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Review Article

INDIGENOUS VOLATILE OILS AS IMPERATIVE GIFT FROM NATURE - A REVIEW

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ABSTRACT

Volatile oils are concentrated odorous essences extracted from various plant parts such as flowers, fruits, heart-wood, rhizome and leaves. They are frequently employed in food flavoring, perfume, medicine and aromatherapy. Essential oils are extracted from various processes such as hydro distillation, effleurage and eucelle depending upon the plant part containing the essential oil. Essential oils are inhaled in the form of fine mist of vapour through aromatherapy and some of them are highly beneficial when ingested. These oils have been used traditionally for preservation of foods, spices and condiments. Essential oils or ethereal oils are natural, complex, multi-component, highly concentrated essences of aromatic plant systems composed mainly of terpenes units in addition to some other non-terpene components. These units biosynthesized by mevalonic acid pathway. Isoprenes/hemi-terpenes are five carbon compound having two unsaturated bonds. In this review paper an attempt has been done to emphasize the most valuable essential oils of Indian origin from nature with focus particularly on the chemical constituents, medicinal and pharmacological usage of volatile oils.

KEYWORDS: Indigenous, Volatile oils, Nature, Resins.

INTRODUCTION

Plants native to particular area are referred to as Indigenous plants. These plants have evolved thousands of years and are suited to survive in environment. Essential oils have been substantially used for so many years. Ethereal oils can be synthesized by various plant organs including flowers, buds, stems, leaves, seeds, fruits, twigs, roots, bark or wood. They are stored in special secretory cells, canals, ducts, cavities, glandular trichomes or epidermic cells. Essential oils are heterogeneous natural mixtures of hydrocarbons. The major group of volatile oil is consists of terpenes and terpenoids and the other of aromatic and aliphatic components, all represented by low molecular weight. Generally essential oils are named as they are considered to indicate the essence of flavor and odor. These oils are generally needed for flavor and curative properties.[1-5]

Essential oils are utilized in aromatherapy to treat several medical conditions. For example, they are helpful to combat infections like microbial attack, to assist wound healing, promoting blood circulation, improving digestion, to mitigate sinus and lung congestion.

Traditionally essential oils were used to promote mucus clearing (diaphoretic agent) and, to induce sleep and also to prevent respiratory infections and fight depression. In Psycho aroma-therapy, they are used as a relaxing, stimulating, calming and tranquilizing agents.[6-7] The detailed description of oils/resins from nature have been shown in Table 1. The oxidation products of heterogeneous essential oils (Resins) are very variegated in chemical composition. The resin is usually secreted in definite cavities or passages. Resins are constantly called gums. Despite, gums form solutions or "sols" with water, resins do not. Resins are insoluble in water. Resins have assured assets in common and form a specific group of plant commodity easily recognizable in practice. Resins protect the plants against microbial attack. Resins have certain individuality that renders them conspicuous to industry. They are used commercially in paint industry and as aroma in culinary practices, pharmaceutical, cosmetics and industrial products.[3-8] There are several methods (hydrodistillation, enflurage, ecuelle) of extracting out the volatile principles from plants.

Table 1: Indigenous Drugs Containing Volatile Oils and Resins[9-55]

Common name	Ayurvedic name	Habitat		Botanical Name/ Family	Chemical Constituents	Medicinal uses	Reported biological activity
		In India	Outside India				
Coriander	*Dhanyaka*	Maharashtra, Karnataka, Andhra Pradesh, Rajasthan, Tamil Nadu,	Morocco, Romania, Canada	*Coriandrum sativum* Umbelliferae	Linalool, 2-hexen-1-ol, 3-hexen-1-ol, cyclodecane	Stimulant, stomachic, carminative, antispasmodic, diuretic	Hepatoprotective
Fennel	*Misreya*	Punjab, Assam, Maharashtra, Gujarat	Egypt, Turkey, Taiwan	*Foeniculum vulgare* Umbelliferae	Carvacrol, 1,8-cineole, fenchone, trans-anethole	Carminative, stomachic, antispasmodic, emmenagogue, galactagogue, anti inflammatory, diuretic	Hypotensive
Caraway	*Krishna jeerka*	Bihar,Orissa, Punjab, Bengal, Andhra Pradesh and in the hills of Kumaon, Garhwal, Kashmir and Chamba	Netherland, Hungary, Egypt, Poland	*Carum carvi* Umbelliferae	Thymol, γ-terpinene, p-cymene	Carminative, antispasmodic, antimicrobial, expectorant, galactagogue, emmenagogue	Hypolipidemic
Cumin	*Sveta jiraka*	Cultivated in Punjab and Uttar Pradesh	Spain, Morocoo, Itally, Denmark	*Cuminum cyminum* Umbelliferae	Cuminlaldehyde, gamma-terpinene, beta-pinene, *trans*-carveol, myrtenal	Carminative, antispasmodic stimulant, diuretic, antibacterial, galactagogue	Insecticidal and acetylcholine esterase inhibition activity
Celery	*Ajamoda*	Uttar Pradesh, Himachal Pradesh and Southern India	China, Egypt, France	*Apium leptophyllum* Syn. *Apium graveolens* Umbelliferae	*d*-limonene, phathalides, coumarins, bergapten, flavonoids apiin and apigenin	Diuretic, carminative, nervine, sedative, antiemetic, antispasmodic, antiseptic	Anti-ulcerogenic and antibacterial
Indian Dill	*Satahva*	Cultivated all over India	Spain, Morocoo, Italy,	*Anethum sowa* Syn. *A. graveolens*	Phenyl derivatives, methylene dioxy phenyl derivatives,	Carminative, stomachic, antispasmodic	Fungistatic or fungicidal

