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FOOD INTEGRITY

5th FOODINTEGRITY CONFERENCE

Nantes, France

14-15 November 2018

Assuring the integrity of the food chain: Delivering real world solutions



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DIFFERENTIATION OF PRODUCTION METHOD AND GEOGRAPHICAL ORIGIN OF SALMON BASED ON THE ANALYSIS OF FATTY ACID COMPOSITION

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Currently, aquaculture production supplies almost 50% of the global fish market, as a response to the increasing global demand for fish [1]. However, several consumers prefer wild over farmed fish, with the former generally attaining higher prices when the same species is considered. Therefore, there is the need to assure correct information, not only about the species, but also about the production method (farmed vs. wild) and the catch origin of fish. Salmon, a high-trophic-level carnivorous species with high economic value due to its popularity, is among the fish species that is frequently produced in aquaculture. Although the feed given to farm-raised salmon is designed to meet its nutritional requirements, it can present differences compared to the diet of wild salmon that can be reflected on the muscle composition of farmed versus wild salmons. Therefore, in this work, the use of fatty acid composition combined with chemometrics was evaluated as a potential tool to authenticate salmon samples. In particular, the work aimed at identifying the geographical origin and production method (farmed vs. caught in the wild) of salmon.

For that purpose, several salmon specimens were analysed, namely specimens caught in the wild in West of Vancouver Island, Canada (n=25) and farm-raised specimens from Canada (n=25), Chile (n=24) and Norway (n=25). Two lipid extraction methods (Soxhlet extraction with n-hexane and an adaptation of the Bligh and Dyer extraction method) and two derivatization procedures (alkaline transmethylation using KOH and acid-catalysed transmethylation using BF3/MEOH solution) were tested. Fatty acid methyl esters (FAME) were analysed by gas chromatography (GC) in a Shimadzu GC-2010 Plus gas chromatograph equipped with a Shimadzu AOC-20i auto-injector, a flame ionisation detector (FID) and a CP-Sil 88 silica capillary column (50 x 0.25 mm i.d, 0.20 μm). The injector and detector temperatures were 250 and 270 °C, respectively. The compounds were identified by comparison with standards (FAME 37, Supelco). Based on the obtained results, the modified Bligh and Dyer method was chosen for lipid extraction since it allowed obtaining higher amounts of long chain unsaturated fatty acids, particularly of docosahexaenoic acid (DHA). Similar results were obtained for both tested derivatization methodologies.

In general, the four groups of salmons showed different profiles (Figure 1), with wild specimens presenting significantly higher contents of health beneficial omega-3 fatty acids, in particular DHA and eicosapentaenoic acid (EPA), while farmed salmon

presented significantly higher amounts of oleic and linoleic acids. Linear discriminant analysis evidenced a clear separation of four groups. Among the three groups corresponding to the farmed salmons with different origin, salmons from Chile and Canada were more similar, with salmons from Norway being more distinctive mainly due to their lower levels of saturated fatty acids and higher of α-linolenic acid.
The results of this study emphasize the effectiveness of chemometrics tools for fish traceability purposes since both production method and geographical origin could be distinguished by the analysis of fatty acids profile coupled with chemometrics.

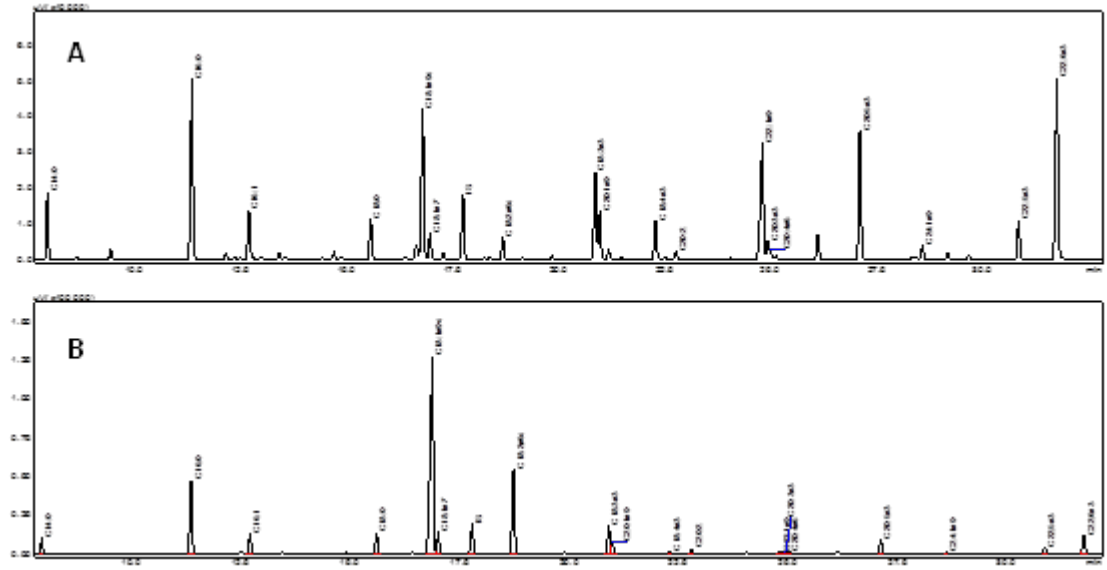

Figure 1. Chromatogram obtained from the GC-FID analysis of a wild (A) and a farmed (B) salmon sample.
The results of this study emphasize effectiveness of chemometrics tools for seafood traceability purposes.

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