

**EFFECT OF HERBAL TEA LEMONGRASS (*CYMBOPOGON CITRATUS STAPF*) ON
HYPERLIPIDEMIC PATIENTS, AND ITS PHARMACOLOGICAL PROPERTIES
OVERVIEW**Aisha Saleem^{1*}, Muhammad Zahid¹, Asad Ali¹, Zaheer Ahmad², Nazuk Kareem³, Bushra Maqsood⁴¹M. Phil Researcher, School of Zoology, Minhaj University Lahore, Pakistan.²Lecturer, Minhaj University Lahore, Pakistan.³University of Education, DG Khan Campus.⁴University of the Punjab, Quaid-e-Azam Campus, Lahore, Pakistan.***Corresponding Author: Aisha Saleemz**

M. Phil Researcher, School of Zoology, Minhaj University Lahore, Pakistan.

Article Received on 14/12/2022

Article Revised on 03/01/2023

Article Accepted on 24/01/2023

ABSTRACT

Lemon grass is an aromatic medicinal grass belonging to the genus (*Cymbopogon citratus*), is a member of poaceae family. It is a medicinal plant with compounds capable of controlling pathogens and increasing herbal resistance to pathogenic diseases. It is prevalent in the semi-temperate and tropical regions of Asian, American and African continents. A strong lemon fragrance, a predominant feature of this grass, is due to the high citral content in its oil. It also contains various bioactive compounds which may be grouped into alkaloids, terpenoids, flavonoids, phenols, saponins and tannins. it uses in different pharmaceutical industries for its anti-depressant, analgesic, antipyretic, bactericidal, anti-septic, carminative and astringent properties. Some patients suffering from cardiovascular disorders, Hyperlipidemic is a foremost risk factor for CAD. A majority of side effects have been linked to currently available antihyperlipidemic drugs. Herbal drugs that are naturally available have fewer side effects and are easily accessible and cultivable. The anti-Hyperlipidemic activities show biochemical parameters such as High Density Lipoprotein, Triglycerides, Total Cholesterol, and Low Density Lipoprotein. It was concluded that lemongrass tea show a considerable decrease in total cholesterol, triglycerides, LDL and shows considerable rise in HDL level.

KEYWORDS: Lemongrass Tea, Bioactive compounds, Pharmacognostics, *Cymbopogon citratus Stapf*, medical benefit, advantages, disadvantages.

INTRODUCTION

Herbal tea looks like tea and is made in the same manner as tea, it is actually not thought of as tea at all. The reason for this is that they are not original From the *Camellia Sinensis* bush, which is the source of all teas.^[1] Herbal teas are more properly referred to as "tisanes," which are combinations of multiple herbs. Combinations of dried leaves, seeds, grasses, nuts, barks, fruits, flowers, or other botanical components are used to create tisanes, which have the flavour of herbal teas and offer their advantages.^[2] Lemongrass, popularly known as citronella grass is a member of the Poaceae family and belongs to the genus *Cymbopogon*. There are about 140 species in the genus *Cymbopogon*, which is widely distributed across semi-arid and tropical regions of the Asian, American, and African continents. Australia and Europe are home to only a few species of lemon grass. Also known as 'Squinant' in English, lemongrass is known by various other colloquial names throughout the world. The members of the *Cymbopogon* genus produce

volatile oils and so are also known as aromatic grasses.^[3,4]

Numerous bioactive substances in lemon grass give it therapeutic benefit. For its uses in ethno-pharmacology, there is a lot of evidence. 4 Over two-thirds of people in poor countries believe that herbal medicine is an essential component of the healthcare sector, according to the WHO.^[5] Lemon grass is a monocotyledonous perennial grass that can reach heights of 6 feet and widths of 4 feet. It develops in clumps. It has three-foot-long, thin, bright green leaves that range in width from 1.3 to 2.5 cm. Simple leaves have complete edges. On spikes, flowers sprout. It has a long inflorescence that is between 30 and 60 cm long. *Cymbopogon* is the name given to this fragrant grass by the flower arrangement. Southeast Asia is home to many *Cymbopogon citratus*.^[6,7]

