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## Review on pharmacological activity of *Cymbopogon citratus*

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### ABSTRACT

*Cymbopogon citratus* belonging to the family Gramineae is an herb worldwide known as lemongrass. The prefix 'lemon' owes to its typical lemon like odor, which is mainly due to the presence of citral, a cyclic monoterpene. *Cymbopogon citratus* a fast growing, perennial aromatic grass is native to South India and Sri Lanka, now widely cultivated in the tropical areas of America and Asia. Freshly cut and partially dried leaves are used medicinally and are the source of the essential oil. The plant is used extensively in Ayurvedic medicine. Studies indicate that *Cymbopogon citratus* possesses various pharmacological activities such as anti-amoebic, anti-bacterial, anti-diarrheal, anti-filarial, anti-fungal and anti-inflammatory properties. Various other effects like anti-malarial, anti-mutagenicity, anti-mycobacterial, anti-oxidants, hypoglycemic and neurobehavioral have also been studied. These results are very encouraging and hence this literature review was intended to study about the plant more extensively to confirm these results and reveal other potential therapeutic effects.

**Keywords:** *Cymbopogon citratus*, pharmacological activity, essential oil.

### 1. Introduction

*Cymbopogon citratus* staff is popularly known as citronella grass or lemongrass. This species belongs to the Gramineae family, which comprises approximately 500 genus and 8,000 herb species [1]. Lemon grass is a tufted perennial grass growing to a height of 1 meter with numerous stiff leafy stems arising from short rhizomatous roots. It has an economic lifespan for about 5 years [2]. The leaf-blade is linear, tapered at both ends and can grow to a length of 50 cm and width of 1.5 cm. The leaf-sheath is tubular in shape and acts as a pseudostem. Leaves are long, glaucous, green, linear tapering upwards and along the margins. This plant produces flowers at matured stages of growth. Conversely, flowering has never been observed under cultivation due to rapid harvesting time. The inflorescence is a long spike about 1 meter in length. Flowers borne on decoumpound spatheate; panicles 30 to over 60 cm long. The rhizome produces new suckers that extend vertically as tillers to form dense clumps [3,4].

### 2. Ethnobotany

*Cymbopogon citratus* is a great interest due to its commercially valuable essential oils and widely used in food technology as well as in traditional medicine. People nowadays are more aware on health issue due to the emergence of new diseases. Treatment using plant-based medicine appears to be an alternative approach due to the adverse effects associated with the use of synthetic drugs [5]. Lemongrass is a folk remedy for coughs, elephantiasis, flu, gingivitis, headache, leprosy, malaria, ophthalmic, pneumonia and vascular disorders. Studies have shown that the lemon grass has antibacterial and antifungal properties. Mixed with pepper, it's a home therapy for menstrual troubles and nausea. The lemon grass is a good cleanser that helps to detoxify the liver, pancreas, kidney, bladder and the digestive tract. It cuts down uric acid, cholesterol, excess fats and other toxins in the body while stimulating digestion, blood circulation, and lactation; it also alleviates indigestion and gastroenteritis. It is said that lemon grass also helps improve the skin by reducing acne and pimples and acts as a muscle and tissue toner. Also, it can reduce blood pressure. A recent study by the Food and Nutrition Research Institute of the department of Science and technology (DOES) showed lemon grass can help prevent cancer [6,7].

### 3. Phytochemistry and Pharmacology

The use of medicinal plants is part of a competitive market, which includes pharmaceuticals, food, cosmetics, and perfumery markets [8]. The chemical composition of the essential oil of

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*Cymbopogon citratus* varies according to the geographical origin, the compounds as hydrocarbon terpenes, alcohols, ketones, esters and mainly aldehydes have constantly been registered. Lemon grass contains active ingredients like myrcene, an antibacterial and pain reliever, citronellal, citronellol and geraniol. The essential oil consists of, mainly, citral a volatile oil with strong lemon fragrance. Citral is a mixture of two stereoisomeric monoterpene aldehydes; the trans isomer geranial (40-62%) dominates over the cis isomer neral (25-38%) and is used in manufacture of perfumes, colored soaps and synthesis of Vitamin A [9,10].

**3.1 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 [11].

**3.2 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 lemongrass and citral against *Candida* species was studied and the study showed that lemongrass oil and citral have a potent *in vitro* activity against *Candida* spp. [12].

**3.3 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 citratus* showed anti-protozoan activity against *Crithidia deanei* [13].

**3.4 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 behavior. Phenolic acids present in the plant showed the anti-oxidant profile [14].

**3.5 Anti-diarrhoeal activity:** In practice, the whole stalk and the leaf of lemongrass are boiled and the decoction is drunk to relieve the diarrhea. In view of its popular use in traditional medicine system, the anti-diarrheal efficacy of *C. citratus* stalk decoction and its main chemical constituent citral, was studied [15].

**3.6 Anti-mutagenic activity:** The ethanolic extract of lemongrass was found to possess anti-mutagenic properties towards chemical-induced mutation in *Salmonella typhimurium* strains TA98 and TA100 [16].

**3.7 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 [17].

**3.8 Anti-malarial activity:** *In vivo* antimalarial activity of essential oil obtained from *Cymbopogon citratus* on mice infected with plasmodium berghei was studied [18].

**3.9 Anti-nociceptive activity:** Essential oil of *C. citratus* 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 [19].

**3.10 Anti-hepatotoxic activity:** The aqueous leaf extracts of *Cymbopogon citratus* 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 [20].

#### 4. Conclusion

Medicinal plants are very important to human beings in preserving our health. There is a growing interest in the pharmacological evaluation of various plants used in Indian traditional system of medicine. Lemongrass is a great interest due to its commercially valuable essential oils and widely used in food technology as well as in traditional medicine. Owing to the new attraction for natural products obtained from lemongrass a proper phytochemical and Pharmacological study is required, which shall open new pharmacological avenues for this magnificent plant which are helpful for clinical experimentation and also in the development of novel drugs.

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