



Research Article

VALUE ADDITION IN FLORICULTURE THROUGH ESSENTIAL OILS

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ABSTRACT

Value-added floriculture is a process of increasing the economic value and consumer appeal of any floricultural commodity. Profit potential is increased when an indistinctive raw commodity is converted into a unique product. The value-addition for marketing flowers includes adoption of post-harvest technology and improved logistics. Export of value-added product e.g. oil (extracted in small units set up in production zones) rather than the raw material e.g. rose petals, can help generate substantial revenue in international market. Working with flowers is of course a benefit, but a successful operation requires a great deal of highly specialised knowledge and skills, since the industry is highly technical and scientific. Value-added products from floriculture include essential oils from ornamental plants, extraction of dyes from plants and flowers, extraction of plant pigments, fresh flower products (bouquets, arrangements, etc.) and dried flowers and plant parts, etc.

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INTRODUCTION

All higher plants have some kind of aroma or flavour in their various parts which include roots, stems, leaves, flowers and fruits. The flavour and aroma in a particular part is due to the presence of essential oils present in special glands in it. The word perfume has been used today to describe scented mixtures and is derived from the latin word, “*per fumum*”, meaning “through smoke”. Perfumes, essential oils and aroma are some of the products which indicate religious values, living standards, personality development for personal use and adornment from years back. Essential oil is a concentrated hydrophobic liquid containing volatile aroma compounds from plants. Essential oils are also known as volatile oils, ethereal oils or aetherolea, or simply as the “oil of the plant” from which they were extracted. Oil is “essential” in the sense that it carries a distinctive scent, or essence, of the plant and is therefore used in food flavouring, perfumery and therapeutically in aromatherapy.

Scenario of essential oils

Global; Estimated world production of perfume oils, for all applications taken together is about 250,000 tons.

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The global export of these oils, perfumes and flavours increased from US \$ 2149 million in 1986 to US \$ 8254 million during 2002. While imports recorded an increase from US \$ 2008 to US \$ 5316 during the same period. On the production side, the total worldwide production of essential oils is estimated at about 1,00,000 to 1,10,000 tonnes. The production of geranium essential oil alone is estimated to be nearly 400 tonnes per annum, with a value of US \$ 20-30 million. The world’s largest importer of aromatic materials is the USA followed by Japan (Verma *et al.*, 2012).

Indian; India ranks 26th in import & 14th in respect of export in world in the trade of essential oil. India holds around 0.7% of import & 1.1% of export. Jasmine and tuberose concentrate from South India have created a mark in world market. The major buyers of Indian essential oil are Former USSR, USA, France, UK, Netherlands, UAE and Saudi Arabia. Growth in perfumery is higher i.e., 15% in India compared to 7% in America and 5% in Europe (Verma *et al.*, 2012).

Opportunities in the essential oil industry

Manufacture of perfumes, creams, aftershave lotions, soaps, detergents, agarbattis, incense, shampoos, bath oils, hair oils, talcum powder and other cosmeceuticals. Flavouring all types of food products like candies, beverages, tobacco, soups, chewing gum, sauces, desserts, cake mixes, etc.

As therapeutics, antiseptics, bactericides or germicides and are also used in making balms, tooth pastes, mouth washes, antiperspirants, deodorants, insecticides and aerosols. For protecting fur, wool, silk clothing and for making shoe polish, and also as solvents in the paint and varnish industry. Manufacture of paper, plastics, textiles, paints as well as synthetic odour and flavours.

Aromatherapy: It is a form of alternative medicine that uses volatile plant materials, known as essential oils, and other aromatic compounds for the purpose of altering a person's mind, mood, cognitive function or health.

The modes of application of aromatherapy include

- **Aerial diffusion:** for environmental fragrancing or aerial disinfection
- **Direct inhalation:** for respiratory disinfection, decongestion, expectoration as well as psychological effects
- **Topical applications:** for general massage, baths, compresses, therapeutic skin care

Different oil extraction methods for flowers

There are five methods of extracting essential oil from flowers;

- **Distillation;** There are three types of distillation used: Water or Hydro distillation; Water and steam or wet steam distillation; and Direct steam or dry steam distillation.
- **Enfleurage;** This process is useful to extract delicate floral scents from flowers that produce essential oils even after being picked (for example; jasmine, tuberose, violets, etc.) or where the oil is affected by higher temperatures.
- **Maceration;** In this method, successive batches of chopped plant materials are digested with hot oil at 45-80°C for several hours. The filtrate is heated with successive batches of fresh flowers up to 20 times.
- **Solvent extraction;** Whenever oil with natural flavour is required, direct extraction with solvents such as petroleum ether or benzene is practised.
- **Mechanical expression;** In this process, the fruits are compressed or squeezed in claw-shaped bowls where juice is sucked out of the fruit through a cannula inserted in the pulp, while the oil released from the oil cells is rinsed with water and then the two are separated by centrifugation or the fruits are placed in a revolving vessel fitted with spikes to release the oils.
- **Adsorption;** In this process, hot air or inert gas is passed over the aromatic plant material which is then led through the activated carbon from which the essential oils are recovered by solvents.