			Denmark	Umbelliferae	sesquiterpene hydrocarbons		
Desi Ajawaayin	*Yavani*	Madhya Pradesh, Andhra Pradesh, Gujarat, Maharashtra, Uttar Pradesh, Rajasthan and Bihar	Iran, Afganistan, Pakistan, Egypt	*Trachyspermum ammi* Umbelliferae	Thymol, γ-terpinene, and p-cymene	Expectorant, bronchial and other respiratory ailments. Used externally in cases of rheumatism	Scolicidal activity
Nutmeg	*Jaiphal*	Nilgiri, Kerala, Karnataka, West Bengal	West Indies, Island of Moluccas, Indonesia	*Myristica fragrans* Myristicaceae	Myristicin, dehydro diisoeugenol frommace	Carminative, spasmolytic, antiemetic, orexigenic	Antioxidant and antiangiogenic
Cinnamon	*Tvak*	Kerala, Western Ghats	Indonesia, China, Japan, America	*Cinnamomum zeylanicum* Lauraceae	Cinnamaldehyde, benzaldehyde, cinnamyl acetate	Carminative, astringent, antispasmodic, expectorant, haemostatic	Diabetes mellitus
Indian Silver Fir	*Talisapatra*	Himalayas from Kashmir to Assam	Western Australia	*Abies webbiana* Pinaceae	The essential oil from leaves contains α-pinene, *l*-limonene, deltacarene	Expectorant, bronchial sedative, decongestant, anticatarrhal	Antibacterial
Tejpaata	*Tamalpatra /Tejapatra*	Subtropical Himalayas, Khasi, Jaintia Hills	Indonesia, China, Japan, Sri Lanka	*Cinnamomum tamala* Lauraceae	Eugenol, eugenol, trans-cinnamyl acetate and β-caryophyllene	Carminative, antidiarrhoeal, spasmolytic, antirheumatic, hypoglycaemic	Hypolipidemic
Bathuaa	*Vastuka*	Northern India	America, Greece, Europe	*Chenopodium album* Chenopodiaceae	4,4-dimethylsterols, ascaridole, α, β-pinene, α-terpineol	Laxative, anthelmintic against round-and hookworms, blood-purifier, antiscorbutic	Antitumor
White Sandalwood	*Sveta chandan*	Dry regions of Peninsular India from Vindhya mountains	Australia Sri Lanka, Pakistan	*Santalum album* Santalaceae	Palmitic acid, oleic acids, α, β-santalol, cedrol, esters, aldehydes, phytosterols	Cooling,diaphoretic,diuretic, expectorant, antiseptic and bacteriostatic	Antihyperglycemic, antihyperlipidemic

		southwards					
Sweet Flag	*Vacha*	Throughout in India in damp marshy places	Europe, Southern Russia, Northern Asia, China	*Acorus calamus* Araceae	α and β-asarone, tannins, triterpenes, sesquiterpenes	Nervine tonic, hypotensive, tranquilizer, sedative	Hepatotoprotecti ve
Himalayan Cedar	*Devadaru*	North-western Himalayas from Kashmir to Garhwal	Pakistan, Afganistan, Nepal	*Cedrus deodara* Pinaceae	β-himachalene, α-himachalene	Decoction of bark is used internally as astringent, antidiarrhoeal and febrifuge	Antioxidant and antimicrobial
Musk-root	*Jatamansi*	Alpine Himalayas, Kumaon, Sikkim, Bhutan	Nepal, China, Egypt	*Nardostachys jatamansi* Syn. *N. grandiflora* Valerianaceae	*d*-nardostachone, valeranone, jatamansone as the major ketonic sesquiterpenes	Treatment of epilepsy, hysteria, convulsive affections, palpitation of heart and in intestinal colic	Antidiabetic
Tilaparna	*Nilgiri*	Nilgiri Hills in Tamil Nadu state in Southern India	Australia, California, Europe, New Zealand, Africa	*Eucalyptus globulus* Myrtaceae	1,8-cineole, α-pinene, d-limonene,linalool acetate	Antiseptic, antibiotic, antiviral, antifungal, antispasmodic	Mosquito repellent
Clove	*Lavang*	Tamil Nadu, Kerala	Sri Lanka, Indonesia, Pakistan, Brazil	*Syzygium aromaticum* Syn. *Eugenia aromatic, Eugenia caryophyllata* Myrtaceae	Carvacrol, thymol, eugenol and cinnamaldehyde	Carminative, antiinflammatory, antibacterial	Beneficial supplement in treating human arthritis
Naagarmot haa, Nut Grass	*Musta*	Cultivated in South India	Europe, Africa, Austria, France	*Cyperus Rotundus* Cyperaceae	Contains mainly sesquiterpenes. The tuber is rich in Cu, Fe, Mg and Ni. β-sitosterol, eudalne, isocyperol	Carminative, astringent, anti-inflammatory, antirheumatic	Potential fumigants
Greater Galangal	*Kulanjana*	The Himalayas and southern region of western Ghats	Philippine, South Asia, Thailand, Indonesia	*Alpinia Galanga* Zingiberaceae	Major constituents of the essential oil are methyl cinnamate, cineole	Carminative, stomachic, circulatory stimulant	Neuroprotective effect

