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Program and Abstract Book

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sciforum-102026: Monitoring the Fermentation of cv. Kalamata Natural Black Olives Using Raman Spectroscopy

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Kalamata table olives are of great significance for the economy of the table olive industry in Greece. Consequently, it is crucial to monitor the fermentation process of cv. Kalamata table olives to ensure product quality and safety. This study aims to evaluate the efficiency of Raman spectroscopy, as a rapid and non-destructive analytical technique, in monitoring the table olive fermentation process. For this purpose, natural cv. Kalamata black olives were fermented according to industrial practice in 7% (w/v) NaCl salt for 145 days. Four substitution levels of NaCl by KCl were performed: namely 0, 25, 50, and 75% (w/v). Raman spectra were acquired from the surface of olives from four spots of three different olive fruits sampled from each fermentation vessel. The spectra were analyzed using Partial Least Squares Regression (PLS-R) in order to correlate spectral information with the population of lactic acid bacteria (LAB) and yeasts, pH changes, and lactic acid concentration in terms of titratable acidity measurements. Orthogonal Partial Least Squares Discriminant Analysis (Ortho PLS-DA) was also employed to discriminate among the olive fruits fermented exclusively in NaCl against those fermented in different NaCl substitution levels. The most efficient PLS-R models provided R^2 and RMSE scores for Cross Validation of 0.65 and 0.81, 0.44 and 0.58, 0.63 and 0.39, and 0.56 and 0.11 for LAB, yeasts, pH, and % lactic acid, respectively. Ortho PLS-DA successfully discriminated olive samples fermented in NaCl from olive samples fermented in various levels of NaCl substitution by KCl. Overall, the results obtained in this work provided promising perspectives for the use of Raman spectroscopy as a rapid and non-invasive technique to monitor table olive fermentation.