

Review: Effect And Application Of Polar Solvents With Different Polarity On Increasing Temperature In Extraction Of Bioactive Compounds

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Abstract

Bioactive compounds are nowadays an important group of organic compounds from natural sources that are useful in a number of fields. Because they possess different pharmacological properties, finding the proper extraction conditions for their separation from plant matrices is a very important step. In this review Liquid Extraction (LE) under different temperature conditions and with different types of extraction solvents were reported. On literature survey it is found that as a matrix, different plant part has been used. A simple high-performance liquid chromatographic method and extraction method mostly used for separation. UV Spectroscopy is used for quantitative analysis of the main component. Different plant species such as Umbelliferone, xanthotoxin, angelicin, isopimpinellin, bergapten, imperatorin and isoimperatorin were investigated and all extracts in generally in the range of 9.91 ± 0.01 – 19.93 ± 0.03 and 10.19 ± 0.98 – 19.05 ± 0.02 mg/100 g, respectively. Dichloromethane, Acetone, Ethanol and methanol were chosen as the most proper suitable solvents for extraction. By increasing the temperature, the amount of extracted material increases in petroleum ether and dichloromethane extracts.

Keywords: Bioactive compounds, Polar solvent, Temperature, Plant matrices

Introduction:

It is found that the major goals for chemist is to transfer as many of molecules of interest possible from the matrix without interfering any substances [1,2]. Mostly liquid-solid liquid-liquid extraction methods is used in many laboratories. Extraction has been the leading technique used for a long time and still is considered to be a standard technique and the main reference to which all other new extraction methods are compared [3]. This method requires organic solvents and long extraction times. Additionally slow analyte diffusion and desorption from the sample matrix to the extraction fluid are characteristic. Extractions also generate dirty extracts, for which clean-up process is necessary [4]. One of the most popular techniques nowadays is Liquid Extraction (LE), also known as Accelerated Extraction (AE). The technique is today well-established and has been used for the extraction of a great variety of compounds from numerous matrices [1]. Compared to classic extraction in a Soxhlet apparatus, complete LE can be achieved in shorter time with a small volume of organic solvent and much better penetration of sample by the solvent [3]. Extraction parameters investigated in order to produce an new methodology, but exhaustiveness very often leads to co-extraction of interfering matrix components, thus the selection of the proper solvent which must be able to solubilize the analyte and minimize co-extraction of other matrix components, is very important.

For extraction of pharmacologically active compounds several methods have been applied, as well as different extraction solvents. On literature survey it seems that some previous experiments showed that the best single solvent for extraction in petroleum ether. Small amounts of organic modifiers, e.g., petroleum ether +30%

dichloromethane, decreasing the extraction time [5]. For eg, Fruits of *Heracleum candicans* were extracted in room temperature with methanol and aqueous solutions of methanol. It was found to be maximum in 30% aqueous methanolic extract, while the maximum concentration found in the pure methanolic extract [6]. The extraction of bioactive compound of biological interest was carried out by Waksmundzka et al. [7]. Initially, solvent was used is petroleum ether, usually used in selective extraction of fraction from plant tissues, was employed, whereas the more polar compounds were extracted with methanol. LE, in most cases, was the most suitable for extraction compared with the other tested methods [7]. Similar results were achieved for other also [8]. Bioactive compounds are nowadays an important group of organic compounds from natural sources that are useful in a number of fields. Because they possess different pharmacological properties, finding proper extraction conditions for their separation from plant matrix is a very important step. As the LE method was found as one of the most proper methods for extraction.

It seems that most of research papers deals with the extraction must be performed with the most adequate solvent and under ideally predetermined analytical conditions of temperature [9]. Initially the extraction solvent must be able to solubilize the analytes and minimize the co-extraction of other matrix components. On choosing the different extraction solvent, it is also observed that the volatility of the solvent if extract concentration is necessary. Next condition is polarity of the solvent which should be close to that of the analyte [10]. It is reported that the highest extraction yield obtained of umbelliferon, angelicin and xanthotoxin when methanol was used as the extraction solvent. In other note it seems again Methanol was slightly better for extraction of bergapten and isopimpinellin than dichloromethane at room temperature, however the highest efficiency was achieved when dichloromethane was used at the temperature of 110 °C (20.93 ± 0.06 mg/100 g and 13.29 ± 0.37 mg/100 g, respectively). Methanol also found for Imperatorin and isoimperatorin but the proportion of those compounds in dichloromethane extracts was slightly higher. Petroleum ether, which was the most popular for extraction showed the lowest extraction efficiencies.

References and Notes

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