Recent techniques used for essential oil extraction

Supercritical Fluid Extraction; Carbon dioxide is the most popular solvent used in SFE. This technique is used for extraction of essential oils in sandal wood, conifers, tanacetum, etc.

Solidphase Micro Extraction; This method is used for the determination of **humulene** and **caryophyllene** in the head space of female hop cones and male hop lupulin samples. For the determination of the humulene to caryophyllene (H:C) ratio for female hops and male lupulin samples including a 100-aeemploy (dimethyl siloxone).

Simultaneous Distillation Extraction; This method is used for extraction of essential oils in conifers, papra, etc. In this method, both atmospheric and reduced pressure can be employed.

Storage of Essential Oils; To prevent browning due to polymerisation, the essential oils are stored in cool dry cellars, in hermetically sealed amber glass containers.

Flowers yielding essential oils

Rosa sp: About 10 tonnes of rose oil is produced in the world out of which Bulgaria produces more than 5 tonnes. India produces a very small amount of rose oil, which does not exceed 10 kg. Important constituents of rose oil are : 1-citronellol (40-65%), nerol, geraniol, linalool, eugenol etc. Recovery and Yield: In Bulgaria, *Rosa damascena* yielded 1 kg oil/4000 kg of flowers, when extracted in industrial still. *Rosa damascene* yields 0.05% oil, of highest quality which fetches highest price.

Jasminum sp: Next to rose, jasmine is the most important perfumery raw material used since the beginning of human civilization. The word 'jasmine' is derived from Persian word 'yasmyn' meaning 'fragrance'. Jasmynes are cultivated throughout our country in an area of 8000 ha. Egypt is the largest producer (10-15 tonnes concrete/yr) followed by Morocco, France, Algeria, Italy and India. Main constituents of jasmine concrete are benzyl acetate, benzyl benzoate, geraniol, eugenol, benzaldehyde, indole, nerol, methyl jasmonate etc.

Jasminum auriculatum 'Juhi' has highest oil recovery (0.29%). Important varieties are Parimullai, CO-1 Mullai, CO-2 Mullai *Jasminum grandiflorum* or 'Chameli' has best Quality oil (0.25-0.30%). Important varieties are JG 1, JG 2, JG 3, JG 4, JG 5, JG 6, CO1 Pitchi, CO2 Pitchi

Polianthes tuberos: About 30,000 kg loose flowers give 27.5 kg of concrete and this concrete gives 5.50 kg absolute. Generally, 1 kg concrete is obtained from 1150 kg of flowers. Oil is used on heavier types of scents and also used in non alcoholic beverages, ice cream, candy, baked goods etc.

Lavandula angustifolia: The fragrant oils of its flowers are used in aromatherapy, baked goods, candles, cosmetics, detergents, jellies, massage oils, perfumes, powders, shampoo, soaps, and tea. Yield is 0.81% on steam distillation. *Known chemical constituents of Volatile oil:* linalyl acetate, linalool, borneol.

Pandanus fascicularia: It is distributed in tropical areas and in India, it is found growing in the coastal district of Orissa, Gujarat, Andhra Pradesh and Tamil Nadu. Male inflorescence exhales odour and it is an economically important part of the plant which is highly scented. Attar is used for flavouring hair oils, soaps, bouquets, cosmetics, snuff and incense.

		
<p><i>Rosa damascena</i>(Damask rose)</p>	<p><i>Rosa centifolia</i></p>	<p><i>Rosa bourboniana</i></p>
		
<p><i>Jasminum auriculatum</i></p>	<p><i>Jasminum grandiflorum</i></p>	<p><i>Jasminum sambac</i></p>
		
<p><i>Lavandula angustifolia</i></p>	<p><i>Polygonum tuberosum</i></p>	<p><i>Michelia champaka</i></p>
		
<p><i>Iris spp.</i></p>	<p><i>Rhizomes of Iris</i></p>	<p><i>Pandanus fascicularia</i> (Kewra)</p>

		
<i>Tagetes erecta</i> (African Marigold)	<i>Tagetes patula</i> (French Marigold)	<i>Tagetes minuta</i>
		
<i>Pelargonium graveolens</i> (Geranium)	<i>Gardenia jasminoides</i>	<i>Cestrum nocturnum</i> (Night Queen)

Tagetes sp

In India, four species *T. erecta*; *T. patula*; *T. signata*; *T. minuta* have been naturalized for processing of essential oil. The plant and essential oils have been found to be repellent to the common house fly, *Musca nebulosa*. The ethanolic extract of the entire herb showed antiviral activity against Ranikhet-disease virus. Volatile oil isolated from *Tagetes minuta* exhibits Tranquillizing, Hypotensive, Spasmolytic, bronchodilatory and anti inflammatory properties.

