

Pharmacological and Pharmacognostic review on Cymbopogon citrus

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Abstract: *Cymbopogon citratus* of the family Gramineae is a plant known worldwide for lemongrass. The origin of the word 'lemon' owes its common lemon as an aroma, largely due to the presence of citral, cyclic monoterpene. *Cymbopogon citratus* is a fast-growing, perennial herb native to South India and Sri Lanka, now widely grown in tropical America and Asia. Freshly cut and slightly dried leaves are used medicinally and are a source of essential oils. This plant is widely used in Ayurvedic medicine. Studies show that *Cymbopogon citratus* has various medicinal properties such as anti-amoebic, anti-bacterial, anti-diarrheal, anti-filarial, anti-fungal and anti-inflammatory properties. Various other effects such as anti-malarial, anti-mutagenicity, anti-mycobacterial, anti-oxidants, hypoglycemic and neurobehavioral have also been investigated. These results are very encouraging and that is why this review of the literature was intended to further study the plant to confirm these effects and to highlight other potential therapeutic effects.

Keywords: *Cymbopogon citratus*, pharmacological activity, essential oil, lemon grass, pharmacognostic activity, citronella grass.

I. INTRODUCTION

The active ingredients of *Cymbopogon citratus* are commonly known as citronella grass or lemongrass. This species is part of the Gramineae family, which includes about 500 species and 8,000 plant species. Lemongrass is a hardy grass that grows up to one meter tall with many stems with strong leaves from short rhizomatous roots. It has economic health for about 5 years. The leaf-blade is straight, tapered at both ends and can grow up to 50 cm in height and 1.5 cm wide. The leaf sheath has a tubular shape and acts as a pseudostem. The leaves are long, green, straight and vertical. This plant produces flowers in mature growth stages. In contrast, flowering has never been observed in agriculture due to the rapid harvest time. The inflorescence is a long spike about 1 meter long. Flowers found in rotten spathe; panicles 30 to 60 cm long. The rhizome produces new suckers that stretch upwards as their teats form dense lumps.

In the past, a growing number of consumers were seeking new pharmaceutical products with unique features that offer acceptable durability while having adequate health benefits.

Herbal medicines were developed from scientific or systematic research of bioactive compounds, ethnopharmacology or traditional knowledge of medicinal herbs. This forms the basis for the development of phytochemistry. In recent times, about 10,000 prescription drugs have been written and about 4500 have been tested for bioactive components and drug tests. One of the therapeutic remedies with the unparalleled medicinal properties is *C. citratus*. Lemongrass (Poaceae) is a perennial herb that is equally dispersed and found in tropical areas, South Central America widely used for its delicious flavors and medicinal properties. It is commonly known as lemongrass or citronella but because of its widespread use, it has several names. *Cymbopogon* is derived from the Greek word "kymbe - pogon" meaning boat-beard (due to flower spike shape) and *citratus* (Latin) meaning lemon-scented leaves. It is part of the Gramineae family. The findings reported more than 55 species. About three species of *Cymbopogon citratus* (West Indian grass), *Cymbopogon flexuosus* (East Indian grass or Malabar), and *Cymbopogon pendulus* (Jammu grass) are widely distributed. Pharmacological activities of *C. citratus* has an outstanding record in traditional and Ayurvedic medicine. Scientific research has reported the activities of *C. citratus* antifungal, antibacterial, antiprotozoal, anti-inflammatory, anti-carcinogenic, antioxidant, anti-rheumatic and cardio-protective. It has also been known to prevent platelet aggregation, to treat diabetes, stomach

ailments, anxiety or depression, malaria and pneumonia. Industrial, they serve as additives, flavors, pesticides and beverage preservatives, baked goods and snacks. To measure and evaluate the therapeutic potential of *C. citratus*, common terms, taxonomical classification, and distribution, traditional significance, economic compatibility, toxicological studies and phytochemistry and pharmacological activities will be examined.

Table 1: Common names for *Cymbopogon citratus*.

