

**LEMONS MEDICINAL MAGIC: EXPLORING PHARMACUTICAL,
BIOLOGICAL ATTRIBUTES****Kirti Rajaram Patil^{*1}, Akshay Jadhav² and Abhijit Rode³**¹Student at Pratibhatai Pawar College of Pharmacy, Wadala Mahadev, Shirampur.^{2,3}Assistant Professor at Pawar College of Pharmacy, Wadala Mahadev, Shirampur.Article Received on
21 Nov. 2024,Revised on 11 Dec. 2024,
Published on 15 Jan. 2025

DOI: 10.20959/wjpr20252-35215

***Corresponding Author****Kirti Rajaram Patil**Student at Pratibhatai Pawar
College of Pharmacy,
Wadala Mahadev,
Shrirampur.**ABSTRACT**

Tropical climates are ideal for growing citrus fruits, which are both nutrient-dense and therapeutic. Several parts of the lemon tree are known to have anti-inflammatory, antiviral, antioxidant, and anti-diabetic qualities in Ayurveda medicine. The antifungal, antioxidant, anti-inflammatory, anticancer, antibacterial, and anti-ulcer properties of lemon are highlighted in this review. Lemons are a good source of ascorbic acid, minerals, citric acid, flavonoids, and essential oils. Alkaloids found in lemon's leaves, stem, root, and blossoms are thought to have antibacterial and anticancer effects. Dealing with conditions like kidney stones, respiratory issues, cancer, blood sugar abnormalities, and cardiovascular problems is one of the main objectives of the Millennium Development Goals (MDGs). Vitamin C is abundant in lemons. The history of a relentless quest to find the source of the ancient hemorrhagic disease scurvy is linked to the

discovery of vitamin C, or ascorbic acid. Vitamin C, which was discovered in 1928, is necessary for the growth and upkeep of connective tissues. It is crucial for the development of bones, the healing of wounds, and the preservation of healthy gums. Activating the B vitamin folic acid, converting cholesterol to bile acids, and converting the amino acid tryptophan to the neurotransmitter serotonin are just a few of the metabolic processes in which vitamin C is crucial. It is an antioxidant that shields the body from the harm caused by free radicals. It is used as a treatment for a variety of illnesses. Vitamin C helps prevent infections, strengthens the immune system, and lessens the intensity of allergic reactions.

KEYWORDS: description of citrus lemon, chemical constituent, vitamin c, uses of citrus lemon, marketed formulation of lemon.



Fig:- Plant of citrus lemon.^[1]

❖ INTRODUCTION

Herbal remedies are frequently chosen in both developed and developing nations because of their natural sources and low risk of adverse effects. The World Health Organization (WHO) has identified more than 21,000 plant species that are used medicinally throughout the world. Medicinal plants are thought to be the best sources of medication variety among these. India is known as the “botanical garden of the world” since it produces the most of these plants. In traditional medicine, the Citrus genus—which belongs to the Rutaceae family—is especially important.^[2] Native to tropical and subtropical regions of Asia, citrus fruits are commonly cultivated in these areas and are vital components of the Mediterranean diet. Eight species of the Citrus genus have been traditionally grown in the Mediterranean region Citrus Limon, commonly known as lemon, is a small evergreen tree native to Asia, recognized for its yellow, ellipsoidal fruit. It ranks just behind oranges and mandarins in importance among citrus fruits. The term “lemon” has its roots in the ancient French “limon” and is related to Arabic “lamun” and Persian “Imun.” The word “lime” is linked to the Sanskrit “nimbu.” Lemon trees belong to the Rutaceae family and the citrus genus comprises around 140 species and 1,300 varieties.^[3] Originating in Southeast Asia, lemons spread to northeastern India, Burma, and China, and have been cultivated globally since ancient times. Notable

