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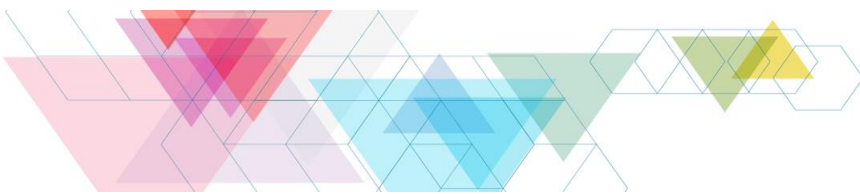
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Salt replacement by *Salicornia ramosissima* to reduce biogenic amines formation in fish

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Salicornia ramosissima is frequently used as a salt replacer due to its high salt content. Its richness in phenolics, organic acids, minerals, and fiber make it an interesting natural preservative. The impact on biogenic amines formation from replace salt by seasoning fish products with salicornia has not been explored. Biogenic amines (BA), including histamine (HIM), cadaverine (CAD), putrescine (PUT), 2-phenylethylamine (2-FEN), tryptamine (TRI) and tyramine (TIR) are a group of undesirable compounds that can arise in foods, such as fish during its shelf-life. Their consumption by susceptible individuals can lead to poisoning, especially histamine [1]. Therefore, reduction of their formation during shelf-life of fish products is of major relevance. The objective of this work was to explore the possibility of using *Salicornia ramosissima* in the formulation of fish hamburgers (salmon and hake) to replace salt seasoning (1%) and protect against biogenic amines formation.

Biogenic amines were analysed by reverse phase HPLC with fluorescence detector, after acid extraction and derivatization with dansyl chloride. On the day of fish acquisition (day 0), salmon presented 5.0, 1.7 and 1.2 mg/kg of HIM, PUT and CAD, respectively and hake presented 8.3, 0.6 and 0.3 mg/kg of HIM, PUT and CAD, respectively. In both fishes tryptamine was detected but not quantified (< 0.487 mg/kg) and 2-FEN and TIR were not detected. On day 2, a considerable increase of all BA was observed in salmon burgers (Σ BA control salmon = 257 mg/kg). The salicornia seasoning led to a mild inhibition of BA formation in those hamburgers, without statistical significance (Σ BA 226 mg/kg). On days 5 and 8, a considerable increase in BA continued to be observed. However in hake, on day 2, the increase in BA was negligible (Σ BA control: 12.6 mg/kg), and no significant effects could be observed by the addition of salicornia (7.9 mg/kg). However, on day 5 (Σ BA control = 56.0 mg/kg), a significant reduction ($p < 0.05$) of the total BA content was observed in the hamburgers seasoned with salicornia (Σ BA = 42.6 mg/kg), especially by inhibition of cadaverine formation (38.2 mg/kg vs 18.0 mg/kg). By day 8, the Σ BA of the control burgers increased to 117 mg/kg, whereas in burgers with salicornia BA content was similar to that observed on day 5 (42.9 mg/kg). Salicornia salt was not able to significantly prevent BA formation in salmon samples. Contrary to hake burgers, in which a strong inhibition of total BA was observed on days 5 (~ 50%) and 8 (~ 80%), this effect being greater than that observed by the addition of salt (~ 20% on day 8), and especially observed in cadaverine.

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References:

- [1] WHO/FAO Public Health Risks of Histamine and Other Biogenic Amines from Fish and Fishery Products. Meeting Report; 2013 ISBN 9789241564670