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Review Article

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A Review on Antidermatophytic Efficiency of Plant Essential Oils

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ABSTRACT

Nature provides initial needs of beings for self-care. Natural remedies have a strong efficacy against several assorted diseases. In All Assorted Disease, Skin Disease Caused by Fungi and moulds are common throughout the world especially in developing countries. The most common using antifungal drugs are azoles, Allylamines as traditional trade for dealing with mycoses and fungal disease. These traditional synthesized drugs have low intention, resistance potential, irreversible side effects on host during the managing of fungus disease. Plant Essential oils are best candidature in presence of their cytotoxic aptitude against fungus. In India, several tribes' citizens are using plants to treat the skin disorders. In current reviewed data a large plant families are studied for their cytotoxic skill against fungus.

Keyword*: Nature; Remedies; Mycoses; Antifungal; Essential Oil.*

INTRODUCTION

Plants are livestock which supplies individual needs as food, clothing, shelter and health care as well as pharmaceuticals, tobacco, coffee, alcohol, and other drugs throughout the planet[1]. They are utilized by people of Homeopathy, Allopathy, Unani as well as Ayurvedic medicine to treat the assorted diseases around planet[2]. Use of plants as a source of medicinal value is started before 4000- 5000 B.C. with Chinese who were the first to use plants as therapeutics. In India use of plants as a medicine appeared from Vedas time. From them, Sushruta Samhita, Charaka Samhita and Bhagvat are three preliminary texts which build the base of Ayush and milestone in medical sciences[3-5]. From opening of 20th century, allopathic systems of medicine have popularity among people, which is based on fast therapeutic actions of synthetic drugs. But traditional route of healthcare system is recently shifted from synthetic to herbal medicine in universal trend. It is called as "Return to Nature" [6-8]. This frequent behavior is come out through high prospects of enormous acquaintance of medicinal plant species and existence of diverse cultures, languages and beliefs of people in India[9].

The plant remedies advantages are attracted for such individuality as strong efficacy, broad spectrum as direct sources of therapeutics, Affordable by populace, Raw base elaboration up to complex semi-synthetic chemical compounds, Taxonomic markers, Renewable source capability[10-11]. WHO has projected that about 80% of more than 4000 million inhabitants in nature consumed traditional medicines as their primary needs [12]. India is one of the 12-mega biodiversity hubs having about 10% of the world's biodiversity capital, which is widen across 16 agro-climatic zones[13]. India has about 4.5 million plant species and among them, around 20,000 medicinal plants where about 800 plant species are used by more than 500 traditional communities as medicinal activist against human diseases[14-17]. The extensive range of phytochemicals and oils are segregated from plants as polysaccharides, vitamins, minerals, enzymes, proteins, alkaloids, glycosides, fats, oils, lectins, saponins, flavonoids, and sterols etc. which have therapeutics importance[18]. Mostly the pharmacological activity of plants resides in presence of secondary metabolites. They are relatively smaller molecules in contrast to primary molecules such as proteins, carbohydrates and lipids.

These natural products synthesize new structural types of antimicrobial and antifungal agents that are relatively safe to man[19]. These metabolic products reveal the variation in their chemical configuration according to family to which the plant belongs.

Review of ethno botanical journalism of India, discloses 269 plant species used to cure skin disorders in India[20]. Some species of them as Ageratum, Aloe-Vera, Abrus, Acalypha, Aglaia, Andrographis, Azadirachta, Boswellia, Chenopodium, Cleome, Erythrina, Hypericum, Heliotropium, Limonia, Ocimum, Pongamia, Sesbania, Withania, Dryopteris, Cedrus, Centella asiatica, Butea are utilized against various diseases by the Adivasi tribes of India[21-23].

