IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

"Conventional Extraction Methods Of Herbal Bioactive"

1Roshan Salim Pathan, 2Vaishnavi Dattatray Mane, 3Dhanashri Vijay Kadam

1Student, 2Student, 3Assisted Professor

1Institute of pharmaceutical science and research for girls Swami Chincholi (Bhigwan),

2Institute of pharmaceutical science and research for girls Swami Chincholi (Bhigwan),

3Institute of pharmaceutical science and research for girls Swami Chincholi (Bhigwan)

Abstract:

Methods with a wide range of applications are utilized extensively in several industries for component separation. Explained are the fundamental theories that apply to different types of extraction, such as liquid-liquid extraction, solid phase extraction, solid liquid extraction, and supercritical extraction, among others. These theories cover the solvent selection process, associated benefits and drawbacks, and applications. In conclusion, the distinct methods of extraction including Soxhlet, Pressurized Fluid, Ultrasonic, and Microwave extraction [1]. The extraction procedures, which are essential to the extraction results (such yield and phytochemical content) and the ensuing testing, are where the research on medicinal plants started. These days, a wide variety of technologies with different extraction methods are available. Because of this, the goal of this review is to identify and evaluate the most popular approaches according to their idea, advantages, and disadvantages in order to help assess the approach's applicability and financial viability [2].

Keywords: Extraction Method Drying, Extraction with Microwave Assisted, Soxhlet apparatus, Reflux Extraction, Ultrasound assisted Extraction or sonication extraction.

Introduction:

Humans have always been fascinated by naturally occurring substances that come from prebiotic, microbial, plant, and animal sources. Different plant extracts have been used extensively in traditional medicines, fragrances, food flavorings, and food preservatives. These extracts are also more frequently used in the treatment of common and chronic illnesses. Alkaloids, steroids, tannins, glycosides, volatile and fixed oils, resins, phenols, and flavonoids are just a few of the active substances found in plants that are distributed throughout their many components. The combination of these active chemicals gives the plant its favorable therapeutic benefits [3]. Pre-extraction and extraction processes, which are crucial stages in the processing of valuable bioactive compounds from plant components, are where the study of medicinal plants starts. In small-scale or (SME) operations, conventional techniques like maceration and Soxhlet extraction are more frequently employed. Today, advanced extraction techniques are used in the processing of medicinal plants. These techniques include supercritical fluid extraction (SFE), microwave assisted extraction (MAE),

ultrasound assisted extraction (UAE), and others. The goal of these advanced techniques is to produce a higher yield at a lower cost [4].

By using a specialized and specific solvent termed menstruum, standardized extraction techniques for crude pharmaceuticals can be effective in removing inert chemicals and reaching the necessary curative elements. Menstruum is a good liquid solvent that has been used for a successful extraction process. Marc is the name given to the inert and insoluble drug material that is left behind following the extraction process [5]. There is ongoing research into more efficient and hygienic methods for extracting natural products from "natural" sources, particularly when it comes to aromatic and medicinal plants (AMP), the essential oils (EOs) of which have been shown to contain additional biological properties. The rise in microorganisms that are resistant to traditional medications has increased the demand for these additional biological activities derived from natural items [6]. This paper primarily focused on analytical methodologies, encompassing extraction techniques, as well as the identification and analysis of bioactive compounds found in plant extracts using a range of techniques that involve chromatographic techniques and certain detection methods [7].

Extraction methods:

1. **Drying**
2. **Extraction with Microwave Assisted**
3. **Soxhlet apparatus**
4. **Maceration Infusion Percolation and Decoction**
5. **Reflux Extraction**
6. **Ultrasound assisted Extraction or sonication extraction**

1. **Drying**:
Produce from medicinal plants needs to be adequately dehydrated before being packaged for storage or transportation. You can get information on the ideal moisture content of particular produce in national pharmacopoeias. Medicinal plant products include pulpy fruits, woody sections, fleshy petals, rhizomes, fleshy roots, fleshy stems (Cissus), fleshy leaves (Aloe), and those containing polysaccharides need special attention to ensure proper drying. The following recommendations could be helpful in enhancing the drying and processing of medicinal plants: To facilitate proper drying, harvested produce that is morphologically big, meaty, or thick should be cut or sliced into small, thin pieces. The product needs to be cut into parts so that the produce's aesthetic appeal is maintained and the drying process is facilitated [2].

i. Microwave drying: This technique makes use of electromagnetic radiation in both electric and magnetic fields. The electric field causes the molecules to heat and oscillate simultaneously during dipolar rotation, alignment on the electric field of molecules with a stable or induced dipole moment (such as solvents or samples), and ionic induction. Molecules clash due to vacillation, which simultaneously causes the samples to heat up quickly. This method can speed up the drying process, but it can also compromise the phytochemicals [2].

ii. Oven Drying: Oven-drying is an alternate pre-extraction method that uses heat energy to extract moisture from materials. The process needs to be standardized and tested for its overall impact on the quality of medicinal plant production before it is used in the field. Monitoring the temperature range and length of such drying is crucial. This preparation of the sample is regarded as one of the quickest and easiest thermal methods for phytochemical preservation. Thirteen The extraction time was shortened as a result of this method [2].

