Effect of the incorporation of Sea Spaghetti, Himanthalia elongata, on product functionality and shelf stability in reduced-salt beef burgers

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Introduction: Beef burgers are a popular product, but are a significant source of salt and fat in the diet, where the daily sodium adult intake can be three times the recommended daily allowance, contributing to increased risk of chronic diseases including obesity, cancer and stroke. Salt however, has an essential function in meat products in terms of flavour, texture and shelf-life (Inguglia et al., 2017). Seaweeds are rich sources of minerals, which can act as flavour enhancers and may replenish lost flavour in reduced salt processed meat products. Additionally, seaweed ingredients have received a lot of interest in recent years as functional ingredients since their addition to meat formulations can be a source of polysaccharides, providing bioactive substances, fibre and additional umami flavours to reduced sodium products (Cofrades et al, 2017). Therefore, the aim of this project is to reduce the salt content in beef burgers in a clean label fashion through the incorporation of the seaweed ingredient, Sea Spaghetti (Himanthalia elongata).

Material and methods: Beef chucks (95% visual lean) were manually trimmed of excess fat and connective tissue and coarsely ground through a 7.5-mm sieve in a mixer mincer. Dry ingredients were manually mixed in for 3 min before the mixture was minced using a 3-mm sieve plate. A total of 10 formulations were developed; a control containing 1% salt (S), reduced salt formulations made with a 50% salt reduction and increasing levels of seaweed (SW) ranging from 0.5 - 5%, and lastly, formulations in which salt was fully replaced by SW in levels ranging from 0.5 - 5%. Physicochemical analysis to monitor composition, cooking loss, water holding capacity, colour changes, lipid oxidation status (TBARS) and instrumental textural changes of the different product formulations were undertaken along with microbiological analysis for detection of Total Viable count (TVC) and Enterobacteriaceae on plate count agar (PCA) and Violet Red Bile Glucose agar (VRBG), respectively, on patties stored under modified atmosphere packaging (MAP) of 80% O2: 20% CO2.

Results: The addition of seaweed (2.5, 5%) led to a significant reduction in cook losses compared to 1% salt (control). The formation of TBARS over storage significantly decreased in reduced salt beef burgers with addition of 1, 2.5 and 5% seaweed. The reduction ($P<0.05$) became more noticeable over time, to the point where no changes were observed in the oxidation levels after 6 days of storage in samples formulated with 5% SW. The results of texture profile analysis indicated that compared to the control, addition of SW (2.5 and 5%) increased the hardness of patties containing 0.05% salt. For microbiological analysis the limit of acceptability was set to 6 log (CFU/g of meat). Results showed that after 6 days of storage at 4oC counts for Enterobacteriaceae were below detectable limits in all formulations and TVC counts were <6 log (CFU/ g of meat).

Conclusion: In conclusion, the development of functional foods opens new possibilities for the industry to improve its "image" and address consumer demands for healthier foods; seaweeds ingredient can play an important role in developing products with good technological performance that contain less sodium. In addition, seaweeds increase antioxidant activity in meat products, which can improve oxidative stability during processing and storage and as suggested by the microbiological studies, even in the absence of added salt, can help to maintain the microbiological quality of the products.

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Literature:

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