varieties include 1. Lisbon Tolerates various climates, grows up to 30 feet tall, and produces abundant fruit annually. 2. Eureka Known as the “Four Seasons” lemon, it can produce fruit and flowers throughout the year. 3. Meyer A cross possibly between a lemon and an orange or mandarin, introduced to the Lemons are traditionally used for their health benefits, including soothing sore throats and providing potential anti-cancer and antibacterial properties.^[4] They are also known to aid in managing blood pressure, respiratory issues, and joint problems. The fruit’s zest is rich in oils, particularly in varieties like the pink Eureka, used in making limoncello. The Omani lemon variety is notable for its high acid and juice content, particularly popular in the Batinah region, including areas like Sohar and Saham.^[5] The chemical composition of lemons includes citric acid and carboxylic acid, along with significant water content. Citrus fruits are categorized into various groups, with lemons, sweet oranges, mandarins, and limes among the most commonly cultivated.^[6] These fruits thrive in tropical and subtropical climates, making citrus the leading tree fruit globally in terms of area and production. In Pakistan, citrus fruits, especially lemons, represent a major agricultural product, with an annual output of 1.5 million metric tons grown across 160,000 hectares. The majority of production occurs in Punjab, which accounts for over 95% due to favorable growing conditions and adequate water supply. Notably, a six-year-old citrus tree can yield around 966 fruits, while a nine-year-old tree can produce approximately 3,173 fruits.

❖ HISTORY

(Citrus Limon), a member of the Rutaceae family, is the third most significant citrus fruit, with annual production exceeding 4.4 million tons. Argentina leads global production, contributing about 1.2 million tons. Lemons are rich in essential compounds, including ascorbic acid, citric acid, minerals, essential oils, and flavonoids.^[7] may support their health and nutritional advantages. Due in great part to the alkaloids included in its leaves, stem, root, and blooms, lemons have antibacterial and anticancer qualities.^[8] Various lemon varieties include Avon, Berna, Baboon, Bearss, and Cameron.^[9] Lemon peels are also a great source of phytochemicals, such as β - and γ -sitosterol, glycosides, and volatile oils. Between 1000 and 1150 A.D., lemons were grown throughout the Mediterranean region. From 760 to 1297 A.D., they were also grown in China. In 1493, they were first brought to Spain and then Hispaniola. Lemons were first grown in California between 1751 and 1786.^[10]

❖ GEOGRAPHICAL DISTRIBUTION

The lemon is both a small evergreen tree which is native to Asia As well as tree's oval yellow fruit. Throughout the world, the fruit can be used for culinary and non-culinary purposes. Primarily it is used for Its juice through the pulp and zest is also used mainly in cooking and baking. The top producers of lemon Include India, Mexico, Argentina, Brazil, Spain, Peoples Republic of China, United States, Turkey, Iran and Italy.^[11]

➤ GRAPHICAL DISTRIBUTION

It is native in north Indian but cultivated in Turkey, Mexico, United States, Argentina, Iran, Brazil, Italy, Spain and People Republic of China. The fruit of lemon can be used for non-culinary and culinary purposes all over the world. Predominantly, lemon is used for its juice from side to side the Pulp and taste is as well used mostly in baking and cooking.^[12]

○ Toxicological Classification

- ✓ Kingdom: Plantae
- ✓ Subkingdom: Angiosperms
- ✓ Phylum: Eudicots
- ✓ Class: Rosids
- ✓ Order: Sapindales
- ✓ Family: Rutaceae
- ✓ Genus: Citrus
- ✓ Species: C. Limon



Figure 2: bud of lemon. (13)



Figure 3: fruits of lemon (14)

❖ DESCRIPTION OF PLANT

Lemons grow on small, thorny trees that typically reach heights of 10 to 20 feet. Their dark green leaves are arranged alternately on the stems. The lemon tree produces fragrant, five-petaled white flowers, specifically from the 'Pink Lemonade' cultivar, which features striped fruit and variegated leaves. Lemons can vary in color from greenish-yellow to bright yellow. While they resemble limes in appearance, mature lemons are yellow and generally larger than limes, which remain green.^[15-19]