Natural territory of fungi cover individual kingdom with clutching to yeast and moulds. Keratinolytic moulds have skilled to digest keratin and grow up in soil and wastewater habitats[24]. They take part in purification of α-keratins with incidence of disulphide and hydrogen bonds which are improperly biodegradable. Dermatophytes are infective agents of superficial mycosis as open health issue at developing countries from the last decades. For that reason is preserving to low hygienic environment and socioeconomic behaviour among people[25-26]. The best moulds genera are *Microsporum, Trichophyton* and *Epidermophyton* to decay of keratin. They are classified as geophilic, zoophilic and antropophilic species based on their habitat. These moulds colonize on human and animal tissues in large number as reservoirs (skin, hair, nails). From there they communicate to another host in presence of favorable environment [27]. Among the most common example of dermatophytosis are Tinea capitis, Tinea cruris, Tinea pedis and Tinea unguium[28].

The most common antifungal drugs are azoles (Clotrimazole, Miconazole, Econazole, Oxiconazole and Tioconazole) and Allylamines, (Terbinafine and Naftifine) which are using as traditional trade for dealing with superficial mycoses[29-30]. Morpholine derivatives such as Amorolfine and Butenafine have been attempted to cure infection[31]. Terbinafine and Itraconazole have been used as oral drugs[32-34]. On host these drugs are intended against the ergosterol biosynthetic pathway. Their intentions are insufficient due to parallel existing between fungi and hosts. In addition, the resistance potential of causative agents against drug leads to malfunction in the management of mycosis.

In consequence, the valuable controls of dermatophytes essentially engage the formation of a new effective broad-spectrum of antifungal from natural planet without irreversible side effects on host. Plant Essential oils have best candidature against dermatophytes[35-36].

Table 1: Essential oil compositions in selected Plants[22,37,38]

Plant family	Scientific name	Compounds
Amaranthaceae	*Chenopodium ambrosioides*	-cymene, myrtenol
Anacardiaceae	*Pistacia lentiscus*	terpineol, α-terpineol
Apiaceae	*Crithmum maritimum*	dillapiole, γ-terpinene, sabinene, thymol methyl ether, β-phellandrene
	Daucus carota	Sardinia: β-bisabolene, 11-α-(H)-himachal-4-en-1-β-ol Portugal: geranyl acetate, α-pinene
	Distichoselinum tenuifolium	myrcene, limonene
	Eryngium duriaei	α-neocallitropsene, isocaryophyllen-14-al, 14-hydroxy-β-caryophyllen, caryophyllene oxide, E-β-caryophyllene
	Ferula hermonis	α-pinene, α-bisabolol, 3,5-nonadiyne
	Trachyspermum ammi	Thymol, p-cymene, γ-terpinene, β-pinene, terpinen-4-ol.
	Coriandrum sativum	Linalool, geraniol
	Foeniculum graveolens	Anethol, Fenchone
Asteraceae	*Arnica longifolia*	camphor , 1,8-cineole
	Aster hesperius	carvacrol, α-bisabolol
	Chrysothamnus nauseosus	Camphor, α- and β-pinene, lyratyl acetate.
	Elephantopus spicatus	β -phellandrene, β –pinene
	Eupatorium semialatum	δ-elemene, farnesene, α-curcumene, selina-4,7(11)-diene, β-bisabolene
Euphorbiaceae	*Croton cajucara*	alool
Gentianaceae	*Gentiana asclepiadea*	xanthones
Hypericaceae	*Hypericum perforatum*	terpinen-4-ol
Labiatae	*Hyptis suaveolens*	Sabinene, -terpinolene, 1, 8-cineole.

