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Extraction of essential oils: Eucalyptus oil - extraction techniques and methods

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Abstract
Pure essential oils are concentrated oils derived from various natural plants, flowers, plants roots, seeds, resins, external tissue of plants, trees or shrubs or fruits rinds [10]. These oils are highly recognized by humans for their beneficiary on body, skin and spirit. These oils are also used commercially due to their high end therapeutic or odoriferous properties. To study extraction techniques available to extract the oils from plants and trees, to come across pros and cons of few extraction methods, selection and efficiency of a single method [5]. Extraction of essential oil by various methods and Innovative techniques retards the risk of losing the essential component of plants and trees, reduce chemical risk, extraction time, acts eco-friendly and increase the quality and yield of the essential oils [6].

Keywords: Eucalyptus oil, steam distillation

Introduction
Mankind has been using plants and trees from thousands of years for healing and it's the same procedure that we use this essentials oils for medicinal component [3]. These essentials oils were used for embalming process, for medicines and in few rituals. Research show that the use of essentials oils has been carried out for centuries due to its "Fragrant pharmacy" contents for biochemical effects. Essential oils are available in 300 different variety and are used by various professional practitioners, and with the perseverance of virus, bacteria, parasitic and fungal contamination in our world, essential oil provides a great medication towards our body and home from this onslaught of viruses [1]. Essential oils are concentrated volatile with strong aromatic compounds that are derived from plants and are easily evaporated essence that gives plants their natural scents. Every complex highly precious liquid is extracted from different species of plants. Essential oils are usually referred to as "Life Force" of plants, Unlike fatty oils essential oil are volatile, high concentrated substance extracted from flowers, stems of plants, roots, seeds, barks, resins and fruit rinds. The amount of essential oil found in a plant ranges between 0.01 % to 10% of the total, therefore tones of plants material is required for just a few hundred pounds of oil. Essential oils have antimicrobial properties and high therapeutic constituents. Due to this they are widely used in foods products, medicines and cosmetic [5].

Methods of Extracting Essential Oil
Earlier the practice of extraction used alcohol and a fermentation process. Recent methods of extracting essential oils are entering the mainstream of aromatherapy, providing new choices in oils which were offered never before. In addition of new labels of CO_2 and Super critical CO_2, along with the traditional "steam" and „hydro" distillation, a little education for the aromatherapy enthusiast can go a long way in essential oil selection [12]. The method used to extract essential oil from plants or other raw material is important because some procedure includes the use of solvents that can destroy the therapeutic properties. Few plants and flowers, do not lend themselves to steam distillation because they are too delicate, or their fragrance and therapeutic essences cannot be completely released by steam distillation. Jasmine oil and rose oil particularly are delicate flowers whose oils are often found in „absolute" form [11]. The value of newer methods depends greatly on the experience of the distiller, as well as the intended application of the final product. Each and every method is important, and possess its place in the making of aromatherapy-grade essential oils. Few methods available for extracting essential oils are given below:

CO_2 and Super critical CO_2 Extraction: This is the most modern technology of extracting essential oil. Carbon dioxide and Supercritical Carbon dioxide extraction involve the use of CO_2 as the solvent which carried the essential oil away from the raw plant material [6]. Lower pressure CO_2 extraction involves the cooling of CO_2 between 35 °F and 55 °F, and then pumping it through the plant material at about 1000 psi. The CO_2 in this condition is condensed to a liquid. Supercritical extraction involves the heating of CO_2 to 87 °F and pumped it through the plant material at around 8,000 psi. Under both the conditions carbon dioxide is likened to a „dense fog" or vapor. With the release of pressure in any of the process, the carbon dioxide escapes in its gaseous form, leaving the essential oil behind.

Turbo distillation extraction: Turbo distillation is useful for hard to extract or coarse plant material, such as bark, roots, and seeds. In the turbo extraction process, the plants soak in water and steam is circulated through this plant and water mixture. During the entire process, the same water is circulated continuously through the plant material [12].

Steam Distillation: In this process, the essence is extracted from the plant using a technique called distillation. The

flowers or plants are placed on a screen, steam is passes through the area and becomes
„charged" with the essence. The steam is then passed through the condenser (a area to cool the steam). This mixture of water and essential oil is separated and bottled [11].

Extraction of Essential Oil Using Steam Distillation Process

Nowadays, distiller plays an important role in restoring the qualities of plant, but the final therapeutic results is not often found until and unless extraction process is performed. During extraction the qualities of oil changed to give it more value- for example, the characteristics of pure blue color German chamomile (chamazulene) is formed during steam distillation process. Steam distillation is a special type of distillation or separation technique for temperature sensitive materials like oils, resins, hydrocarbons, etc. which are insoluble in water and may decompose at their boiling point. In this process, the fresh leaves of eucalyptus plant are cut into pieces less than 2x2 cm within half a day after collection and then placed into the still chamber where steam is being passed from the bottom. The essential oil (eucalyptus oil) is being carried out along with the steam from the top of the still and then sent to the condenser. In the condenser the cooling water stream is continuously supplied to cool the mixture (steam and oil). The mixture is then cooled and collected from the bottom of the condenser [14]. The mixture is then separated using separating funnel or the water is evaporated from the mixture and the residue is pure essential oil of eucalyptus [17].

Result and Discussion

The technique used to extract essential oil from plants is important, because some methods use solvents which can destroy the therapeutic properties of plants and trees. There are various methods for extraction, but the quality and yield of the oil never remains the same [18]. In this experiment, Soxhlet apparatus technique has been employed due to its mild extracting conditions and low operating cost. Steam is used as the key component to extract oils.

Conclusion

Steam distillation is a special type of distillation (a separation process) for temperature sensitive materials like oils, resins, hydrocarbons, etc. which are insoluble in water and may decompose at their respected boiling point [4]. The temperature of the steam must be enough to vaporize the oil present however the temperature should not be so high that it destroys the plants, flowers or burn the essential oils. The eucalyptus plant has high content of essential oil. Such eucalyptus oil, which have been used as perfume and chemical raw material for a long time. Oil content in eucalyptus is higher and can be easily extracted. The eucalyptus oil contains more than 65% of 1, 8-Cineole. Hence the incorporation of very small amount of eucalyptus oil as cosolvent in aqueous ethanol and petrol mixture improved the water tolerance of the system [19], Therefore the work can be extended for the study of ternary phase equilibrium of the water ethanol and 1, 8-cineole or eucalyptus oil.

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