- Leaves
- Lemon leaves are serrulate and sharply pointed, varying in size from 6.5 to 100 mm. The petiole, which has a slender winged appearance, connects to the leaf. The leaf edges are elliptical to ovate, measuring 8-14 cm long, with a mucronate tip and crenulate margins.
- Fruits
- The term "hesperidium" refers to a category of citrus fruits. The structure of the fruit can vary based on tree age and fruit maturity, influenced by variety, crop load, rootstock, and irrigation methods. Mature lemons transition from green to yellow, typically weighing 50-80 g and measuring 5-8 cm in diameter.
- Flowers
- Lemon flowers can be male or hermaphroditic, featuring white petals with a purple hue. The fruit is ovoid or oblong, turning yellow upon maturity, with 20-30 stamens. The flesh is highly acidic and juicy.
- Seeds
- Lemon seeds are located within the pulp at the fruit's center. They vary in size and quantity, primarily being white, somewhat wrinkled, firm, oval, or circular, measuring approximately 3/8 inch long.

❖ The following are the primary plant chemicals found in lemon

Here's a concise summary of the key points regarding the benefits and nutritional content of lemons and Health Benefits of Lemon components.

- 1) Citric acid
- 2) Hesperidine
- 3) Diosmine

- 4) Eriocirin
- 5) D-limonene
- 6) Vitamin c

➤ **Citric Acid:** Citrus fruits contain citric acid, which may help avoid kidney stones

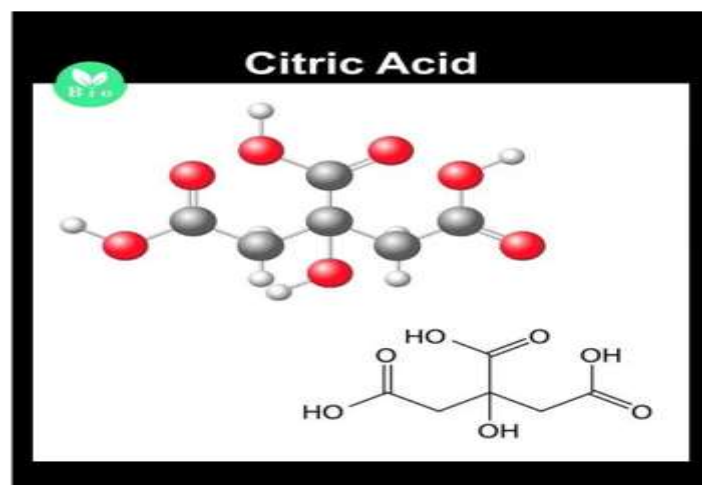


Figure no. 4: Structure of Citric acid.^[20]

- **Hesperidin:** This antioxidant may lessen atherosclerosis and promote blood vessel health.
- **Diosmine:** Another antioxidant that enhances muscle tone and reduces chronic inflammation in blood vessels, often included in circulatory medications.
- **Eriocitrin and D-limonene:** Present in lemon peel and juice, these antioxidants may aid in digestion, particularly for heartburn and gastric reflux

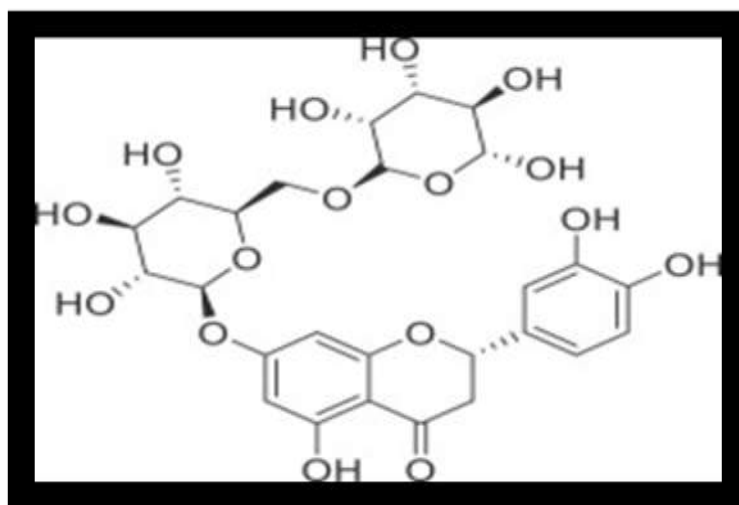


Figure no.5: structure of eriocitrine.^[21]

➤ Vitamin C

Can be found in one lemon. Eating vitamin C-rich lemon rice lowers your risk of heart disease and stroke, according to research.