Lamiaceae	*Calamintha nepeta subsp. nepeta.*	Sardinia: pulegone Portugal: isomenthone, 1,8-cineole
	Lavandula viridis	1,8-cineole, camphor, α-pinene, linalool
	Mentha cervina	pulegone, isomenthone
	Salvia officinalis	cis-thujone, β-pinene, 1,8-cineole, α-humulene
	Thymbra capitata	Carvacrol, γ-terpinene, p-cymene.
	Thymus vulgaris	Thymol, ρ-Cymene, γ-Terpinene
	Origanum vulgare	Carvacrol, ρ-Cymene, Thymol
Lauraceae	*Aniba rosaedora*	Linalool
	Laurus nobilis	1,8-cineole
	Sassafras albidum	Safrole
	Cinnamomum zeylanicum	trans-cinnamaldehyde
Moringaceae	*Moringa oleifera*	pentacosane, hexacosane
Myrtaceae	*Eucalyptus citriodora*	Citronellal, Isopulegol
	Syzygium aromaticum	Eugenol
Piperaceae	*Piper barberi*	1,8 ceneole, α-pinene , eugenol isomer , camphor
	Cymbopogon citratus	Geranial, Neral, Limonene
Ranunculaceae	*Nigella sativa*	Nigellone
Rutaceae	*Citrus aurantiifolia*	Limonene, γ-terpinene, terpinolene.
	Citrus hystrix	limonene , citronellal, β-pinene
	Haplophyllum tuberculatum	α- and β-phellandrene, limonene, β-ocimene, β-caryophyllene, myrcene.
Verbenaceae	*Vitex agnus-castus*	Leaves: bicyclogermacrene , (E)-β-farnesene, 1,8-cineole flowers: bicyclogermacrene, manool, fruits: (E)-β-farnesene, bicyclogermacrene, 1,8-cineole
	Vitex rivularis	germacrene D , γ-curcumene, α-copaene, β-caryophyllene
	Lantana achyranthifolia	Carvacrol, α-bisabolol, isocaryophyllene.
	Lippia graveolens	Carvacrol, α-terpinyl acetate, m-cymene, thymol.
Zingiberaceae	*Zingiber officinale*	Zingiberene,geranial, α-curcumene , β-bisabolen, β-sesquiphellandrene

ESSENTIAL OIL:

Essential oils are volatile, natural, lipid and rarely colored, lipid soluble and soluble in organic solvents with a generally lower density than water from aromatic plants having a strong odour[39-40]. They are concentrated hydrophobic liquids which are extracted from various plant parts such as flowers, buds, seeds, leaves, twigs, bark, woods, fruits and roots usually localize in tropical countries[41]. The cytotoxic aptitude of essential oils depend on pro-oxidant performance which formulate them an excellent antiseptic and antifungal agents. Enormous additives of essential oils have ability to treat long time genotoxic threats [41-42].

They are usually obtained by steam or hydro-distillation [39]. There are several methods for extracting essential oils including utilization of liquid carbon dioxide or microwaves, and mainly low or high pressure distillation employing boiling water or hot steam. The extracted invention can differ in quality, quantity and in composition based on climate, soil composition, plant organ, age and vegetative cycle stage [43-44]. The essential oils are involved in cytoplasmatic and cell wall metabolism on pointed causatives. It is founded especially about monoterpenes that they swell to cytoplasmic membrane smoothness and increase permeability. Through it disturb regulation of surrounded proteins, inhibit cell respiration and modify ion transportation processes [45].

Essential oils are complex mixtures which contain about 20–60 components at relatively different concentrations [46]. They are characterized by two or three key components usually as terpenoids for odor and flavor allied with herbs, spices and perfumes. The main ingredients of essential oils are mono and sesquiterpenes as well as carbohydrates, phenols, alcohols, ethers, aldehydes and ketones[47-48]. At universal, plant-derived essential oils and extracts are potentially effective against several microorganisms including fungal pathogens causing superficial infections[49-50]. The main assembly is composed of terpenes and terpenoids with other aromatic and aliphatic constituents of low molecular weight.

Terpenoids:

Essential oils are secondary metabolites that have compounds based on several 5-carbon- base (C_5) unit's isoprene structure. They are called terpenes ($C_{10}H_{16}$) and found in diterpenes, triterpenes and tetraterpenes as well as hemiterpenes and sesquiterpenes. When terpene complex attach additives usually as oxygen, they converted to terpenoids[43]. The monoterpenes are formed from the coupling of two isoprene units (C_{10}) which are the most constituting part of 90% essential oils.