Taxonomic classification^[8]

Kingdom: Plantae
 Division: Magnoliophyta
 Class: Liliopsida
 Order: Poales
 Family: Poaceae
 Genus: *Cymbopogon*
 Species: *citrat*

Chemical composition

Lemongrass (*Cymbopogon citratus*) is well known because it contains more citral than other plants. Essential oils were impacted by early or late lemongrass harvesting, along with the citral's contents in some way. Temperature, lighting intensity, soil moisture, fertiliser, and maturity all had an impact on the essential oils and citral components. The plant transitions from the vegetative to the reproductive stage as it ages. Overall, there is a strong correlation between the production of plant biomass and the yield of essential oils.^[9] The ratio of young to older leaves determines whether essential oils are of higher quality and contain more citral (75%) when harvested at a particular time.

Different processes, such as solvent, rapid solvent dense CO₂ and the Soxhlet, solidphase matrix, and supercritical fluid extraction techniques, are typically used to get lemongrass essential oils.^[10] Due to the intricacy of the essential oil components, modern techniques like high performance liquid chromatography in conjunction with gas chromatography (HPLC-GC) are the recommended analysis method. A sample can be placed into a GC for further, greater separation using HPLC, which is more effective for a broad class separation of a sample.^[11]

Table 1: Nutritional Content of Lemon grass.^[12]

NO.	Nutritional component	Quantity
1	Carbohydrate	55.00 %
2	Crude fat	5.10 %
3	Crude protein	4.56 %
4	Crude fiber	9.28 %
5	Energy	360.55 al/100g

Hyperlipidemic is defined as unusually high amounts of fats or low-density lipoprotein in the blood caused by improper lipid burning or activity, and it can be triggered by nutritional complications, adiposity, genetic disorders such as familial hyperlipidemia (FH), or even further diseases like as Hyperglycemia. Hyperlipidemic patients are roughly twofold as expected to suffer cardiovascular disease (CVD).^[13] Hyperlipidemia is a common condition and a situation of the body in which triglyceride levels go beyond 200mg/dl, LDL levels go beyond 160mg/dl, total cholesterol points go beyond 200mg/dl, and HDL points fall below 40mg/dl.^[14] It has a crucial role in the onset and progression of atherosclerosis as well as coronary heart disease (CHD). Atherosclerosis is a widespread illness mutually in advanced and unindustrialized nations, and it is now acknowledged as an inflammatory disorder that leads to the progress of ischemic heart disease, cerebrovascular disease, and peripheral vascular disease.^[15]

The majority of individuals are afflicted with diseases like Hyperlipidemic. To treat such diseases, conventional allopathic medications are used, but they have a number of side effects.^[16] Thus, Herbal remedies and Natural plant medicines are used to treat various diseases with minimal side effects. Naturopathy is a complex healthcare field of study in that it focuses on the root cause of suffering and disease. Medicinal herbs are more advantageous than pharmaceutical medications.^[17]

**Figure 01: Lemongrass tea plant.**^[12]

Pharmacological properties of Lemongrass Antioxidant and Antibacterial properties

Lemongrass has many antioxidants properties, including iso-orientin, chlorogenic acid, and swertiajaponin, which aid in scavenging free radicals that could lead to illness.^[17] A basic activity in human cells, tissues, and systems is oxidation, which produces reactive oxygen species (ROSs) like free radicals, superoxide anion, and hydrogen peroxide (H₂O₂).^[18] Medical conditions, including atherosclerosis, rheumatoid arthritis, and muscular atrophy. Others include cancer, some neurological conditions, cataracts, and ageing. To provide a defense mechanism against the detrimental effects of the oxidation process brought on by free radicals, antioxidants must be present in the body.^[19]

