IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 12, April 2025
Impact Factor: 7.67

Lemongrass: A Review on its Botany, Properties, Applications and Active Components:

Ms. Vaishnavi Bhor, Ms. Nikita Dandawate, Ms. Sharvari Ugale,
Ms. Sonal Kumavat, Ms. Kaveri Gadage.
Samarth College of Pharmacy, Belhe, India

Abstract: *Lemon grass (Cymbopogon citratus) is a member of the Poaceae family. It is a medicinal plant containing compounds that can control pathogens and enhance the plant's resistance to diseases. Lemongrass is widely used in herbal teas, non-alcoholic beverages, baked goods, and confections. Essential oil extracted from lemongrass is commonly used as a fragrance in perfumes and cosmetics like creams and soaps. This essential oil is rich in citral, which serves as a source for producing beta-carotene and vitamin A. Due to its various chemical constituents, lemongrass oil finds applications in the pharmaceutical industry for its antidepressant, analgesic, antipyretic, bactericidal, antiseptic, carminative, and astringent properties*

Keywords: Poaceae: Grass family

I. INTRODUCTION

Here's a rephrased version of the text, aiming for a more concise and engaging tone:
Lemongrass, a fragrant herb with a citrusy scent, is a popular ingredient in Asian cuisine and traditional medicine. Its scientific name is Cymbopogon citratus. This tall perennial grass, native to India and Southeast Asia, thrives in warm, tropical climates.

Key components and uses:

- Essential oils: Rich in citral, a compound with various applications, including as a precursor for vitamin A.
- Culinary uses: Fresh or dried lemongrass leaves are used to flavor soups, curries, teas, and other dishes.
- Medicinal properties: Traditionally used to treat digestive issues, inflammation, and nervous disorders.
- Antimicrobial activity: Effective against various bacteria and fungi, making it a potential natural preservative.

Potential challenges and future directions:

- While lemongrass offers numerous benefits, its strong flavor and potential toxicity at high doses limit its direct use in food products. Researchers are exploring ways to reduce the concentration of essential oils in food formulations to mitigate these issues.
- By understanding the properties and limitations of lemongrass, scientists and food manufacturers can harness its potential to develop innovative and natural food products.

History:

Here's a rephrased version of the text, aiming for a more concise and engaging tone: Lemongrass: A Versatile Herb
Lemongrass, a fragrant herb with a citrusy scent, is widely cultivated in tropical and subtropical regions. Two main species dominate the market: West Indian
lemongrass (Cymbopogon citratus) and East Indian lemongrass (Cymbopogon flexuosus).

DOI: 10.48175/568

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 12, April 2025
Impact Factor: 7.67

Diverse Applications:

- Culinary Uses: Lemongrass is a popular ingredient in Asian cuisine, adding a unique flavor to soups, curries, and teas.
- Essential Oils: The essential oil extracted from lemongrass is used in perfumes, cosmetics, and as a flavoring agent in food and beverages.
- Medicinal Properties: Lemongrass has been traditionally used to treat various ailments, including digestive disorders, inflammation, and respiratory infections. Its essential oil exhibits antimicrobial, antifungal, and insect-repellent properties.

Growing and Harvesting:

Lemongrass is a hardy plant that thrives in warm climates. It can be grown in pots or directly in the ground. To harvest, simply cut the stalks near the base of the plant.

Incorporating Lemongrass into Your Diet:

- Herbal Tea: Steep fresh or dried lemongrass leaves in hot water to create a soothing and refreshing beverage.
- Cooking: Use lemongrass stalks to flavor soups, curries, and stir-fries. Remember to remove them before serving.
- Infused Water: Add lemongrass to water for a refreshing and flavorful drink.

With its numerous benefits and versatility, lemongrass is a valuable addition to any home garden or kitchen.

Location:

Lemongrass, a tropical plant, thrives in warm, sunny, and humid conditions. While it can tolerate a wide range of soil types, including loamy and lateritic soils, it performs best in well-drained, sandy soils.

High temperatures, particularly above 30 degrees Celsius, can negatively impact the plant's growth and reduce its essential oil content. Excessive waterlogging and saline soils can also hinder growth and oil production.

Lemongrass is a valuable crop, especially in regions like Kerala, where it is cultivated for its essential oil, which is used in various industries, including perfumery, food, and medicine.

Botany, Morphology, Ecology:

Lemongrass is a large, perennial sedge, characterized by its dense rhizome and clustered leaves. The plant can grow up to 1.8 meters tall, with long, glaucous green leaves that taper upwards. The ligule, a short appendage at the base of the leaf blade, is very short. The leaf sheaths are cylindrical, with barren shoots widening at the base and tightly clasping at the bottom, while others are narrow and separate. As a short-day plant, lemongrass produces abundant flowers in South India. Its inflorescence can reach a length of approximately 1 meter.

