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# CHARACTERIZATION OF ESSENTIAL OIL EXTRACTED FROM MEDICINAL PLANTS: A REVIEW

**Navneet Kaur**
Department of Biotechnology,
Uttaranchal College of Applied and Life sciences
Uttaranchal University,
Dehradun

**Nistha Kapoor**
Department of Biotechnology,
Uttaranchal College of Applied and Life sciences
Uttaranchal University,
Dehradun

**Esha Bhatti**
Department of Biotechnology,
Uttaranchal College of Applied and Life sciences
Uttaranchal University,
Dehradun

**ABSTRACT**

***Medicinal plants have been utilized for various medicinal purposes since ages. Medicinal plants and their product comprise an indispensible part of traditional as well as modern system of medicine. Leaves, root, flowers, seeds have been reported to possess several medicinal properties alongwith this oil obtained from different parts of plant also possesses inherent biological and pharmacological properties. Ever since medicinal potential of oil extracted from plants have been recognized substantial research has been conducted to optimize procedure and protocol for isolation and characterization of plant oil. Simultaneously, studies have been conducted to evaluate different biological properties including antibacterial, antiinflammatory, antidiabetic, etc possesses by plant oil. There is requirement to scale up production of medicinal oil so as to achieve their practical application in healthcare sector, the primary requirement of which is practicing large scale commercial cultivation of medicinal plants so as to obtain sufficient amount of raw material and their respective product (oil) and achieve their medicinal application.***

**KEYWORDS :** ***Medicinal plants, essential oil, biological activity, GC-MS***

## INTRODUCTION

Medicinal Plants have been utilized in treatment of diseases since ages. The inherent medicinal properties of these plants is attributed to production of compounds which possess biological or pharmacological properties. One or the other part of medicinal plant synthesizes biologically active compounds belonging to different chemical classes such as alkaloids, Steroids, flavonoids etc. In different medicinal plants such compounds are synthesized in different parts including leaves, roots, rhizomes, bark, fruits, seeds, etc. (Bozin *et al* 2016). By far roots and leaves constitute the most important medicinal component of several plants such as *Withania somnifera* (commonly known as Ashwagandha), plants *Picorhizae kurroa* (Sood *et al* 2009) and *Valeriana wallichi* (Bahuguna *et al* 2019, Sharma *et al* 2019). Roots, leaves and seeds remain most common source of extraction of oil from medicinal plants for various purposes (Sharma *et al* 2015). Characterization of oil

extracted from plants has been a prime focus in recent past due to widespread application of oil including medicinal, pharmacological properties, Utilization in food processing, cosmetic industries etc (Yentema *et al* 2007). Essential oil contains several phytocompounds with biological activity (Bishob and Thornton 1997). Alongwith biochemical and medicinal characterization studies conducted have focused on analysis of physical properties of oil extracted from plants. Major physiochemical properties analysed include refractive index, Saponification value, acid value, density, solubility optical activity etc aid in assessment the nature and quality of oil (Yentema *et al* 2007 ,Hagos *et al* 2017).

## EXTRACTION AND CHARACTERIZATION OF OIL FROM MEDICINAL PLANTS

With advancements in healthcare system and development of bio analytical techniques biologically active compounds have been identified, isolated, characterized from several medicinal plants. Several bio analytical techniques such as Chromatography (for purification of compounds), GC-MS,FTIR,LCMS,NMR (for prediction of chemical structure of the compound)have been utilized (Sasidharam *et al* 2010).Beside isolation and characterization studies have also conducted to evaluate toxicity level of administration of purified phytocompounds.

