USE OF POTASSIUM CHLORIDE AS SALT REPLACER IN REDUCED-SALT BACK BACON RASHERS: IMPACT ON SHELF LIFE

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Abstract – Two different formulations of reduced-salt back bacon rashers were produced: control rashers (C) with a salt level of 1.25% and rashers with the same salt level plus 1.25% of potassium chloride (KCl). The rashers were packaged under modified atmosphere (75% N_2, 25% CO_2) and stored at 6 °C for two thirds of the storage time and at 8 °C for the remainder. Their shelf life was analysed at day 8, 18 and 25 in terms of colour, pH, water activity, lipid oxidation (TBARS) and microbial stability. The use of KCl resulted in rashers with less lightness, redness and yellowness. The microbial shelf life was increased by 5 days when using KCl as a salt replacer.

Key Words – total viable counts, processed meat, reduced sodium

I. INTRODUCTION

High sodium consumption increases systolic blood pressure and leads to hypertension, a major risk factor in cardiovascular disease; salt provides 90% of the sodium consumption in the human diet [1]. In Ireland, one fifth of the salt intake comes from processed meat, bacon being one of the main contributors [2]. Salt has an important role in meat products as it not only helps provide the characteristic salty taste and flavour, but it is also essential in the development of the correct texture and acts as a preserving agent [3]. In previous experiments our group showed that salt reduction in back bacon rashers was viable in terms of technological and sensorial properties with the use of potassium chloride (KCl) as a salt replacer. In this study we aim to observe the effect of salt reduction on the shelf life of back bacon rashers in terms of colour, lipid oxidation and microbial counts.

II. MATERIALS AND METHODS

Six pork loins were purchased from a meat supplier (Rosderra, Edenderry, Ireland) and transported to the meat processing facility at Teagasc Food Research Centre Ashtown. Brines were prepared according to each formulation, the control (C) containing only sodium chloride (1.25%) and sodium nitrite (150 ppm) and (K) with potassium chloride (1.25%), sodium chloride (1.25%) and sodium nitrite (150 ppm). Each loin was randomly assigned to a formulation; hence, each formulation was repeated three times. The loins were pumped to 113% of their green weight using a 20-needle brine injector (Inject-O-MAT type PSM-21, Dorit Maschinen, Handels AG, Switzerland), weighed, vacuum packed and left to mature at 0-4 ºC for 48 h. The bacon was frozen to -5 ºC before being sliced and packed under modified atmosphere (75 % N_2, 25 % CO_2) with two slices per tray and three trays per sampling day and batch. Shelf life analysis followed the recommendations from the Food Safety Authority of Ireland [4] regarding storage time and temperature: two thirds of the storage time at 6 °C (representative of the 75th percentile of the chill chain in Ireland) and one third at 8 °C (representative of the 75th percentile of domestic refrigeration temperatures in Ireland). The following analysis took place at day 8, 18 and 25: Gas composition was measured with a headspace gas analyser, bacon colour was analysed using a Hunterlab Ultrascan XE spectrophotometer (CIE L*a*b system); TBARS as in Delgado-Pando *et al.* [5]; pH using an Orion 420A pH-meter ; water activity with the Aqualab Lite meter (Decagon Devices Inc., Pullman, WA); and ISO 4833-2:2013, 15214:1998, 13722:1996, 13720:2010 were followed for the analysis of total viable counts (TVC), lactic acid bacteria (LAB), *Brochothrix Thermospacta* and *Pseudomonas spp*, respectively.

III. RESULTS AND DISCUSSION

Gas composition did not significantly vary during the storage time for any of the formulations; presence of oxygen in the measured trays was always below 0.5 %. Colour was significantly affected ($p<0.05$) by both the use of a salt replacer and storage time. Control bacon rashers were lighter, redder and yellower than the samples with potassium chloride. During storage, redness of both formulations decreased significantly ($p<0.05$) from 4.64 to 2.20 and from 2.11 to 1.11, for C and K samples respectively. This discoloration during storage could be attributed to the residual oxygen, as it has also been observed in cooked ham [6]. Lipid oxidation was very low for both formulations, being significantly higher for sample K at the end of storage, where sample K reached a level of 0.22±0.05 mg MDA/kg sample and the control was 0.08±0.03 mg MDA/kg sample. pH values were also influenced by the formulation and storage time, ranging from 5.30-5.49 for C and 5.28-5.71 for K. The use of KCl increased the pH ($p<0.05$) when compared to the control sample from day 8 of storage. At day 25, in both samples the pH was significantly higher than the initial one. No significant differences were found in the water activity of both formulations during storage, levels were around 0.970 for both samples.

Figure 1 shows the variation of TVC and LAB counts of both formulations during storage. LAB were the predominant bacteria. Commercial rashers (standard salt content of 2.6 %) have a shelf life of 30-40 days. Reduced-salt control rashers reached their microbial shelf life at 15 days, whereas this was increased by 5 days when using KCl as a salt replacer. The counts for *Pseudomonas* and *Brochothrix* were below the detection limit during the whole storage period and for both formulations.

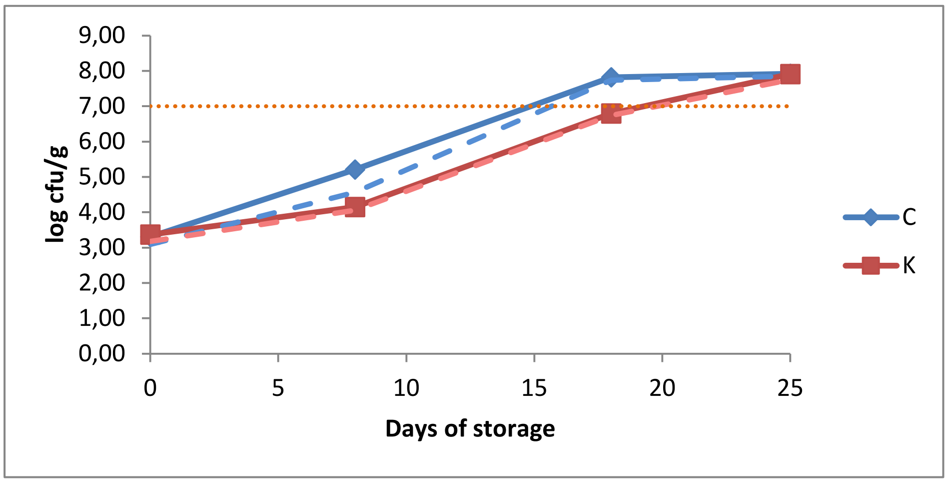

Figure 1. Total Viable Counts (continuous lines) and Lactic Acid Bacteria (dashed lines) of back bacon samples, C and K.

IV. CONCLUSION

A reduction of sodium content greatly reduced the shelf life of back bacon rashers. The use of potassium chloride as a salt replacer appears to be a good strategy to partially overcome this issue.

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