

EXTRACTION AND FORMULATION OF PERFUME FROM PLANTS: A REVIEW

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Abstract: Aromatic plants are a source of fragrances, flavors, cosmeceuticals, health beverages and chemical terpenes. Essential oils are isolated from plant materials which are liquid and have strong aromatic components and are highly concentrated oils extracted from aromatic plants. Extraction is the separation of aromatically active portions of plant tissues using selective solvents. The general techniques of aromatic plant extraction include, supercritical CO₂ fluid extraction, steam distillation, enfleurage and many other, may be employed. The products so obtained from plants are relatively complex mixtures of metabolites, in liquid or semisolid state. Various processes of aromatic plants extraction and essential oils used for formulation of perfume are reviewed in this paper.

Key Words: Aromatic plants, extraction, essential oil, metabolites, perfume, etc.

I. INTRODUCTION

Flavours and fragrances are generally extracted from plants and animals since immemorial time. Aromatic plants synthesise and preserve a variety of biochemical products, many of which are extractable and useful as chemical feed stocks or as raw materials for various scientific investigations[1]. The characteristic property of the plants is due to a variety of complex chemical compounds. Several aromatic plants are popular for their fragrance. Aromatic plants produce redolent volatile substances, known as essential oil [2][3]. There are numerous essential oils present in countless plants and flowers, even after 100s of years of its use, still we have not explored each and every species present with such immense benefits. Oils with antibacterial, antifungal, anti-virus and antiseptic properties are used in the field of medicine as well as in many medical therapies such as aroma therapy [3][4], essential oils are accompanying to fragrance or perfumes because this redolence is oily in nature and they represent the essence or active elements of plants. Essential oils are merchandise of secondary metabolism and are secreted through specialized cells positioned in unique elements of most plants[15]. By virtue of certain characteristic properties, they have wide spread uses and are used in perfumery, they are variable mixtures of terpenoids[1][5]. Essential oils in aroma family are classified into 8 different sections depending upon their scent and also upon whether they should be a part of top note middle note or base note. Those 8 sections are as follows: - floral, herbaceous, camphoraceous, minty, spicy, resinous, woody, citrus.

They can be customarily distinguished by their characteristic redolence also they are concentrated, hydrophobic liquid containing volatile aroma compounds. Generally, they are immiscible in water and have low density, as they are terpenoids they are miscible in organic solvents[5]. Essential oils are predominantly extracted from various parts of plants like leaves, flowers, barks, stem, seeds, etc. A wide range of technologies are available for the extraction of active components and essential oils from aromatic plants (lavender, rosemary, Eucalyptus, sandalwood, lemongrass, plumeria, jasmine, etc.) such as supercritical CO₂ fluid extraction, steam distillation, enfleurage, microwave assisted hydro distillation, solvent extraction, etc [5][6].

Natural fragrances can be made either by extraction of single essential oil or by mixture of two or more essential oils. When mixtures of essential oils is used to formulate a redolence, the essential oils should be studied properly according to their volatility, and should be mixed accordingly[4]. Natural redolence in a perfume can be classified into three different notes, base note middle note and top note[8]. Evaporation of each essential oil in its own time according to the volatility of the oil causes fluctuations in the final fragrance obtained after blending the oils. Generally, there should be differences in the volatility of the three oils to be mixed, in which the top note is highly volatile and first scent to be dissipated after the application of fragrance, followed by middle note and base note[7][8]. Namely jasmine and lavender fall under floral category of aroma family and are often associated as middle note or base note in any redolence.

Lemongrass is associated with Citrus category of aroma family followed by rosemary, sandalwood which are a part of herbaceous and woody categories. Extraction of essential oil from lemongrass by Microwave Air Hydro Distillation Method rather than using hydro distillation and extraction method achieve best quality and a large amount of citronella essential oil, the chemical composition of essential oils mainly composed of isomers, geraniol and nerol which together form the compound citral, (the aldehyde responsible for the lemon odor) generally determines the quality of lemongrass oil[9][11].