Lemongrass extracts have antibacterial characteristics and are effective against *Streptococcus mutans*, which causes tooth decay.^[17] In recent years, numerous sources have shed light on the anti-bacterial action of plant extracts, with encouraging results. This property has also been studied in the volatile oil component of the lemon grass aqueous extract.^[20] The oil was found to have significant amounts of -citral (neral) and -citral (geranial) bioactive chemicals. These elements prevent the growth of both Gram positive and Gram negative bacteria, demonstrating their antibacterial action. However, the third component, myrcene, has no antibacterial properties on its own but does so when coupled with other substances.^[18]

Anti-inflammatory properties

Citral and geranial chemicals, which serve to stop the release of some inflammation-causing signals in our bodies, are said to be present in lemongrass.^[22] One of the most important health problems in the world is tissue inflammation. Its increased prevalence has been linked to the more affluent lifestyles brought on by technological innovation. As a result, inflammation is more often to blame for human death. Importantly, it has been connected to other health issues such as diabetes, rheumatoid arthritis, cancer, and cardiovascular disease.^[23] Animal tissue inflammation is typically brought on by physical stress or by the presence of chemical inducers (like lipo-polysaccharide) in the tissue itself. Mechanistically, inflammation will happen if macrophages are exposed to lipo-polysaccharide (LPS), which causes the release of pro-inflammatory mediators such as nitric oxide (NO) and prostaglandin E₂ (PGE₂). Reactive oxygen species (ROS), cytokines, such as tumor necrosis factor (TNF), interleukins, and up-regulation of nuclear factor kappa-B are additional inductive elements.^[24]

Anticancer Properties

Lemongrass contains bioactive citral, which either induces apoptosis or strengthens the immune system to combat cancer.

Anti-obesity and antihypertensive activity of lemongrass tea

Since lemon grass aqueous extract contains essential oil and other extractants, it has been suggested that the presence of anti-hypertensive substances such as flavonoids and alkaloids.^[25,26] Similar to this, lemon grass extracts were successful in lowering blood cholesterol levels. Endozepine octa deca-neuropeptide (ODN), which is an inhibitor of food intake in small animals, is an endogenous ligand of central-type benzodiazepine receptors, according to researchers.^[27]

Anti-fungi properties of lemon tea

According to research, the impact of the essential oils derived from lemon grass decoction against both pathogenic and edible fungus is significant. Inhibiting the formation of fungus cells that are linked to the release of mycotoxins during the storage of grains and other food goods, lemon grass oil stood out among other essential oils as having promising potential.^[28, 29] Lemon tea's essential oil fraction has been shown to have anti-fungal activities against filamentous fungi of several classes, demonstrating the tea's broad range of activity against both pathogenic and non-pathogenic fungi.^[30]

Antiseptic

Tea tree extract is used in the preparation of hand sanitizer and cleansers since it is effective against infection causing bacteria and viruses including *E. coli*, *S. pneumoniae* and *H. influenzae*.^[31]

Anxiolytic properties of lemongrass tea

Researchers have looked into the anxiolytic characteristics of lemongrass tea in order to clarify its effectiveness in treating anxiety-related illnesses noted adverse effects associated with the anxiolytic characteristics of the decoctions prepared from lemon tea.^[32,33] However, recent research findings showed that when lemon grass decoctions and infusions (lemon grass tea) are offered to animals, they have the potential to have anxiolytic effects.^[34] Positive results from the light/dark box test made this obvious. In this test, a biphasic dosage response, (U-shaped) curve resembling those extensively.^[35]

Health Benefits of lemongrass tea

Herbal teas are frequently drunk for their medicinal and energetic qualities since they can promote calm. Having the capacity to support digestion or herbal teas can aid in offering the body cleaning effects and boosting the immune system. It is crucial to keep in mind that various herbs may have various therapeutic characteristics, allowing us to create our own herbal infusions in accordance with how we want the cup of tea to help us.

