CURING ALTERNATIVE FOR EMULSIFIED COOKED PORK SAUSAGES

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I. INTRODUCTION

Meat curing is an ancient process associated with the addition of nitrite to achieve meat preservation. The public debates about the potential carcinogenic effects of cured meat have left nitrite with a bad image. In addition, the consumer-driven demand for label-friendly meat products has challenged scientists to search for suitable alternatives. Attempts to identify an effective single replacement have been unsuccessful to date. The difficulty lies in finding an alternative that offers all the well-known benefits of nitrite. Nitrite salts simultaneously provide protection against lipid oxidation, alter colour and flavour, and serve as an important antimicrobial agent. Indeed, the best-known characteristic is its ability to suppress outgrowth of *Clostridium botulinum*. Kemin invented a special blend (RUBINITE™ GC Dry) [1] containing label-friendly ingredients including buffered vinegar, red radish powder, rosemary extract and green tea extract which working together can mimic each of the desired functions of nitrite. The objective of the current study was to confirm the indispensability of all blend constituents to act as curing alternative for emulsified cooked pork sausages.

II. MATERIALS AND METHODS

Different low-salt (1.2%) emulsified cooked pork sausages were prepared in duplicate containing kitchen salt (negative control), kitchen salt (1.2%) combined with RUBINITE GC Dry (0.4%) or combined with a blend constituent at equivalent concentration. A meat batter containing 72 ppm $NaNO_2$ was prepared as a positive control. The efficacy of the RUBINITE GC Dry blend and its constituents was evaluated during 8 weeks of storage at 7 °C. The last 72 h of the storage period the samples were subjected to continuous illumination to reproduce supermarket shelf conditions. For each replicate, the colour ($L^*a^*b^*$-values) of three sausage slices was measured and the colour difference to the initial colour of the positive control (ΔE^*-values) was calculated based on the average $L^*a^*b^*$-values. Additionally, outgrowth of inoculated *Clostridium botulinum* spores was measured. Analysis of variance (one way ANOVA) and multiple range tests (95.0 percent Least Significant Difference procedure) were performed using STATGRAPHICS® Centurion XVIII (Statpoint Technologies, Inc., Warrenton, USA) on following parameters: a^*-values, *anaerobic* counts.

III. RESULTS AND DISCUSSION

The initial colour of the sample prepared with RUBINITE GC Dry mimicked well the initial colour of the positive control ($\Delta E^* < 2.3$) [2]. During illuminated storage, the colour difference of the positive control rapidly increased (Fig. 1A). This was attributed to the decrease in the redness value (Fig. 1B). The colour and redness value of the samples containing red radish powder and RUBINITE GC Dry was more stable than of the sample prepared with sodium nitrite (Fig. 1).

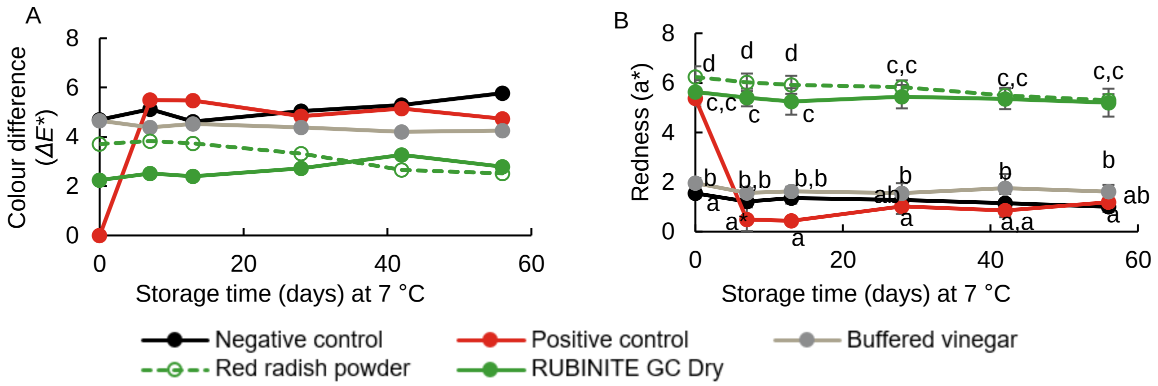

Figure 1. Colour differences (*ΔE**) (A) and redness values (*a**) (average ± standard deviation) (B) of low-salt emulsified cooked pork sausages stored at 7 °C including 72 h of illumination. Significant ($p < 0.05$) different redness values within one time point are indicated with different letters.

Outgrowth of inoculated *C. botulinum* spores was observed after 4 weeks of storage in the negative control, after 6 weeks in one replicate of the samples prepared with only red radish powder and after 8 weeks in one replicate of the sausages prepared with only buffered vinegar. The challenge test indicated no outgrowth of *C. botulinum* in the positive control sample nor in the sausages prepared with 0.4% RUBINITE GC Dry.

Table 1. Anaerobic count (log_{10}CFU/g) of the low-salt emulsified cooked pork sausage before and after storage at 7 °C.

	Treatment (average)					Pooled standard error	P-value
Storage time	Negative control	Positive control	Buffered vinegar	Red radish powder	RUBINITE GC Dry		
0 days	3.7^{a}	3.7^{a}	3.7^{a}	3.6^{a}	3.1^{a}	0.3	0.5696
14 days	3.9^{a}	2.3^{a}	2.5^{a}	2.4^{a}	2.7^{a}	0.6	0.3875
28 days	5.9^{a*}	2.4^{b}	2.4^{b}	2.4^{b}	2.7^{b}	0.3	0.0009
42 days	6.0^{a*}	2.2^{b}	2.4^{b}	4.1^{ab*}	2.4^{b}	0.6	0.0170
56 days	4.3^{ab*}	2.2^{c}	3.2^{abc*}	5.2^{a*}	2.3^{bc}	0.6	0.0490

Significant ($p < 0.05$) differences within one time point are indicated with different letters. Significant outgrowth within one treatment (> 0.5 log_{10}CFU/g) [3] in at least one replicate is indicated with *.

IV. CONCLUSION

The colour stability of the sausages made with the special blend outperformed sodium nitrite. The presence of all RUBINITE GC Dry constituents were critical to control outgrowth of *C. botulinum.* The results of the current study demonstrate that RUBINITE GC Dry might be a valuable alternative for sodium nitrite for emulsified cooked pork sausages.

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