



Nutritional and Nutraceutical Potentials of Lemongrass (*Cymbopogon citratus*)

Fathima Thasrin J.¹, Anitha V.²

¹Student, Department of Nutrition and Dietetics, Sengamala Thayaar Educational Trust Women's College (Autonomous), Mannargudi, Tamilnadu, India.

²Assistant Professor, Department of Nutrition and Dietetics, Sengamala Thayaar Educational Trust Women's College (Autonomous), Mannargudi, Tamilnadu, India.

ABSTRACT: Lemongrass (*Cymbopogon citratus*) is a Poaceae family perennial grass that yields essential oil. The prefix 'lemon' refers to the odour, which is mostly owing to the presence of citral, a cyclic monoterpene. It is a rapidly growing and native to South India and Sri Lanka that is now widely cultivated throughout tropical America and Asia. The essential oil is used medicinally which is derived from freshly cut and slightly dried leave. Lemongrass has recently gained global prominence due to its extensive industrial applications. It also contains a significant amount of flavonoids, essential oils, phenolic compounds, and other phytochemical constituents that have pharmacological properties such as anti-obesity, antibacterial, anti-fungal, anti-nociceptive, anti-oxidants, anti-diarrheal, and anti-inflammatory properties that may improve health. Numerous studies reported that it might possess the excellent health potentials to cure various communicable and non-communicable diseases.

The various properties and potentials of lemongrass are discussed in this review paper.

KEY WORDS: Bioactive compounds, *Cymbopogon citratus*, Medicinal value, Nutritional Composition, Therapeutic Value.

INTRODUCTION

Lemongrass is an indigenous aromatic, evergreen, clump-forming, perennial grass with a strong lemony scent that thrives in tropical and subtropical temperature regions such as Southeast Asia, including Indochina, Indonesia, Malaysia, Sri Lanka, and North and Southern India. The volatile composition of lemongrass was dominated by citral compound, a mixture of two geometric isomers (neral and geranial) that contributed (34.6% and 48.1%, respectively) to the lemony aroma (Bassolé *et al.*, 2011). Parts of lemongrass have been used for thousands of years in traditional folk medicine to treat neurological and gastrointestinal disorders as well as spasms, pain, inflammation, and fever. Additionally, lemongrass is frequently used in the food, fragrance, pharmaceutical, and cosmetic industries (Asri Hashim *et al.*, 2019). Lemon grass is a good source of folic acid, magnesium, zinc, copper, iron, potassium, calcium, and manganese. It also contains vitamins A and C. In recent years, Consumers become much more concerned about the quality and safety of food as they look for safer, healthier, and more wholesome food options. Research on innovative technology for better food preservation during manufacturing, storage, and transport reflects this tendency. For this reason, new alternatives from natural sources have been investigated. One of the most beneficial plants for food's nutritional and functional components is lemongrass (*Cymbopogon citratus*). The term "herb" refers to a "herbaceous plant" in botany. It is a tall, densely tufted grass with many stiff stems emerging from short rhizomatous rootstocks that can grow up to 120 cm tall and have a lifespan of 4 years on average. Fresh grass produces 0.2-0.4% oil on average, or 50–120 kg of oil per hectare (Ranjah *et al.*, 2019). It rarely produces flowers. The leaves are blue-green, upright, and linear in shape, and when crushed, they release a distinctive lemon flavour. Although it is believed that *C. citratus* originated in Malaysia, it is currently grown extensively in gardens and on a commercial scale throughout Central and South America, as well as in some regions of Africa, Southeast Asia, and the Indian Ocean Islands (Majewska *et al.*, 2019). Hence, the present review was investigated to explore the value of underutilised, potential and nutritious medicinal plant lemongrass (*Cymbopogon citratus*) and its efficacy on health.

