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ESSENTIAL OIL: THEIR ROLE IN HEALTH - A REVIEW

Nahida Tun Nisa

Department of Botany, Government College for Women M. A. Road Srinagar - 190006, Jammu and Kashmir, India.

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Correspondence to Author:

Dr. Nahida Tun Nisa

Department of Botany,
Government College for Women M.
A. Road Srinagar - 190006, Jammu
and Kashmir, India.

Email: nahidatn@gmail.com

ABSTRACT: The therapeutic potential of essential oil-bearing plants have been realized. Like herbal remedies, essential oils and their constituents cover a wide field of performance. These include antibacterial, antifungal, antiviral, anticancer, anti-inflammatory and anti-oxidant properties. The field of aroma and smell is so attracting that Nobel Prize (2004) in physiology and Medicine was awarded for unlocking the secrets of smell. Thanks to Prof. Richard Alex of Columbia University, and Linda B. Buck, who unlocked the secrets of the olfactory system at the molecular level. These odor bearing substances pass through nasal passage are detected by particular neurons called olfactory cells present in the upper part of nasal epithelium which contains five (5) million neurons. Essential oils are chemically a mixture of organic compounds belonging to different chemical entities such as terpenes, phenols, aliphatic compounds, benzoyl compounds, and heterocyclic compounds. Terpenes are classified as mono, sesquiterpenes, and diterpenes based on isoprene units. Oxygenated terpenes are the chief odor transporters of the essential oils. They include the alcohols, aldehydes, ketones, carboxylic acids, esters, ethers, *etc.*

INTRODUCTION: A variety of medicinal plants have been subjected to detailed chemical test leading to the isolation of pure bioactive molecules pharmacologically evaluated. As a result, new drugs have been discovered along with new applications. These bioactive molecules are employed as therapeutic agents, starting material for the synthesis of drugs, models for the synthesis of pharmacologically active compounds and new reagents for molecular biological investigation.

At present, there are 125 clinically useful drugs of the known constitution which have been isolated from about 100 species of higher plants. It has been estimated that about 5000 plant species have been studied in detail as possible sources of new drugs^{1, 2}. Polyphenols and flavonoids are the common antioxidants, natural products found in medicinal plants. Herbal medicines have been used since ancient times as they contain pharmacological and biological active ingredients³.

Bioprospection of plant species experiments in many laboratories for the recognition of new therapeutic molecules which may be useful for some health problems- such as drug-resistant infectious diseases, diabetes, asthma, arthritis, neurological and psychiatric disorders. Production of plant-based drugs in bulk is one of the important

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criterion for the pharmaceutical industry in India as well ⁴. Some of the important plant-based drugs used in modern medicine are shown in **Table 1**.

TABLE 1: IMPORTANT PLANT BASED DRUGS USED IN MODERN MEDICINE ^{1,2}

Drug	Name of plant species	Activity
Artemisinin	<i>Artemisia annua</i>	Antimalarial
Ajmalicine	<i>Rauwolfia canescence</i>	Hypotensive
Berberine	<i>Berberis lyceum</i>	Antiemetic
Colchicine	<i>Colchicum luteum</i>	Anti-inflammatory
Diosogenin	<i>Dioscorea deltoidea, costuss sps</i>	Base material for steroid synthesis/ cortisone drugs
Digoxine / Lanatosides	<i>Digitalis lantana;</i>	Cardio tonic
Ergotamine / Ergot alkaloids	<i>Claviceps purpurea</i>	Post-partium-hemoorrhage
Etoposide / tenopside	<i>Podophyllum emodii</i>	Anticancer
Guggulsterones / Guggalipid	<i>Commiphora mukul</i>	Hypocholerolemic
Hypericin / Hyperfolin	<i>Hypericum perforatum</i>	Antiviral and Antidepressant
Hyoscine and Hyoscyamine	<i>Hyoscyamus niger, Hyoscyamus muticus</i>	Parasympathetic
Methoxsalen	<i>Ammi majus, Heracleum candicans</i>	Leucoderma
Morphine / Codeine / Papaverine	<i>Papaver somniferum</i>	Sedative
Psoralen	<i>Psortia corylifolia</i>	Leucoderma
Resperine	<i>Rauwolfia serpentine</i>	Hypotensive
Rutin	<i>Sophora japonica; Fagopyrum esculatum</i>	Vitamin P
Sennosides	<i>Cassia angustifolia</i>	Laxative
Silymarin	<i>Silybium marianum</i>	Hepatoprotective
Taxol / Topotecan / Irinotecan	<i>Camphotheca acuminata/ Mapia foetida</i>	Anticancer
Valepotriates	<i>Valeriana wallichiana</i>	Sedative / Tranquilizer
Vinblastine / Vincristine	<i>Catharanthus roseus</i>	Anticancer