Country	Name
Brazil	capim-cidrao, capim-santo
Egypt	lemon grass
Ethiopia	Tej-sar
French	Citronelle
Hindi	Verveine, sera
India	Gandhabene
USA	Citronella

1.1 Botanical Classification

Cymbopogon citratus is a perennial herb with long, needle-like leaves. The band-like leaves are 1.3-2.5 cm wide, 0.9 cm long with loose tips and a bright blue color with a pleasant orange scent when supported due to the presence of citral and high content of neral and aldehyde geranial. The leaf mass is approximately 18-36 cm with consistent venation and spectacular fall features. They do not produce flowers or panicles (cultivars). The inflorescence is about 30-60 cm with a pair of spike-lets raceches in the inflorescence section. This plant grows into fertile clusters and can grow to about 1.8 m and 1.2 m in height and width, respectively. The dried leaf contains about 1-2% of essential oils that contain bioactive chemicals that vary depending on their habitat, genetic differences and agricultural treatment.

1.2 Taxonomy

Kingdom: Plantae, Division: Magnoliophyta, Class: Liliopsida, Order: Poales, Family: Poaceae, Genus: *Cymbopogon* Spreng, Species: *citratus*

1.3 Traditional Importance

In the continents of Asia, South America, and Africa, the leaves have been used as a tea or decoction. The leaf contains important bioactive elements that regulate the anti-inflammatory, antiseptic, anti-dyspeptic, and anti-fever effect, antispasmodic, analgesic, antipyretic, tranquilizer, anti-hermetic and -diuretic plant properties. They act as deodorants in a number of products such as perfumes, local soaps, candles and other pesticides. It has been used as an antidote for snakes and reptiles in parts of Asia and Africa.

1.4 Economic Importance

Essential oils such as citral, geraniol, α -oxobisabolene and myrcene isolated from *C. citratus* is an immature essential ingredient in the soap and bath industries, food, beverage, perfumes, cosmetics, and confectionery industries.

1.5 Pharmacological Appraisals of *C. citratus*

A. Anti-Bacterial Activity

Essential oils such as α -citral (geranial) and β -citral (neral) are isolated, isolated and analyzed for *C*-leaf. *citratus*. These compounds are an active anti-bacterial compound with prominent functions against gram-positive and negative bacterial isolates. In traditional medicine, this plant is used to fight infections caused by viruses such as meningitis, pneumonia, impetigo, cellulitis, folliculitis and food poisoning. They have been reported to be effective against *Clostridium botulinum*, *Campylobacter jejuni*, *Escherichia coli*, *Salmonella* and *Listeria monocytogenes*. Myrcene, an essential oil in *C. citratus* has been reported to show low immunity against bacteria but combining with other essential oils can provide important functions.

B. Anti-Inflammatory Activity

Chronic inflammation is one of the major health challenges worldwide and has been linked to life-threatening diseases, such as cancer. Natural products have been used in traditional medicine to combat inflammation in human tissues. Ethnopharmacological studies of lemon grass have described its use as an anti-inflammatory drug in African and Asian countries. Citral issued in *C. citratus* greatly inhibits inflammation mediators and acts as a supplement to creams and ointments to treat local inflammation. It has also been reported to suppress tumor necrosis factor (TNF) α -induced neutrophil adhesion at 0.1% concentration, inhibit inducible nitric oxide synthase (NOS), nitric oxide (NO) production and other lipopolysaccharide (LPS), binds jointly to receptors thereby blocking the nuclear factor-kappaB (NF- κ B) pathway, 60-70% COX-2 suppression and peroxisome proliferator-activated receptor alpha (PPAR- α) and inhibits inflammation of the tissues of the mouth and upper (80- 90%). Certain combinations of solids and derivative isolate from *C. citratus* as citral, epoxystragole, 6,7-epoxycitral, Luteolin, peritoneal and 6,7-epoxycitronellal, glycoside (O-, C-), 8,9-epoxycarvone, and carvone, have successfully inhibited the release of prostaglandins (PGE₂) and NO associated with inflammation, anti-inflammatory mediators linking sugar moiety and aglycone and suppressing postoperative cramps and surgical pain by reducing the expression of specific pain mediators. Antinociceptive Function In traditional medicine, lemon grass is very important in reducing pain and anxiety in living organisms. In ancient times, this herb was used as an analgesic or painkiller during surgery and may even help to reduce the body's reaction to acute pain. *C. citratus* fungus activities *C. citratus* Essential oils from lemon grass have been reported to show significant resistance to pathogenic fungal cells causing disruption in the proper production of mycotoxins during storage of grain and other nutrients. It also shows significant inhibition against fungal infections such as athlete's foot, ringworm, jock itch and yeast infections, anti-inflammatory and synergistic effects by inhibiting the growth of filamentous fungi by yeast cell dysfunction.