2. **Extraction with Microwave assisted (MAE):**
The microwave-assisted extraction is regarded as a unique technique for utilizing microwave radiation to extract soluble compounds into a fluid from a variety of materials. Electromagnetic energies with frequencies between 300 MHz and 300 GHz are known as microwaves. They consist of two perpendicular oscillating fields, such as the magnetic and electric fields. The direct effects of

microwave radiation on polar materials provide the basis of the microwave heating principle . Ionic conduction and dipole rotation processes are the ways by which electro-magnetic energy is transformed into heat. The heat created by the ionic diffusion mechanism occurs due to the medium's resistance to ion transport. Ions, on the other hand, maintain their orientation along constantly shifting field indications. Heat is produced as a result of the molecules colliding due to this frequent direction change. the three sequential steps of the extraction mechanism of microwave-assisted extraction are:
(1) solute separation from active sites of the sample matrix under elevated temperature and pressure;
(2) solvent diffusion throughout the sample matrix; and
(3) solute release from sample matrix to solvent.

Have detailed a number of advantages of MAE, including faster heating for the extraction of bioactive compounds from plant materials, less temperature gradients, smaller equipment dimensions, and higher extract yield. Compared to conventional extraction procedures, MAE can extract bioactive compounds faster and potentially result in a greater recovery. It is a methodical approach to the extraction of more complete organic and organometallic compounds. Due to its decreased reliance on organic solvents, MAE is often regarded as a green technique. When extracting polyphenols and caffeine from green tea leaves, MAE produced a greater extraction yield after 4 minutes compared to all other extraction techniques used for 20 hours at room temperature. The yield of ginseno-sides extracted from ginseng root obtained in 15 minutes utilizing a targeted MAE approach was superior to that of conventional solvent extraction for 10 hours. By extracting silybin in, a flavolignin demonstrated increased extraction efficiency of MAE as compared to traditional extraction methods like Soxhlet maceration. extracted a few bioactive substances (tannic acid, cinnamon aldehyde, and E- and Z-guggolsterone) from a variety of plants under ideal circumstances and shown that MAE is a simpler and faster procedure than traditional extraction techniques. Used MAE to extract bound phenolic acids from bran and flour fractions of sorghum and maize of varying hardness. Using planned experiments, the MAE method from Chinese quince (Chaenomeles sinensis) was optimized for solvent content, extraction time, and microwave power to maximize flavonoid and phenolic recovery and to improve the extracts' capacity to donate electrons [8].