➤ One of the healthiest herbal teas to consume is green tea. It has a number of benefits, including preventing some malignancies, battling dental decay and gum disease, assisting with weight loss, and more. Green tea is sometimes offered in "matcha" form, which is simply green tea leaves that have been finely powdered. The

ingestion of green "matcha" tea, which is actually whole tea leaves ground into a fine powder, has a variety of positive side effects on the body.^[8,12]

Skin treatment: Lemongrass essential oil is reportedly utilised as a medicinal agent for the treatment of inflammatory skin diseases, according to research.	[36]
Repellent: Lemongrass extract is used in the preparation of insect repellents due to the presence of compounds citral and geraniol	[37]
Controls dandruff: Due to its antibacterial properties, lemongrass oil is used in hair tonics to alleviate dandruff. as well as anti-inflammatory qualities Additionally, it prevents the development of the fungus M. furfur, which is linked to dandruff.	[38, 39]
Prevents anemia: Lemongrass is a rich source of iron and other minerals, it encourages erythropoiesis to ward off anemia's symptoms.	[40]
Treats oral issues: Lemongrass extracts aid in preventing gum disease and cavities.	[41]
Wound treatment: The antibacterial activity of tea tree extract makes it an effective wound healer	[42]
Antiseptic: Tea tree extract is used in the manufacturing of hand sanitizers and cleansers because it is efficient against infection-causing bacteria and viruses such as E. coli and S. aureus. H. influenzae and H. pneumoniae	[43]

Side effects of lemongrass tea

Lemongrass is typically regarded safe to use in cooking, but if ingested in excess, it might cause negative effects like fatigue, dry mouth, dizziness, and elevated heart rate.	[44]
Additionally, because it begins menstruation early, avoid using it while pregnant.	[45]
A lack of appetite, frequent urination, and allergic rashes and itching	[46]
<i>Melaleuca alternifolia</i> , the botanical name for the tea tree, is a native of Queensland and New South Wales in Australia.	[47]
Tea tree oil has been used as a conventional medicine by Aborigines and Australians for treating common cold and cough.	[48]
Terpinen-4-ol, an antibacterial substance that increases the activity of white blood cells against foreign infections, is a component of tea tree extract.	[49]

CONCLUSION

Lemon grass (*Cymbopogon citratus*), is a member of poaceae family. It is a medicinal plant with compounds capable of controlling pathogens and increasing herbal resistance to pathogenic diseases. Lemongrass is widely used in the herbal teas and other non-alcoholic beverages in baked food, and also in the confections. The cholesterol-lowering ability of herbal teas may be linked to variations in intestine cholesterol uptake, as well as cholesterol transformation to bile acids and impaired absorption. The extract's hypocholesterolaemic properties were evidenced, which could lead to its use in enthomedicine for the treatment of heart disease. Some lipid-lowering drugs also lower HDL levels in the body along with total cholesterol, triglycerides, and LDL, but lemongrass and basil tea have a unique ability to increase HDL levels in the body and decrease total cholesterol, triglycerides, and LDL. HDL is good cholesterol that aids in the regulation of blood cholesterol. These herbal teas are an arsenal for fighting hyperlipidemia and preventing cardiovascular disease.