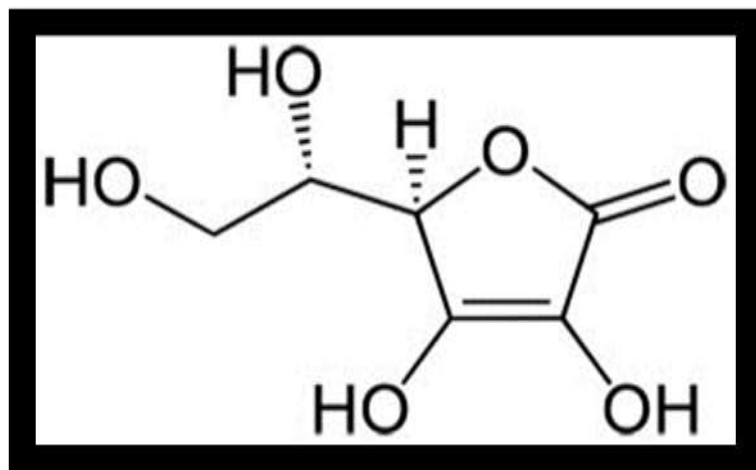


Figure no.6: structure of vitamin c.^[22]

Ascorbic acid, another name for vitamin C, is a water-soluble vitamin that humans cannot produce on their own, unlike the majority of mammals. As a result, vitamin C must be obtained from diet.

- Interesting fact: the word "ascorbic acid" is derived from the New Latin word "scorbutus," which means "scurvy!"

➤ Functions

- Collagen synthesis, a crucial structural element of bone, tendons, ligaments, scar tissues, and blood vessels.
- The production of norepinephrine, a neurotransmitter that is essential to brain function and is believed to influence mood.
- A potent antioxidant guards against free radical damage to proteins, lipids (fats), carbohydrates, and nucleic acids (DNA and RNA).
- Restores vitamin E and other antioxidants.
- The creation of carnitine, a tiny chemical necessary for the movement of fat to mitochondria for conversion to energy, depends on vitamin C.^[23]

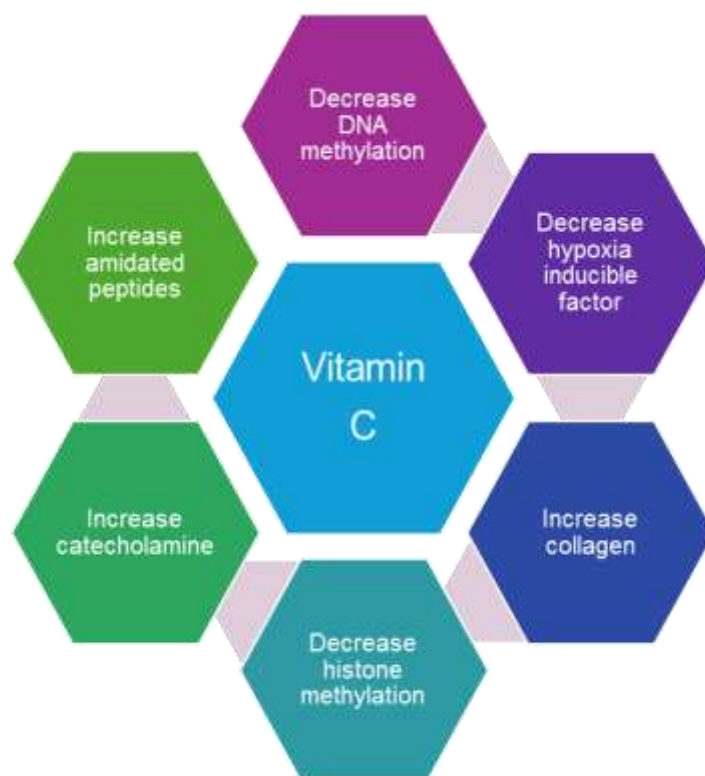


Figure No.7: MOA of vitamin c (24).