					and *d*-pinene		
Costus	*Kushtha*	Kashmir and neighbouring region	Asia, Europe, North America,	*Saussurea Lappa* Syn. *S. costus* Asteraceae	Resinoids, essential oil, alkaloid inulin, saussurea lactone, fixed oil, tannins and sugars	Antispasmodic, expectorant, carminative, astringent, antiseptic	Inhibit prostate cancer cell migration
Ginger	*Ardraka*	Kerala, Andhra Pradesh, Uttar Pradesh, West Bengal, Maharashtra	South Asia, Caribbean, East Africa	*Zingiber Officinalis* Zingiberaceae	Monoterpenes mainly geranial neral, sesquiterpenes	Antiemetic, antiflatulent, hypocholesterolaemic ,anti-inflammatory, antispasmodic, expectorant, circulatory stimulant	Antiglycating potential
Turmeric	*Haridra*	Cultivated all over India, particularly in West Bengal, Tamil Nadu, Maharashtra	China, Peru, South Asian Region	*Curcuma Longa,* Syn. *C. domestica* Zingiberaceae	Curcumin, curcuminoids, turmerones, bitter principles, resin, starch, sugars	Cholagogue, hepatoprotective, blood purifier, antioxidant	Anti-inflammatory, anti-HIV, anti-bacterial, antioxidant effects and nematocidal activities
Indian Jalap	*Trivrit*	Throughout India mainly in Andhra Pradesh	Pakistan, Deccan Region	Operculina turpethum, Syn. Ipomoea turpethum Convolvulaceae	Glycoside, turpethin, α-and β-turpethein	Purgative, antiinflammatory	Anti-inflammatory, purgative, hepato-protective agent
Hemp	*Vijaya*	Commonly occurs in waste grounds, along road side	China Japan, Korea, North Africa	*Cannabis Sativa,* Cannabinaceae	Cannabinoids, cannabispirans and delta-9-tetrahydrocannabinol (THC)	Hallucinogenic, hypnotic,sedative, analgesic, antiinflammatory	Inflammatory bowel diseases
Colocynth Bitter Apple	*Indravaruni*	Throughout India	Turkey, Nubia, Trieste, Asia	*Citrullus Colocynthis*, Cucurbitaceae	Cucurbitacin E, J, L glucosides, caffeic acid chlorogenic acid derivatives	Dried pulp of ripe fruit is cathartic, drastic purgative, irritant and toxic	Hypoglycemic
Embelia	*Vidanga*	Throughout evergreen forests in India	Sri Lanka, Malaysia, China	*Embelia Ribes,* Myrsinaceae	Embelin, rapanone, homoembelin, homorapnone and	Ascaricidal, anthelmintic, carminative, diuretic	Anticonvulsant

