

## CYMOPOGON CITRATUS; AN UPDATED REVIEW ON NUTRITIONAL AND NUTRACEUTICALS ASPECTS

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**ABSTRACT:** *Cymbopogon citratus* is a significant medicinal plant belongs to family *Gramineae*. It originates from Ethiopia, India Africa America and is broadly extended all over humid, subtropical and warm temperate regions of the world. This present review article showed the antioxidant, antimicrobial and toxicological potential of *Cymbopogon* leaves. *Cymbopogon* leaves extract can be used efficiently to make antioxidant and antimicrobial agents which can be used in various industries like pharmaceutical, food and cosmetic etc.

**Key words:** *Cymbopogon*, antioxidant, antimicrobial, toxicological, lemon grass.

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### INTRODUCTION

*Cymbopogon citratus* is scientific name of lemongrass. The word *Cymbopogon* comes from Greek words “kymbe” (ferry) and “pogon” (mustache), which means to arrange spike of the flower. The word *citratus* comes from the older Latin, which means lemon fragrant leaves (Shah *et al.*, 2011). In Mexico “te limon” or “zacate limon” are the common name of *Cymbopogon citratus*. It is a constant different temperatures resistant stiling grass and can produce in hot, semi-warm and temperate climate. It has pleasant fragrance and taste, Its height is from 60 to 120cm, its leaves are green, slats and long with rhizome and dense tufted fibrous root (Vázquez-Briones *et al.*, 2015). Its stem are short underground with segmented ring (Carlin *et al.*, 1986).

The aromatic plant Lemongrass belongs to family *Gramineae* (Akhila., 2010). The leaf-blade of this plant is linear, elongated at both ends and it can raise to a 1.5 cm in width and 50 cm in length. The tubular shape of leaf sheath acts as a pseudo stem. This plant at mature stage of growth produces flowers (Tajidin *et al.*, 2012). Lemon grass (*Cymbopogon citratus*) widely cultured in warm, tropical and subtropical regions. On dry basis it has 1% to 2% essential oil and its chemical composition may be different as a genetic diversity function, habitat and cultural agronomic treatment (Hadjilouka., 2012).

Lemongrass contains various main bioactive compounds which are beneficial in several health problems. Usually leaves contain these active compounds. The various methodologies are used for extraction of such bioactive compounds (Olorunnisola *et al.*, 2014).



Fig 1.1. *Cymbopogon citratus* plant

Moreover, the plant comprises phytochemicals such as flavonoids and phenolic compounds which have luteolin-apiginin, quercetin, rhamnoside, isoorientin and kaempferol. Studies demonstrated that it takes different

pharmacological activities such as, anti-bacterial, antifungal, well as anti-inflammatory properties and other properties such as anti-malarial, anti-mutagenicity, hypoglycemic, antioxidants, anti-mycobacterial and have also been studied (Hasim *et al.*, 2015).

*Cymbopogon citratus* is present abundantly due to its commercially value able vital oils and generally can be used in traditional medicine and in food technology (Manvitha and Bidya, 2014). The lemongrass use was used in common medicine for coughs, elephantiasis, utilization, malaria, pneumonia, ophthalmia, and vascular

disorder. Hence, lemongrass oil is active in drug manufacturing (Naik *et al.*, 2010).

Against house flies (Diptera: Muscidae) and mosquitoes (Diptera: Culicidae) lemongrass oil (*Cymbopogon citratus*) is an active repulsive agent. Some lemon grass species such as, *Cymbopogon ambiguus*, *C-obtectus*, *bombycinus*, *C-refractus*, *C-citrate*, *C-nardus*, *C-schoenanthus* etc and found in countries such as America, Pakistan, India, China, Africa, Australia and many others (Al-Snafi., 2016).



**Fig 1.2. Stems of *Cymbopogon citratus* plant**



**Fig 1.3. Dry form of *Cymbopogon citratus* plant**

**Taxonomical classification:** Some lemon grass species such as *Cymbopogon obtectus*, *Cymbopogon ambiguus*, *bombycinus*, *Cymbopogon refractus*,

*Cymbopogon nardus*, *Cymbopogon citrate*, and *Cymbopogon schoenanthus* etc are found in countries

such as Australia, Africa, India, China and others (Al-Snafi, 2016).

**Table 1.1: Botanical classification of Cymbopogon.**

Kingdom:	Plantae
Unranked	Angiosperms
Unranked	Monocots
Unranked	Comeliness
Sort	Poales
Family unit	Poaceae
Subfamily	Panicoideae
Family	Andropogoneae
Subordinate	Andropogoninae
Kind	Lemon grass

(Vanisha *et al.*, 2012).