- **Caloric Values:** A lemon without the peel contains 17 calories, while one with the peel Lemon juice has only 3 calories per tablespoon.
- **Vitamins and Minerals:** A quarter cup of lemon juice provides 31% of the daily recommended intake of vitamin C, along with small amounts of folate and potassium.
- **Weight Management:** Lemon juice mixed with water lowers calorie intake and acidity, which may help with weight loss.
- When included in the diet, lemons' abundance of vital nutrients and antioxidants promotes good health.^[25-28]

❖ PHYTOCHEMISTRY

The main ingredients of lemon juice are sugars and organic acids, particularly citrus extracts (8%). The outer layer of the lemon peel, known as the pericarp, includes chemicals such as terpineol, geranyl acetate, and linalool in addition to essential oil (6%) composed of citral (5%), with traces of citronellal and limonene (90%). In addition to bitter flavone glycosides and coumarin derivatives, the inner layer (mesocarp) also includes trace amounts of gum, sugar, and potash. By dissolving tartaric acid in water, adding sulfuric acid, and flavoring with lemon oil, artificial lemon juice can be produced. In addition to trace levels of citronellal and pinene, lemon oil is dextrogyre, with 7-8% citral that can be converted to geraniol.^[29]

❖ IMPORTANCE IN MEDICINE

Interest has grown in using natural foods, herbs, and their derivatives as alternatives to pharmaceuticals. Emphasizing the medicinal properties of natural foods, lemon stands out due to its various bioactive components. Traditionally, lemon has been utilized in home remedies for a range of ailments, including obesity, urinary tract infections, bladder stones, kidney stones, and skin issues like acne scars. Lemon's therapeutic potential is noteworthy, as it has been linked to benefits for both minor conditions and serious diseases, such as cancer and urinary tract infections. Each component of the lemon offers unique health benefits, making it a valuable addition to holistic health practices.

➤ Based on your text, here is a brief synopsis of the health advantages of lemons

1. Obesity:- Lemon juice combined with boiling water may help reduce body fat and control hunger due to its pectin content. Lemon peel extract has also shown promise in addressing childhood and teenage obesity, while lemon's citrus properties may help lower cholesterol levels.

2. Hypertension:- Flavonoids found in lemons include eriocitrin, hesperidin, and diosmin, which can help decrease cholesterol and blood pressure. Lemon juice may help prevent kidney stones and is useful in treating disorders like idiopathic hypocitraturia.^[30]

3. Cancer:- Lemon's monoterpenes and alkaloids make it an anticancer food. These substances are employed in many medical applications, such as the treatment of throat infections and osteoporosis, and they may also prevent the formation of dangerous bacteria.

4. Immune System Enhancement:- Lemons, which are high in vitamin C, can boost immunity and possibly shorten the length of colds. For colds and coughs, a calming concoction of lemon juice, hot water, and honey is advised.

5. Weight Loss:- Lemon's function in weight control was highlighted by a study that found women on a lemon detox diet improved more in body weight, BMI, and insulin resistance than those on other diets. Including lemons in your diet may help you lose weight, strengthen your immune system, and feel better overall.

6. Blood Pressure and Lemon Consumption:- According to a 2014 study, Japanese women who walked frequently and ate lemon every day had lower blood pressure than those who did not. Although this points to a possible association between eating lemons and lowering blood

pressure, more research is required to fully understand the direct effects of lemons vs the advantages of consistent exercise.

7. Heart Health:- Every two hours, a person dies from coronary heart disease, which includes heart attacks and strokes. A lower risk of many illnesses is linked to diets high in vitamin C, especially from citrus fruits. A higher risk of stroke is associated with low blood levels of vitamin C, especially in those who are overweight or have high blood pressure. Furthermore, citrus fruits' soluble fibers can help decrease cholesterol, and lemons' essential oils may stop LDL (bad) cholesterol from oxidizing. Plant substances like hesperidin and diosmin may have a favorable impact on important heart disease risk factors, according to recent mouse research.

❖ GENERAL USES OF LEMON

Lemon essential oil is prized for both its energizing scent and health benefits. It can improve wellbeing in the following ways:

1. Loco motor Activity

According to research from Ohio State University, exposure to lemon oil can raise norepinephrine levels and elevate mood, which has a good impact on both mental and physical states.

