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TULSI AND TURMERIC ESSENTIAL OIL: EXTRACTION AND MEDICINAL BENEFIT

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Abstract:

According to the European Pharmacopeia 7th edition essential oils are defined as “Odoriferous substances derived from plant raw materials obtained through steam distillation, dry distillation or mechanical method without heating exhibiting a complex composition. In general, a physical process is employed for extracting essential oil from the aqueous phase maintains the oils chemical properties unchanged. Oil are gathered from various fragrant plants. We selected the rhizome of *Curcuma longa* L (Turmeric), and Tulsi (*Ocimum sanctum*) plants for this article. Hence the selected essential oil from these plants was utilized in the current research. The oil was sourced from both plants were utilized to extract the essential oil. The extraction process was executed using the Soxhlet apparatus Clevenger apparatus.

Keywords: Essential oil, Extraction process, Turmeric (*Curcuma longa*), Tulsi (*Ocimum sanctum*) Ayurveda, Clevenger apparatus Soxhlet apparatus.

Introduction

Tulsi is a fragrant plant belonging to the basil family family *Lamiaceae* within the tribe ocimeae. It is believed to have originated in north central India and how naturally found throughout the eastern world tropics [1]. In Ayurveda, holy basil is called “The unmatched One,” “Nature Mother Medicine” and “The supreme Herbs Queen of,” and is esteemed as an “life giving elixir” that suppresses all other in its dual medicinal and spiritual benefits [2]. In India, tulsi is integrated into spiritual ceremonies and daily routines offering a wide range of health advantages that are now being scientifically validated. This burgeoning field of research on holy basil, uphold the ancient Ayurvedic wisdom, indicate that holy basil is a rejuvenating agent tonic for the body, mind and spirit addressing numerous contemporary health issue.

Curcuma longa L (Turmeric), a yellow spice (native to Southeast Asia) belonging to the ginger family (*Zingiberaceae*); contain Curcumin, its primary active ingredient is known diferuloylmethane. In its dried and

powdered state, it is widely utilized as a spice and coloring agent across the globe (in textiles, pharmaceuticals, confectionery, and cosmetics) [3]. The active ingredient in turmeric, curcumin, is a safe substance that is widely utilized in medicinal, biological, pharmacological, and food cosmetic applications. In the realm of medicine, curcuminoids exert a more significant influence; they have been linked to the alleviation of neuropathic pain, depression, angiogenesis, tumor development, diabetes, and conditions affecting the liver, skin, and respiratory systems, as well as cardiovascular issues. Curcumin can be obtained through two methods: synthesis and extraction from plants. A variety of sources have detailed methods for creating synthetic curcumin [4]. Nevertheless, obtaining curcumin directly from plants, which are naturally present, remains the most economical way to produce it. Soxhlet extraction, maceration, and solvent extraction are common techniques used in extracting substances [5, 6]. Essential oils are multifunctional and exhibit a wide spectrum of activities, such as antiphlogistic, spasmolytic, antinociceptive, immunomodulatory, psychotropic, acaricidal expectorate and cancer-suppressing activities [7]. Essential oils (EOs) are oily, aromatic and volatile liquids that can be harvested from plant material [8]. Multiple segments of the oils' plants such as peels, barks, leaves, flowers, buds, seeds, and others are used to produce these aromatic oily liquids, and various extraction techniques are applied for the extraction process. Essential oils are lipophilic, and soluble in organic solvents, due to their hydrophobic nature and lower density than water. The extraction yields are dependent on the type of species and plant segments used, but a very low yield like 1%, can make them highly valuable rare components [9]. Extraction is a process in which one or more components are separated selectively from a liquid or solid mixture in which impurities are eliminated from the solvent containing the desired compound [10].

Essential oil extraction methods

Distillation

- a. ***Steam distillation:*** It is the oldest and the traditional method of oil extraction. The percentage of essential oils being extracted by this technique is 93% and the remaining 7% can be further extracted by other methods [11]. In another study a component 2, 2-diphenyl-1-picryl hydrazyl (DPPH) used to evaluate the antioxidant properties of essential oils by using steam distillation extraction process.
- b. ***Fractional distillation:*** It is an energy efficient and economically feasible upgrading process which has been continuously developed since the first refineries were built in the late 19th century until now [12]. So, from the above properties of steam distillation process we used Clevenger Apparatus for our study.

Essential oil methodology

The name was titled after its inventor, Joseph Franklin Clevenger in 1928. The round-bottomed flask at the bottom contains the mixture of material and water. As the steam rises, the steam assembles in the condenser and the condensate falls into a burette. In the burette, oil floats on the water. After few hours of extraction, the oil can be collected for further use [13]. The oil layer will be separated from the aqueous phase, and then filtrated and dried over anhydrous sodium sulphate ($\text{Na}_2\text{S}_2\text{O}_4$) to remove traces of moisture. Physical characteristics and percentage yield will be calculated according to dry weight of the plant materials.

Extraction of essential oils from Tulsi leaves

50 gm. of Tulsi leaves were taken in 300 ml of water and were extracted for 7-8 hours in Clevenger apparatus. Then the oil layer is separated from the aqueous phase using n-hexane with the help of separating funnel. The extraction procedure was repeated for several times. The samples were pooled, dried at low temperature and kept in refrigerator at 4°C.

