

Lemongrass: it's uses, medicinal and industrial properties

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ARTICLE ID: 065

Introduction:

Lemon grass (*Cymbopogon*) is an aromatic perennial tall grass with rhizomes and densely tufted fibrous roots from the Poaceae grass family. It has short underground stems, ringed segments, thick, slightly leathery green leaves in dense clusters (Carlin *et al.*, 1986). The plant is native to India and is grown in other tropical and subtropical countries (Figueirinha *et al.*, 2008). Lemongrass oil is extracted through the process of steam distillation from the dried leaves of the plant. It has a thin consistency, and a pale or bright yellow color. It has a strong, fresh, lemony, and earthy scent. The botanical classification of lemon grass is described in (Table 1).



Table 1: Botanical classification of lemon grass

Kingdom	Plantae
(unranked)	Angiosperms
(unranked)	Monocots
(unranked)	Commelinids

Order	Poales
Family	Poaceae
Subfamily	Panicoideae
Tribe	Andropogoneae
Subtribe	Andropogoninae
Genus	Cymbopogon

Several species of lemon grass such as *Cymbopogon bombycinus* , *Cymbopogon ambiguus* , *Cymbopogon obtectus* , *Cymbopogon refractus*, *Cymbopogon citrate*, *Cymbopogon nardus*, *Cymbopogon schoenanthus* etc. found in countries such as Australia, China, India, Africa and others (Table 2).

Table 2: Species of lemon grass

Species	Country
<i>Cymbopogon bombycinus</i> , <i>Cymbopogon ambiguus</i> , <i>Cymbopogon obtectus</i> , <i>Cymbopogon refractus</i>	Australia
<i>Cymbopogon citrates</i>	China
<i>Cymbopogon nardus</i>	Thai
<i>Cymbopogon proximus</i>	Egypt
<i>Cymbopogon schoenanthus</i>	southern Asia and northern Africa
<i>Cymbopogon flexuosus</i> , <i>Cymbopogon citriodora</i>	India

Traditional use of Lemon grass:

Lemon grass has been used as a food ingredient, in cosmetics and as folk medicines in several regions of the world (Table 3).

1. As a Food ingredient:

Lemon grass is used as a basis of a popular drink in the tropics. It is known as “Takrai” in Thailand as it is used in many Thai cuisines. In the western world, it is often used in curries, marinades and sea foods soups; added to salads in Vietnam; used for the preparation of soft drinks and as an aromatic, pleasant- tasting herbal tea

all around its distribution area in Peru. In Java, it is used in preparation of highly spiced “sherbet” (Burkill, 1935).



2. In Cosmetics:

Due to its lovely fragrance, lemon grass is used as a flavouring ingredient in several products such as soaps, perfume, candle, mosquito and other insect repellents.



3. In Folk Medicine:

Though there are limited scientific data on the medical claims of lemon grass, it has been used in traditional medicine for treatment of several ailments (Simon *et al.*, 1984), stated that *C. citratus* is used in different parts of the world in the treatment of digestive disorders, fevers, menstrual disorder, rheumatism and other joint pains. The infusion or decoction of aerial parts of Lemon Grass has wide spread used in folk medicine. (Carlin *et al.*, 1986) has reported that this plant is recommended to treat digestive disorder, inflammation, nervous disorder and fever as well as other health problems.

The study was performed by (Carbajal *et al.*, 1989) with doses similar to those employed in traditional medicine and reported a weak diuretic and anti-inflammatory effect for the oral intake of a 10 or 20% decoction at a dose of 25 mL/kg in rats.

(Puatanachokchai *et al.*, 2002) stated that lemon grass contains some components that may be cancer chemo preventive. In fact, the extract has been shown to inhibit rat colon carcinogenesis in animal models.

(Stehmann *et al.*, 1995) reported that the lemon grass tea also has diuretic properties and can help in urinating difficulties and water retention.

Table 3: Country wise use and application of Lemon grass

Country	Purpose	Reference
India	Used for gastrointestinal problems	Alves <i>et al.</i> (1960)
	A decoction made from the leaves is recommended as diaphoretic in fever	Chopra <i>et al.</i> (1958)
China	as ansiolitic	Peigen <i>et al.</i> (1983)
Mauricio islands, Malay Peninsula	Common to use the lemon grass tea against flu, fever, pneumonia, and to solve gastric and sudorific problems	São Paulo (1959)
Nigeria	As antipyretic, and for its stimulating and antispasmodic effects	Olaniyi <i>et al.</i> (1975)
Indonesia	Indicated to help the digestion, to promote diuresis and sweating	Hirschorn (1983)
Cuba and other Caribbean region	For analgesic and anti-inflammatory actions.	Ortiz <i>et al.</i> (2002)
Africa and	Considered as antitussive, antiseptic, sudorific,	Alves & Souza

Asia	anti-rheumatic and to treat backache, sprain and haemoptysis.	(1960)
London	The grass has been reported to revitalize the body and promote good health. It aids digestion and inhibit chemical-induced carcinogenesis by modulating xenobiotic-metabolizing enzymes in the liver and intestine	Vickery <i>et al.</i> (1979)

Properties of Lemon grass:

Due to its common use in folk medicine, Lemon grass is bestowed with a plethora of medicinal properties which have not been scientifically proven. Scientifically-based properties of Lemon grass include:

1. Relaxes muscles

The most important health benefit of Lemon grass oil is its ability to calm and relax the muscles. It provides relief from headache, migraines and muscle strains.