					vilangin		
Kamala tree	*Kampillaka*	Throughout tropical regions of India	Afganistan, Sydney, Philippine, Australia	*Mallotus Philippensis* Euphorbiaceae	Phloroglucinol derivatives, rottlerin, isorottlerin,	Gland and hair of fruit is purgative, anthelmintic, styptic also used for the treatment of tapeworm infestation	Bactericidal
Iron-wood	*Nagakesara*	Eastern Himalayas, Assam, West Bengal, Western Ghats	Sri Lanka, Nepal, Burma, Thailand Philippines	*Measua Ferrea, syn M. nagassarium* Guttiferae	Euxanthone, mesuaxanthones A and B, mesuol, mammeigin, mammeisin	Antidysenteric, astringent, haemostatic, anti-inflammatory, stomachic	Antiarthritic activity
Indian Bdellium	*Guggulu*	Rajasthan, Madhya Pradesh, Assam, Andhra Pradesh, Karnataka	Northern Africa, Central Asia	*Commiphora Weightii,* Syn. *Commiphora mukul* Burseraceae	Gugglsterones Z and E, diterpenoids, volatile oil	Oleo-gum-resin is used for reducing obesity and in rheumatoid arthritis, osteoarthritis	Potent inhibitory effects on tumour cells and anti-inflammatory efficiency
Indian Frankincense	*Shallaki*	The drier parts of Peninsular India	Asia, Africa	*Boswellia Serrata* Burseraceae	Boswellic ester, triterpenes of oleanane, ursane	Antiseptic, anti-inflammatory, antiatherosclerotic, emmenagogue, analgesic, sedative, hypotensive	Antioxidant
Long-leaved Pine	*Sarala*	The Western and Eastern Himalayas	*Pakistan, Nepal, Bhutan*	*Pinus Roxburghi* Syn. *P. longifolia* Pinaceae	β-pinene, carene and longifoline	Decongestant, expectorant, antiseptic	Analgesic and anti-inflammatory
White Damar	*Sarjarasa*	Peninsular India, from Kanara to Trivandrum	South Africa, Mexico, Ceylon	*Vateria malabarica* Dipterocarpaceae	*d, l epi*-catechin, bergenin, triterpene hydrocarbons, ketones, alcohols acids, sesquiterpenes	Astringent, antibacterial, antidiarrhoeal, emmenagogue	In-vitro antioxidant
Asafoetida	*Hingu*	Kashmir	Europe, Afganistan, Pakistan, Nepal	*Ferula foetida,* Syn. *F. asafoetida* Umbelliferae	Farnesiferols, ferulic acid, volatile oil, sulphated terpenes	Oleo gum resin stimulates the intestinal, respiratory tracts and the nervous system	Bronchitis, asthma, whooping cough

Adulteration in Essential Oils[55-64]

Adulteration is a habit of substituting original crude drug with inferior substances which is devoid of chemical or therapeutic properties. Adulteration involves following Condition as mentioned in Table 2.

Table 2: Conditions in adulteration

Deterioration	Admixture	Sophistication	Substitution	Inferiority	Spoilage
It is the impairment in the quality of a drug	It is the addition of one article to another due to ignorance or carelessness, or by accident	It is the intentional or deliberate type of adulteration	It occurs when some totally different substance is added in place of original drug	It refers to any sub-standard drug	It refers to deterioration due to the attack of microorganisms

Types of Adulterants

Crude drugs are manipulated by substitution with inferior varieties, sub standard varieties artificially manufactured substances as mentioned in Table 3 and 4 given below.

Table 3: Types of adulteration

S.No.	Type of adulterant	Genuine drug	Adulterant
1	Substitution with sub-standard commercial varieties	*Strychnous nux-vomica*	*Strychnous nux-blanda Strychnous potatorum*
2	Substitution with superficially similar inferior drugs	Belladonna leaves	Ailanthus leaves
3	Substitution with artificially manufactured substances	Coffee	Compressed chicory
4	Substitution with exhausted drug	Fennel, clove, coriander, caraway	Exhausted drug
5	Presence of vegetative matter from the same plant	Cascara or cinchona	Lower plants like epiphytes, moss and liverworts growing on bark portion
6	Harmful adulterants	Asafoetida	Pieces of amber coloured glass in colophony, limestones
7	Adulteration of powders	Powdered ginger	Exhausted ginger powder

Table: 4 Examples of few Adulterants in volatile oils containing drugs

S.No.	Crude Drug	Part used	Biological Source	Adulterants
1	Orange peel oil	Peel	*Citrus sinensis* Rutaceae	*Citrus tangerine*
2	Cinnamon oil	Bark	*Cinnamomum zeylanicum* Lauraceeae	Addition of cinnamon leaf oil
3	Nutmeg oil	Mace	*Myristica fragrans* Myristicaceae	Addition of nutmeg terpenes, pinene, limonene, turpentine fractions etc.
4	Eucalyptus oil	Leaves, flower buds	*Eucalyptus globulus* Myrtaceae	*Eucalyptus radiata*
5	Green cardamom oil	Fruit	*Elettaria cardamomum* Zingiberaceae	Various unofficial cardamoms
6	Fennel oil	Fruit	*Foeniculum vulgare* Umbelliferae	Exhausted fruits of fennel
7	Dill oil	Fruit	*Anethum graveolens* Umbelliferae	Addition of α-phellandrene and limonene
8	Clove oil	Flower buds	*Syzygium aromaticum* Myrtaceae	Clove stalks, mother cloves, Brown cloves, Exhausted cloves

9	Rose oil	Petals	*Rosa centifolia* Rosaceae	*Pelargonium graveolens*, *Cymbopogon martinii*
10	Lavender oil	Flowering tops	*Lavandula angustifolia* Labiatae	*Lavandula intermedia*
11	Patchouli oil	Leaves	*Pogostemon cablin* Labiatae	Addition of gurjun balsam vegetable oils
12	Sandalwood oil	Heart-wood	*Santalum album* Santalaceae	Addition of sandalwood terpenes
13	Lemongrass oil	Leaves	*Cymbopogon citratus* Poaceae	Addition of citral
14	Jasmine oil	Flowers	*Jasminum officinale* Var. *Grandiflorum* Oleaceae	Synthetic terpenes are added
15	Geranium oil	Leaves, stalks, flowers	*Pelargonium graveolens* Geraniaceae	Diluents are added propylene glycol, benzyl alcohol