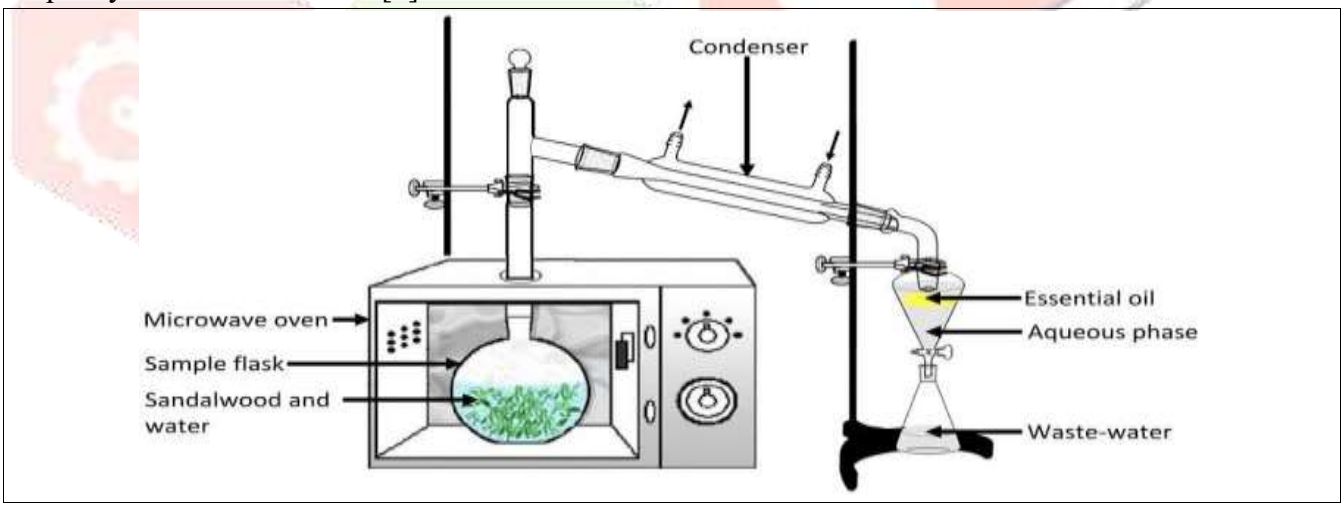

Fig 1: Microwave Assisted Extraction

3. **Soxhlet Extraction Apparatus:**

Another name for this method is continuous heat extraction. The apparatus is referred to as the glass-made Soxhlet extractor. It is made up of an extraction chamber, a condenser at the top, a siphon tube, and a flask with a circular bottom. Placed within and securely closed is a porous bag (thimble) filled with dried, ground, and finely ground plant material. It is made of strong filter paper or clean cloth. The extraction chamber is filled with the thimble after the solvent to be employed in the procedure is poured into the flask's bottom. The bottom flask's solvent is heated before evaporating and passing through the condenser. Here, it condenses and flows into the extraction chamber, where the medication is extracted by coming into touch with the solvent. Consequently, the solvent and the extracted material flow back into the flask when the solvent level in the chamber reaches the top of the siphon. Until the medication is entirely removed, the entire process is carried out continuously. This happens when there are no leftovers left by the extraction chamber's solvent flow. Comparing this process to the ones

previously mentioned, the advantage is that a significantly smaller volume of solvent is required to extract a large amount of medication. This has a significant impact on the economy in terms of duration, energy, and consequently, expenditure of money. It is employed as a batch process on small scales. It becomes more feasible and cost-effective on medium and large size when it is transformed into a continuous extraction process. This method works well for plant components that include impurities that are insoluble and that are only partially soluble in the chosen solvent. That method, however, is inappropriate for thermolabile plant chemicals since it is impractical to shake continuously [5].

Fig 2: Soxhlet Extraction Apparatus

4. **Maceration, Infusion, Percolation and Decoction:**
Maceration is a wine-making technique that is now frequently employed in studies on medicinal herbs. Plant materials, either in powder or coarse particle form, are macerated by soaking them in a suitable solvent in a closed-mouth container and heating them often over a minimum of three days at room temperature. The plant sample's cell walls burst and the soaking sample becomes mushy, releasing the soluble phytochemicals. The mixture is crushed or filtered after three days. It is a conventional approach, in which heat is transported through convection and conduction. The solvent used in this procedure alone determines the kind of substance that is extracted from the sample.[5]

5. **Reflux Extraction:**
Extraction of Refux extraction uses less solvent and less time for extraction than maceration or percolation. It is also more efficient. The extraction of thermolabile natural compounds is not possible with it. Out of all the extraction methods (sonication, reflux, Soxhlet, maceration, and percolation), refluxing with 70% ethanol produced the highest yield of the natural bio-insecticidal, didehydrostemofoline (0.515% w/w of the extract), from Stemona collinsiae root. The best yields of pururin and baicalin were obtained from the refux method using 60% ethanol as the extraction solvent, which was found to be superior to the decoction approach [9].

6. **Ultrasound assisted Extraction or sonication extraction:**
Sonication extraction, also known as ultrasound assisted extraction (UAE), In the UAE, ultrasound wavelengths between 20 and 2000 kHz are utilized. Both the permeability of the cell wall and the surface contact between solvents and samples are enhanced by the mechanical action of ultrasound-induced acoustic cavitation. The physical and chemical properties of materials subjected to ultrasound ae altered and the plant cell wall is disturbed, allowing chemicals to be released and increasing the mass

transit of solvents into plant cells. The method is an easy-to-use, reasonably priced technique that can be applied to the extraction of phytochemicals on a small or big scale. The shortened extraction time and solvent depletion are primarily responsible for UAE's benefits. On the other hand, active phytochemicals might be impacted if ultrasonic energy above 20 kHz produces free radicals[2].

