nitrite is a typical curing agent and acts against lipid oxidation by binding to heme and preventing the release of the catalytic iron [6]. According to literature, meat products remain non-rancid when MDA levels are under 2-2.5 mg MDA/kg [7]. The sausages analyzed exhibited MDA levels below 2 mg/kg, affirming their non-rancid status. The results for colour parameters, lightness (L*), redness (a*) and yellowness (b*) of the sausages are shown in Table 1. The a* and b* values were significantly affected by treatment

and storage period, respectively. Sausages containing nitrites salt displayed increased redness (P=0.018) compared to sausages containing NaCl throughout the storage period. Greater red colour is an indication of cured meat colour development [1]. The yellowness of both sausages decreased (P=0.031) at day 15 and remained unstable with no significant changes until the end of storage period.

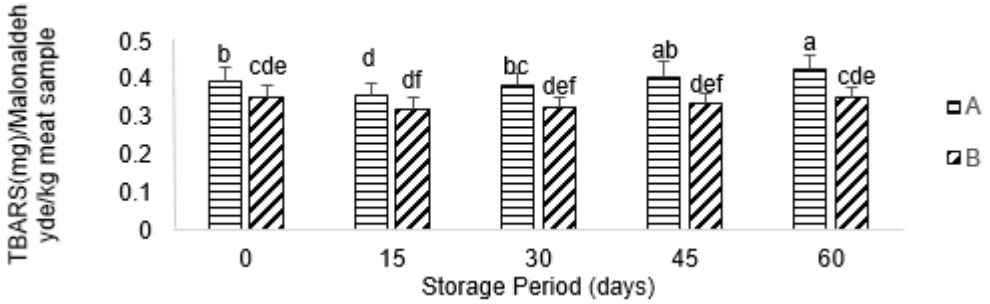

Figure 1. Lipid oxidation of cooked cow blood sausages at -10°C over 60 days storage period.

Treatment A=Sodium chloride, B=Sodium nitrites. Error bars represent standard deviations of means. Means with the same letter are not significantly different at the 5% level. Treatment (P=0.002), Day (P<0.001), Interaction Tmt x Day (P=0.137).

Table 1. Colour changes (mean ± standard deviation) of cooked cow blood sausages stored at -10°C for 60 days.

Cp	Tmt	Storage period (days)					P-values		
		0	15	30	45	60	Tmt	Day	Tmt x Day
L*	A	29.22 ± 3.59	28.59 ± 2.35	30.84 ± 4.71	26.85 ± 2.90	29.84 ± 4.30	0.614	0.168	0.779
	B	30.75 ± 4.05	29.67 ± 2.54	30.35 ± 1.24	28.39 ± 1.66	29.02 ± 3.38			
a*	A	8.15^{c} ± 1.80	8.47^{bc} ± 1.18	8.49^{bc} ± 2.32	9.72^{ab} ± 1.74	8.10^{c} ± 1.80	**0.018**	0.258	0.659
	B	10.37^{ab} ± 2.08	10.67^{a} ± 1.34	10.78^{a} ± 1.06	11.07^{a} ± 1.87	11.08^{a} ± 2.15			
b*	A	7.86^{bc} ± 1.24	7.71^{a} ± 0.71	8.92^{ab} ± 1.90	8.85^{ab} ± 2.05	7.66^{abc} ± 1.50	0.824	**0.031**	0.699
	B	7.67^{bc} ± 1.04	7.48^{a} ± 0.94	8.50^{ab} ± 1.10	8.33^{ab} ± 1.34	8.24^{abc} ± 2.10			

Cp= Colour parameters, Treatment (Tmt) A=Sodium chloride, B=Sodium nitrites.
Values with the same superscript for a colour parameter are not significantly different at the 5% significance level.

IV. CONCLUSION

Incorporating curing salt (Prague powder) in blood sausage formulations improved oxidative stability and enhanced colour retention compared to formulations with common salt.

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