REFERENCES

- Kumar A, Nair AGC, Reddy AVR, Greg A. Analysis of essential elements in Pragyapeya A herbal drink and its constituents by neutron activation. *Journal of Pharmaceutical and Biomedical Analysis*, 2005; 37(4): 631–828.
- Aoshima H, Hirata S, Ayabe S. Anti-oxidative and antihydrogen peroxide activities of various herbal teas. *Food Chemistry*, 2007; 103(2): 617–622.
- Kumar J, Verma V, Goyal A, Shahi AK, Sparoo R, Sangwan RS, Qazi GN, Genetic diversity analysis in *Cymbopogon* species using DNA markers, *Plant Omics Journal*, 2009; 2(2): 20-29.
- Adhikari S, Bandopadhyay TK, Ghosh PD, Assessment of genetic diversity of certain Indian elite clones of *Cymbopogon* species through RAPD analysis, *Indian Journal of Biotechnology*, 2013; 12(1): 109-114.
- Viabhav S, Subodh D, Ashish M, A review on lemon grass: agricultural and medicinal aspect, *International Research Journal of Pharmacy*, 2013; 4(1): 42-44.
- Kumar R, Krishan P, Swami G, Kaur P, Shah G, Kaur A, Pharmacognostical investigation of *Cymbopogon citratus* (DC.) Stapf., *Der Pharmacia Lettre*, 2010; 2(3): 181-189.
- Okémy NA, Moussoungou AS, Koloungous BC, Abena AA, Topical anti-inflammatory effect of aqueous extract ointment of *Ageratum conyzoides* L. in wistar rat, *International Journal of Phytopharmacy*, 2015; 5: 37-41.
- Shah G, Shri R, Panchal V, Sharma N, Singh B, Mann AS, Scientific basis for the therapeutic use of *Cymbopogon citratus*, Stapf (Lemon grass), *Journal of Advanced Pharmaceutical Technology & Research*, 2011; 2(1): 3-8.
- Almeida Costa CAR de, Kohn DO, de Lima VM, Gargano AC, Flório JC, Costa M, The GABAergic system contributes to the anxiolytic-like effect of essential oil from *Cymbopogon citratus*

