ULTRASONIC BATH EXTRACTION AS AN ADVANCED METHOD FOR EXTRACTING THE PHARMACEUTICAL HERB VALERIAN

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Abstract

Valerian is a pharmaceutical plant known for its calming and insomnia-helping properties. It is a plant that has been known since ancient times, but the 20th century is a starting point for the production of extracts, mainly in Europe. All studies aim to obtain an extract at a lower cost and, on the other hand, complete isolation of the carrier substances present in Valerian. The raw material used is the roots of the Valerian plant, which are very rich in valerian acids, which are claimed to be the main carrier substances. All methods used for extraction have their advantages and disadvantages. The maceration method is a very practical method for obtaining Valerian extract, but due to the strong pungent smell, it risks a very large space for exceeding pollution limits, so many European countries prohibit the use of Valerian precisely because of this. air contamination with a counterproductive aroma. Therefore, other more advanced extraction methods are required so that the process is at least a little more closed and the amount of extract is more controlled. The ultrasonic extraction method is actually much more advanced since the process is carried out almost closed and does not pollute the air to the maximum limits and on the other hand it has the same extraction coefficient as maceration extraction and is much cheaper.

Keywords : Extraction.maceration,extraction coefficient

Introduction

Valerian is an annual plant that grows in Asian countries and Western European countries. The harvest time is September when the maximum presence of carrier substances is reached. There are many scientific researches on valerian in order to accurately define its practical application in pharmaceuticals. Researches are oriented on the influence of valerian extract in stabilizing insomnia, concentration and headaches. (Carrasco MC, Vallejo JR, Pardo-de-Santayana M, Peral D, Martin MA, Altimiras J. 2009.) The valerian type plant is also known by the name Valeriana which comes from the Latin word "valere" which means to be healthy. This plant with its healing properties has been known since the 19th century. It is characterized by a disagreeable smell that does not go away easily, for this reason, the places that benefit from valerian extract are mainly concentrated outside residential areas. It grows mainly in humid places high and grow to a height of 0.5-1 meter. They are characterized by light pink flowers with a perfect arrangement at the top of the Valerian plant.(Yuan SH, Zhang BH Wu FJ. 1989) The parts that are used in pharmaceuticals to obtain the extract are the roots (Valerianae radix). In addition to the main roots, thin roots connected to the main root are also used. In Valerian, a large number of carrier substances are concentrated such as ethyl oils, oils consisting of mono terpenes, Iridoids, Lignans, Caffeic acids and small amounts of Amino Acids, Flavonoids and alkaloids.(Hazelhoff B, Smith D, Malingré Th M, Hendriks H. 1979.) There are scientific opinions that it is precisely these carrier substances that have an effect on calmness and insomnia. Valerian is used in different forms, in the form of tea. Tablets or in the form of extract drops obtained by pressing. Valerian affects the reduction of the layer, and the quality of sleep. It is important to be taken for a longer time regularly in order to achieve a maximum effect.(Tomić M D., Kundaković M J., Petrović S D. 2005) In Indian folk medicine, Valerian extract has been used to treat epilepsy and depressive illnesses. In addition to being used as a monopreparation, Valerian is also used in combination with other extracts to increase its

healing abilities, such as Kava Kava extract.(Yuan CS, Mehendale S, Xiao Y, Aung HH, Xie JT, Ang-Lee MK. 2004)The amount of carrier substances varies depending on the growing conditions of Valerian, its type and the age of the plant. However, in Valerian, the presence of Aetheric oils and Valeportriates is observed, which are the components that have the greatest impact on practical use. (Yunfu W, Jie Y, Shenggang S, Guohou H. 2004.)The Aetheric oils found in Valerian roots have a concentration of 0.2-2.8%. This is what makes Valerian characterized by a very strong odor and which also depends on the species of this plant. In the group of carrier components of Sesquiterpenes Valerian acids are found which are present in the etheric oils.(Komori T, Matsumoto T, Motomura E, Shiroyama T. 2006) Other components which are very important in the composition of Valerian are Iridoids which are found in a concentration of 0.05-0.7% in almost all species of Valerian and belong to the Valerianacea family and are found in the form of Glycosides.(Alkharfy KM, Frye RF. 2007.) Another component which accompanies Valerian are Phenylpropanes in the form of Lignans which are also present in Flavonoidglycosides, Triterpenes as well as a considerable amount of Alkaloids. (Yao M, Ritchie HE, Brown-Woodman PD. 2007)In general, there are more than 150 different types of carrier components which are present in Valerian. It is very important to emphasize that the presence of Lignans expands the practical application in medicine as they exert biological activities among others antitumor and antioxidant.(Zhongguo Zhong Xi Yi Jie He Za Zhi.)

