Abstract

Isolation of active ingredients and pharmacologically active components from natural products is often accomplished using organic solvents. During this process, liquid organic solvents are discarded to the natural environment and volatile compounds are released to the atmosphere as airborne particles or vapor. Further, the unavoidable settling of some of those hazardous residues with the final product is considered a drawback. Hence conventional organic solvents and techniques need to be replaced with environmentally benign and cost-effective extraction media and methods that have the ability to improve product quality. The research utilizes a supercritical fluid (SCF) in the extraction mechanism named supercritical fluid extraction (SFE) as the replacement.

The most outstanding achievement in this research is the proven capability of SFE to carryout selective extractions from a natural matrix. This research used supercritical carbon dioxide [CO_2] to extract and determine compounds that brings-about the fragrance of Jasmine (*Jasminum sp.*), as a case example, while demonstrating sensitivity and selectivity of the method. The rationale is that, the yield of an extraction of volatile compounds such as aromatics is almost negligible in conventional extraction methods as opposed to SFE where yield is considerably high.

The instrument made a feed of liquid CO_2 to transform itself between a gaseous and supercritical form. Experimental conditions were adjusted to convert the CO_2 feed into its supercritical form just before the actual extracting stage. This achieved a combination of near extraction solvent power of a liquid and higher diffusion co-efficient of a gas which attributed to the desired extraction under supercritical condition. Selectivity of supercritical (SC) CO_2 was high and remained adjustable at both extraction and releasing stages of the process. The end result was a higher yield, a definite advantage in trace analysis. The returning of CO_2 to gaseous phase precipitated extracted material solvent free, with gaseous CO_2 being the only effluent. The method was also a test for extracting directly from solid sample/s, with and without the use of a desiccant. SFE is also gifted with the advantages of non oxidation and lesser thermal degradation of extract / analyte as proven in this research.

Conditions of the extraction were optimized to result in 0.03 g to 0.13 g of analyte/s being extracted from the matrix. Those were trapped by 5 cm^3 to 8 cm^3 of isopropyl alcohol. Same amount of analyte would have involved bulks of both sample and solvent, tedious processes and high exposure levels in conventional solvent extraction.

The extractions obtained under several combinations of pressures and temperatures were then tested to determine chemical components. Presence of the analyte was screened specially by a gas chromatography coupled mass spectroscopic analyzer (GCMS). Method development also optimized conditions by seeking the best combination that yields optimum purity of the major compound (cis-jasmone) and its associates sought. Therefore, combinations of values of pressure and temperature specific to respective compounds could be defined for SFE. This was a major selectivity advantage over other methods of separation.

Development of SFE carries great efficacy in countries such as Sri Lanka, where percentage of endemic flora is considerably high. There still remain much of it undiscovered despite extracts of plants from tropical rainforests and tropical seas being highly sought after. Therefore, countries such as Sri Lanka should start using SFE to utilize its indigenous resource base in both analytical and industrial scale while ensuring safe environmental standards in the process.