

Antioxidant Activity and Total Phenolic Content of Oils Extracted from *Pinus pinaster* Sawdust Waste. Screening of Different Innovative Isolation Techniques

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Abstract:

Essential oils from *Pinus pinaster* sawdust waste was extracted using different technologies including conventional hydrodistillation method (HD) and some intensified technologies namely turbo-hydrodistillation (THD), ultrasound assisted extraction HD (UAE-HD) and two microwave techniques; microwave hydrodiffusion and gravity (MHG) and solvent-free microwave extraction (SFME). The essential oils were qualified and quantified using chromatography coupled to mass spectrometry analysis. The analysis of the oil has resulted in the identification of 45 components; α -terpineol and β -caryophyllene were the main components. The antioxidant activity was assessed by diphenyl-1-picrylhydrazyl (DPPH) free radical scavenging activity and ferric reducing antioxidant power (FRAP) assays. The highest radical-scavenging activity was obtained for the two microwave techniques with IC_{50} value about 15 $\mu\text{g/ml}$, followed by the other techniques for which IC_{50} ranged between 59.8 and 123 $\mu\text{g/ml}$. For FRAP assay, the same classification was obtained with the highest values of 0.598 and 0.591 $\mu\text{g/ml}$ for respectively microwave extractions (MHG and SFME) and 0.307, 0.322 and 0.401 $\mu\text{g/ml}$ respectively for HD, THD and UAE-HD. DPPH and FRAP assays were found to be highly correlated. The total phenolic compounds (TPC) were more present in microwave extracts (78.5 and 74.6 GAE/g extract) respectively for MHG and SFME) compared to other technique for which the values ranger between 54.1 and 56.6 GAE/g extract. TPC were correlated with DPPH and FRAP ($R^2 > 0.95$; $p < 0.01$) indicating that the total phenols are highly contributes to the antioxidant activity.