Lavendula officinalis Chaix (Labiatae) is one of the most important plants of nowadays. Lavender is the spa therapist's dream oil, the jack of all trades, the oil with the answer to most of our needs. True lavender oil distilled from the flowering spikes is the oil of high aroma value and has a commanding position in perfumery, flavor and cosmetic industries. Other products like lavender concrete, lavender absolute, lavender water and dried lavender flowers have an ever-growing demand. Lavender marc left after the distillation of oil is used in 'Agarbaties' and as organic manure ⁵. The chemical interaction between plants and their environment is intervened mainly by the biosynthesis of secondary metabolites, which

excise their biological roles, as a plastic adaptive response to their environment ⁶.

Treatment of Depression: Tincture of *Lavendula officinalis* in combination with imipramine was found more effective in the treatment of mild to moderate depression than imipramine alone ⁷.

Treatment of Colitis: Similarly, 1, 8-cineole predominant in the shoots, attenuates the colonic damage in rats on acute trinitrobenzene sulfonic acid (TNBS) - colitis ⁸.

Use of Linalool: Linalool, the naturally occurring enantiomer in lavender oil, possess anti-inflammatory, antihyperalgesic and antinociceptive effects in different animal models ⁹.

Fungi Static and Fungicidal Activity: The main components linalool and linalyl acetate of *Lavendula officinalis* also show fungistatic and fungicidal activity against *Candida albicans*. At lower concentration, it inhibits germ tube formation and hyphal elongation, indicating that it is effective against *Candida albicans* dimorphism and may thus reduce fungal progression and the spread of infection in host tissues ¹⁰.

Treatment of Malaria: Combination of limonene, 1.22 mM with other antimicrobial drugs, like fosmidomycin, could be in the new strategy for the treatment of malaria ¹¹.

Application in Aromatherapy: Beside gastroprotection, lavender oil reveals an interesting analgesic activity mainly relevant after inhalation, at doses devoid of sedative side effect, suggesting the interest for protection application of this oil in aromatherapy ¹².

Given its continued popularity and commercial value, it was confirmed: "Herb of the year 1999" in USA ¹³. The essential oils of lavender and Australian tea tree oil had useful antimicrobial properties with additional properties of being stable and nonirritant to sensitive or damaged skin ¹⁴. Importance of the essential oils distilled from members of the genus *Lavendula* has been used both cosmetically and therapeutically. The lavender oil is used as antibacterial, antifungal, carminative, sedative, antidepressive and effective for burns and insect bites ¹⁵.

Lavendendula officinalis Chaix is vegetatively propagated, but the poor rooting ability of stem cuttings, as well as the lack of selected clones, restrain its industrial exploitation¹⁶. Accordingly, an alternative procedure is required for propagating *Lavendula* plants efficiently. Tissue culture is one of the useful methods which can be employed for clonal propagation.

Pelargonium graveolens (Geraniaceae) produces a wide range of essential oil components including mono and sesquiterpenes. The essential oil, obtained by distillation of aerial parts, is extensively used in perfumery and cosmetic industries. Besides a flavoring agent, the oil is used for staunching bleeding, healing of wounds, skin disorders, diarrhea and colic. Also, the oil of *Pelargonium graveolens* and its main constituents are reported to enhance antifungal effects of Ketoconazole in general and in Trichophyton species in particular¹⁷.

The current international demand of *Pelargonium graveolens* is more than 600 tons annually, which is mostly met by countries like China, Morocco, Reunion Island and South Africa¹⁸. As against the annual consumption of 149 tons, India produces just 5 tons of geranium oil annually, and the rest of the demand is met largely through imports. The restricted area of cultivation is the major reason for India's dependence on import of Geranium oil^{19, 20, 21, 22}. Predominant vegetative mode of propagation also restricts the genetic improvement of *Pelargonium graveolens* through classical sexual breeding leads to limited genetic base²³. Due to inherent male sterility of the plant, its seed setting and seed viability are low in India²⁴. The study implemented *in-vitro* propagation method offers a powerful tool for germplasm maintenance and multiplication.

Artemisia dracunculus L. (Tarragon, Compositae) is used as a seasoning and flavoring agent. The oil is widely used in food flavoring formulations. The aromatic leaves are used as apertient, stomachic, stimulant and febrifuge and also as a spice. The therapeutic properties reported are analgesic, expectorant, tonic, antiseptic and stimulant. *In-vivo* studies mainly in rodents highlight potential anti-inflammatory, hepatoprotective and antihyperglycemic effects²⁵. The antiplatelet activity has

been reported from the oil of *Artemisia dracunculus*²⁶.