Aromatic compounds:

The biosynthetic path relating to terpenes and phenylpropanic imitative are separated in plants. Consequent from phenylpropane, the aromatic ingredient have Aldehyde (cinnamaldehyde), Alcohol (cinnamic alcohol), Phenols (chavicol, eugenol), Methoxy derivatives (anethole, elemicine, estragole, Methyleugenol) and Methylene dioxy compounds (apiole, myristicine and safrole) take away from terpenes. Nitrogenous or sulphured components as glucosinolates or isothiocyanate derivatives from garlic and mustard oils are also pointed as terrified, grilled or roasted products[51].

ESSENTIAL OILS ANTIFUNGAL ACTIVITY

The escalating resistance of antifungal drugs leads to exploration of new option along with aromatic plant's essential oils[52-54]. A number of research have been contributed the importance of several plant families i.e. *Asteraceae, Liliaceae, Apocynaceae, Solanaceae, Caesalpinaceae, Rutaceae, Piperaceae, Sapotaceae, Caricaceae, Euphorbiaceae, Moraceare, Solaneaceae, Papaveraceae*, used as therapeutic plants[55]. Antidermatophytic activity of pods of *Acacia concinna* commonly known as 'Shikakai' was studied against *Trichophyton rubrum, Trichophyton mentagrophytes, Trichophyton violaecum, Microsporum nanum* and *Epidermophyton floccosum*[56].

Again the lemon grass (*Cymbopogon citrates*), lantana (*Lantana camara*), nerium (*Nerium oleander*), basil (*Ocimum basilicum*) and olive leaves (*Olea europaea*) were extracted with either water solvent to investigate their antifungal activities. In current view, a highest activity was against *Trichophyton rubrum* followed by *Microsporum canis, M. gypseum* and *T. mentagrophytes*, respectively [57].

Antifungal effect of *Hypercom perforatum* essential oil was determined against *Epidermophyton floccosum, Microsporum canis, Microsporum gypseum, T. mentagrophytes var. interdigital, T. mentagrophytes var. mentagrophytes., T. rubrum* and *Trichophyton tonsurans* [58]. Terpinenol is the main component of the essential oil of *H. perforatum*, play the important role in antidermatophytic activity [59]. Among evaluated 14 medicinal plants, peak anti-mycotic activity was shown by *Eucalyptus globulus* (88%) and *Catharanthus roseus* (88%) followed by *Ocimum sanctum* 85.50%, *Azadirachta indica* (84.66%), *Ricinus communis* (75%) and *Lawsonia inermis* (74.33%) while the minimum activity was exhibited by *Jatropha curcas* (10%) [60-61]. In the essential oils of *Origanum compactum* carvacrol (30%) and thymol (27%) are the major components while linalol (68%) of the *Coriandrum sativum* essential oil, α- and β-thuyone(57%) and camphor (24%) of the *Artemisia herbaalba* essential oil, 1,8-cineole (50%) of the *Cinnamomum camphora* essential oil, α-phellandrene (36%) and limonene (31%) of leaf and carvone (58%) and limonene (37%) of seed *Anethum graveolens* essential oil, menthol (59%) and menthone (19%) of *Mentha piperita* essential oil[37]. Essential oil of *Santolina chamaecyparissus* showed significant antifungal activity against experimentally induced superficial cutaneous mycosis in guinea pigs by the hair root invasion test[62].

Various publications have documented the antimicrobial activity of essential oils and plant extracts including rosemary, peppermint, bay, basil, tea tree, celery seed and fennel[63]. *Thymus pulegioids* essential oil has potential as a topical antifungal agent against Dermatophytes, Aspergilus, and Candida [64]. The in vitro activity of some essential oils (thyme red, fennel, clove, pine, sage, lemon balm and lavender) was determined against clinical Dermatophytes and environmental fungal strains. The minimal inhibitory concentrations were determined by a micro dilution method and by a vapor contact assay, MICs values for Dermatophyte ranged from 0.0078% to 0.5% [65].

A study was conducted to evaluate in vitro antimicrobial properties of *Eucalyptus intertexta* and *Eucalyptus largiflorens*. In investigation observed about a stronger activity and broader spectrum of oils potential as antimicrobial activities than those of 1,8-cineole as their main component [66-67].