Plant Morphology

The genus *Cymbopogon* belongs to the Poaceae family, is a perennial herb recognised for its essential oil with pharmacological and therapeutic properties, and is widely distributed throughout tropical and subtropical regions of the world



(Nambair and Mehta, 2012; Ekpenyong *et al.*, 2014). Out of 144 *Cymbopogon* species, three are commercially grown in India: *C. citratus* (West Indian lemongrass), *C. flexuosus* (East Indian lemongrass), and *C. pendulus* (Jammu lemongrass). These are the most popular species for cultivation because to its high output of essential oil per tonne of herbage and drought tolerance (Avoseh *et al.*, 2015). Other common names for *Cymbopogon* include lemon grass, silky heads, citronella fever grass, and barbed wire grass. The leaves and twigs of lemon grass contain an essential oil known as citral or 3,7-dimethyl-2,6-octadienal, which may be extracted with ease by hydro distillation. It is a tropical perennial grass with strong, strap-like leaves that grow from rhizomes that are very slightly branched. It grows to a height of about 1 to 2 m and a width of between 0.5 and 1 cm. Rarely does it produce flowers. It has a nodding, pinkish florescence that is 30 to 60 cm long (Dutta *et al.*, 2017). The pedicel is rectangular, linear, reddish-tinged, and develops between 6 and 10 millimetres long. There are numerous significant chemical components in lemon grass essential oil that are beneficial in a variety of applications. The compound contains cis and trans citral, myrcene, geranium, etc. Following distillation, citral can be used to create ionones, vitamin A, and various citral acetals. These acetals have a wide range of uses in perfumery and can be useful in reducing antibacterial activities (Shahzadi, 2017). The parts of the plant and taxonomical classification, botanical description of *Cymbopogon Citratus* are presented in Figure 1 and Table.1.

Nutritional properties of Lemongrass

Good nutrition is the basic pillar for growth, health and development across the entire life cycle. For the last four decades, India had invested interventions for improving the health of many individuals. Consuming a sufficient, safe and nutritious food is crucial (Anitha and Raajeswari, 2022). Table II reveals the nutritional significance of lemon grass which contains carbohydrate (55 %), crude protein (4.56 %), energy (360.6 kcal), crude fat (5.1 %). The plant is also rich in many essential minerals such as sodium (54.8 mg), potassium (59.5 mg), calcium (39.5 mg), magnesium (70 mg), iron (0.024 mg), manganese (0.952 mg), zinc (121 mg), phosphorous (89.3 mg), and phytate (11860 mg) (Ranade and Thiagarajan, 2015). Lemon grass can be incorporated into health mix and supplemented to people in order to combat undernutrition as suggested by the study on formulation and supplementation of brahmi leaves incorporated health mix which was done by Anitha (2022).

Nutraceutical potentials of Lemongrass

Lemongrass essential oil has been used since ancient times in folk medicine as a remedy to improve circulation, stabilise menstrual cycles, promote digestion or increase immunity. It is also used to produce perfumes, flavours, detergents, and pharmaceuticals (Majewska *et al.*, 2019). Lemongrass can be used fresh or dried and powdered as a food flavour. It is frequently used in teas, soups, and curries, it may also be served with poultry, fish, beef, and seafood. Numerous studies have demonstrated the benefits of using lemongrass leaves and other parts in an infusion to treat nausea, stomach aches, and constipation as well as to prevent ulcers and fight a variety of stomach infections (Carbajal *et al.*, 1989). According to Fokom *et al.* (2019), lemongrass essential oil is a thick yellow liquid that is volatile and chemically lipophilic. It mostly consists of monoterpenes, sesquiterpenes, and phenylpropanoids. The primary component of oil, citral, is composed of the geranial and neral isomers and serves as a precursor for the production of alpha-, beta-, and beta-carotene. While beta ionone is used to synthesise vitamin A, alpha ionone is used in flavours, cosmetics, and fragrances. It also possesses potential antibacterial, anti-inflammatory, analgesic, antioxidant, antispasmodic, antipyretic, diuretic, insecticidal, larvicidal, pesticidal, and antifeedant activities and sedative properties. It is used as spice due to its good taste appeal and not only used as flavouring agent but also utilized in food preservation and food processing (Boukhatem *et al.*, 2014; Barbosa *et al.*, 2008). The most common chemicals found in *Cymbopogon citratus* are terpenes, alcohols, ketones, aldehydes, and esters. It also contains the other phytoconstituents such as Terpinolene, Geranyl acetate, Citral, Nerol Geraniol, Citronellal, Myrcene, and Terpinol Methyl heptenone which are found in their essential oils. Additionally, the plant has been identified as having phenolic compounds like luteolin, isoorientin 2'-O-rhamnoside, quercetin, kaempferol, and apiginin as well as flavonoids and other reported phytoconstituents (Shah *et al.*, 2011).