DETECTION METHODS OF ADULTERATION IN VOLATILE OILS

Volatile oils are complex mixtures of terpenes that need to be analysed by various techniques to ensure identity, quality, purity and efficacy of the drug. Authentication of volatile oils is of prime concern today. Odour evaluation and physicochemical methods such as specific gravity determination, optical rotation, refractive index etc., are the common methods but are not much reliable. The most important standard chromatographic-spectroscopy technique for analysis of constituents of essential oils includes gas chromatography coupled with mass spectroscopy, FTIR and NMR. Other modern approach includes fingerprinting of volatile oils and enantiomeric analysis.

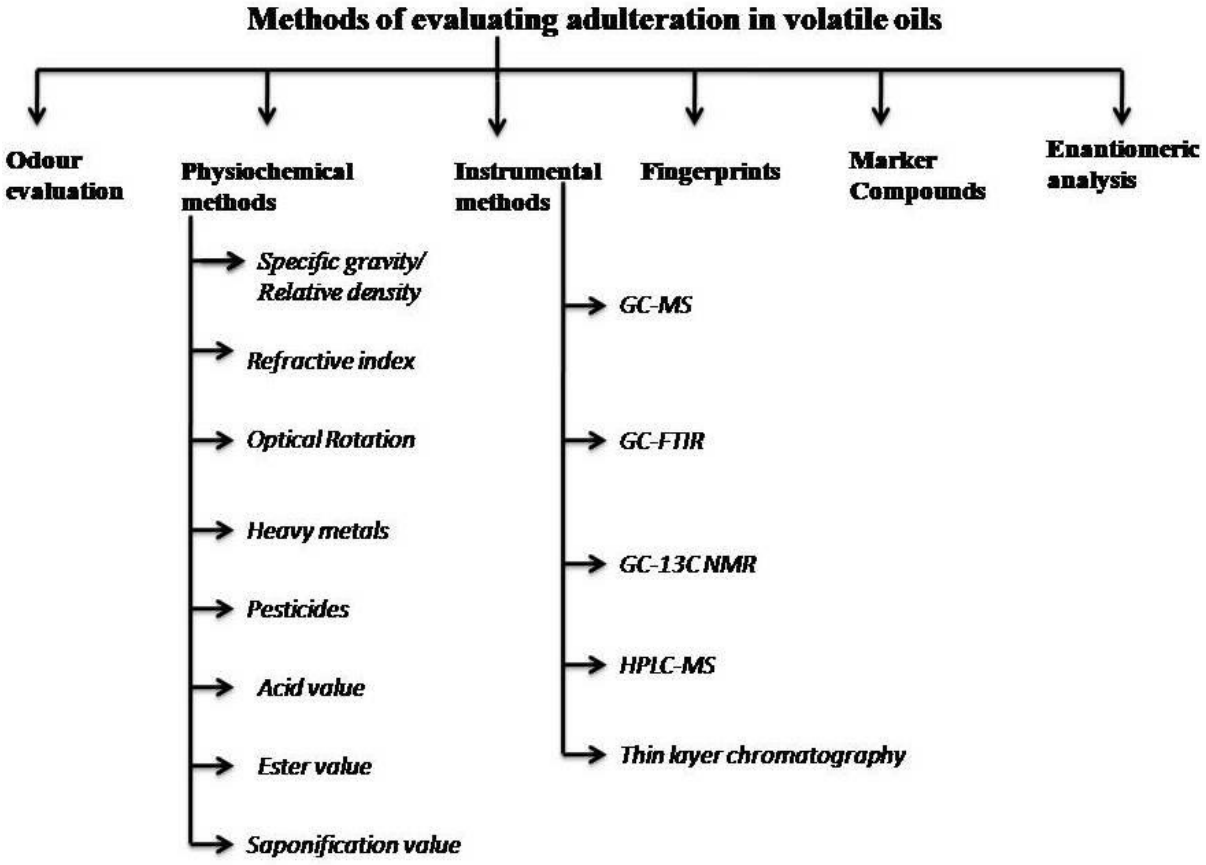

Fig.2: Various methods of detection of volatile oils

CONCLUSION

Nature in form of indigenous plants make us to use essential oils to prevent and treat various health ailments. Essential oils also strengthen the human senses promote healthy living. Inhalation, ingestion and topical applications of the aroma of plants and the aromatics extracted from those plants by various methods like hydro distillation, enfleurage, ecuelle and supercritical fluid extractions is proved to enhance the sense of smell and directly contributes to mental health and treat hormonal imbalances along with other disorders. Adulteration in volatile oils is a topic of great concern today. Different methods are employed to detect adulteration in volatile oils which includes the preliminary examination of oils by physicochemical methods and the most significant instrumental methods which includes chromatographic and spectroscopic approach. Further analysis and understanding of essential oils will help us to contribute more towards Ayurvedic and Pharmaceutical industry.