The oil has also shown antifungal, antibacterial and antioxidant properties²⁷. Essential oil use is particularly common in dermatology and for treating fungal infections which they are the most popular natural products of choice²⁸. The anticonvulsant activity has been reported from the oil of Iranian origin²⁹. The essential oil after restructure is used for flavoring vinegar sauces, salad dressings, canned soups, and liquors. It is also in use in perfumes of cheaper type³⁰. Flavonoids, coumarins, phenylpropanoids terpenes determine antimicrobial, antiviral, antifungal and antioxidant action of *Artemisia dracunculus*³¹.

Artemisia dracunculus L. is a sexually sterile plant that is vegetatively propagated by cuttings. Proliferation by cuttings is dependent on seasonal sensitivity to rooting; propagation by division is limited by the number of plants that can be formed from one stock plant³². Accordingly, an alternative procedure is required for propagating *Artemisia dracunculus* L. plants efficiently. Tissue culture is one of the useful methods which can be used for clonal propagation.

Acorus calamus L. (Acoraceae) is a perennial herb, the root system of the adventitious type with thick branched rhizome, simple sword shape leaves. It grows to 1 meter in height. Venation parallel, petaloid with a membranous sheathing base. It has a yellow flower in summer³³. The leaves of the wild or cultivated plant are blenched, crushed or chopped and applied to swellings, wounds, painful joints, tumors. A paste of the roots pounded finely together with a little ginger (*Zingiber officinalis*) is applied externally to cure bone aches. The rhizome is taken as a tonic, and as an aphrodisiac, small amounts are thought to reduce stomach acidity, while large doses increase deficient acid production³⁴. It is most effective antispasmodic, relieve spasm of the intestine. The plant remains a popular, herbal remedy^{35, 36}. Rhizomes of *Acorus calamus* L. are beneficial in chronic, diarrhea, dyspepsia. It is a source of starchy food also used in perfumery³⁷. It is also added to bath preparations to alleviate nervous exhaustion³⁸. The rhizomes of *Acorus calamus* L. possess anti-spasmodic, carminative and anthelmintic properties and also used for the

treatment of epilepsy, mental ailments, chronic diarrhea, dysentery, bronchial catarrh, intermittent fevers and tumors³⁹.

The genus *Ammi* (Apiaceae), a native of Egypt, is commonly known as Bishops Weed⁴⁰. The bishop's weed produces strongly aromatic seeds. The seeds contain drugs, used in the Unani system of medicine. The seeds bear ammoidin (xanthotoxin), ammidin (imperatorin) and majudin (bergaten)⁴¹.

All these compounds are used in the treatment of leucoderma, vitiligo, psoriasis, and other dermal diseases. Bishops weed reputedly helps to treat patchy skin pigmentation of normal skin and testing of antitumor activity. There have been many valuable contributions of plant tissue culture in the fields of fundamental, academic and applied botany⁴². *Ammi majus* L. is well known for its horticultural importance. It is also used in the manufacture of the suntan lotions in the west and thus has great export potential.

All types of mints have a distinctive flavor and refreshing aroma. The dried leaves and flowering tops of the plant constitute the drug. Infusion of its leaves is used in rheumatic pains, aching head, and indigestion. Aerial parts of the plant are refrigerant, stomachic, carminative, stimulant and diuretic. They possess antispasmodic and emmenagogue properties and are also given to stop vomiting and to treat jaundice.

The oil is a valuable antineuralgic. Mint oil is used for flavoring purposes, foods, beverages. Dementholized oil is employed for mouthwash; toothpaste *etc.*⁴³ In India, menthol production is non-promising because of the restricted cultivation. Thus, there is a need to expand the cultivation of this herb to ensure round the year availability.

CONCLUSION: Essential oils are today widely used for various purposes *viz.* - Bathing, hair care, shampoo, massage blend, skin care, vaporization, steam inhalation. The essential oil has shown great inhibitory activity in both acute and chronic anti-inflammatory process. Scents are powerful stimuli that directly enter the brain, triggering intense emotional responses. By inhaling essential oils, our brain will signal certain emotions that can leave us feeling energized, optimistic and hopeful.

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CONFLICT OF INTEREST: The essential oil can change the economic scenario in our state Jammu and Kashmir. The essential oil is found to be more useful when distinct features of life like diet, microbial activity, antioxidant activity, *etc.* are considered. Thus I have no conflict of interest in this review.

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