Some of plant families are reviewed here for their antifungal activity.

1. *Asteraceae*

Most associates of Asteraceae are herbs with a considerable amount of shrubs, vines and trees spread across 1,620 genera and 12 subfamilies[68]. This family has an economically importance as well as providing products including cooking oils, lettuce, artichokes, sweetening agents, coffee substitutes and herbal teas. The family is dispersed universally in arid and semi-arid regions of subtropical area at global level[69]. Medically usable plants of current family have the sesquiterpene, lactone compounds which make them an important cause of allergic contact dermatitis but essential oils from aromatic plants have potential to cure as antidermatophytic activity. Echinacea (*Echinacea purpurea*), is used as a medicinal tea.

The genus *Artemisia* is a source of chemical composition of 1, 8- cineole, chamazulene, davanone, artemisia ketone, germacrene D, β- caryophyllene and caryophyllene oxide in their essential oils[70]. Another potent member of the Asteraceae family is *Stevia rebaudiana* known as Honey leaf, Candy leaf. Plant has a huge amount of terpenes and flavanoids. The phytochemicals of *Stevia rebaudiana* are austroinullin, β-carotene, nilacin, rebaudi oxides, riboflavin, steviol, stevioside and tiamin. With the large presence of metabolites, it is used in beverages as well as medicinal source agent to dealing with anesthetic and anti-inflammatory[71]. The antifungal potential of essential oil of *Chrysanthemum coronarium* L. was estimated with the metabolic products as camphor, α- and β-pinene and lyratyl acetate. The essential oils of three *Artemisia* species i.e. *Artemisia absinthium* L., *A. santonicum* L. and *A. spicigera* C. had potent to inhibit the fungi growth[72]. In Sequence essential oil of *Tagetes patula* L. have two main compounds, piperitone and piperitenone for the antifungal efficacy. One more essential oils from *Chrysactinia mexicana* Grag inhibited the growth of *Aspergillus flavus*[73].

2. *Rutaceae*

Rutaceae is universally recognized as citrus family which has economic magnitude in warm temperate and sub-tropical climates for its abundant edible fruits such as the orange, lemon, calamansi, lime, kumquat, mandarin and grapefruit. Non-citrus fruits include the White sapote, Orangeberry, Clymenia, Limeberry and the Bael. Most species are trees or shrubs; few are herbs, frequently aromatic with glands on the leaves, sometimes with thorns [74]. In this family, the essential oil from the epicarp of *Citrus sinensis* (L.) Osbeck demonstrated absolute fungi toxicity. *Aegle marmelos* (L.) commonly called Vilvam have long been used in traditional medicine for its medicinal value. The using parts are as leaves, stem, bark and fruits to treat diarrhoea, dysentery, and skin and eye diseases [75-77]. The *Haplophyllum tuberculatum* (Forsskal) has abundant oil components as α- and β-phellandrene, limonene, β-ocimene, β-caryophyllene and myrcene. The antifungal efficacy of *Bergamot* essential oil is possibly affected by method of oil extraction and the sensitivity of the strains [78].

3. *Liliaceae*

The Liliaceae family is monocotyledon, perennial, herbaceous, bulbous or rhizomatous. Mainly plants in this family are ornamental plants which are widely grown for their gorgeous flowers. The members of this group are native of primarily to temperate and subtropical regions. The endosperm part of plant contains oils and aleurone [79-80]. The potential activity of essential oils from *Allium fistulosum*, *A. sativum* and *A. cepa* three more usable plants were investigated against *Trichophyton* species for mycoses in humans [81].

