RETASTE Conference Abstracts
RETASTE-HAR-1400-Virtual Oral
Rethymno, September 16-18, 2026
© Author(s) 2026 CC BY 4.0 License
DOI:10.5281/zenodo.23678103

Apricot and Plum Cold-Pressed Kernel Oils: Thermal Behaviour Dependent on Triacylglycerols Nature

Ionita Daniela and Cristea Mariana

Physics of Polymers and Polymeric Materials Department, "Petru Poni" Institute of Macromolecular Chemistry, 41A Grigore Ghica Voda Alley, Iasi, 700487, Romania

ACCEPTED

Abstract

Cold-pressed apricot and plum kernel oils were characterized to evaluate the impact of triacylglycerol (TAG) composition on their thermal properties, establishing novel structure–thermal behavior relationships for these high-value stone fruit oils. The quantification of fatty acids composition – total saturated fatty acids (SFA), monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) – was performed by detailed NMR studies (^{1}H, ^{13}C, ^{1}H-^{13}C HSQC, ^{1}H-^{13}C HMBC) by integrating the different proton environments and the targeted detection and characterization of fatty acids and predominant triacylglycerols were performed by HPLC-ESI-MS. The triacylglycerol composition of apricot and plum kernel oils played a decisive role in shaping their differential scanning calorimetry (DSC) profiles by modulating the melting and crystallization behaviour through differences in acyl-chain packing and unsaturation degree. The broad overlapping transitions with multiple shoulders observed in the low temperature range of the second heating scan were mainly associated with the heterogeneous composition, structural diversity and polymorphic behavior of TAG species. Different thermal protocols, including controlled cooling and heating programs were applied to achieve a better separation and interpretation of overlapping thermal events with the aim to discern between the influences of polyunsaturated and monounsaturated fatty acids. The melting and crystallization behavior was significantly affected by TAG polymorphism, as the formation of distinct crystalline arrangements generated complex phase transitions and differences in crystal stability. The modulated DSC approach provided a deeper insight into the melting and crystallization processes occurring in the oils during heating by separating the overlapping exothermic crystallization events from the endothermic melting transitions, thus providing improved characterization of polymorphic transitions and crystalline phase stability. The results provide deeper insights into the relationship between the TAG composition and thermal behavior in stone fruit kernel oils and highlight the importance of optimized thermal protocols for resolving complex polymorphic transitions. These findings contribute to a better understanding of the thermal behavior of natural oils, paving the way for their optimized use in various applications.

Keywords: apricot, plum kernel oil, thermal properties, modulated differential scanning calorimetry