Achorus calamus

Its essential oil is extracted from the roots by steam distillation and has been used since ancient times as one of the ingredients of the holy anointing oil. Traditionally, this herb was smoked, eaten, or brewed into a tea, decoction, extract and syrup. The oil has the compound *asarone* which has tranquilizing and antibiotic activity but is also potentially toxic and can cause mild hallucinations. So it should be well diluted before use.

Other important essential oil-bearing ornamentals

Michelia champaca, *Narcissus*, *Magnolia sp.*, Sweet pea, *Cestrum nocturnum*, *Gardenia jasminoides*, *Iris sp.*, *Dianthus caryophyllus*, *Michelia champaca*, etc.

Brief Review of Literature

Yield and Chemical Composition

Ahmad *et al.*, (1998) found that the quality of jasmine concrete obtained from morning harvested flowers was better than evening harvested flowers. Harvest time did not affect the quantity of jasmine concrete. Zhu Shunying *et al.*, (2005) analyzed three essential oils of fresh, air-dried and processed flowers of *Chrysanthemum indicum* and found out that major constituents of oils were 1,8-cineole, camphor, borneol and bornyl acetate, but the percentage of these compound varied greatly because of the processing of flowers. Okoh *et al.*, (2008) extracted the essential oils of fresh leaves, dry leaves and fresh flowers of *Calendula officinalis* by hydrodistillation yielding 0.06, 0.03 and 0.09%, respectively. The analysis of the oils by GC-MS revealed a total of 30, 21 and 24 compounds from fresh leaves, dry leaves and the flowers in the same order.

Essential Oils for Plant Protection;

Hashem *et al.*, (2010) succeeded to control root rot of cumin caused by different *Fusarium spp.* under greenhouse and field conditions through the application of cumin, basil and geranium essential oils. Kadoglidou *et al.*, (2011) examined the effect of lavender, oregano, sage and spearmint essential oils

on growth of *Aspergillus*, *Fusarium*, *Penicillium* and *Verticillium* fungi. All tested essential oils and their individual monoterpenoids inhibited mycelia growth in all fungi. Kabera *et al.*, (2011) evaluated the effect of essential oils of *Pelargonium graveolens* and *Cymbopogon citratus* on maize weevil (*Sitophilus zeamais*) and found 90% mortality of weevils that come in contact or ingest contaminated food and only 40% when inhaled.

Essential Oils as Therapeutics

Shunying *et al.*, (2005) evaluated the antimicrobial activity of essential oils from air-dried and processed flowers of *Chrysanthemum indicum* and found out that the oil of the processed flowers with higher percentage of camphor, exhibited greater bacteriostatic activity. Adamczak *et al.*, (2011) determined the variability in the content of oil and main fatty acids in hips of all native rose species of section *Caninae*. Katsukawa *et al.*, (2011) identified geraniol and citronellol, the major chemical components of rose oil, as suppressors of COX-2 expression and activators of PPAR α and γ ; this may be important in understanding the anti-inflammatory and anti-lifestyle-related disease properties of these chemicals.

Essential Oils as Food Preservatives

Lodhia *et al.*, (2009) tested the anti-bacterial activities of essential oils extracted from flower petals of palmarosa, evening primrose, lavender and tuberose against gram-positive and gram-negative bacteria. Palmarosa oil showed the highest activity against both bacteria among the tested essential oils.

Conclusion

This review summarizes and characterizes the importance of essential oils found from a wide range of flowers and ornamentals. A number of compounds in these oils (and the oils themselves) have medicinal, pharmacological, bactericidal, fungicidal, pesticidal, therapeutic properties and are used in the cosmetic, flavor and fragrance or perfumery industries. The use of essential oils in any form stated above is highly desirable, since they are economical as well as eco-friendly.

Future prospects of essential oil industry

Flower and fragrance plant industry is an upcoming sector with tremendous opportunities for India to have its due share in the international trade in essential oils. Worldwide demand for flavours and fragrances including blends, essential oils and other natural extracts is projected to increase 4.3 percent per year.

The best opportunities for flavours and fragrances will be found in the Asia/Pacific region, which accounts for one-third of total value gains between 2009 and 2014. US is the world's largest user of flavours and fragrances, the fastest growth will occur in developing regions like Asia, Central and South America, Eastern Europe and the Africa/Mideast region. The industry use flavours in processed food, snacks, soft drinks, candy and confectionaries and other items like seafood products, sauces, condiments as per the requirement of the consumers.

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