Belonging to the Gramineae family, lemongrass is an aromatic plant known for its high-quality essential oils and low production costs. It is a large, clumped grass that can grow up to 1 meter in height. The linear leaf blades are conical at both ends and can reach lengths of up to 50 cm and widths of up to 1.5 cm. The tubular leaf sheaths function as pseudo-stems. Lemongrass flowers during its mature growth phases.

Chemistry:

Lemongrass (Cymbopogon citratus) is a member of the Poaceae family. This medicinal plant contains compounds with the ability to control pathogens and enhance plant resistance to diseases. The aromatic plant is used in perfume production and cultivated for its essential oils, which are commercially valuable. Due to its pleasant aroma, it is used in the pharmaceutical industry to produce colognes, deodorants, and soaps.

The primary components of lemongrass are citral monoterpenes (a mixture of geranial and neral isomers) and myrcene, both of which possess antibacterial and medicinal properties. Citral monoterpenes exhibit antifungal and antimicrobial activity. These characteristics make lemongrass an interesting subject in the field of agronomy.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 12, April 2025
Impact Factor: 7.67

Chemical composition:

Lemongrass (Cymbopogon citratus) is renowned for its high citral content. The timing of lemongrass harvesting, whether early or delayed, can significantly impact the quality of its essential oils and citral content. Factors such as temperature, light intensity, soil moisture, fertilization, and plant maturity can influence both the essential oil yield and citral composition. As the plant matures, it transitions from the vegetative to the reproductive stage.

Generally, the yield of essential oils is closely linked to the overall plant biomass. To obtain essential oils of superior quality with a higher citral content (around 75%), it is crucial to harvest the plant at a specific stage, considering the ratio of young to old leaves.

Lemongrass essential oils can be extracted using various methods, including solvent extraction, accelerated solvent extraction, supercritical fluid extraction, Soxhlet extraction, and solid-phase matrix extraction. Advanced analytical techniques like High-Performance Liquid Chromatography coupled with Gas Chromatography (HPLC-GC) are preferred for analyzing the complex composition of essential oils. HPLC is effective for initial broad-spectrum separation, while GC provides further detailed separation.

Post-Harvest Technology:

Lemongrass typically flowers during the winter season. Subsequent harvests are conducted at intervals of 60-70 days. Under normal conditions, three harvests are possible in the first year, and 3-4 harvests can be achieved in subsequent years, depending on specific management practices.

The crop is harvested using sickles, cutting the plants 10 cm above the ground level. The harvested lemongrass is then transported to the distillation plant and allowed to wilt in the fields. The lifespan of a lemongrass plantation is generally 3-4 years, influenced by factors like soil quality and weather conditions.

The yield of essential oils varies with the age of the plant. In the initial year, the oil yield is lower, but it increases in the second year and reaches a peak in the third year. Thereafter, the yield gradually declines. On average, 25 to 30 tonnes of fresh lemongrass herbage can be harvested per hectare per year from 4-6 cuttings, yielding approximately 80 kg of oil. Under irrigated conditions and with newly developed varieties, oil yields of 100-150 kg/ha can be obtained.

Lemongrass typically contains 0.3% oil. Before distillation, thick stems, which are devoid of oil, are removed.

General uses:

Disrupting their structure and increasing permeability.

Lemongrass flavonoids, particularly luteolin and its glycosides, have gained attention for their medicinal properties. These compounds, identified in lemongrass infusions, exhibit anti-inflammatory activity. While glycosylation reduces luteolin's anti-inflammatory potency, it also lowers Its cytotoxicity. Some luteolin glycosides, such as 7-O-β-glucopyranoside luteolin, have been found to inhibit the production of inflammatory mediators like nitric oxide and IL-1β. Due to their lower toxicity, these lemongrass flavonoids have potential applications in the food and pharmaceutical industries.

Lemongrass oil is widely recognized for its various health benefits beyond its culinary uses. It possesses antidepressant, analgesic, antipyretic, bactericidal, antiseptic, carminative, and astringent properties. Traditionally, lemongrass oil has been used to treat ailments like toothaches and headaches. Additionally, it serves as an insect repellent, diuretic, and menstrual pain reliever.

Lemongrass oil blends well with other essential oils like coriander, basil, jasmine, cedarwood, geranium, tea tree, and lavender. It is also an effective antiseptic and deodorizer, making it suitable for foot baths and foot powders. However, it's important to note that lemongrass oil can sometimes cause skin irritation and other inflammatory reactions. Therefore, it's advisable to avoid its use during pregnancy. Overall, lemongrass is a versatile herb with numerous medicinal and culinary applications. Its essential oil and flavonoids offer a range of health benefits, making it a valuable natural remedy.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 12, April 2025
Impact Factor: 7.67

Summary:

Lemongrass (Cymbopogon citratus) belongs to the Poaceae family. It is a medicinal plant containing compounds that can control pathogens and enhance plant resistance to diseases. Lemongrass is widely used in herbal teas, non-alcoholic beverages, baked goods, and confections. The essential oil extracted from lemongrass is commonly used as a fragrance in perfumes and cosmetics, such as creams and soaps.