4. *Lamiaceae*

The Lamiaceae is a family of flowering plants. They have been considered traditionally closed to Verbenaceae. Plants are frequently aromatic in all parts and include many widely used culinary herbs, such as basil, mint, rosemary, sage, savory, marjoram, thyme, lavender. Many members of the family are widely cultivated. Many members of this family are useful economically for medicinal, culinary, ornamental and various commercial utilizations[82]. Previous studies on the essential oils of many Lamiaceae show that, they have a broad range of biological activities. The essential oil of *Ocimum basilicum* L. is known for its wound healing property and hence, is used in the treatment of fungal infections[83]. Major component of this oil was linalool. The essential oil from another species of the *Ocimum* genus, basil *Ocimum micranthum* showed a dose-dependent antifungal activity against pathogenic and food spoiling yeasts. Twenty three compounds, accounting for 99.8% of the total oil were identified. The main constituents were 1, 8-cineole and 4α, 7α-abetanepetalactone [84-85].

The composition and the antifungal activity of the essential oil of *Thymbra capitata* on *Candida, Aspergillus* and dermatophytes strains were studied. The oil exhibited antifungal activity against all the strains tested, particularly for dermatophytes, with IC50 values ranging from 0.08 to 0.32µg/ml[86]. Recently examined the antifungal activity of essential oil of *Thymus daenensis, Zataria multiflora* and *Thymbra spicata* against *A. flavus* and *A. parasiticus*. The volatile oil of *T. striatus* L. exhibited strong inhibitory effects against all the test fungi. In addition, sage (*Salvia officinalis* L.), lavender (*Lavendula angustifolia* Mill.) used to treat various skin diseases and cosmetic products for skin care. Lavender is also used for healing wounds in ethno medicine and its essential oil possess components like, linalool, linalyl acetate, limonene, cineole and camphor. The efficacy of essential oil can be explained by interactions of individual components like, linalyl acetate and linalool[87-90].

The chemical composition of the essential oil of *Rosmarinus officinalis* L. obtained by hydro-distillation was also studied. The major compounds in the essential oil were α-pinene, borneol, camphene, camphor and verbenone and bornyl acetate[43]. The antifungal effect of the essential oils from several species of the Lamiaceae family, *Satureja montana* L., *Lavandula angustifolia, L. hybrida* Reverchon, *Origanum vulgare* L., *Rosmarinus officinalis* L. and six chemotypes of *Thymus vulgaris* L. on *Candida albicans* growth91. The most active oils were *Origanum vulgare* L., *Thymus serpyllum* L., *Thymus vulgaris, Lavandula latifolia* Medik. *L. angustifolia. T. vulgaris* inhibited the fungal growth due to the presence of phenolic compounds, namely thymol and carvacrol91. The activity of *Mentha arvensis* L. essential oil was also well studied. The antifungal activity of essential oils of *Mentha piperita* and *T. vulgaris* was evaluated against mycotoxin producers *Aspergillus flavus* and *A. parasiticus*. Menthol and thymol are the major component of essential oils[38, 92-95].

5. *Verbenaceae*

Verbenaceae is a family of mainly tropical flowering plants. It constitutes trees, shrubs and herbs notable for heads, spikes, or clusters of small flowers, many of which have an aromatic smell. The fruit is usually a drupe or nutlets. Some of the medicinal and aromatic plants have been reported to be anti-infectious agents. A study to estimate the antifungal activity of oregano (*Lippia berlandieri* Shauer) was reported of leaf essential oil. The antifungal activity of the essential oils of aerial parts of *Lantana achyranthifolia* and *Lippia graveolens* against *Fusarium sporotrichum, Aspergillus Niger, Trichophyton mentagrophytes and Fusarium moniliforme L. graveolens* presented higher antifungal activity[38, 96].

6. *Lauraceae*

The Lauraceae are family of flowering plants, mainly in warm temperate and tropical regions. Most are aromatic trees or shrubs containing high concentrations of essential oils, which have valued for spices and perfumes[96-97]. *Cinnamomum zeylanicum* Linn bark is commonly used as food additive all over the world with its major use in South Asia and China[98]. *Cinnamomum zeylanicum* bark contains about 0.5 -10% of volatile oil, 1-2 % of tannins(Phlobatannins), mucilage, calcium oxalate, starch and sweet substance in the form of mannitol. Cinnamon oil contains 60-75% w/w of cinnamic aldehyde. Genuine oil also contains 4-10% of phenols (mainly Eugenol), hydrocarbons (pinene, phellandrene and caryophyllene), bezaldehyde, cumin aldehyde and small amount of ketones, alcohols and esters. Oil distilled from fresh bark samples contained a high proportion of cinnamyl acetate[32].