Reference:

1. Komal patel, Namrata painchal, Dr pradnya Jingle, review of extraction techniques, International Journal of advanced research in 2120) chemical science (IJAR(S) Volume & JIssue 3, 2019, pp 6-21, ISSN NO-2349-0403
2. Farid Chemat, Giancarlo Cravotto, 2012, Microwave-assisted Extraction for Bioactive compounds: Theory and Practice", Food Engineering Series.
3. Mrunali patel, Kruti Dave and priti patel, For a different extraction methods of plants, IJBPAS December, Special Issue,2021, 10(12); 511-527, ISSN: 2277-4998
4. Huie, C. W. A review of modern sample-preparation techniques for the extraction and analysis of medicinal plants. Anal. Bioanal. Chem.373, 23–30 (2002)
5. Mohammed Golam Rasul Extraction, Isolation and characterization of natural products from medicinal plants, International Journal of basic sciences & Applied Computing (IJBSAC) ISSN: 2394-367x, Volume-2, Issue-6 December 2018.
6. A. Ahmad, A.F.M. Alkarkhi, S. Henaand L.H. Lima. (2009, February). Extraction, Separation and Identification of Chemical
   Ingredients of ElephantopusScaber L Using Factorial Design of Experiment, International Journal of Chemistry. 1(1), pp. 36-49.
7. Harmonider kaur , Review on the extraction methods used in medicinal plants International Journal of advanced in management Technology & Engineering Sciences, ISNN NO: 2249-7455, volume 8, Issue III, march/2018,page no- 1314-13200
8. Handa SS, Khanuja SPS, Longo G, Rakesh DD (2008) Extraction Technologies for Medicinal and Aromatic Plants, (1stedn), no. 66. Italy: United Nations Industrial Development Organization and the International Centre for Science and High Technology.
9. Sushma Rudraswamy, Brinda Suhas Godhi, Hommergally puttabuddi Jai Shankar, MruthunJaya kenganora, M.N.Sumana, A review on extraction methods For the Research on medicinal plants, indian Journal of oral health and research - January 2021 page no-1-8.
10. Ingle KP, Deshmukh AG, Padole DA, Dudhare MS, Moharil MP, Khelurkar VC. Phytochemicals: Extraction methods, identification, and detection of bioactive compounds from plant extracts. J Pharmacogn Phytochem 2017;6:32-6
11. Nejia Herzi, Jalloul Bouajila, Severine camy, ovaborMehrez Romdhane Jean Stephan Condoret for a revieco of extraction methods food chemistry 1, 2013, vol.141, pp-3537-3545. 22 10.1016/J.foodchem. 2013.06:065hiou-00875913
12. Schaneberg, B. T., & Khan, I. A. (2002). Comparison of extraction methods for marker compounds in the essential oil of lemon grass by GC. Journal of Agricultural and Food Chemistry, 50, 1345–1349.
13. Krishnananda tp. Ingle, Amit & deshmukh, Dipika Apadole, Mahendra. S. Dudhare, Mangesh.p. Mohasil and vaibhav c. khelurkar phytochemicals. extraction methods, identification and detection of 102 bioactive Compounds from plant extracts Journal of pharmacognosy and phytochemistry 2017; 6(1): 32-36
14. Delazar A, Nahar L, Hamedeyazdan S, Sarker SD. Microwave-assisted extraction in natural products isolation. Methods Mol Biol. 2012; 864:89-115
15. J. Azmir .I.S.M. Zaidul, M.M: Rahmän, k.m. Sharif, A.Mohamed, F. sahena, M.HA Jahurul K.Ghafoor, N.A.N .Norulaini, A.K.M. omar, Techniques / forurextraction of bioactive Compoundsia from plant materials, Journal + Food of food engineering 117 (2013) 426-436.
16. Chemat, F., Tomao, V., & Virot, M., 2008. In: Otles, S. (Ed.), Handbook of FoodAnalysis Instruments. Ultrasound-Assisted Extraction in Food Analysis. CRC
    Press, pp. 85–94.

17. Qing-Wen Zhang!", Li- Goen Lin Lin' & Wen Qi ye2* Techniques for extracth & Isolat? of natard products: a Comprehensive review.
18. Jovanović AA, Đorđević VB, Zdunić GM, Pljevljakušić DS, Šavikin KP, Gođevac DM, Bugarski BM. Optimization of the extraction process of polyphenols from Thymus serpyllum L. herb using maceration, heat- and ultrasound-assisted techniques. Sep Purif Technol. 2017;179:369–80.
19. Speybrouck D, Lipka E. Preparative supercritical fuid chromatography: a powerful tool for chiral separations. J Chromatogr A. 2016;1467:33–55.
20. Sasidharan S, Chen Y, Saravanan D, Sundram KM, Yoga Latha L. Extraction, isolation and characterization of bioactive compounds from plants' extracts. Afr J Tradit Complement Altern Med 2011;8:1-10.