**Phytochemistry:** The chemical analysis of Cymbopogon revealed that it contains, saponins, tannins, saponin glycosides, alkaloids, flavonoids, triterpens, balsams, glycosides, steroids, cardiac glycosides and volatile oils (Bharti *et al.*, 2013). The important phytoconstituents are essential oils which includes Citral  $\alpha$ , Citronellal, Geranyl acetate, Terpinolene, Geraniol, Terpinol Methylheptenone, Nerol,  $\beta$  Myrcene, Geranyl acetate and Terpinol Methylheptenone. phenolic and flavonoids compounds, which contain isoorientin 2'-O-rhamnoside, luteolin, kaempferol, quercetin, and apigenin (Vanisha *et al.*, 2012).

Lemon grass also possess esters, hydrocarbon, aldehydes, terpenes, alcohols and generally ketones (Shah *et al.*, 2011). The chemical composition of *C. citratus* extracts differs according to the, genetic differences, geographical origin, part of the plant used, age, stage of maturity, method of extraction, and season of harvest. Despite these modifications, numerous classes of compounds are reproducibly found, including tannins, alkaloid phenols, saponins, flavonoids and anthraquinones. Citral, geraniol, myrcene, nerol, geraniol, nerol, citronellol, limonene, burneol,  $\alpha$ -terpineol, luteolin, kaempferol, elemicin, caffeic acid, quercetin, apigenin, chlorogenic acid and geranyl acetate are found in the essential oil, along with many compounds so far to be identified (Bharti *et al.*, 2013).

Manganese (Mn), iron (Fe), cobalt (Co), copper (Cu), and zinc (Zn) are the trace elements belong to the micronutrients group and require in very small quantity for human body (normally a lesser amount of 100 mg/day), the elements such as calcium (Ca), potassium (K), chlorine (Cl), potassium (K), sodium (Na), and magnesium (Mg) chlorine (Cl) which are required in greater quantities considered as macronutrients. The important constituents of biological structures are trace elements (Aftab, 2011).

The concentration of each element in lemon grass differs extremely. The leading four elements (i.e., K, Cl, Ca and Mg) are more in concentrations than the

remaining four (i.e., Mn, Al, Cu and Na). The element in most high quantity was K and the least was the Cu (Godwin *et al.*, 2014).

Calcium content in lemon grass found to be present from 5.157 to 6.012 mg/kg. The essential nutrient element performs a significant role in

neuromuscular function. Many enzyme-mediated processes and metabolic processes provide rigidity to the skeleton (Hindumathy, 2011).

Na together with K and Cl are electrolytes that retain normal fluid balance outside and inside cells and appropriate acid and bases balance in the body. Hypertension and muscle cramp are caused by deficiency of this element. When intake of sodium in sodium chloride form is increased, it increases the renal calcium excretion to inhibit gall stone creation, more than while in the form of sodium acetate and sodium bicarbonate the sodium ingestion increased (Godwin *et al.*, 2014).

In this plant levels of Mg element found to be from 0.764 to 0.0.790 mg/kg. Magnesium play an important role as a co-factor for various enzymes mixed up in DNA and RNA production, protein synthesis, metabolism (Anal, 2014). Furthermore, dietary Mg and low serum may be associated to the cardiovascular disease, hypertension, diabetes and atherosclerosis in humans (Cristiane *et al.*, 2008).

In lemon grass Manganese content are found to be in range from 0.193 to 0.271 mg/kg. Mn is an important abundantly found element required for development, cellular homeostasis and normal growth (Erikson *et al.*, 2005). After harvest citral contents, essential oil and substance structure were analyzed by the use of mass spectrometry-gas chromatography (MS -GC) analysis. The influences of mature stages are important on citral contents and essential oil. After planting the lemongrass harvested at 5.5 and 6.5 months taken considerably greater oil contents as compared to those harvested at 7.5 months.

These three phases of maturity total of 65 compounds were detected. However, at each of the maturity stage merely 13 compounds were present. Among 13 compounds, the concentration of merely 8 substances or compounds (quercetin, geraniol, nerol,  $\beta$ -myrcene, geraniol acetate, nerol and juniper camphor, 3-undecyne) had of more than 1.5% (Tajidin *et al.*, 2012).