- (lemongrass). *Journal of ethnopharmacology*, 2011; 137(1): 828-836.
10. Tajidin N, Ahmad S, Rosenani A, 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): 2685-2686.
 11. Manzoor F, Naz N, Malik SA, Arshad S, Siddiqui B, Chemical Composition of Essential Oils Derived from Eucalyptus and Lemongrass and Their Antitermitic Activities Against *Microtermes mycophagus* (Desneux). *Asian Journal of Chemistry*, 2013; 25(5): 2405-2406.
 12. Kumar R, Krishan P, Swami G, Kaur P, Shah G, Kaur A, Pharmacognostical investigation of *Cymbopogon citratus* (DC.) Stapf. *Der Pharmacia Lettre*, 2010; 2, 181-189.
 13. Yao YS, Li TD, & Zeng ZH, Mechanisms underlying direct actions of hyperlipidemia on myocardium: an updated review. *Lipids in Health and Disease*, 2020; 19(1): 1-6.
 14. Dasgupta D, Bandyopadhyay S, Sarkar N, & Chakraborty M, Natural remedies for hyperlipidemia: A review. *Journal of Pharmacognosy and Phytochemistry*, 2021; 10(5): 181-189.
 15. Kumar VS, Inamdar MN, & Viswanatha GL, Protective effect of lemongrass oil against dexamethasone induced hyperlipidemia in rats: possible role of decreased lecithin cholesterol acetyl transferase activity. *Asian Pacific journal of tropical medicine*, 2011; 4(8): 658-660.
 16. Bahmani M, Mirhoseini M, Shirzad H, Sedighi M, Shahinfard N, & Rafieian-Kopaei M, A review on promising natural agents effective on hyperlipidemia. *Journal of evidence-based complementary & alternative medicine*, 2015; 20(3): 228-238.
 17. Balakrishnan B, Paramasivam S, Arulkumar A. Evaluation of the lemongrass plant (*Cymbopogon citratus*) extracted in different solvents for antioxidant and antibacterial activity against human pathogens. *Asian Pacific Journal of Tropical Disease*, 2014; 4: S134-S139.
 18. Moore-Neibel K, Gerber C, Patel J, Friedman M, Ravishankar, S. Antimicrobial activity of lemongrass oil against *Salmonella enterica* on organic leafy greens. *J Appl Microbiol*, 2012; 112: 485-492. PubMed: <https://pubmed.ncbi.nlm.nih.gov/22188296/>
 19. Agbafor KN, & Akubugwo E, Hypocholesterolaemic effect of ethanolic extract of fresh leaves of *Cymbopogon citratus* (lemongrass). *African Journal of Biotechnology*, 2007; 6(5): 596-598.
 20. Heo SJ, Lee KW, Song CB, and Jeon YJ, Antioxidant activity of enzymatic extracts from brown seaweeds. *Algae*, 2003; 18: 71-81.
 21. Jaswir I, and Monsur AH, Anti-inflammatory compounds of macro algae origin: A review. *Journal of Medicinal Plants Research*, 2011; 5, 7146-7154.
 22. Olorunnisola SK, Hamed AM, Simsek S. Biological properties of lemongrass: An overview. *International Food Research Journal*, 2012; 4: 21.
 23. Francisco V, Figueirinha A, Neves B M, GarcíaRodríguez C, Lopes MC, Cruz MT, and Batista MT, *Cymbopogon citratus* as source of new and safe anti-inflammatory drugs: bio-guided assay using lipopolysaccharide-stimulated macrophages. *Journal of Ethnopharmacology*, 2011; 133: 818-827.
 24. Kulinsky VI. Biochemical aspects of inflammation. *Biochemistry*, 2007; 72: 595-607.
 25. Onabanjo AO, Agbaje EO, and Odusote O, Effects of Aqueous Extracts of *Cymbopogon citratus* in Malaria. *Journal of Protozoological Research*, 1993; 3: 40-45.
 26. Oladele S B, Ayo JO, and Auda A O, Medicinal and physiological properties of flavonoids, coumarin derivatives and anthraquinones of plant origin. *West African Journal of Pharmacology and Drug Research*, 1995; 11: 134-144.
 27. Onawunmi GO, Yisak WA and Ogunlana EO. Antibacterial constituents in the essential oil of *Cymbopogon citratus* (dc.) Stapf. *Journal of Ethnopharmacology*, 1984; 12: 274-286.
 28. Fandohan P, Gnonlonfin B, Laleye A, Gbenou J D, Darboux R, and Moudachirou M, Toxicity and gastric tolerance of essential oils from *Cymbopogon citratus*, *Ocimum gratissimum* and *Ocimum basilicum* in Wistar rats. *Food and Chemical Toxicology*, 2008; 46: 2493-2497.
 29. Nguefack J, Tamgue O, Dongmo JBL, Dakolea CD, Leth V, Vismer HF, Zollo PH A, and Nkengfack, AE, Synergistic action between fractions of essential oils from *Cymbopogon citratus*, *Ocimum gratissimum* and *Thymus vulgaris* against *Penicillium expansum*. *Food Control*, 2012; 23: 377-383.
 30. Dharmendra S, Suman PS K, Atul PK, Subhash CG, and Sushil K, Comparative antifungal activity of essential oils and constituents from three distinct genotypes of *Cymbopogon* spp. *Current Science*, 2001; 80: 1264-1266.
 31. Carson CF, Riley TV. Antimicrobial activity of the major components of the essential oil of *Melaleuca alternifolia*. *J Appl Bacteriol*, 1995; 78: 264-269.
 32. Liberalli CH, Helou JH, and Franca AA, Contribuicao ao estudo das gramineas aromaticas. O capim-cidrao: *Cymbopogon citratus* DC.) Stapf. *Revista Brasileira de Farmacia*, 1946; 4: 189-209.
 33. Alves AC, Prista LN, and Souza AF. A preliminary note on the phytochemical study of *Cymbopogon citratus*. *Garcia de Orta*, 1960; 8: 629-638.
 34. Costa C A, Bidinotto LT, Takahira RK, Salvadori D M, Barbisan LF, and Costa M, Cholesterol reduction and lack of genotoxic or toxic effects in mice after repeated 21-day oral intake of lemongrass (*Cymbopogon citratus*) essential oil. *Food and Chemical Toxicology*, 2011; 49: 2268-2272.

