Stability of Added *gamma*-oryzanol during Sunflower Oil Heating at Frying Temperatures: Kinetics and Degradation Products

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Compounds with potential antioxidant capacity are frequently added in order to increase oil stabilty during food thermal processing. Nowadays, there is a growing interest in those obtained from Food industry by-products. *Gamma*-oryzanol, present in rice bran, is composed mainly of ferulic acid esters of triterpene alcohols (cycloartenol, 24-methylenecycloartanol) and of sterols (campesterol, *beta*-sitosterol). Although it is considered a radical scavenger, ferulates degrade upon heating. Thus, understanding their fate during common thermal processing is crucial. However, limited research has been addressed on this subject and even less regarding the characterization of their degradation products. In this context, the fate of *gamma*-oryzanol when added at 0.5% and 1% to sunflower oil during heating at 170 °C in the absence of food was studied. The degradation of *gamma*-oryzanol was monitored by Proton Nuclear Magnetic Resonance Spectroscopy (^{1}H NMR), while the resulting degradation products were identified using Direct Immersion Solid-Phase Microextraction followed by Gas Chromatography-Mass Spectrometry (DI-SPME-GC/MS).

^{1}H NMR results showed that, regardless the level of enrichment, triterpenyl alcohol and steryl ferulates exhibited first-order degradation kinetics, resulting in a similar overall loss of about 60% after 36 h of heating. The generation of six compounds derived from the ferulic acid moiety after the ester bond cleavage of *gamma*-oryzanol was observed by DI-SPME-GC/MS. These were mainly vanillin, followed by acetovanillone, 4-vinylguaiacol, scopoletin, 4-methylguaiacol (creosol), and guaiacol. Free triterpernic alcohols and sterols were also detected, but their abundances did not increase, possibly because their degradation rate exceeded that of their formation.

Acknowledgments: Grant PID2021-123521OB-I00 funded by MCIU/AEI/10.13039/501100011033/ and by “ERDF A way of making Europe”, and EJ-GV IT1490-22. S.A-P. thanks UPV/EHU for a predoctoral contract (PIF22/35).