Antioxidant activity

Antioxidants are substances which delay or prevent the oxidation of an oxidizable substrate they can either be natural antioxidants or synthetic antioxidants. The anti-oxidant properties of essential oils might be encouraging to consider them as natural oxidant in nutraceuticals, functional food and pharmaceutical preparations (Nambiar and Matela, 2012). In recent years, there is an increasing



interest in finding antioxidant photochemically, because they can inhibit the propagation of free radical reactions, protect the human body from diseases and retard lipid oxidative rancidity in foods. According to Lawrence *et al.*, (2015), most plant species have occasionally been looked into for their potential as antibacterial and antioxidant agents. Depending on where they are cultivated, essential oils typically have different biological activity. The IC₅₀ values for the antioxidant capacity of lemongrass oil was 4.73 0.15 L/mL which was estimated by DPPH method. Lemon grass possessed a very good antioxidant activity. Figure 2 depicts the anti-oxidant potential of lemon grass.

Therapeutic use of lemon grass (*Cymbopogon citratus*)

Figure 3 indicates the therapeutic usages of lemon grass consumption. The phytochemicals found in *Cymbopogon citratus*, including terpenoids, flavonoids, and phenolic compounds and some essential oils may be the cause of the plant's different biological effects. Antiamoebic, antibacterial, antidiarrheal, antifilarial, antifungal, and anti-inflammatory effects are just a few of the pharmacological actions of *Cymbopogon citratus*. There are numerous other benefits, including anti-malarial, anti-mutagenic, anti-mycobacterial, antioxidant, hypoglycemic, and neuro behavioural activity (Shah *et al.*, 2011). Lemongrass is of great interest because of its incredibly valuable essential oils and broad use in both conventional medicine and culinary technologies. Due to the growing interest in the natural products made from lemon grass, a thorough phytochemical and pharmaceutical investigation is needed. This will open up new pharmacological possibilities for this magnificent plant that will aid in both the development of new drugs and clinical research (Manvitha and Bidya, 2014).

CONCLUSION

People rely greatly on medicinal plants in order to keep themselves healthy. The pharmacological evaluation of numerous plants used in India's traditional medical system is becoming increasingly popular. Lemongrass is gaining popularity because of its incredibly valuable essential oils and widespread use in traditional medicine and culinary technology. A detailed phytochemical and pharmacological analysis is required due to the increased interest in natural products made from lemon grass. This will provide new pharmacological opportunities for this lovely plant, assisting in the creation of novel medications as well as clinical studies. Human studies on the toxicological properties of lemon grass have been performed however there is not much information on clinical trials for its therapeutic use in enhancing health. By increasing serum antioxidant levels and decreasing the incidence of illnesses caused by free radicals, lemon grass can help to strengthen the body's antioxidant defence system. However, clinical trial research is needed to validate laboratory findings that lemon grass has a high antioxidant potential.

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Figure 1. Lemon Grass Plant (*Cymbopogon citratus*)

Table I. Taxonomical Classification and Botanical Description of *Cymbopogon citratus*

