

The Therapeutic Properties of Cymbopogon Citratus (DC.) Stapf (Lemon grass): A Review

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Abstract

Lemon grass (*Cymbopogon citratus*), is a medicinal plant. It has several compounds, capable of controlling pathogens and increasing resistance to pathogenic diseases. It is widely used in the herbal tea and in other non-alcoholic beverages. Lemon grass oil contains a high content of citral, which is used as a source for the production of vitamin A and beta carotene etc. Its essential oil is commonly used in the cosmetics and perfumes. In different pharmaceutical industries lemon grass is used for its analgesic, anti-septic, antipyretic, anti-depressant, bactericidal, carminative and astringent properties.

Keywords: Poaceae, Citral, Vitamin A, Beta carotene, Essential oil.

Introduction

Medicinal plants have been discovered and used in traditional medicine practices since prehistoric times. The earliest historical records of medicinal herbs are reported from the Sumerian civilization, where hundreds of medicinal plants are listed on clay tablets. A medicinal plant is a plant that is used with the aim of maintaining health, to be administered for a specific condition, or both, whether in traditional medicine or in modern medicine (Ahn, K., 2017). In 2002, the Food and Agriculture Organization estimated that more than fifty thousand medicinal plants are used across the world (Schippmann, U. et.al., 2002). According to folk medicine, several plants possess ethno medicinal properties and *Cymbopogon citratus* Stapf (lemon grass) remained one of them.

Cymbopogon citratus (DC.) Stapf (lemongrass) is commonly cultivated in the tropics and sub-tropics areas of Asia, South and Central America, Africa and other tropical countries. It is a member of Poaceae (Gramineae) family. The name lemon grass is derived from typical lemon like flavour of the essential oil present in the plant. Lemon grass is a perennial C₄ grass with numerous stiff stems arising from a short rhizomatous rootstock. The culm is erect, stout, upto 2 meter high. The leaves of lemon grass are glaucous, green, long, striped, which tapered upwards linear and along the margins. It is a short day plant. The inflorescence is a long spike about one meter in length. The *Cymbopogon citratus* grows well in moist, sunny and warm tropical conditions. The lemon grasses are commercially cultivated in the India, China, Sri Lanka, England, Guatemala, Paraguay and the other parts of Africa, South America and Central America. India is the largest producer of lemon grass (producing more than 2 million pounds per year). In India, it is cultivated along the foothills of Arunachal Pradesh and beside the mountain range of the Western Ghats and Sikkim in the Himalayan Mountains. Lemon grass is commonly used in tea, curries and soups. In several parts of the world, the root of lemongrass is also being used as chewing stick for mouth cleaning.

Aim of the Study

The main aim of the present study is to draw attention towards the need of a detailed study on lemon grass (*Cymbopogon citratus*) which may provide better and efficient remedies in future for the various diseases.

Therapeutic Properties of Lemon Grass

In Asia, *Cymbopogon citratus* (lemon grass) is widely used as an important component for health. It contains various flavonoids and phenolic compounds, terpenoids and essential oils. Lemon grass is commonly used as sedatives for the central nervous system in India (Schaneberg B.T.,



Preeti Singh

Associate Professor,
Dept. of Botany,
S. S. Khanna Girls'
P.G. College,
Prayagraj, India

et.al, 2002). Traditionally leaves of lemongrass are effective as antiseptic, antipyretic, anti-inflammatory diuretic, tranquilizer, spasmolytic, analgesic, and stomachic agent (Adejuwon et al.; 2007; Sawyerr, E., 1982; Tatiana et al., 2011; Viana et al., 2000). Essential oil is one of the major components of lemon grass extracts and it is used in cosmetics and perfumes as co-Ingredient. The essential oils of lemon grass are characterized by the presence of monoterpene constituents like citral, limonene, elemol, geraniol, 1,8 cineole, citronellol, linalool, b-carophyllene, geranylformate, methylheptenone, and geranyl acetic acid derivation. Citral is one of the important ingredients of the oil with huge modern uses, for example, crude material for confectionery, perfumery, beta carotene and vitamin A etc. (Singh, B.R., et.al., 2011). Investigations carried out on lemongrass extracts showed other important therapeutic potentials such as anti-cancer, antihypertensive and anti-mutagenicity. It also includes non-toxic, anti-diabetic, anti-oxidant, anxiolytic, anti-nociceptive and anti-fungal properties (Shah G., et al., 2011). Several important bioactive compounds are found in lemon grass, which are useful in several health problems. These bioactive compounds are usually found in the leaves (Table- 1).

Table-1: Bioactive compounds found from lemon grass extract and essential oil, (Olorunnisola, S. K., et.al, 2014)

S. No	Component	Biological activities	References
1.	Citral	Antibacterial activity	Grace et al., 1984
2.	Myrcene	Antibacterial activity	Grace et al., 1984
3.	Dipentene		Grace et al., 1984
4.	Heptenone		Grace et al., 1984
5.	Borneol		Grace et al., 1984
6.	Linalool		Grace et al., 1984 Berenice et al., 1991
7.	α -citral (geranial)	Antinociceptive activities	Viana et al., 2000
8.	β -citral (neral)		Dharmendra et al., 2001
9.	Geranial	Antimicrobial action	Mirghani et al., 2012
10.	Geraniol	Antiviral activity	Celso et al., 2011;
11.	Limonene	Anti-oxidant activity	Bidinotto et al., 2010;
12.	β -myrcene	Anti-gout activity	Blanco et al., 2009
13.	6-methyl-5-hepten-2-ona undecan-2-one	Anti-diabetic activity Anxiolytic properties Antinociceptive activity Anti-	Costa et al., 2006; Viana et al., 2000; Dharmendra et al., 2001, Shigeharu

		fungal activity	et al., 2001; Berenice et al., 1991
14.	Citronellol	Anti-fungal activity	Berenice et al., 1991, Dharmendra et al., 2001

Although a number of pharmacological researches have been carried out based on the constituents present in the lemon grass, but a lot more can still be explored and utilized. A summary of the findings of these studies is presented below.