2. Antiscorbutic and Vitaminic Properties

Vitamin C-rich lemon boosts the body's defenses against disease by promoting the immune system and aiding in the regeneration of white blood cells.

3. Antimigraine Effects

Lemon oil's stimulating qualities, which aid in constricting blood vessels surrounding the head, may help relieve headaches, especially migraines.

4. Depurative Properties

Lemon is good for rheumatism, gout, and excessive cholesterol because it includes limonene and ascorbic acid, which help with detoxification.

5. Diuretic Effect

Lemons contain citric acid, which can improve urination, aid in weight loss, stop kidney stones from forming, and reduce gallbladder inflammation.

6. Anticancer Properties

Components of lemon essential oil are believed to have anti-cancer effects, potentially preventing tumor growth and metastasis.^[31-33]

7. Improved Energy and Alertness

Lemon oil's energizing aroma and possible internal application can improve mental clarity, alertness, and brain function.

8. Astringent Effects

Lemon oil has whitening properties and can be used to treat acne by reducing the amount of oil produced by the face and hair.

9. Acne Treatment

Vitamin C and citric acid from lemons can fight bacteria that cause acne. When applied regularly, a solution of lemon juice and water can help minimize acne.

10. Aromatherapy

Lemon is a common ingredient in air fresheners and aromatherapy products because it helps boost mood, lower anxiety, and increase concentration.^[34]

11. Treatment for Canker Sores

Lemons have antiviral and antibacterial properties that have been demonstrated by science. It has been demonstrated that regular intake of lemon juice, particularly a glass of diluted lemon juice three times a day, can help heal canker sores and lessen oral inflammation. Highlights the fruit's potential advantages for dental health and general wellness while reiterating its use as a natural treatment for a variety of conditions.

12. Fever treatment

Lemon mix with honey with warm water help to treat fever.

13. Cold and Flu Treatment

Lemons can help people recover from colds and the flu because they are high in vitamin C and have antiviral qualities.

14. Eczema Relief

A diluted lemon oil solution wrapped in a towel can be applied to eczema-affected regions, while lemon juice can be used as a gargle for sore throats.

15. Combating Fatigue

Lemon juice can improve energy and mental focus and is a better hydration option than water.

16. Cholesterol Reduction

Because lemon peel contains an active compound, eating it may help decrease cholesterol.^[35]

17. Anti-inflammatory Properties

Traditional medicine uses components with anti-inflammatory properties found in lemon essential oils.^[36]

18. Antimicrobial Activity

Lemon peel is a powerful antibacterial that helps keep skin healthy and prevent infections.^[37]

19. Antifungal Activity

Essential oils that have been derived from different plants demonstrated potent antioxidant and bactericidal properties.^[38–42] Lemon oil can be applied directly to control the growth of mold in specific foods or can work in the packaged product with the settling to generate blocking effects in the scheme.^[43]

❖ NON CULINARY USES OF LEMON

1. Traditional Treatments

In the past, lemons were employed as a bleaching agent, invisible ink, and to treat epilepsy.

2. Extraction of Essential Oil

Oil from lemons is extracted and used in furniture polish, cosmetics, and fragrances.

3. Tension Reduction

According to Japanese research, vaporized lemon essential oil may assist lower tension.

4. Pectin

Sold commercially Commercial pectin, which is used as a gelling ingredient in a variety of products, is derived from lemon peel.

5. Educational Trials

In classroom experiments, lemons can be used as a light battery, with electrodes creating electricity to run small gadgets or cars. All things considered, lemons have many uses outside of the kitchen, supporting industry, science, and health.