C. Antimalarial Activity

Second metabolites such as citral (3, 7-dimethyl-2, 6-octadienal), myrcene and citronellal are isolated from lemon grass and appear as antimalarial compounds. These isolated compounds reflect the declared activity against Plasmodium species. Dichloromethane extract of *C. citratus* tested against *P. berghei* and *P. falciparum* with specified functions of 2–10 μ g / mL. Ethanol extracts show pronounced antiplasmodial activities of EC₅₀ against two types of *P. falciparum* (multidrug resistant (Dd2) and CQ-sensitive (3D7)). Functions Lemongrass has been implanted in hypolipidemic and hypoglycemic herbs In traditional and Ayurvedic medicine, used to control blood sugar, lipid and serum levels in serum blood pressure that can prevent obesity and high blood pressure, commonly referred to as tea, chlorogenic acids, phenolic acids, swertajaponin and isoorientin, β -carotene and 1,1-diphenyl-2-picryl-hydrazyl (DPPH) test. It also helps to suppress oxidative stress in Wistar mice under investigation conditions of diabetes

II. CONCLUSION

This review has emphasized on the *C. Citratus* parts and pharmacological activities and pharmacognostic activity associated with them. These properties and chemicals in lemon grass make it a very important medicinal plant for curing and prevention of various ailments. Medicinal herbs have tremendously and uncharacteristically improve the quality of primary health care system in the provision of herbal drugs with no health effects or reactions. Also, their applications have been reported in pharmaceutical, cosmetics, soap and detergent industries. In folk medicine, it has been used as antibacterial, antifungal, anti-inflammatory, anticancer, analgesic, antiseptic and antinociceptive and antioxidant agents. Recently, interests in medicinal plants have been centered on investigation of the pharmacology and phytochemical screening of secondary metabolites to explore their therapeutic potency and boost the production of novel herbal drugs. Essential oils and other bioactive compounds have been isolated, characterised and analysed in *C. citratus* for their pharmacological activities. Also, their applications have been reported in food, pharmaceutical, cosmetics, beverages, soap and detergent industries. In attempt to improve the phytochemical and pharmacological studies of *C. citratus*, important factors such as mode of propagation, extraction procedures, harvesting time should be monitored and addressed. These will enhance the physicochemical composition and biological activities of the *C. citratus* extracts and therefore, boost its economic value.