Extraction of essential oils from rhizomes of Haridra:

50 gm. of Rhizomes of Haridra was taken in 300 ml of water in one liter flask in Clevenger apparatus and extracted for 7-8 hours. The essential oil was collected in separating funnel and extracted with n-hexane. The essential oil was dried at room temperature. The process was repeated several times; samples were pooled and kept in refrigerator at 4°C. In the 19th century, turmeric rhizome's main color element was isolated and named as 'Curcumin. It was Roughley and Whiting (1973) who determined its chemical structure [14].

Results**Yield of essential oils of *Curcuma longa* (Haldi) rhizome paste and *Ocimum sanctum* (Tulsi) leaves**

Essential oils of *Curcuma longa* (Haldi) rhizome paste and *Ocimum sanctum* (Tulsi) leaves was obtained by hydro-steam distillation by Clevenger extraction methods for 4-7 hour daily for several days. A total of 300 gm. of the plant materials of each plant was extracted in which yielded 1.25 gm essential oil of *Curcuma longa* and 0.7 gm. of essential oil of *Ocimum sanctum* after 6 times of extraction. % Yield of essential oils of *Curcuma longa* (Haldi) rhizome paste and *Ocimum sanctum* (Tulsi) leaves is given in table 1.

Table 1: Yield of essential oils of *Curcuma longa* (Haldi) rhizome paste and *Ocimum sanctum* (Tulsi) leaves.

Name of plants	Amount of plant materials extracted in per extraction (gm.)	Total amount of plant materials extracted Gm.	Total Yield of essential oils	% Yield
<i>Curcuma longa</i> (Haldi) rhizome paste	50	300	1.25	0.42
<i>Ocimum sanctum</i> (Tulsi) leaves	50	300	0.7	0.23

Plant material was extracted for 5 hour in Clevenger apparatus daily for several days.

Properties of Haridra

- 1. Anti-inflammatory activity:** Oral administration of *Curcuma longa* decreased inflammatory swelling significantly. *C. Longa*'s anti-inflammatory properties may be due to its ability to suppress both biosynthesis of inflammatory prostaglandins from arachidonic acid and inflammatory neutrophil activity [15].
- 2. Anti-microbial activity:** Turmeric extract and *Curcuma longa* essential oil inhibit the growth of a wide range of bacteria, parasites and pathogenic fungi. The *Curcuma longa* treated group of rabbits showed a significantly higher mean value for wound contraction compared to controls [16].
- 3. Repellent activity:** *Curcuma aromatica* was chosen to examine mosquito repellent behavior under laboratory and field conditions. A 95% ethanol extract of CA [*Curcuma aromatica*] showed 3.5h biting protection when applied at a 25g percent concentration. The ethanol extracts also showed protective effect against *Armigeres subalbatus*, and *Culex quinquefasciatus*, when applied to human skin the ethanol extract of curcuma did not cause any dermal irritation. Therefore, it concluded that curcuma extract can be used as an important personal protection against mosquito bites [17]. In a research volatile oil and rhizome extract derived from *Curcuma aromatica*, including larvicidal, adulticidal and repellent activity against the *Aedes aegypti* mosquito [18].

Properties of Tulsi:

1. **Antibacterial activity:** Extract taken from *O. Sanctum* was found to be equally effective against gram-positive and gram-negative pathogens [19].
2. **Antifungal activity:** Essential oil of *Ocimum sanctum*, Methyl chavicol and linalol have shown strong antifungal efficacy against *Candida*, including azole-resistant strains [20]. Minimum inhibitory concentration (MIC) and minimum fungicidal concentration (MFC) of different extracts and fractions of *Ocimum sanctum* leaves have also been evaluated against dermatophytic fungi used.
3. **Larvicidal activity:** Larvicidal activity of essential oils and various extracts of *Ocimum sanctum*, *O. Basil* and *O. gratissimum* were compared with *Culex quinquefasciatus* field collected and laboratory reared larvae. The *O. basilicum* and *O. sanctum* oil LD50 value were 39.31 and 40.02 on laboratory reared larvae and LD50 value 129.53 and 139.49 on field collected larvae. The larvae reared in Laboratory were more sensitive than the larvae collected in the field [21].
4. **Anti-inflammatory activity:** Fixed oil and linoleic acid of *Ocimum sanctum* have been shown to possess significant anti-inflammatory activity against PGE₂, leukotriene and arachidonic acid-induced paw edema [22].

Discussion

Curcumin (diferuloyl methane) and various volatile oils, including tumarone, atlantone and zingibarone, polyphenolic curcuminoids, etc. The medicinal actions of Haridra [*Curcuma longa*] are antimicrobial activity, antiviral activity, antifungal activity. The chemical composition of Basil [*Ocimum sanctum*] contains volatile oils, phenolic compounds, flavonoids, esculentin, esculin, stearic acid aromadendrin oxide, benzaldehyde etc. The medicinal activities of Tulsi [*Ocimum sanctum*] are antimicrobial activity, anti-inflammatory activity. We chose these plants because of their properties and because of the various studies that have been done to obtain the essential oils of these plants as extracts, we used the Clevenger apparatus. For this reason, the plants were taken in fresh form for better extraction through Clevenger equipment.

Conclusion

Essential oils, also called volatile essential oils, are fragrant oily liquids extracted from various parts of plants, for example, leaves, peels, bark, flowers, buds, seeds, etc. Essential oils are a good source of many bioactive compounds, which have antimicrobial anti-inflammatory properties. In our study we use Clevenger apparatus to extract oil. By using this process, we obtained essential oil of Tulsi (*Ocimum sanctum*) and Haridra (*Curcuma longa*) for our further study

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