REFERENCES

1. Duke James A. Godwin Mary Jo Bogenschutz, duCellier Judi, Duke Peggy-Ann K. Handbook of medicinal herbs 2nd ed. Published in CRC press Boca Raton London New York Washington, D. C. 1929
2. Kar Ashutosh, Pharamacogonosy and Pharmacobiotechnology, Revised –expanded 2nded. New Age International (P) Limitid Publishers 2007.
3. Jackson Bettyp, Snowdon Derek W. Atlas of microscopy of medicinal plants, culinary herbs and spices, Belhaven Press A division of printer publisher, London 1990.
4. Pratt R, Youngken H. Pharmacognosy: the Study of Natural Drug Substances and Certain Allied Products. J.B. Lippincott Company USA 1951.
5. Bakkali F, Averbeck D, Idaomar M. Biological effects of essential oils – A review. Food and Chemical Toxicology. 2008; 46 (2): 446-475.
6. Johnston L, Parsons P. Healing with Essential Oils and Aromatherapy 1999 (http://www.healing therapies.info /Aromatherapy.htm)
7. Mukherjee PK. Quality Control of Herbal Drugs. Edition-I, Business Horizons, New Delhi 2002.
8. Kokate CK, Purohit AP, Gokhale SB. Pharmacognosy. 29th Edn.Nirali Prakashan, Pune Mumbai 2004.
9. Evans and Trease. Pharmacognosy. Edition-12, Eastbourne, U.K., 1983.
10. Khare CP, Indian Medicinal Plants 1st Edn., Berlin/Heidlburg, Springer verlang 2007.
11. Pandey A, Bigoniya P, Raj V, Patel K K. Pharmacological screening of Coriandrum sativum Linn. for hepatoprotective activity. J Pharm Bioallied Sci. 2011; 3(3): 435–441.
12. El Bardai S, Lyoussi B, Wibo M, Morel N. Pharmacological evidence of hypotensive activity of Marrubium vulgare and Foeniculum vulgare in spontaneously hypertensive rat. Clin Exp Hypertens. 2001; 23(4):329-43.
13. Saghir MR, Sadiq S, Nayak S, Tahir MU.Hypolipidemic effect of aqueous extract of Carum carvi (black Zeera) seeds in diet induced hyperlipidemic rats. Pak J Pharm Sci. 2012;25(2):333-7.
14. Yeom HJ, Kang JS, Kim GH, Park IK.Insecticidal and acetylcholine esterase inhibition activity of Apiaceae plant essential oils and their constituents against adults of German cockroach (Blattella germanica). J Agric Food Chem. 2012;60(29):7194-203.
15. Baananou S, Bouftira I, Mahmoud A, Boukef K, Marongiu B, Boughattas NA Antiulcerogenic and antibacterial activities of Apium graveolens essential oil and extract. Nat Prod Res. 2012.
16. Sarbhoy AK, Varshney JL, Maheshwari ML, Saxena DB.Efficacy of some essential oils and their constituents on few ubiquitous molds. Zentralbl Bakteriol Naturwiss. 1978;133(7-8):723-5.
17. Moazeni M, Saharkhiz MJ, Hosseini AA. In vitro lethal effect of ajowan (Trachyspermum ammi L.) essential oil on hydatid cyst protoscoleces. Vet Parasitol. 2012;187(1-2):203-8.
18. Piaru SP, Mahmud R, Abdul Majid AM, Mahmoud Nassar ZD.Antioxidant and antiangiogenic activities of the essential oils of Myristica fragrans and Morinda citrifolia. Asian Pac J Trop Med. 2012;5(4):294-8.
19. Leach MJ, Kumar S.Cinnamon for diabetes mellitus. Cochrane Database Syst Rev. 2012;9.
20. Vishnoi SP, Ghosh AK, Debnath B, Samanta S, Gayen S, Jha T.Antibacterial activity of Abies webbiana. Fitoterapia. 2007;78(2):153-5.
21. Kumar S, Vasudeva N, Sharma S.GC-MS analysis and screening of antidiabetic, antioxidant and hypolipidemic potential of Cinnamomum tamala oil in streptozotocin induced diabetes mellitus in rats. Cardiovasc Diabetol. 2012;11:95.
22. Khoobchandani M, Ojeswi BK, Sharma B, Srivastava MM.Chenopodium album prevents progression of cell growth and enhances cell toxicity in human breast cancer cell lines. Oxid Med Cell Longev. 2009;2(3):160-5.
23. Kulkarni CR, Joglekar MM, Patil SB, Arvindekar AU. Antihyperglycemic and antihyperlipidemic