❖ Toxicity of lemon

Every citrus species has an irritating, fototoxic essential oil that reacts to the high-mountain, ultraviolet light. These reactions include lip or dermatitis pockets in the internal body parts that come into contact with the juice. Therefore, if we are allergic or exposed to strong radiation, it is best to avoid drinking citrus juice. Additionally, the crucial oil should not be used while pregnant or nursing. Because it assaults and can yellow the dental plaque, citric juice is bad for your teeth. Having a painting is a lovely approach to avoid this.^[44–45]

❖ NUTRITIONAL VALUE

Following is the nutritional content of 100 grams of raw lemon without peel

- Energy – 121 kJ (29 kcal)
- Carbohydrates – 9.32 g
- Sugars – 2.50 g
- Dietary fibre – 2.8 g
- Fat – 0.30 g
- Protein – 1.10 g
- Thiamine (Vit. B1) – 0.040 mg (3%)
- Riboflavin (Vit. B2) – 0.020 mg (1%)
- Niacin (Vit. B3) – 0.100 mg (1%)
- Pantothenic acid (B5) – 0.190 mg (4%)
- Vitamin B6 – 0.080 mg (6%)
- Folate (Vit. B9) – 11 µg (3%)
- Vitamin C – 53.0 mg (88%)
- Calcium – 26 mg (3%)
- Iron – 0.60 mg (5%)
- Magnesium – 8 mg (2%)
- Phosphorus – 16 mg (2%)
- Potassium – 138 mg (3%)

- Zinc – 0.06 mg (1%).^[46]

There are numerous noteworthy medicinal applications for lemons

- **Scurvy:** Lime is well-known for its ability to treat scurvy, a condition that is brought on by a lack of vitamin C and is characterized by recurrent cold and cough infections, cracked lips and lip corners, mouth and tongue ulcers, and spongy, swollen, and bleeding gums. That even a youngster can tell you that these days. Since vitamin C insufficiency is the cause, vitamin C is the only treatment for it, and limes are gifted with this vitamin. In the past, sailors and soldiers were given lime to protect them from scurvy, a disease that was feared at the time. In order to protect them against scurvy, it is still given to employees who work in polluted environments, such as mines, cement factories, furnaces, painting shops, and heat treatment facilities.
- **Skin Care:** When applied externally or taken internally, lime juice and its oil are highly helpful for the skin. Because it contains a lot of vitamin C and flavonoids, which are class-1 antioxidants, antibiotics, and disinfectants, it revitalizes the skin, keeps it looking great, shields it from infections, and lessens body odor. When applied externally to the skin, its acids remove dead cells, treat rashes, bruises, dandruff, and other skin conditions. If its juice or oil is added to your bath water, it also provides a revitalizing bath.
- **Digestion:** Primary digestion is aided by the seductive aroma of limes, which moisten the mouth (the digestive saliva floods your mouth even before you taste it). Its acids then take care of the remainder. As they dissect Flavonoids, which are the macromolecules of the food and substances present in the aromatic oils recovered from lime, stimulate the peristaltic action and the digestive system, increasing the secretion of acids, bile, and digestive fluids. This explains why eating lemon pickles for lunch and dinner is a long-standing custom in India and some of its neighboring nations.¹⁰⁹⁸
- **Constipation:** First of all, the abundance of acids in limes helps cleanse the tracts and clear the excretory system, just like some acids are used to clean toilets and floors. Additionally, the roughage in it helps to relieve constipation. However, excessive acids are primarily at blame. Overdosing on lime juice and salt also relieves constipation because it works as a great purgative with no negative side effects.
- **Peptic ulcer:** Limonoids, such as Limonin Glucoside, are unique molecules found in limes that, in addition to vitamin C, offer anti-oxidant, anti-carcinogenic, anti-biotic, and detoxifying qualities. These substances aid in the healing of peptic and oral ulcers.