Body of Manuscript

Valerian is a medicinal plant whose extract, despite its great importance in pharmacy, is not easy to obtain. Since the active ingredients are concentrated in the roots, not all extraction methods are suitable. While maceration is a practical method, it has disadvantages: it takes place outdoors, and the pungent odor causes significant environmental pollution, impacting living conditions. Ultrasonic extraction, on the other hand, minimizes environmental impact while simultaneously enabling a high extraction yield and complete isolation of the active ingredients. Both extraction methods—maceration and ultrasonic extraction—were analyzed and compared. The same amount of solvent and the same degree of fineness were used for both samples. The extraction temperature was identical for both methods. First, the raw material was prepared by drying it for 60 minutes at 105 °C in a Büchi dryer. Before extraction, the valerian roots were milled in a Retsch 1000 mill with a 1.5 mm sieve. 50 g of the milled raw material were weighed and sieved for 10 minutes. Various fractions were observed, classified as having a medium fineness, with fractions of 1.0–0.25 µm being predominant (Table 1, Figure 1). A strong, unpleasant odor was noticeable even during milling. Two unmilled samples of the same fineness were prepared for extraction by maceration and ultrasound. 210 g of valerian from the first milled sample were weighed out in a laboratory chemical container and mixed with 1750 ml of 50% ethyl ethanol. The raw material-to-solvent ratio was thus 8.3:1. This mixture was placed on a rack in a container heated to 50 °C. A stirrer operating at 240 rpm was then placed on top of the container. The extraction process, which involved maceration, then began and lasted 75 minutes. During maceration, samples of the solution were taken at various intervals and filtered through a 0.2 µm filter. The dry mass of all filtered samples was determined using a Toledo 5000 instrument. From the results obtained, the extraction curve was generated and the extraction coefficient calculated. The extract yield was also logarithmically normalized with respect to the amount of raw material used. In this case, 1500 ml of extract with a dry mass of 3.31% was obtained. This resulted in a dry extract yield of 49.65 g, corresponding to a leaf mass to extract ratio of 1:4.2 – a satisfactory ratio. From the same ground sample, 210 g of valerian were weighed out and placed in an ultrasonic bath. Subsequently, 1750 ml of 50% ethanol were added. The ultrasonic bath was set to 50 °C, and

the extraction lasted 75 minutes. At various time points, a sample of the solution mixture was taken, filtered through a 0.2 µm filter, and the dry mass was determined using the Toledo 5000 instrument. Based on the results, the extraction curve was generated (Table 2, Figure 2). After extraction, the solution was filtered through filter paper. 1420 ml of extract with a dry mass of 3.35% was obtained. The logarithm of the obtained dry extract was 47.57 g. The ratio of ground valerian to the amount of extract obtained by ultrasound was also calculated logarithmically and was 1:4.4. Subsequently, the two extracts were compared with respect to their extraction coefficients.

Conclusion

From the results obtained, it is concluded that both methods used for extraction have a fairly high extraction coefficient. Although through the maceration extraction method, a higher amount of extract is obtained but with a lower amount of dry mass, while the amount of extract obtained by extraction in an ultrasonic bath is lower but with a higher dry mass. It can be concluded that the amount of dry extract for both methods used for extraction is almost the same. This allows the possibility of using ultrasonic extraction since the process is more compact and the resistance is much lower and for this reason it is preferable to use this extraction method for extraction. It is worth noting that maceration extraction is slightly more complicated since it is the mixture that decomposes the aromatic components which cause a much more intense resistance.

Table end figures

Table 1. Granulometric analysis of Valeriana

Size of strainer	Measuring vessel (gr)	Vessel + raw material (gr)	Netto (gr)
8.00 mm	448.1	44.3	0.2 %
4.00 mm	430.82	431.92	1.1 %
2.00 mm	399.7	404	4.3 %
1.00 mm	362.8	372.5	9.7 %
0.50 mm	322.5	336.2	13.7 %
0.25 mm	290.1	302.6	12.5 %
0.125 mm	279.48	283.98	4.5 %
Sludge	400.88	405.08	4.2 %

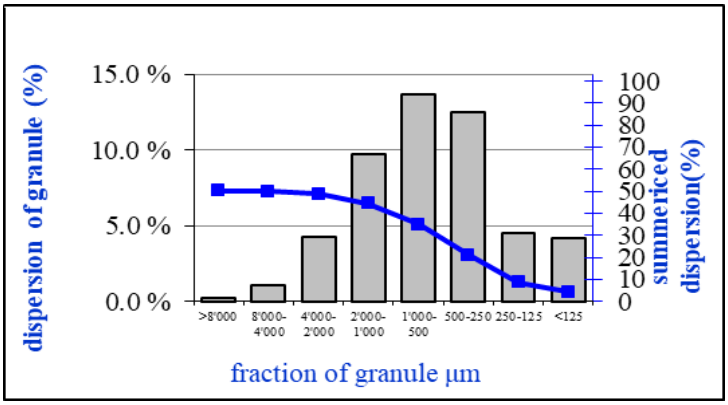

Figure 1. Fraction of granule Valeriana

Table 2 results of dry mass in relation with the extraction time of Valeriana Sample 1 ,2

Sample 1	
Time(min)	**Dry content (%)**
0	0.3
10	1.23
15	1.65
45	2.85
55	3.05
65	3.21
75	3.31
Sample 2	
Time (min)	**Dry content (%)**
0	0.25
10	1.32
15	1.99
45	2.85
55	3.08
65	3.26
75	3.35

1 ,2

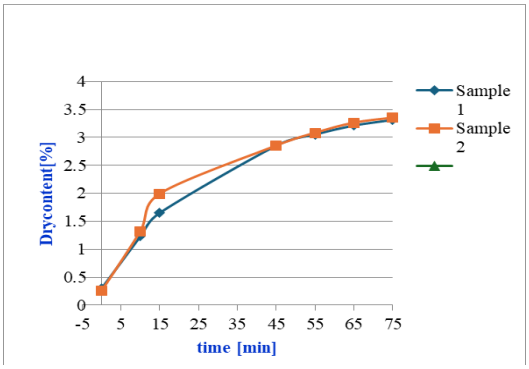

Figure 2 Outline of extraction Valeriana Sample

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