As jasmine essential oil is composed of heat sensitive chemical compounds, the use of conventional steam distillation technique would inevitably inflict thermal degradation to the natural fragrance, so solvent extraction method was employed due to its mild extracting condition.

Supercritical CO₂ extraction (SCE) has been suggested as an alternative technique for the extraction of essential oil from lavender flowers, since it has several advantages over the conventional extraction methods like degradation of thermo-labile compounds due to high operating temperature, hydrolysis of water sensitive compounds[12]. Supercritical CO₂ extraction method

is a latest technique to extract oil from sandalwood rather than using conventional extraction methods as it works under high pressure and allows constituents to be extracted without heat and also requires shorter extraction time to provide strong aroma redolence[10].

The vast majority of Rosemary essential oil is produced by steam distillation. During steam distillation, the temperature of the steam should be moderated so that it is high enough to open the oil pouches without destroying the plants, fracturing or burning the essential oils.

Table 1.1- Essential oil composition of various plants

PLANTS AVAILABLE	COMPOSITION OF ESSENTIAL OIL	SOLVENT USED	NOTE	REFERENCES
Jasmine	Cis-Linalool oxide, Linalool, Benzyl acetate, Levomenthol, Cis-3-hexenyl benzoate, α -epi-Murol, α -Cadinol	methanol	BASE NOTE	Nguyen Dinh Phuc ¹ , Le Hoang Phuong Thy ¹
Sandalwood	90% sesquiterpenic alcohols, 50-60% Is tricyclic α -santalol, β -Santalol comprises 20-25%.	ethyl alcohol	BASE NOTE	Kusuma, H.S. and Mahfud,
Rosemary	1,8-cineole, camphor and α -pinene	ethanol and water	MIDDLE NOTE	C.Boutekedjiret, F. Bentahar, R. Belabbes
Lavender	1,5-Dimethyl-1-vinyl-4-hexenylbutyrate, 1,3,7-Octatriene, 3,7-dimethyl- (25.10%), Eucalyptol (7.32%) and Camphor (3.79%).	hexane	MIDDLE NOTE	Valtocho.D. zheljaskov
Plumeria	β -farnesene (16.0%), α -patchoulene (13.0%), limonene (12.1%), (E)- β -farnesene (10.8%), α copaene (7.2%) and phytol (6.3 (E)-non-2-en-1-ol (15.7%), limonene (10.8%), phenyl acetaldehyde (9.0%) and n-tetradecanal	petroleum ether	TOP NOTE	Oladipupo A. Lawal ^{1*} , Isiaka A. Ogunwande
Lemongrass	Neral, geranial, geranyl acetate, undecane, myrcene, citrus.	N-hexane	TOP NOTE	Olayemi R.F Neeraj Singh Jeffery B. Cannona, Charles L. Cantrell,

Harvesting time of the plant also plays an important role in determining the oil content present in the plant or flower. Tajidin and team studied the effect of harvesting at three different maturity stages. Lemongrass plant was taken for the study, the plant was harvested at 3 different stages of 5.5, 6.5 and 7.5 months after planting. After harvesting, the essential oil, chemical composition and citral content were analysed using GC-MS. The lemon Grass harvested at 5.5 months and 6.5 months after planting showed higher amount of oil than the one harvested at 7.5 month. Also there was a significant amount of difference between the citral content present in all 3 samples. This concludes that harvesting at appropriate time is necessary for achieving high quality essential oil and also lower the production cost due to increase in yield[12].

Categorisation of different flowers and plants according to essential oils and composition of the essential oils is done in the following table (table 1.1).

II. MATERIAL AND METHODS

2.1 Raw materials:-

The main raw material used in this study are Sample of different Redolence plants.

2.2 Methods:-

2.2.1 Solvent Extraction: -

It is also known as liquid liquid extraction. It is mainly used in the processing of perfumes, bio diesel, etc. It is used to extract essential oils from plants that cannot withstand high heat used in steam distillation. Very delicate aromatics, jasmine, Linden,

blossom, etc. cannot survive the process of distillation. The solvent dissolves all extractable matter from the plant which includes non-aromatic waxes, pigments.