2. Depression

Lemon grass oil is also useful in relieving symptoms related to depression, anxiety and panic attacks.

3. Edema

Its diuretic property is useful in curing edema and its carminative properties help relieve gas and acidity.

4. Digestion

Consumption of Lemon grass oil improves digestion and eases bowel movements in case of constipation.

5. Fever

Lemon grass oil has antipyretic properties that helps reduce temperature during high fever and also eliminates fever completely.



6. Infection

The fungicidal, antimicrobial and antibacterial properties of Lemon grass oil make it beneficial in the prevention and cure of fungal as well as bacterial infections, both internal and external.

7. Clotting of blood

The astringent properties of Lemon grass oil help to speed up the process of blood clotting and prevent excessive loss of blood when applied to injuries that bleed profusely.

8. Nerve tonic

Lemon grass oil can help cure many nervous system related disorders like Vertigo, Alzheimer's, Parkinson's disease, etc. by strengthening the nerves and the immune system as well.

9. Anti-cancer

Research indicates that Lemon grass or Lemon grass oil can cause programmed death in cancerous cells, without harming the useful cells.

10. Skin care

Its antibacterial, astringent and antiseptic properties prevent and cure skin infection, prevent acne breakouts and soothe broken or inflamed skin. It is used as an ingredient in many skin care products like soaps, lotions, perfumes and deodorants.

Industrial properties of Lemon grass:

Formulation	Method	Purpose	Reference
Emulsion	Liquid paraffin solution	Mosquito-repellant	Dudai <i>et al.</i> (2005)

Microemulsion	Surfactants: Tween 80 and Tween 20 , Cosurfactants: Transcutol-P, Ethanol, and Distilled Water	Acne vulgaris	Dayananda (1990)
Cream	Liquid paraffin solution	Mosquito-repellant	Faiyazuddin <i>et al.</i> (2009)
Shampoo	Broth dilution assay	Anti-dandruff	Leite <i>et al.</i> (1986)
Solution	Filter paper diffusion bioassay	Licidal activity against human head lice	Lyn <i>et al.</i> (2010)

Medicinal properties of Lemon grass:

1. Anti-microbial activity

The ethanolic extracts of the leaves of Lemon grass showed potential antibacterial property against *Staphylococcus aureus*. Flavonoids and Tannins found in the extract are responsible for the activity.

2. Anti-fungal activity

Candida albicans is an important pathogen of human infections; moreover, other species can be associated with some infections. The anti-fungal activity of lemon grass and citral against *Candida* species was studied and the study showed that lemon grass oil and citral have a potent in vitro activity against *Candida* spp.

3. Anti-protozoan activity

The family Trypanosomatidae harbours protozoans that are agents of important illnesses in humans, animals and in plants. This family also includes some lower trypanosomatids such as *Crithidia*, *Blastocrithidia*, and *Herpetomonas*, monoxenous protozoans usually found in insect hosts. The essential oil extracted from *Cymbopogon citrates* showed anti-protozoan activity against *Crithidia deanei*.

4. Anti-oxidant activity

The role of phenolic acid and flavonoids as natural anti-oxidants and free radical scavenger has been of interest due to their pharmacological behaviour. Phenolic acids present in the plant showed the anti-oxidant profile.

5. Anti-diarrhoeal activity

In practice, the whole stalk and the leaf of lemon grass are boiled and the decoction is drunk to relieve the diarrhoea. In view of its popular use in traditional medicine system, the anti-diarrheal efficacy of *C. citrates* stalk decoction and its main chemical constituent citral, was studied.

6. Anti-mutagenic activity

The ethanolic extract of lemon grass was found to possess anti-mutagenic properties towards chemical induced mutation in *Salmonella typhimurium* strains TA98 and TA100.

7. Anti-Inflammatory activity

Anti-Inflammatory Activity of *Cymbopogon citratus* leaf infusion in lip polysaccharide stimulated dendritic cells was studied and used for the treatment of inflammatory diseases, in particular of the gastrointestinal tract.

8. Anti-malarial activity

In vivo antimalarial activity of essential oil obtained from *Cymbopogon citratus* on mice infected with plasmodium berghei was studied.

9. Anti-nociceptive activity

Essential oil of *C. citrates* possesses a significant anti-nociceptive activity. Comparing the results obtained with three different experimental models of nociception viz., hot-plate, acetic acid-induced writhing in mice, and formalin test, essential oil acts both at the peripheral and central levels.

10. Anti-hepatotoxic activity

The aqueous leaf extracts of *Cymbopogon citrates* showed anti-hepatotoxic action against cisplatin induced hepatic toxicity in rats. Hence the extracts have the potential to be used for the management of hepatopathies and as a therapeutic adjuvant in cisplatin toxicity.

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