REFERANCES

- [1]. Oluwole Oladeji, Odelade Kehinde Abraham, et.al, Phytochemistry and Pharmacology of *Cymbopogon citratus*: A review
- [2]. O.S. Oladeji, F.E . Adelowo and D.T. Ayodele et al. / Scientific African 6 (2019) e0 0137,pp-1-11.
- [3]. Karkala Manvitha, Bhushan Bidya.et.al Review on pharmacological activity of *Cymbopogon citratus* International Journal of Herbal Medicine 2014; 1 (6): 5-7
- [4]. Barbosa LCA, Pereira UA, Martinazzo AP, Maltha CRA, Teixeira RR, Melo EC. Evaluation of the Chemical Composition of Brazilian Commercial *Cymbopogon citratus* (D.C.) Staff Samples. *Molecules* 2008; 13:1864-1874.
- [5]. Carianne de Boer. Organic lemongrass, a guide for small holders. EPOPA (Export Promotion of Organic Products from Africa) 2005:1-27.
- [6]. Tajidin NE, Ahmad SH, Rosenani AB, Azimah H, Munirah M. Chemical composition and citral content in lemongrass (*Cymbopogon citratus*) essential oil at three maturity stages. *African Journal of Biotechnology* 2012; 11(11):2685-2693. 6. Lemongrass. Available from Available from: http://nhb.gov.in/Horticulture%20Crops%5CLemongrass%5CLe_mongrass1.htm. 17 Feb, 2014
- [7]. Mirghani MES, Liyana Y, Parveen J. Bioactivity analysis of lemongrass (*Cymbopogon citratus*) essential oil. *International Food Research Journal* 2012; 19(2):569-575
- [8]. Ojo OO, Kabutu FR, Bello M. Babayo Inhibition of paracetamol-induced oxidative stress in rats by extracts of lemongrass (*Cymbopogon citratus*) and green tea (*Camellia sinensis*) in rats. *African Journal of Biotechnology* 2006; 5(12):1227-1232.
- [9]. Lemongrass. Available from: www.dehydrate2store.com, 2013.
- [10]. Rocha RP, Evandro DCM, Demuner AJ, Radunz LL, Corbin JJB. Influence of drying air velocity on the chemical composition of essential oil from lemon grass. *African Journal of Food Science and Technology* 2011; 2(6):132-139.
- [11]. Shah G, Shri R, Panchal V, Sharma N, Singh B, Mann AS. Scientific basis for the therapeutic use of *Cymbopogon citratus*, staff (Lemongrass). *Journal of advanced pharmaceutical technology and research* 2011; 2(1):3-8.
- [12]. Tchoumboungang F, Zollo PH, Dagne E, Mekonnen Y. In vivo antimalarial activity of essential oils from *Cymbopogon citratus* and *Ocimum gratissimum* on mice infected with *Plasmodium berghei*. *Planta Medica* 2005; 71(1):20-3.
- [13]. Viana GSB, Vale TG, Pinho RSN, Matos FJA. Antinociceptive effect of the essential oil from *Cymbopogon citratus* in mice. *Journal of Ethnopharmacol* 2000; 70(3):323-327.
- [14]. Arhoghro EM, Kpomah DE, Uwakwe AA. Curative Potential of Aqueous Extract of Lemon Grass (*Cymbopogon citratus*) on Cisplatin Induced Hepatotoxicity in Albino Wistar Rats. *J Phys Pharm Adv* 2012; 2(2):282-294.
- [15]. S.O. Oladeji, K.A. Odelade, J.K. Oloke, Phytochemical screening and antimicrobial investigation of *Moringa oleifera* leaf extracts, *Afr. J. Sci. Tech. Innov. Dev.* doi:10.1080/20421338.2019.1589082.
- [16]. F. Bensabah, A. Lamiri, J. Naja, Effect of purified wastewater from the city of SETTAT (Morocco) on the quality of *Lippia citriodora* essential oil and infusion, *J. Saudi Soc. Agric. Sci.* 14 (2015) 1–108. O.S. Oladeji, F.E. Adelowo and D.T. Ayodele et al. / Scientific African 6 (2019) e00137 9
- [17]. A. Figueirinha, M. Cruz, V. Francisco, M. Lopes, M. Batista, Anti-inflammatory activity of *Cymbopogon citratus* leaf infusion in lipopolysaccharide-stimulated dendritic cells: contribution of the polyphenols, *J. Med. Food.* 13 (3) (2010) 681–690.
- [18]. O.M. Bello, S.M. Jagaba, O.E. Bello, A.B. Ogbesejana, O.A. Dada, C.O. Adetunji, S.M. Abubakar, Phytochemistry, pharmacology and perceived health uses of non-cultivated vegetable *Cyphostemma adenocaula* (Steud. ex A. Rich.) Desc. ex wild and R.B. Drumm: a review, *Sci. Afr.* 2 (2019).
- [19]. O.A. Lawal, A.L. Ogundajo, N.O. Avoseh, I.A. Ogunwande, *Cymbopogon citratus*, *Med. Spices Veget. Afr.* (2017) 397–423.
- [20]. B. Balakrishnan, S. Paramasivam, A. Arulkumar, Evaluation of the lemongrass plant (*Cymbopogon citratus*)

- extracted in different solvents for antioxidant and antibacterial activity against human pathogens, *Asian Pacific J. Tropical Dis.* 4 (2014) 134–139.
- [21]. D. Asioli, J. Aschemann-Witzel, V. Caputo, R. Vecchio, A. Annunziata, T. Næs, P. Varela, Making sense of the “clean label” trends: a review of consumer food choice behavior and discussion of industry implications, *Food Res. Int.* (2017).
- [22]. R. Yasmeen, N.K. Fukagawa, T.T. Wang, Establishing health benefits of bioactive food components: a basic research scientist’s perspective, *Curr. Opin. Biotechnol.* 44 (2017) 109–114.
- [23]. S. Román, L.M. Sánchez-Siles, M. Siegrist, The importance of food naturalness for consumers: results of a systematic review, *Trends Food Sci. Tech.* 67 (2017) 44–57.
- [24]. B. McCarthy, H.B. Liu, Food waste and the “green” consumer, *Australasian Market. J.* 25 (2017) 126–132.
- [25]. P. Jayasinha, *Lemon Grass: A Literature Survey. Medicinal and Aromatic Plant Series No. 9*, Industrial Technology Institute, Baudhaloka Mawatha, Colombo, Sri Lanka, 2001.