#### Pharmacological properties of lemongrass:

Lemongrass possess antioxidant, bactericidal, antidepressant, astringent, sedative, fungicidal, nervine and antiseptic properties (Naik *et al.*, 2010). According to biological effects citratus extracts describe to its main bioactive elements, resulting from its stem, roots and leaves, in addition to secondary metabolites of these compound (Christopher *et al.*, 2014). The biologically active citral component of lemon grass consists of its

essential oil more than 75% (w/w) of (Huynh *et al.*, 2008).

In Asian cuisines lemongrass is extensively used as necessary ingredient due to its sharp lemon flavor (Singh *et al.*, 2011). Lemongrass (*C. citratus*) is a wide spread aromatic plant used as analgesic, anti-inflammatory agent and food flavoring (Gupta *et al.*, 2016). Medicinal plants possess biological potential (Hassan *et al.*, 2022).

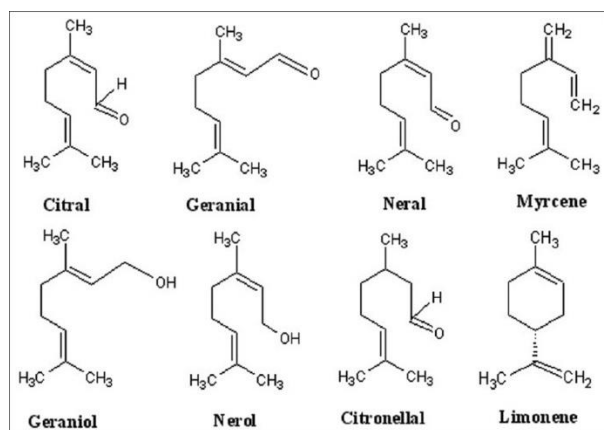


Fig 1.4. Important phytoconstituents present in *Cymbopogon citratus* plant

**Antioxidants activity:** Antioxidants are used primarily for oils and fats preservation. They act by protecting lipids from oxidative break down and reducing reactivity of free radicals. The common use of Antioxidants is in synthetic form such as BHT (butyl hydroxy toluene), TBHQ (terta-butyl hydroxy quinon) and BHA (butyl hydroxyl anisole). Currently, the synthetic antioxidants activated to be used in minor quantity due to its harmful effect. For safe human health the natural antioxidants usage are the new concern (Hasim *et al.*, 2015). They have great antioxidant activity so they have positive effect on human health and preserve foods quality due to presence of phenolic compounds in vegetables and fruits. Various studies show that phenolic compounds possess antioxidant activity, cardiovascular disorder; inhibit degenerative disease such as cancer and brain disfunctions by phenolic compounds having antioxidant activity. Lemon grass is known body to protect by antioxidant system by lessen the free radical mediated infections and raising the level of serum antioxidant (Vanisha *et al.*, 2012)

**Anti-fungal activity:** The main pathogens of human infections are *Candida albicans*, and some other species can also cause some infections. The citral and lemongrass anti-fungal activity against *Candida species* was investigated and the study revealed that lemongrass oil and citral have a strong in vitro activity against *Candida spp.* (Manvitha *et al.*, 2014). It was found that

*Cymbopogon citratus* show antifungal activity (Trivedi and Singh, 2014). Lemongrass oil is categorized for citral and monoterpenes compounds which main components which are present about 65-85%. Lemon grass oil antifungal activity has been tried that tempted human infections, containing dermatophyte species and *C. albicans* (Gupta *et al.*, 2016).

**Antimicrobial activity:** Antimicrobial activities of essential oils acquired from three cultivars of lemongrass that is, Pragati, Suvarna, and Praman were determined through agar well diffusion method (Gupta *et al.*, 2016). Antimicrobial activity of the *Cymbopogon citratus* (DC) against essential oil was used to find the pathogen were detected lessening bacterial inhabitants of cream-filled baked properties (Vaziriana, 2012). Other than antibiotics Antimicrobial substances can be strangely useful as an adjuvant in the multi resistant strains treatment (Soares *et al.*, 2013).

**Herbicidal Activity:** The lemongrass oil having Citral and other monoterpenes were reported to have phytotoxic properties when used as a foliar bio-herbicide spray useful to buckhorn redroot pigweed (*Amaranthus retroflexus*), barnyard grass (*Echinochloa crus-galli*) and thale cress (*Arabidopsis thaliana*), buckhorn plantain (*Plantago lanceolata*) (Sotelo *et al.*, 2013)

**Conclusion:** Phytoconstituents of plants can be utilized in food and cosmetic industries to retard the process of oxidation. Significant Pharmacological constituents present in the leave extracts of *Cymbopogon* can be found very effective against various microorganisms. In this way advancement in the formulation of new medicines will be possible by use of *Cymbopogon*.

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