Review Article

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# A review on pharmacological activities of cymbopogon citratus

Sumeet Magotra*, Ajeet Pal Singh & Amar Pal Singh

St. Soldier Institute of Pharmacy, Lidhran Campus, Behind NIT (R.E.C), Jalandhar-Amritsar by pass NH-1 Jalandhar-144011, Punjab, India

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**Abstract**

Lemongrass is the aromatic plant Cymbopogon citratus, which belongs to the Gramineae family. The name Cymbopogon comes from the Greek word "kymbe –pogon," which means "boat-beard". Cymbopogon citratus, a perennial fragrant grass native to South India and Sri Lanka, is now widely grown throughout tropical America and Asia. The essential oil is extracted from freshly cut and slightly dried leaves, which are used medicinally, Pharmacological properties of Cymbopogon citratus are extensively explored, however, research suggests that other species may prove helpful pharmaceutically.

***Keywords:*** *Cymbopogon citratus*, ethnopharmacology, pharmacological activity, Lemon grass, phytochemicals.



***Corresponding Author**

Sumeet Magotra

Email: summetmagotra@gmail.com

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## Introduction

Citronella grass or lemongrass is the common name for Cymbopogon citrates class. This species is a member of the Gramineae family, which includes about 500 genera and 8,000 plant species [1]. Plants are natural factories that produce a variety of phytochemicals that have specific physiological effects on living organisms. In our search for novel medicines, studying the phytochemical and pharmacological characteristics of medicinal plant extracts is a sensible strategy [2]. It is a medicinal and fragrant perennial tall grass with rhizomes and fibrous roots that are densely tufted. It is a member of the Poaceae family, which is known for producing a lot of oil. On short subterranean stems, dense clusters of green, slightly leathery leaves emerge [3]. Previous research and information on the phytochemical and pharmacological properties of lemongrass are included in this review article.

**Taxonomy [4, 5]**

Current Name: Cymbopogon citratus (DC.) Stapf
Family/Genus: Poaceae (Graminae)

**Classification [4-5]**

Kingdom - Plantae – Plants
Subkingdom - Tracheobionta – Vascular plants
Super division - Spermatophyta – Seed plants
Division - Magnoliophyta – Flowering plants
Class - Liliopsida – Monocotyledons
Subclass - Commelinidae
Order - Cyperales
Family - Poaceae – Grass family
Genus - Cymbopogon Spreng. – Lemon grass
Species - Cymbopogon citratus (DC.) Stapf – lemon grass

**Common Names [4-5]**

**Brazil**: Capim-cidrao, Capim-santo
**Egypt**: Lemon grass
**English**: Lemongrass, Citronella, Squinant
**Ethiopia**: Tej-sar
**Hindi**: Sera, Verveine
**Indonesian**: Sereh
**Italian**: Cimbopogone
**Malaysia**: Sakumau
**Mexico**: Zacate limon
**Swedish**: Citrongräss

**Thailand**: Ta-khrai
**Turkish**: Limon out
**USA**: Citronella
**Synonym(S)**
Lemon grass stalk, *Andropogon citratus*.
**Botanical Description**
In the garden, lemongrass may be used in a variety of ways. With a short rhizome, this tropical grass grows in thick clumps up to 6 feet (1.8 metres) tall and 4 feet (1.2 metres) wide. The morphological description of Cymbopogon citratus is shown in the table [6-7].

**Table 01: Morphological description of *Cymbopogon citrates***

| Part | Description |
|---|---|
| Leaves | The strap-like leaves are 0.5–1in (1.3–2.5 cm) wide, about3 ft (0.9 m) long and have gracefully drooping tips. The evergreen leaves are bright bluish-green and release a citrus aroma when crushed Leaf arrangement: most emerge from the soil, usually without a stem Leaf type: simple, Leaf margin: entire, Leaf shape: linear, Leaf venation: parallel, Leaf type and persistence: fragrant, Leaf blade length: 18–36 in Leaf color: green Fall characteristic: showy |
| Flowers | The lemongrasses plants that you are likely to encounter are cultivars and do not typically produce flowers, or flowering panicles are rarely formed. |
| Inflorescence | Inflorescences are 30–60-cmlong and nodding, the partial inflorescences are paired racemes of spikelets subtended by spathes |