Anti-Inflammatory Properties

Inflammation of tissue is one of the main health issues worldwide. Solvent extracts, polyphenol rich extractants and citral isolate are the major components of lemongrass exhibiting anti-inflammatory activities as reported by several investigators (Carbajal D., et.al., 1989).

Antibacterial Activity

The chromatographic fraction of the essential oil of *Cymbopogon citratus* in agar plate was effective on *Escherichia coli*, *Bacillus subtilis*, *Staphylococcus aureus* (Melo S.F., 2001) and *Shigella flexneri* and *Salmonella paratyphi* (Syed M. et. al., 1990). These activities are shown in two of the three main components of the lemon grass oil identified through mass spectrometric and chromatographic methods. The α -citral (geranial) and β -citral (neral) components of lemon grass oil individually show an antibacterial action on gram-positive and gram-negative bacteria, while the third component of oil, myrcene, did not show any recognizable antibacterial activity on its own (Onawunmia G.O. et.al., 1984).

Antidiarrheal Activity

It has been reported that *Cymbopogon citratus* stalk decoction is effective in diarrhea in a dose-dependent manner (Tangpu V., et. al., 2006).

Antifilarial Activity

Extract of fresh leaves of lemon grass was active on filarial parasite - *Setaria digitata* (Suresh M., et. al., 1990)

Antifungal Activity

Oil of *Cymbopogon citratus* is active against such dermatophytes such as *Epidermophyton floccosum*, *Trichophyton rubrum*, *Trichophyton mentagrophytes* and *Microsporum gypseum* (Wannissorn B., et.al., 1996). It is among the most effective agents against human dermatophytes. Other investigations have been reported that lemon grass oil is active against 32 ringworm fungi (Kishore N. et. al. 1993), keratinophilic fungi and food storage fungi (Misrha A.K., et.al, 1994). Lemongrass oil is also useful as a herbicide and as an insecticide due to its naturally occurring antimicrobial properties.

Anti-amebic Effect

The essential oil of lemon grass in broth culture was active against *Entamoeba histolytica*, causal organism of Amebiasis. (Blasi D.V., et.al, 1990)

Antimalarial Activity

The essential oils of *Cymbopogon citratus* were effective against *Plasmodium berghei*, (Tchoumboungang F., et. al., 2005)

Antimutagenicity

The ethanolic extract of lemon grass extract reveals an antimutagenic activity (Meevatee U., et.al., 1993). It checks the growth of fibrosarcoma cells transplanted in mice in association with the prevention of lung metastasis (Puatanachokchai R., 1993). Inhibitory effects of the plant extract on the early phase of hepatocarcinogenesis after initiation with diethylnitrosamine were reported in 344 male Fischer rats (Puatanachokchai R., et.al. 2002)

Antiprotozoan Activity

A dose-dependent antiprotozoan effect of the essential oil of lemon grass was reported on two strains of *Crithida deanei* (Pedroso R.B., et.al., 2006)

Ascaricidal Activity

Ascaris is an intestinal parasite of humans. The essential oil of lemon grass has an ascaricidal activity (Chungsamarnvart N., et.al., 1992)

Free Radical Scavengers and Antioxidant Effects

Methanol, MeOH/water extracts, infusion and decoction of *Cymbopogon citratus* were shown to have free radical scavenging effects by measuring the bleaching of the 1, 1-diphenyl-2-picryl-hydrazyl (DPPH) radical, scavenging of the superoxide anion and inhibition of the enzyme xanthine oxidase and lipid peroxidation in human erythrocytes (Cheel J., 2005).

Hypocholesterolemic Effect

The elevated cholesterol concentration was significantly lowered in the animals given the plant extract of lemon grass. This reduction was found to be dose dependent. The result shows that the extract possesses a hypocholesterolemic potential (Agbafor K.N., et.al. 2007).

Effects on plasma Glucose, Triglycerides, low-Density Lipoproteins and Total Cholesterol

It has been reported that a fresh leaf aqueous extract of *Cymbopogon citratus* administered in normal rats lowered the fasting plasma glucose, triglycerides, low-density lipoproteins and total cholesterol (Adeneye A. A., et.al. 2007)

Essential Oil of Lemon Grass

The essential oil of lemon grass works as an effective remedy against bacteria, flu and colds as a vaporizer. It has stimulating agent, aromas, diuretic, tonics, antispasmodic and so on. Lemon grass oil is also useful in urine problems. This is the best oil in hot weather to cool down the body temperature and to revive the mind and soul. Lemon grass oil is used to improve digestion, nausea and menstruation problems and ailments like spasms, headaches, muscle cramps, and rheumatism.

Conclusion

Cymbopogon citratus contains various flavonoids and phenolic compounds, terpenoids and essential oils, which may be responsible for the different biological activities. Lemon grass is used in folk medicine as an antiseptic, antispasmodic, hypotensive, anticonvulsant, analgesic, antirheumatic and treatment for nervous and gastrointestinal disorders and fevers. In the changing global scenario, interest toward plants with therapeutic value is increasing significantly in the primary healthcare system both in the developing and in the developed

countries. Therefore, the information will help researchers to investigate the compounds responsible for different bioactivities and to reveal the molecular mechanism of action.

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