In this process, one of the components of a mixture dissolves in a particular liquid and the other component is separated as a residue by filtration. At the time of distillation, the fragrance is absorbed by the alcohol and thus is evaporated leaving the aromatic absolute in the pot residue. The method is a bit more complicated for oils extraction and also relatively time consuming and costly.

2.2.2 Supercritical Co₂ Extraction:-

Supercritical carbon dioxide extraction is a commonly used method to separate various components from the plant. When carbon dioxide (CO₂) is subjected to high pressure, the gas turns into liquid. This liquid can be used as an inert and safe solvent which will extract the aromatic molecules. Extraction of essential oils using supercritical carbon dioxide (SCCO₂) has been the subject of considerable interest, mainly for the extraction of natural products. CO₂ exhibit certain distinctive characteristics as it is innocuous and inert and possesses lower critical pressure (7.38 Mpa) and temperature (31.1 °C). Compared with conventional extraction methods, extraction with SCCO₂ has many advantages including more selective extracts without thermal degradation and which are solvent-free, thus providing an oil of superior quality. The selectivity of carbon dioxide in relation to the essential oil can be adjusted by changing the temperature and pressure conditions leading to oils with different compositions

2.2.3 Microwave Hydro distillation :-

Microwave assisted hydro distillation (MAHD) have been developed in order to shorten extraction time, improve the extraction yield, and reduce the operational costs. The advantages of using microwave energy for oil extraction are more effective heating, fast energy transfer, faster response to process heating control, faster start-up, increased production, and elimination of some process steps.

2.2.4 Enfleurage :-

Enfleurage is a method that makes use of odorless fats that are present in solid state at normal conditions. The process can be classified as "cold Enfleurage" and "Hot Enfleurage". Sometimes, flowers containing less amount of essential oil or flowers which are very delicate get thermally degraded even before the extraction of oils. In such cases, this method of extraction is sometimes used to extract the essential oil.

In cold Enfleurage, a large framed plate of glass, called a chassis, is smeared with a layer of animal fat, usually Lard or tallow allowed to set. Botanical matter, usually petals or whole flowers then placed on the fat and its scent is allowed to diffuse into the fat over the course of 1–3 days.

2.2.5 Steam Distillation:-

In steam distillation, steam which is generated is passed through the plant material containing the desired oils. Eucalyptus oils, camphor oil, orange oil are obtained by this method. Many other important essential oils are extracted through this method where the principle of the method is mainly based on vapor pressure. Each substance has some vapor pressure even lower than its boiling point, therefore it can be distilled at any temperature by collecting and condensing its vapors. If the volatiles are liquid not miscible with water, they will spontaneously form a distinct phase after condensation, allowing them to be separated by decantation or with a separating funnel. The percentage of essential oils being extracted by this technique is approximately 93%. It is the most widely used process due to simplicity of the process.

III. Formulation of Perfume From Essential Oil:-

Formulation of perfume depends upon its composition, if two or more essential oils are being mixed, then the study of suitability of these essential oils for different notes should be studied which will give optimum and best quality results. Along with essential oils, solvents such as Ethanol, methanol, etc are to be mixed along with other fixatives to increase the longevity of perfume. Also, the proportion of base note top note and middle note should be adjusted depending upon the essential oils which are into consideration.

IV. Discussion and conclusion:-

Discussion about various essential oils obtained by plants and flowers of aroma family was done and their suitability as top note, base note or middle note was also discussed which concluded that there's no hard and fast rule about associating any essential oil with any note and it changes according to different combinations. Notably, different method of extraction of oils were also discussed and most optimum method for each species was also mentioned with some experimental data. Moreover, formulation of fragrance was discussed along with factors affecting the yield and the importance of harvesting time which can significantly affect the economics of the fragrance industry

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