The use of SFE and PLE to revalorize low-quality black truffle (*Tuber melanosporum*)

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Truffles are a well-known worldwide product mainly appreciated for their unique aroma. According to the current truffle categorization (UNECE Standard FFV-53) [1], only physical aspects were considered to evaluate truffle quality. Therefore, the non-classified truffles, mainly because damage or small size, are categorized as low quality and achieve minor prizes. So, they could be a potential source of flavoring and bioactive compounds that can be extracted (revalorizing these other truffles) and used to design natural extracts to improve the aroma and the quality of truffled products acting as flavor enhancers.

A workflow (Figure 1) using supercritical fluids and pressurized liquids were carried out to maximize the target compounds extractions. Firstly, several parameters such as time, pressure and flow rate were optimized and using HS-GC-MS (head space – gas chromatography) and GC-O (olfactometry) to study aromatic compounds from the extracts [2]. After SF application, the residue was submitted to pressurized liquids (water, ethanol and a combination of them) to obtain several compounds [3]. In addition, the bioactivity (antioxidant, antidiabetic and immunomodulatory) of the extracts was tested.

As results, we optimized the aromatic extract process with SF, extracting a total of 95 aromatic compounds such as hydrocarbons, alcohols, aldehydes, esters, ketones, benzene derivatives and sulphur compounds. The use of oil as trapping material in SFE process, such as gelatin or oil, allowed capturing of higher sterols levels in truffle extracts than the other matrices. So far, there is no aromatic extract that evokes the real smell of truffles to use it as food flavoring, except ours.

T. melanosporum is a potential source of bioactive compounds. Different conditions of PLE (time, temperature, solvent) were tested but the combination 180 ºC-30 min was able to extract the highest content of polysaccharides (with water) and fungal sterols (with ethanol) from truffles showing immunomodulatory, antioxidant and antidiabetic activities. Besides, the black truffle polysaccharide structure and links were determined in PLE extracts by NMR due to its concentration.

In conclusion, the use of SFE and PLE allow for an efficient enrichment of molecules underlying the bioactivity, aromaticity and flavor of black truffle. These results opened a new direction in the revalorization of the truffe world.

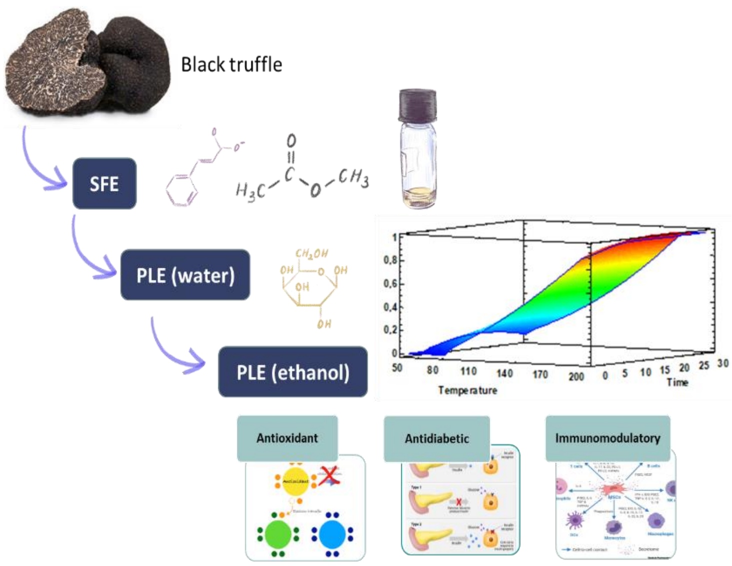

Figure 1. Black truffle bioactive and flavoring compounds flow extraction optimization and their potential bioactivities.

References

[1] UNECE Standard FFV-53 recomendation, 2017.

[2] Tejedor-Calvo, E. et al. Supercritical CO2 extraction method of aromatic compounds from truffles. LWT, 2021, 150, 111954. http://doi.org/10.1016/j.lwt.2021.111954

[3] Tejedor-Calvo, E. et al. Screening of bioactive compounds in truffles and evaluation of pressurized liquid extractions (PLE) to obtain fractions with biological activities. Food Research International, 2020, 132, 109054. https://doi.org/10.1016/j.foodres.2020.109054