effect of Santalum album in streptozotocin induced diabetic rats. Pharm Biol. 2012 Mar; 50(3): 360-5.
24. Ilaiyaraja N, Khanum F.Amelioration of alcohol-induced hepatotoxicity and oxidative stress in rats by Acorus calamus. J Diet Suppl. 2011; 8(4):331-45.
25. Zeng WC, Zhang Z, Gao H, Jia LR, He Q.Chemical composition, antioxidant, and antimicrobial activities of essential oil from pine needle (Cedrus deodara). J Food Sci. 2012;77(7):C824-9.
26. Song MY, Bae UJ, Lee BH, Kwon KB, Seo EA, Park SJ, Kim MS, Song HJ, Kwon KS, Park JW, Ryu DG, Park BH. Nardostachys jatamansi extract protects against cytokine-induced beta-cell damage and streptozotocin-induced diabetes. World J Gastroenterol. 2010;16(26):3249-57.
27. Kweka EJ, Mosha F, Lowassa A, Mahande AM, Kitau J, Matowo J, Mahande MJ, Massenga CP, Tenu F, Feston E, Lyatuu EE, Mboya MA, Mndeme R, Chuwa G,Temu EA. Ethnobotanical study of some of mosquito repellent plants in north-eastern Tanzania. Malar J. 2008;7:152.
28. Grespan R, Paludo M, Lemos Hde P, Barbosa CP, Bersani-Amado CA, Dalalio MM, Cuman RK. Anti-arthritic effect of eugenol on collagen-induced arthritis experimental model. Biol Pharm Bull. 2012;35(10):1818-20.
29. Chang KS, Shin EH, Park C, Ahn YJ.Contact and fumigant toxicity of Cyperus rotundus steam distillate constituents and related compounds to insecticide-susceptible and resistant Blattella germanica. Med Entomol. 2012;49(3):631-9.
30. Hanish Singh JC, Alagarsamy V, Diwan PV, Sathesh Kumar S, Nisha JC, Narsimha Reddy Y. Neuroprotective effect of Alpinia galanga (L.) fractions on Aβ (25-35) induced amnesia in mice. J Ethnopharmacol. 2011;138(1):85-91.
31. Kim EJ, Hong JE, Lim SS, Kwon GT, Kim J, Kim JS, Lee KW, Park JH.The hexane extract of Saussurea lappa and its active principle, dehydrocostus lactone, inhibit prostate cancer cell migration. J Med Food. 2012;15(1):24-32.
32. Saraswat M, Suryanarayana P, Reddy PY, Patil MA, Balakrishna N, Reddy GB.Antiglycating potential of Zingiber officinalis and delay of diabetic cataract in rats. Mol Vis. 2010 Aug 10;16:1525-37.
33. Araújo CC, Leon LL.Biological activities of Curcuma longa L. Mem Inst Oswaldo Cruz. 2001;96(5):723-8.
34. Ahmad R, Ahmed S, Khan NU, Hasnain AU. Operculina turpethum attenuates N-nitrosodimethylamine induced toxic liver injury and clastogenicity in rats. Chem Biol Interact. 2009;181(2):145-53.
35. Esposito G, Filippis DD, Cirillo C, Iuvone T, Capoccia E, Scuderi C, Steardo A, Cuomo R, Steardo L. Cannabidiol in Inflammatory Bowel Diseases: A Brief Overview. Phytother Res. 2012 Jul 20.
36. Agarwal V, Sharma AK, Upadhyay A, Singh G, Gupta R. Hypoglycemic effects of Citrullus colocynthis roots. Acta Pol Pharm. 2012; 69(1):75-9.
37. Mahendran S, Thippeswamy BS, Veerapur VP, Badami S.Anticonvulsant activity of embelin isolated from Embelia ribes. Phytomedicine. 2011;18(2-3):186-8.
38. Zaidi SF, Yoshida I, Butt F, Yusuf MA, Usmanghani K, Kadowaki M, Sugiyama T.Potent bactericidal constituents from Mallotus philippinensis against clarithromycin and metronidazole resistant strains of Japanese and Pakistani Helicobacter pylori. Biol Pharm Bull. 2009;32(4):631-6.
39. Jalalpure SS, Mandavkar YD, Khalure PR, Shinde GS, Shelar PA, Shah AS.Antiarthritic activity of various extracts of Mesua ferrea Linn. seed. J Ethnopharmacol. 2011;138(3):700-4.
40. Shen T, Li GH, Wang XN, Lou HX.The genus Commiphora: a review of its traditional uses, phytochemistry and pharmacology. J Ethnopharmacol. 2012;142(2):319-30.
41. Hartmann RM, Morgan Martins MI, Tieppo J, Fillmann HS, Marroni NP.Effect of Boswellia serrata on antioxidant status in an experimental model of colitis rats induced by acetic acid. Dig Dis Sci. 2012;57(8):2038-44.
42. Dhirender Kaushik, Ajay Kumar, Pawan Kaushik, and A. C. Rana. Analgesic and Anti-Inflammatory Activity of Pinus roxburghii Sarg. Adv Pharmacol Sci. 2012; 2012: 245431.
43. Mondal SK, Chakraborty G, Gupta M, Mazumder UK. In vitro antioxidant activity of Diospyros malabarica Kostel bark. Indian J Exp Biol. 2006; 44(1):39-44.
44. Mahendra P, Bisht S. Ferula asafoetida: Traditional uses and pharmacological activity. Pharmacognosy Rev. 2012;6(12):141-6.
45. Dadalioglu I, Evrendilek GA. Chemical compositions and antibacterial effects of essential oils of Turkish oregano (Origanum minutiflorum), bay laurel (Laurus nobilis), Spanish lavender (Lavandula stoechas L.), and fennel (Foeniculum vulgare) on common foodborne pathogens. J Agric Food Chem. 2004;52(26):8255-60.
46. Moazeni M, Saharkhiz MJ, Hosseini AA In vitro lethal effect of ajowan (Trachyspermum ammi L.) essential oil on hydatid cyst protoscoleces. Vet Parasitol. 2012;187(1-2):203-8.
47. Zhang XH, da Silva JA, Jia YX, Zhao JT, Ma GH. Chemical composition of volatile oils from the