35. Leite JR, Seabra ML, Maluf E, Assolant K, Suchecki D, Tufik S, Klepacz S, Calil H M, and Carlini EA, Pharmacology of lemongrass (*Cymbopogon citratus* Stapf). III. Assessment of eventual toxic, hypnotic and anxiolytic effects on humans. *Journal of Ethnopharmacology*, 1986; 17: 75–83.
36. Silva CD. BD, Guterres SS, Weisheimer V, Schapoval EE. Antifungal activity of the lemongrass oil and citral against *Candida* Braz, *J Infect Dis*. 2008; 12: 63-66. PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/18553017>
37. Oyedele AO, Gbolade AA, Sosan MB, Adewoyin FB, Soyelu OL, et al. Formulation of an effective mosquito-repellent topical product from lemongrass oil. *Phytomedicine*. 2002; 9: 259-262. PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/12046869>
38. Boukhatem MN, Ferhat MA, Kameli A, Saidi F, Kebir HT. Lemon grass (*Cymbopogon citratus*) essential oil as a potent anti-inflammatory and antifungal drugs. *Libyan J Med*, 2014; 9: 25431. PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/25242268>
39. Chaisripipat W, Lourith N, Kanlayavattanukul M. Anti-dandruff hair tonic containing lemongrass (*Cymbopogon fl exuosus*) oil. *Complementary Medicine Research*, 2015; 22: 226-229. PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/26566122>
40. Ekpenyong CE, Daniel NE, Antai AB. Bioactive natural constituents from lemongrass tea and erythropoiesis boosting effects: potential use in prevention and treatment of anemia. *J Med Food*, 2015; 18: 118-127.
41. Rajesvari R, Lakshmi T. Lemon grass oil for improvement of oral health. *Dental Hypotheses*, 2013; 4: 115.
42. Chin KB, Cordell B. The effect of tea tree oil (*Melaleuca alternifolia*) on wound healing using a dressing model. *J Altern Complemen Med*, 2013; 19: 942-945. PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/23848210>
43. Carson CF, Riley TV. Antimicrobial activity of the major components of the essential oil of *Melaleuca alternifolia*. *J Appl Bacteriol*, 1995; 78: 264-269. PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/7730203>.
44. Leite J, Maria De Lourdes VS, Maluf E, Assolant K, Suchecki D, et al. Pharmacology of lemongrass (*Cymbopogon citratus* Stapf). III. Assessment of eventual toxic, hypnotic and anxiolytic effects on humans. *J Ethnopharmacol*, 1986; 17: 75-83.
45. Mirghani MES, Liyana Y, Parveen J. Bioactivity analysis of lemongrass (*Cymbopogon citratus*) essential oil. 2012.
46. Tsui B, Dennehy CE, Tsourounis C. A survey of dietary supplement use during pregnancy at an academic medical center. *Ame J Obstet Gynecol*, 2001; 185: 433-437. PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/11518905>
47. Carson CF, Hammer KA, Riley TV. *Melaleuca alternifolia* (tea tree) oil: a review of antimicrobial and other medicinal properties. *Clin Microbiol reviews*, 2006; 19: 50-62. PubMed: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1360273/>
48. Hart PH, Brand C, Carson CF, Riley TV, Prager RH, et al. Terpinen-4-ol, the main component of the essential oil of *Melaleuca alternifolia* (tea tree oil): suppresses inflammatory mediator production by activated human monocytes. *Infl amm Res*, 2000; 49: 619-626. PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/11131302>
49. Carson CF, Riley TV. Antimicrobial activity of the major components of the essential oil of *Melaleuca alternifolia*. *J Appl Bacteriol*, 1995; 78: 264-269. PubMed: <https://www.ncbi.nlm.nih.gov/pubmed/7730203>.