The antifungal activities of the essential oils from several aromatic species from the Lauraceae family are as *Aniba rosaedora, Laurus nobilis, and Sassafras albidum* Nees and *Cinnamomum zeylanicum*. Linalool was the main component in the essential oil of *A. rosaedora*, while 1, 8-cineole was dominant in *L. nobilis*. Safrole was the major component in *S. albidum* essential oil, and the main component of the oil of *C. zeylanicum* was trans-cinnamaldehyde. The essential oil of *C. zeylanicum* showed strongest antifungal activity. Another antifungal *Cinnamomum* species is *Cinnamomum osmophloeum* has significant antifungal activity against wood decay fungi. Essential oil of *Ocimum gratissimum* (L.) had significant fungi static activity against all the species investigated. The biological activity of this oil is probably due to its prominent concentration in thymol, which is a phenolic compound[99].

7. *Cupressaceae*

The Cupressaceae family is family with worldwide distribution. *Calocedrus formosana*'s leaf essential oil constituents displayed activity against four fungi *namely, Lenzites betulina, Pycnoporus coccineus, Trametes versicolor* and *Laetiporus sulphurous*. Two compounds, α-cadinol and murolol exhibited the strongest antifungal activity[100]. The essential oil from *Juniperus communis* was found active against dermatophytes, *Aspergillus* and *Candida* strains[101-102].

8. *Umbelliferae*

It is commonly known as carrot or parsley family, are a family of mostly aromatic plants with hollow stems. Many plants in this family have been used as a folk medicine[103]. The antifungal effects of ajwain essential oil against *Trachyspermum ammi* were investigated. Analysis of ajwain essential oil showed the presence of twenty six identified components, which account for 96.3% of the total amount. Thymol was found to be a major component along with p-cymene, γ-terpinene, β-pinene and terpinen-4-ol[104]. Volatile oil exhibited a broad range of antifungal activity, inhibiting some nail infecting fungi such as *Aspergillus niger, A.flavus, A. fumigatus, A. ustus, Candida albicans, Epidermophyton flooccosum, Microsporum canis, and M. audouini, M. nanum, M. gypseum, Rhizopus nigricans, Trichophyton tonsurons and T.violaceum*. Essential oil of fennel plant roots, stem, leaves and seeds against commonly encountered the aerial parts of *Bupleurum gibraltaricum* Lamarck, which yielded an antifungal essential oil active towards *Plasmopara halstedii*. The main compounds in this oil were sabinene, α-pinene and 2, 3, 4-trimethylbenzaldehyde[105-107].

9. *Gramineae*

This is a large and nearly ubiquitous family of monocotyledonous flowering plants. It constitutes the most economically important plant family in modern times. Plant oils are important source of fungi toxic compounds which provide a renewable source of useful fungicides that utilized in antimycotic drugs[108]. The antifungal activities of essential oils from *C. martini* were effective against *Candida sp., Aspergillus fumigatus* and *Trichophyton rubrum*. Lemongrass oil was found to be among the most active against human dermatophytes strains inhibiting 80% of strains as reported[109].

10. *Moringaceae*

The family Moringaceae is the major group of Angiosperms (Flowering plants). Moringa is individual genus contains 13 species range in size from tiny herbs to massive trees in Moringaceae. Ethanol extracts showed antifungal activities *in vitro* against dermatophytes such as *Trichophyton rubrum, T. mentagrophytes, Epidermophyton flooccosum,* and *Microsporum canis* [95,110]. Among a pearly study, *Moringa* pregrina used to evaluate the antimicrobial potential where its six active components were assayed as lupeol acetate, α-amyrin, β-amyrin, β -sitosterol, β - sitosterol-3-O- β -D-glucoside and apignin. These active constituents have potential antimycotic activity against several dermatophytes[111].