**Table 02: Phytochemical constituents**

| Phytochemical | Compound |
|---|---|
| **Flavonoids** | luteolin 7-*O*-glucoside (cynaroside) ,isoscoparin, quercetin, kaempferol, isolated elimicin , catechol , chlorogenic acid , caffeic acid and hydroquinone , eugenol, eugenol methylether [8-11]. |
| **Mineral content** | potassium (K), sodium (Na), magnesium (Mg), man- ganese (Mg), iron (Fe), zinc (Zn), phytate and phosphorus (P), Calcium to Phytate (0.05), Phytate to Zinc (9.6) [12]. |
| **Terpenoids** | cymbopogonol and cymbopogone [13], |
| **Proximate analysis** | crude fiber (9.28%),crude fat, crude ash, crude protein and 5% carbohydrate [14]. |
| **Essential oil** | mycrene, genariol, citronellol, $\alpha$-oxobisabolene, neointermediol (7.2%), selina- 6-en-4-ol (27.8%), $\alpha$-cadinol (8.2%),methyheptenone (1.2%),decanal (0.25%) and naphtalene (0.79%),β-eudesmol (45%), cubebol (4.7%), humulene (4%),sabinene, geranyl acetate, citronella, mentha-1(7), limonene (19.33%),mentha-1(7),8-dien-2-ol trans [15-17]. |
| **Tannins** | Prothocyanidins, *C. citratus* from Nigeria showed about 0.6% of tannins [18] |
| **Alkaloids** | Contain about 0.52% alkaloids from 300 g plant material [19] |

**Traditional uses of lemon grass [20-23]**

- Lemongrass leaves contain a significant amount of oil, which has antibacterial, carminative, fungicidal, analgesic, antiseptic, astringent, bactericidal, and antidepressant effects. Due to its capacity to function as an antibiotic and antiseptic, it can be used to treat ringworm and athlete's foot disease. Lemongrass has a strong antimicrobial effect against methicillin-resistant Staphylococcus aureus (MRSA). It can help with colitis, indigestion, and gastro-enteritis. It aids in the relief of headache, bodily discomfort, nervous weariness, and other stress-related symptoms. Its infusions are frequently used to treat illnesses including sore throats, laryngitis, and bronchitis.
- It has been used to treat gastrointestinal disorders.
- In cases of fever, a decoction of lemongrass leaves is used as a diaphoretic
- Lemongrass revitalizes the body and improves overall wellness.
- Lemon grass tea is frequently used to treat illness, fever, and pneumonia.

- It promotes digestion and prevents chemical-induced carcinogenesis by regulating xenobiotic-metabolizing enzymes in the liver and gut.

## Pharmacological Activities

The pharmacological effects of Cymbopogon citrates are mentioned below

## Antibacterial Activity

On Bacillus subtilis, Escherichia coli, Staphylococcus aureus, Salmonella paratyphi, and Shigella flexneri, the chromatographic fraction of the essential oil in agar plate was active. Two of the three primary components of the oil identified using chromatographic and mass spectrometric techniques exhibit evidence of these actions. While the -citral (geranial) and -citral (renal) components both have antibacterial activity against gram-negative and gram-positive bacteria, the third component, myrcene, has no antibacterial activity on its own. When the volatile oil extract was oxidised with active oxygen, the extract remained active [24].

**Antinociceptive Effect**

The essential oil of Cymbopogon citratus has potent antinociceptive properties. We may assume that the essential oil operates both at the peripheral and central levels based on the results obtained with three distinct experimental models of nociception (hot-plate, acetic acid-induced writhings, and formalin test [26].

**Free Radical Scavengers and Antioxidant Effects**

By measuring the bleaching of the 1, 1-diphenyl-2-picryl-hydrazyl (DPPH) radical, scavenging of the superoxide anion, inhibition of the enzyme xanthine oxidase, and lipid peroxidation in human erythrocytes, Methanol, MeOH/water extracts, infusion, and decoction of Cymbopogon citratus were found to have free radical scavenging effects [27].

**Hypocholesterolemic Effect**

In the mice administered the plant extract, the increased cholesterol concentration was significantly reduced. This decrease was shown to be dosage dependent. This indicates that the extract has hypocholestecolemic properties [28].

**Anti-inflammatory activity**

Citral derived from C. citratus inhibits inflammatory mediators significantly and can be used as an ingredient in lotions and ointments to treat topical inflammation. It has also been reported to suppress tumour necrosis factor (TNF)-induced neutrophil adherence at concentrations as low as 0.1 percent, inhibit inducible nitric oxide synthase (iNOS), nitric oxide production (NO), and other LPS-induced pathways, covalently bind to receptors, thereby inhibiting the nuclear factor-kappa B (NF-B) pathway, and suppress COX-2 by 60–70% [29-30].

**Anti-fungal activities**

Essential oils from lemon grass have been shown to have substantial resistance to pathogenic fungus cells that cause problems with mycotoxins production during grain and other food storage.It also has significant inhibitory and synergistic actions against fungal diseases such as athlete's foot, ringworm, jock itch, and yeast infections by limiting filamentous fungus development by inactivating yeast cells [31-33].