Lemongrass essential oil is rich in citral, a compound used as a source for the production of beta-carotene and vitamin A. Due to the presence of various chemical constituents in lemongrass oil, it is used in the pharmaceutical industry for its antidepressant, analgesic, antipyretic, bactericidal, antiseptic, carminative, and astringent properties.

REFERENCES

[1]F. Manzoor, N. Naz, S.A. Malik, S. Arshad, B. Siddiqui. (2013). Chemical Composition of Essential Oils Derived from Eucalyptus and Lemongrass and Their Antitermitic Activities Angainst Microtermes mycophagus (Desneux). Asian Journal of Chemistry. 25(5): 2405.

[2] N.G. Tzortzakis, C.D. Economakis. (2007). Antifungal activity of lemongrass (Cympopogon Citratus L.) essential oil against key postharvest Pathogens. Innovative Food Science C Emerging Technologies. 8(2): 253-258.

[3] B.T. Schaneberg, I.A. Khan. (2002). Comparison Of extraction methods for marker compounds in the Essential oil of lemon grass by GC. Journal of Agricultural and food chemistry. 50(6): 1345-1349.

[4] Ahmad, M.A. Hanif, R. Nadeem, M.S. Jamil, M.S. Zafar. (2008). Nutritive evaluation of Medicinal plants becondiments in South Asian Region. Journal of the Chemical Society of Pakistan. 30(3): 400-405.

[5] A.Y. Al-Maskri, M.A. Hanif, M.Y. Al-Maskari, A.S. Abraham, J.N Al-sabahi, O. Al- Mantheri. (2011). Essential oil from Ocimum basilicum (Omani Basil): a desert crop. Natural product Communications. 6(10): 193.

[6] Z. Arshad, M.A. Hanif, R.W.K. Qadri, M.M. Khan. (2014). Role of essential oils in plant diseases Protection: a review. International Journal of Chemical and Biochemical Sciences. 6: 11-17.

[7] B.R. Singh, V. Singh, R.K. Singh, N. Ebibeni. (2011). Antimicrobial activity of lemongrass (Cymbopogon citratus)oil against microbes of Environmental, clinical and food origin. International Research Journal of Pharmacy and Pharmacology. 1: 228-236.

[8] C.A.R.d.A. Costa. (2007). Estudo da ação Ansiolítica e sedativa de preplaces obtidas de Cymbopogon citratus (DC) Stapf.

[9] G. Vardar-Ünlü, F. Candan, A. Sökmen, D. Daferera, M. Polissiou, M. Sökmen, E. Dönmez, B. Tepe. (2003). Antimicrobial and antioxidant Activity of the essential oil and methanol extracts of Thymus pectinatus Fisch. Et Mey. Var. pectinatus (Lamiaceae). Journal of Agricultural and Food Chemistry. 51(1): 63-67.

[10] S. Amirdivani, A.S. Baba. (2011). Changes in Yogurt fermentation characteristics, and antioxidant Potential and in vitro inhibition of angiotensin-1 Converting enzyme upon the inclusion of Peppermint, dill and basil. LWT-Food Science and Technology. 44(6): 1458-1464.

[11]. V. Francisco, G. Costa, A. Figueirinha, C. Marques, P. Pereira, B.M. Neves, M.C. Lopes, C. García-Rodríguez, M.T. Cruz, M.T. Batista. (2013). Anti-inflammatory activity of Cymbopogon Citratus leaves infusion via proteasome and nuclear Factor- κB pathway inhibition: contribution of Chlorogenic acid. Journal of ethnopharmacology.148(1): 126-134.

[12] A.M. Hanaa, Y. Sallam, A. El-Leithy, S.E. Aly. (2012). Lemongrass (Cymbopogon citratus) Essential oil as affected by drying methods. Annals Of Agricultural Sciences. 57(2): 113-116.

[13] M.R. Santin, A.O. dos Santos, C.V. Nakamura, B.P. Dias Filho, I.C.P. Ferreira, T. UedaNakamura. (2009). In vitro activity of the essential Oil of Cymbopogon citratus and its major Component (citral) on Leishmania amazonensis. Parasitology research. 105(6): 1489-1496.