11. *Zingiberaceae*

Zingiberaceae is a family of flowering plants consisting of aromatic perennial herbs with creeping horizontal or tuberous rhizomes [112-113]. Many species are important ornamental or medicinal plants. The antidermatophytic activity of essential oil on *Curcuma longa* L. studied and identified major components such as Terpinolene, α-phellendren and terpinene-4-ol [114].

14. *Meliaceae*

The Meliaceae family is a flowering plant family used for vegetable oil, soap-making and insecticides [115]. Plant oils are important source of fungitoxic compounds a renewable source of useful fungicides. Several reports have been made on the fungicidal properties of *Azadirachta indica* (neem) oil [116]. A study was conducted to evaluate the Antifungal effects of methanol extract of chinaberry against strains of *Trichoderma spp, Sclerotium spp Geotrichum spp, Fusarium oxysporum* and *Rhizoctonia solani* [117].

15. *Myrtaceae*

Myrtaceae includes the species of woody plants with essential oils distributed widely in tropical and warm-temperate regions of the world and are typically common in many of the world's biodiversity hotspots [118-119].

The antifungal activity of the clove oil and its main component eugenol, were investigated against *Candida*, *Aspergillus* and dermatophyte clinical and American Type Culture Collection strains which showed inhibitory activity against all the tested strains [120]. It is difficult to attribute the activity of natural essential oils which are complex mixtures to a particular constituent, it is reasonable to assume that the activity of clove oil can be related to the presence of a high concentration (85.3%) of eugenol. As typical lipophiles, essential oils can travel through the cell wall and cytoplasmic membrane, disrupt the structure of the different layers of polysaccharides, fatty acids and phospholipids, and permeabilize them. Clove oil significantly suppressed growth of various dermatophytes, such as *Microsporum canis*, *Trichophyton mentagrophytes*, and *Microsporum gypseum* [121].

16. *Piperaceae*

The Piperaceae, also known as the pepper family, is a large family of flowering plants. Recently, antifungal activity of essential oil from fruits of *Piper barberi* Gamble. Similarly, reported *Piper nigrum* L. volatile oils as effective for *Fusarium graminearum* [122-123].

ORGANIZATION IN INDIA:

There are National Medicinal Plants Board was set up to recur the rich heritage of Indian system of medicine. Various institutes like National Institute of Pharmaceutical Education and Research (NIPER), National Botanical Research Institute (NBRI), Central Institute of Medicinal and Aromatic Plants (CIMAP) and Central Research Drug Institute (CDRI) are continually having a crucial role in renewing standards for system of medicine.

COMMERCIAL PRODUCT IN MARKET:

The Southern African Development Community (SADC) is an insignificant player in the world market for essential oils. Novo taste is another big market producer of essential oil with offering high quality, innovative, and competitive flavoring content situated at Montreal, Canada, and northern USA. IBIS World's Essential Oil Manufacturing market In addition to that, a number of multinational firms that use essential oils as an input in the production process have subsidiaries in the country. Essential oil association of India (EOAI) has No.1 position in production of natural essential oils in global markets In India. With all there are other industries as Unilver, Procter & Gamble, L'Oreal, Colgate-Palmolive, GlaxoSmithKline, Pfizer which are either in the cosmetic, pharmaceutical and food industries.

CONCLUSION

Use of plants as a medicine source appeared from Vedic period. Ayurvedas assorted the nurse annals of medicine system which claimed to cure the perilous disease around earth. Plant remedies attracted for their strong efficacy, broad spectrum as direct sources of therapeutics compared to synthetic drug source. Their volatile oils are active agent as antimycotic agent with a strong odour. The best dermatophytic genera are *Microsporum*, *Trichophyton* and *Epidermophyton* which assemble the metabolic yield of keratinase for inflamative responses in the host. The researcher reviewed that potential source of natural drug from plants which will be helpful to summarize the importance of plants remedies.

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