**Antimalarial activity**

The activity of a dichloromethane extract of C. citratus against P. berghei and P. falciparum was measured at 2–10 g/mL. Ethanolic extracts of EC 50 demonstrate significant antiplasmodial activity against two P. falciparum strains (multidrug resistant (Dd2) (54.84) and CQ-sensitive (3D7)) (28.75) [34-35].

**Anti-obesity**

Lemon grass is used in hypolipidemic and hypoglycemic medications. It has been used in folk and Ayurvedic medicine to control glucose, lipid, and fat levels in the blood serum, which may help to avoid obesity and hypertension. It is generally consumed as tea [36].

**Antihypertensive activities**

The plant has been utilised to keep blood glucose levels in check by secreting insulin (hyperinsulinemia).It lowers blood pressure, which minimises the risk of hypertension. Citral, isolated from C. citratus, acts as an endothelium-independent vasodilator by blocking Ca2+ inflow and the prostacyclins (PGI2) channel [37].

**Dermatotoxicity activity**

Rashes, itching, and swollen skin have all been treated with Cymbopogon citratus in herbal soap. Clinical samples were used to test the dermatoxicity of herbal soap made from C. citratus leaf, tea tree oil, and orange

peel. After 40 days of treatment with the soap, significant activity of 60% (p 0.05) was found [38].

**Anti-diarrhoeal activity**

In practise, the entire stalk and leaf of lemongrass are cooked together, and the resulting decoction is consumed to cure diarrhoea.The anti-diarrheal effectiveness of C. citrates stalk decoction and its primary chemical component citral was investigated due to its widespread usage in traditional medicine [39].

**Anti-mutagenic activity**

In Salmonella typhimurium strains TA98 and TA100, an ethanolic extract of lemongrass was discovered to have anti-mutagenic effects against chemical-induced mutation [40].

**Anti-protozoan activity**

Protozoans belonging to the Trypanosomatidae family cause serious diseases in people, animals, and plants.rithidia, Blastocrithidia, and Herpetomonas, monoxenous protozoans that are frequently found in insect hosts, are also members of this family. Crithidia deanei was successfully treated with essential oil derived from Cymbopogon citrates [41].

**Anti-hepatotoxic activity**

In rats, Cymbopogon citrates aqueous leaf extracts demonstrated anti-hepatotoxic activity against cisplatin-induced liver damage.As a result, the extracts might be utilised to treat hepatopathies and as a therapeutic adjuvant in the treatment of cisplatin toxicity [42].

**Anthelmintic activity**

The anthelmintic potential of an aqueous extract of Cymbopogon citratus (lemon grass).In this bioassay, three distinct dosages of the above-mentioned extract, namely 25, 50, and 1000mg/ml, were assessed in a bioassay by monitoring the time of worm paralysis and death in minutes. In the same amounts, piperazine citrate was utilised as a standard reference chemical, and normal saline was utilised as a control. Lemon grass crude extract exhibits anthelmintic activity in a dose-dependent manner, according to the findings [43].

**Acaricidal activity**

The acaricidal properties of Cymbopogon citratus leaf extract essential oil (lemongrass) Twenty-five adult mites were put on plant extract-soaked filter paper and exposed to various concentrations (50.00 percent, 25.00 percent, 12.50 percent, 6.25 percent, and 3.13 percent) and exposure periods (24hrs, 48hrs, 72hrs and 96 hrs) [44].

**Antiglycation activity**

The anti-glycation activity of ascorbic acid and ethanol extracts of C. Citratus on hydrogen peroxide. The ethanol extract has the same anti-glycation capability as ascorbic acid. The presence of C. Citratus leaves extract inhibited the glycation process, according to the findings [45].

**Neurobehavioral study**

In rats, beta-myrcene, a key component of lemongrass (Cymbopogon citratus) causes analgesia. In mice, the drug exhibited no protective effect against seizures caused by pentylenetetetrazol (PTZ) this suggests it has no benzodiazepine-like anxiolytic action and that it is unlikely to have antidepressant or antipsychotic effects on the central nervous system. The study was published in the Journal of Clinical Pharmacology and Experimental Therapeutics46.Hydrodistillation was used to extract essential oil (EO) from fresh leaves, which was then given orally to Swiss male mice 30 minutes before the trial. EO delayed clonic seizures generated by pentylenetetrazole and prevented tonic extensions induced by maximum electroshock. Sleeping time, percentage of entries, and time spent in the open arms of the raised plus maze were all improved by EO. These effects were seen even when no motor impairment was present as measured by rotarod and open field tests [47].

## Conclusion

Human beings rely heavily on medicinal plants to maintain their health. The pharmacological assessment of numerous plants utilized in Indian traditional medicine is becoming increasingly popular. The numerous types of phytochemicals identified in C. Citratus components and the pharmacological actions connected with them were highlighted in this review.

## Disclosure statement

There are no conflicts of interest.

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