The process of characterization of phytocompounds begins with extraction from plant source. Generally plant parts (leaves, root, seeds) are shade dried, powdered, dissolved in solvent and extracted through soxhlet. Most commonly utilized solvent involve methanol, ethanol, mixture of alcohol and water and ether. However other solvents have also been utilized as choice of solvent varies from plant species to species. Cosa *et al* 2016 reported utilization of hexane to remove chlorophyll content. Ethyl acetate, dichloro methane etc. are also utilized as solvent in process of extraction (Sasidharan *et al* 2010). Sonification and macaration are also commonly utilized for extraction (Zygmunt and Namiesnik 2003, Huie 2002). Besides these other modern techniques (Table 1) with advantages of reduction in degradation of sample, reduced utilization of solvent, concentration of phytocompounds before purification through chromatography has also been utilized. Extraction is followed by Identification and Characterization of phytocompounds oil extracted from medicinal plants by various chromatography techniques (TLC, HPLC, GC, Column chromatography, Sephadax chromatography are most common and efficient technique utilized for identification of phytocompounds. HPLC analysis has specifically gained momentum in recent past for identification of phytocompounds. Results obtained through HPLC are not only accurate and precise but also reliable. Utilization of UV detectors in HPLC system efficiently detects those phytocompound which might be present in minimum quantity or concentration. Among several bio-analytical techniques employed for characterization of oil extracted from different parts (seeds, leaves, roots, rhizomes, etc.) GC-MS remains the most commonly utilized technique. Kasrati *et al* 2017) reported the presence of 27 phytocompounds in essential oil obtained from *Mentha suaveolensas as* revealed by GC-MS analysis. The same study also reported an increase in antioxidant activity when the plants (*M. suoveolans*) were cultivated with mineral fertilizers and VAM. Hagos *et al* 2017 extracted oil from leaves of *Myrtus communis* and reported presence of compounds through GC-MS analysis Eucalyptol, alpha linalool, linalyl anthromilate, alpha terpineol. The oil has been reported to be a potent source of antioxidant and antibacterial activities. Beets 2001 reported thymol, carvacrol to be major component of essential oil extracted from *Origanium compactum*. Similarly, Hassan *et al* 2016 subjected oil extracted from *Carum copticum* and reported p-cyme, beta- pinene, o-cymene and gamma terpenes to be major compounds present. Biochemical Composition of oil may vary among same species /genus cultivated under varying geographical/environmental conditions. Lawrence *et al* 1988 classified four different chemo types of *Ocimum* (Basil, a well-known medical herb) based upon Constituent of oil, the four chemo types were identified as methyl chavicol rich chemotype, linalool rich chemotype, methyl eugenol rich chemotype and lastly methyl cinnamate rich chemotype. Based upon geographical origin and major constituents Basil has also been classified into four different chemo types namely European chemotype rich in linalool and estragole, reunion chemotype rich in estragole, tropical chemotype rich in methyl cinnamate and eugenol chemotype rich in euganol (Koutsos *et al* 2009). Murarikova *et al* 2017 have also reported different chemotypes of Basil based upon GC-MS characterization of oil.

**Table 1: Summary of techniques utilized in extraction and characterization of oil from medicinal plants**

| | Parameter to be achieved | Bioanalytical technique | References |
|---|---|---|---|
| 1 | Isolation/Extraction | Soxhlet method, Maceration, Solid phase micro extraction, Microwave assisted extraction, Pressurized liquid extraction, Surfactant mediated techniques | Huie 2002 Zygmunt and Namiesnik 2003 |
| 2 | Identification, characterization | Chromatographic techniques including TLC, HPLC, GC-MS, Sephadax chromatography, Phytocompound assay, Fourier transformation infrared spectroscopy (FTIR), LC-MS | Sasidharan *et al* 2010, Cannell 1998, Fane *et al* 2006, Cai *et al* 2000, He 2000 |

## BIOLOGICAL PROPERTIES OF OIL EXTRACTED FROM MEDICINAL PLANTS

Several studies conducted have revealed numerous biological, medicinal properties of oil extracted from medicinal plants. Antimicrobial activity of oil extracted from different parts of various medicinal plants have been the most commonly investigated biological activity however oil obtained from various plant species have been reported to possess anti-inflammatory, antidiabetic, anticancer, antiallergy, antioxidant activities. Table 2 summarizes biological / medicinal properties of oil extracted from medicinal pants.

**Table 2: Medicinal property / biological activity of oil extracted from medicinal plants**

| Name of Plant | Biological Activity | Author |
|---|---|---|
| *Thymus Vulgaris* | Insecticidal,antifungal,ant oxidative | Eqbal 2017 |
| *Echinacea purpurea* | Anti-inflammatory | Yu *et al* 2013 |
| *Santalum album* | Used in cosmetics,anti-inflammatory | Heuberger *et al* 2006 |
| *Origanum vulgare* | Anti-inflammatory | Fuentes *et al* 2011 |
| *Carum Copticum* | Antibacterial | Hassan *et al* 2016 |
| *Myrtus Communis* | Antioxidant,Antibacterial | Hagos *et al* 2017 |
| *Garlic* | Anticancer | Milner (2001, 2006) |
| *Ficus carica* | antimicrobial activity antioxidant | Kislev *et al* 2006 |
| *Syzygium cumini* | anti-inflammatory activity, Used intreatment of asthma, diarrhea, fever, diabetes | Benherlal and Arumughan 2007 |
| *Morus nigra L.* | Antidiabetic, utilized against urinary tract infection | Volpato *et al* 2011 |
| *S. nigra* L. | Diaphoretic, diuretic, expectorant , ointment and pectoral | Volpato *et al* 2011(b) |
| *Papaver rhoeas* | medicinal usage, especially for ailments in adults and children | Hasplova *et al* 2011 |
| *Korerima* | used as spices, medicine, and means of soil conservation | Eyob *et al* 2008 |
| *Annona* | for medicinal and nutritional purposes | Silva JJ *et al* 2014 |

## CONCLUSION

Several studies conducted have revealed inherent medicinal property of oil present in several medicinal plants and there has been sufficient advancement so as to optimize extraction, purification and characterization of oil extracted from plant species. There is requirement of scaling up of production of such oil which can be achieved by initializing commercial cultivation of medicinal plant so as to produce sufficient raw material for oil extraction.

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