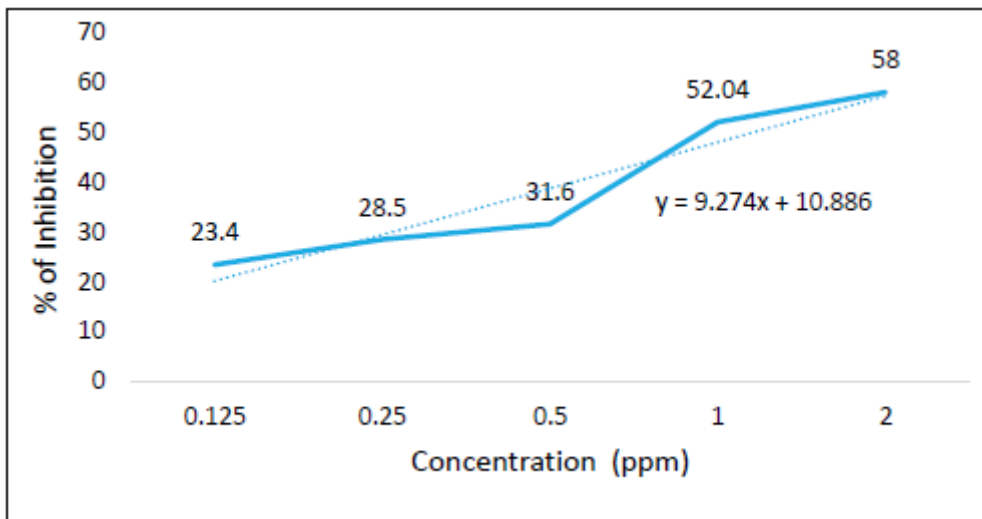
Biological Source	Common Names	Botanical Description
Kingdom – Plantae	Tamil - Elumichai pul	Height - 6 ft (1.8 m)
Family - Poaceae	English - Lemon Grass	Width - 4 ft (1.2 m)
Class - Liliopsida	Hindi - Neemboo ghaas	Leaves - Strap like
Order - Poales	Telugu - Nim'makāya Gaḍḍi	Leaf Colour - Green Colour
Division - Magnoliophyta	Bengali - Lēbu Ghāsa	Aroma - Citrus
Genus - Cymbopogon Spreng	Kannada - Nimbehaṅṅu Hullu	Flowering Panicles – Rare
Species - Citratus	Malayalam – Naaranga Pullu	Stem - No

Source: Shah et al., (2011)

Table II. Nutritional Composition of *Cymbopogon citratus*

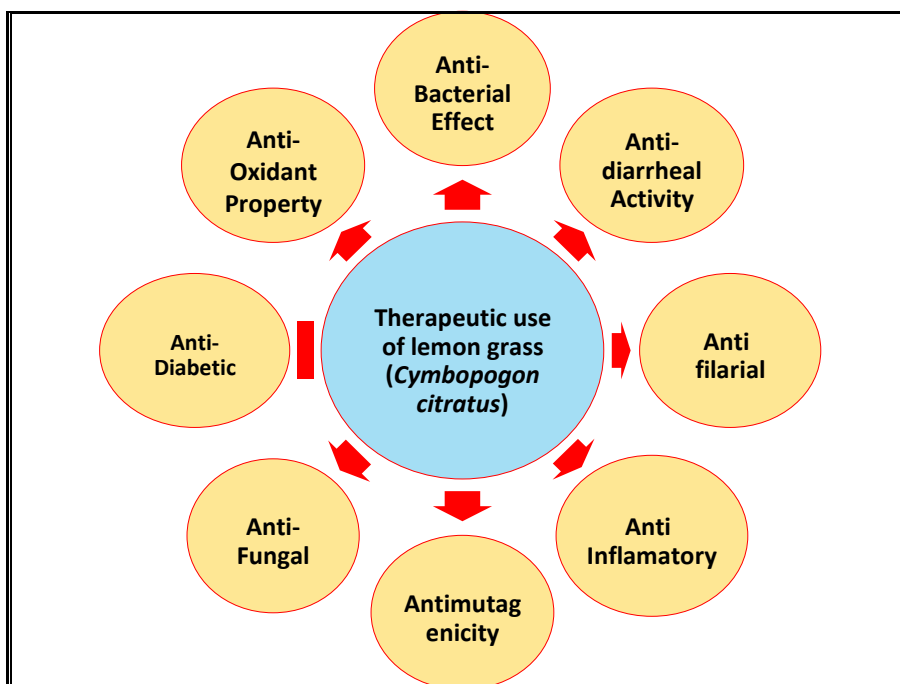
Nutritional Component	Quantity
Carbohydrate	55 %
Crude protein	4.56 %
Crude fat	5.1 %
Crude fibre	9.28 %
Energy	360.55 Kcal
Sodium	54.8 mg
Potassium	59.5 mg
Calcium	39.5 mg
Magnesium	70 mg
Iron	0.024 mg
Manganese	0.952 mg
Zinc	121 mg
Phosphorous	89.3 mg
Phytate	11860 mg

Source: (Ranade and Thiagarajan, 2015).



Source: (Lawrence et al., 2015)

Figure 2. DPPH Free radical scavenging activity of essential oil of lemon grass (*Cymbopogon citratus*)



Source: (Shah et al., 2011)

Figure 3. Therapeutic use of lemon grass (*Cymbopogon citratus*)

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