pericarps of Indian sandalwood (Santalum album) by different extraction methods. Nat Prod Commun. 2012;7(1):93-6.
48. Dong W, Yang D, Lu R. Chemical constituents from the rhizome of Acorus calamus L Planta Med. 2010; 76(5):454-7.
49. Chaudhary A, Kaur P, Singh B, Pathania V. Chemical composition of hydrodistilled and solvent volatiles extracted from woodchips of Himalayan Cedrus:Cedrus deodara (Roxb.)Loud. Nat Prod Commun. 2009;4(9):1257-60.
50. Kumar P, Mishra S, Malik A, Satya S. Compositional analysis and insecticidal activity of Eucalyptus globulus (family: Myrtaceae) essential oil against housefly (Musca domestica). Acta Trop. 2012; 122(2):212-8. doi: 10.1016/ j.actatropica. 2012.01.015.
51. Chaieb K, Hajlaoui H, Zmantar T, Kahla-Nakbi AB, Rouabhia M, Mahdouani K, Bakhrouf A. The chemical composition and biological activity of clove essential oil, Eugenia caryophyllata (Syzigium aromaticum L. Myrtaceae): a short review. Phytother Res. 2007;21(6):501-6.
52. Furletti VF, Teixeira IP, Obando-Pereda G, Mardegan RC, Sartoratto A, Figueira GM, Duarte RM, Rehder VL, Duarte MC, Höfling JF. Action of Coriandrum sativum L. Essential Oil upon Oral Candida albicans Biofilm Formation. Evid Based Complement Alternat Med. 2011;2011:985832.
53. Kumar Suresh, Sharma Sunil, Vasudeva Neeru. Chemical compositions of Cinnamomum tamala oil from two different regions of India. Asian Pacific Journal of Tropical Disease 2012;Volume 2, (2): S761–S764.
54. Corio-Coste Marie France, Chapuis Laurence, Scalla Rene, Delbecque Jean- Pau, Analysis of sterols in plants and cell cultures producing ecdysteroids: Chenopodium album. Plant Science Volume 91, 1, 1993: 23-33.
55. Ahmad Ateeque, Misra Laxmi N., Nigam Munishwar C A dihydrobenzofuran from indian dill,seed oil Phytochemistry, Volume 29, Issue 6, 1990: 2035–2037.
56. Arctander S. Perfume and Flavour Materials of Natural Origin publ. Elizabeth NJ 1960.
57. Bachman S. & Gieszczynska J. Aspects of the introduction of food irradiation in developing countries1973. AEAE STI/PUB/362: 43.
58. Bernreuther A & Schrier P. Multidimensional gas chromatography/mass spectroscopy: a powerful tool for the direct chiral evaluation of aroma compounds in plant tissues. II. Linalol in essential oils and fruits 1991; Phytochemical Analysis; 2: 167-170.
59. Biolandes Parfumerie. Reconstitutions. Biolandes Parfumerie Letter 1997;12.
60. Boelens M. Differences in chemical and sensory properties of orange flower and rose oils from hydrodistillation and from supercritical CO2 extraction. Perf & Flav. 1997;22:31.
61. Buchbauer G. The detailed analysis of essential oils leads to the understanding of their properties - paper presented at 20th IFSCC Congress Sept 14-18th 1998 Cannes, France and reproduced in Perf & Flav. 1998; 25, pp64-67.
62. Burfield T. Natural aromatic materials - odours and origins pub.AIA, Tampa, USA 2000.
63. Cotroneo A, D Alcontres I S & Trozzi A. On the genuineness of citrus essential oils Part XXXIV Detection of added reconstituted bergamot oil in genuine bergamot oil by high resolution gas chromatography by chiral capillary columns. Flav. & Frag 1992;7:15-17.
64. Dugo G, Mondello L, Cotroneo A, Bonaccorsi I, Lamonica G. Enantiomeric Distribution of Volatile Components of Citrus oils by MDGC. Perf & Flav. 2001;26:20-33.

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