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Nmr and ft-ir characterization of pleurotus mushrooms cultivated on agro industrial wastes

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Introduction: The exploitation of agro industrial wastes for the production of value-added products, like mushrooms, is in line with the concept of recycling and sustainability. Mushrooms' consumption is constantly increasing due to their health benefits and organoleptic characteristics, with *Pleurotus* species being widely commercialized worldwide.

Methods: The present study aimed to assess the effect of substrates enriched with wine and olive oil production wastes on *Pleurotus ostreatus*, *P. eryngii*, and *P. nebrodensis* metabolite profiles. Substrates tested were wheat straw (control), grape marc, olive leaves and two-phase olive mill wastes, in mixtures or separately. Harvested mushrooms were freeze-dried, homogenised and their NMR and ATR-FTIR spectra were recorded.

Results: The untargeted monitoring protocol utilized the 1D NOESY-PRESAT pulse sequence and achieved the identification of 106 metabolites, 32 of them detected in *P. nebrodensis* only. Metabolites such as free amino acids, carbohydrates, nucleotides, and organic acids were correlated with the clustering of samples. The performance of ATR-FTIR spectroscopy indicated changes in these compounds e.g. carbohydrates, amino-acids, organic acids according to the substrate used. For instance, spectra of mushrooms cultivated on substrates containing olive sector by-products revealed stronger absorption intensities in regions related to aromatic compounds (e.g. phenolics), while those cultivated on wheat-straw and grape marc in regions related to carbohydrates. To a step further, chemometrics were implemented in both spectral data. PCA differentiated the samples according to species, and highlighted information related to cultivation substrates.

Discussion: Overall, the three *Pleurotus* species responded in a different manner by selectively absorbing organic compounds, producing value-added mushrooms. It was the first time that the critically endangered *P. nebrodensis* was studied by NMR and ATR-FTIR.

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