[14] L. Salvia-Trujillo, A. Rojas-Graü, R. SolivaFortuny, O. Martín-Belloso. (2013). Physicochemical characterization of lemongrass Essential oil–alginate nanoemulsions: effect of Ultrasound processing parameters. Food and Bioprocess Technology. 6(9): 2439-2446.

[15] M.A. Rojas-Graü, R. Soliva-Fortuny, O. MartínBelloso. (2009). Edible coatings to incorporate Active ingredients to fresh-cut fruits: a review. Trends in Food Science C Technology. 20(10): 438-447.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 12, April 2025
Impact Factor: 7.67

[16] R.T. Liggins, H.M. Burt. (2004). Paclitaxel-loaded Poly (L-lactic acid) microspheres 3: blending low And high molecular weight polymers to control Morphology and drug release. International journal Of pharmaceutics. 282(1): 61- 71.
[17] M. Ahmad, S. Benjakul, P. Sumpavapol, N.P. Nirmal. (2012). Quality changes of sea bass slices Wrapped with gelatin film incorporated with Lemongrass essential oil. International Journal of Food Microbiology. 155(3): 171-178.
[18] B. Wannissorn, S. Jarikasem, T. Soontorntanasart. (1996) Antifungal activity of lemon grass oil and Lemon grass oil cream. Phytotherapy Research.10(7): 551-554.
[19] T. Juntachote, E. Berghofer, F. Bauer, S. Siebenhandl. (2006). The application of response Surface methodology to the production of phenolic Extracts of lemon grass, galangal, holy basil and Rosemary. International journal of food science C Technology. 41(2): 121-133.
[20] S.S. Shankar, A. Rai, A. Ahmad, M. Sastry. (2005). Controlling the optical properties of lemongrass Extract synthesized gold nanotriangles and potential Application in infrared-absorbing optical coatings.Chemistry of Materials. 17(3): 566-572.
[21] J. Cheel, C. Theoduloz, J. Rodríguez, G. SchmedaHirschmann. (2005). Free radical scavengers and Antioxidants from Lemongrass (Cymbopogon Citratus (DC.) Stapf.). Journal of agricultural and Food chemistry. 53(7): 2511-2517.
[22] R.M. Raybaudi-Massilia, J. Mosqueda-Melgar, O. Martin-Belloso. (2006). Antimicrobial activity of Essential oils on Salmonella enteritidis, Escherichia Coli, and Listeria innocua in fruit juices. Journal of Food Protection®. 69(7): 1579-1586.
[23] N. Srivastava, A. Akhila. (2010). Biosynthesis of Andrographolide in Andrographis paniculata. Phytochemistry. 71(11): 1298-1304.
[24] N. Tajidin, S. Ahmad, A. Rosenani, H. Azimah, M. Munirah. (2012). Chemical composition and citral Content in lemongrass (Cymbopogon citratus) Essential oil at three maturity stages. African Journal of Biotechnology. 11(11): 2685.
[25] C.A.R. de Almeida Costa, D.O. Kohn, V.M. de Lima, A.C. Gargano, J.C. Flório, M. Costa. (2011). The GABAergic system contributes to the Anxiolytic-like effect of essential oil from Cymbopogon citratus (lemongrass). Journal of Ethnopharmacology. 137(1): 828-836.
[26] R. Duamkhanmanee. (2008). Natural essential oils From lemon grass (Cymbopogon citratus) to control Postharvest anthracnose of mango fruitInternational Journal of Biotechnology. 10(1): 104-108.
[27] M.M. Khan, M. Iqbal, M.A. Hanif, M.S. Mahmood, S.A. Naqvi, M. Shahid, M.J. Jaskani. (2012). Antioxidant and antipathogenic activities of Citrus peel oils. Journal of Essential Oil Bearing Plants. 15(6): 972-979.
[28] M.A. Hanif, H.N. Bhatti, M.S. Jamil, R.S. Anjum, A.Jamil, M.M. Khan. (2010). Antibacterial and Antifungal activities of essential oils extracted from Medicinal plants using CO2 supercritical fluid Extraction technology. Asian Journal of Chemistry.22(10): 7787.
[29] M. Maizura, A. Fazilah, M. Norziah, A. Karim. (2007). Antibacterial activity and mechanical Properties of partially hydrolyzed sago starch–Alginate edible film containing lemongrass oil. Journal of Food Science. 72(6): C324-C330.
[30] K.A. Hammer, C. Carson, T. Riley. (1999). Antimicrobial activity of essential oils and other Plant extracts. Journal of applied microbiology.86(6): 985-990.
[31] M.I. Naik, B.A. Fomda, E. Jaykumar, J.A. Bhat. (2010). Antibacterial activity of lemongrass(Cymbopogon citratus) oil against some selected Pathogenic bacterias. Asian Pacific Journal of Tropical Medicine. 3(7): 535-538.