From Matrix to FAME: Rapid Profiling of Fatty Acids

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The advancement of food science is crucial to ensure consumer safety and to accurately detect misleading information regarding the origin and quality of food products. Over the past 70 years, food science has seen the development of numerous techniques aimed at optimizing sample preparation methodologies and enhancing chromatographic analysis to accurately elucidate the fatty acid profiles in diverse matrices, including both animal and plant sources.
To address the complexities of fatty acid analysis while minimizing costs, time, and potential interferences, traditional methods such as Soxhlet extraction have been largely replaced by modern techniques like ultrasound extraction and accelerated solvent extraction (ASE).
For achieving high-resolution fatty acid profiles, gas chromatography remains the preferred method, however, the choice of column, detector, temperature program, and other parameters can vary significantly among researchers.
In this study, we developed a comprehensive sample preparation and analytical method that achieves fatty acid profiling from raw samples in under 90 minutes, utilizing ASE[1] (extration procedure), derivatization[2] and a 20-minute chromatographic run, by employing a wax column measuring 30 meters in length, 0.25 mm in diameter, and with a 0.25 µm film thickness. It was possible to chromatographically resolve the fatty acid profile of complex samples, such as fish tissues. The method effectively separated fatty acids, ranging from capric acid (C8:0, retention time 2.94 minutes) to docosahexaenoic acid (DHA, C22:6ω3, retention time 17.42 minutes).
In conclusion, we believe that this method enables more rapid sample preparation and analysis while achieving superior separation in a shorter time compared to previous methodologies[1].

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