- **Respiratory Disorders:** Respiratory Disorders: Because it contains kaempferol, the oil that is extracted from limes and contains flavonoids and specific oils is widely used in anti-congestive medications like balms, vaporizers, inhalers, etc. Simply scratching the peel of a lime and inhaling it provides instant relief from nausea and congestion.
- **Eye Care:** Vitamin C once again! Flavonoids help shield eyes from infections, and its antioxidant qualities prevent macular degeneration and aging.
- **Gout:** There are two primary causes of gout: the first is the buildup of free radicals in the body, and the second is the buildup of toxins, mainly uric acid. Lime juice can help with both of these because it contains antioxidants and detoxifiers (vitamin-C and flavonoids) that both reduce free radicals and detoxify the body.
- **Gums:** Microbial growth and vitamin C deficiency (scurvy, which causes bleeding and spongy gums) are the main causes of gum disease. Ulcers and wounds from hard items, such as bones, might also be the cause. Lime juice can be useful in all of these situations. Its potassium and vitamin C prevent microbial growth, while its flavonoids aid in the healing of wounds and ulcers.
- **Piles:** Lime eliminates all the underlying causes of piles by healing ulcers and sores in the digestive and excretory systems and relieving constipation.
- **Weight Loss:** Weight Loss: In addition to being a fantastic refresher and antioxidant beverage, a glass of warm water with full-lime juice in it is also a great way to lose weight. Lime juice contains citric acid, which is a great fat burner. Take two glasses every day, and within a week, you'll see the amazing difference.
- **Urinary Disorders:** Urinary Disorders: Because limes have a high potassium content, they are particularly good at removing poisonous chemicals and precipitates that have accumulated in the kidneys and bladder. Additionally, their disinfecting qualities aid in the treatment of urinary system infections. Additionally, it eliminates urinary tract blockages caused by calcium buildup and inhibits prostate growth, which is especially common in men over 40.
- **Other benefits:** Additional advantages: Lime is a tasty appetizer and digestive. Contrary to popular perception, it helps heal cholera, arteriosclerosis, diabetes, heart disease, arthritis, rheumatism, prostate and colon cancer, exhaustion, and even extremely high fevers. Its lack of adverse consequences is its strongest feature.^[47]
- **Scurvy:** Due to their high vitamin C content.
- **Common Cold and Flu:** Believed to boost immunity.
- **H1N1 Flu:** Sometimes included in remedies.

- **Tinnitus and Meniere's disease:** Suggested for symptom relief.
- **Kidney Stones:** Citric acid may help prevent stone formation.
- **Malaria and Rheumatic Arthritis:** Traditionally used, though evidence is limited.
- **Fever:** applied to a number of home cures

While lemons are generally safe and nutritious, scientific support for their effectiveness in treating these conditions is limited.

- Benefits of Lemon Juice for Your Body
- Relieves a sore throat. ...
- May prevent and help fight cancer. ...
- Prevents kidney stones. ...
- Aids in digestion. ...
- Helps regulate blood sugar. ...
- Promotes weight loss. ...
- Helps clear skin (48-58).

Lemon water in the morning

Pharmaceutical preparations of lemon typically involve using its active compounds, such as vitamin C (ascorbic acid), flavonoids, and essential oils. Here are a few common forms:

1. Lemon Juice Extract

Concentrated lemon juice can be used for its vitamin C content and as a natural preservative in formulations.

2. Lemon Oil

Essential oils extracted from lemon peels are used in aromatherapy and as natural flavoring agents in various formulations.

3. Powdered Lemon Peel

Dried and powdered lemon peel can be incorporated into supplements for its antioxidants and dietary fiber.

4. Syrups and Lozenges

Lemon can be combined with honey or other ingredients to create soothing syrups or throat lozenges.

5. Topical Preparations

Lemon extracts can be included in creams or gels for their antibacterial and skin-brightening properties.

6. Vitamin C Supplements: Many formulations include lemon extract as a natural source of vitamin C, often marketed for immune support.

7. Lemon Essential Oil: Available for aromatherapy, it is used for its mood-lifting and antimicrobial properties.

8. Lemon-Flavored Cold Remedies: Syrups and lozenges for sore throats often include lemon for its soothing effects.

9. Digestive Aids: Products like herbal teas or digestive supplements may feature lemon for its potential digestive benefits.

10. Topical Creams: Some skincare products incorporate lemon extract for its brightening and exfoliating properties.

These products leverage the health benefits of lemon, focusing on its vitamins, antioxidants, and natural flavoring.

❖ CONCLUSION

Vitamin C-rich citrus lemons have important biological and pharmacological Advantages. Because of its antibacterial, anti-inflammatory, and antioxidant qualities, it Supports cardiovascular health, strengthens the immune system, and improves skin health. In addition to improving tissue repair and preventing oxidative stress, the high vitamin C Content promotes collagen formation. Lemon is a valuable dietary supplement that contains Bioactive components that have potential therapeutic use in both conventional and modern Medicine.

❖ REFERENCES

1. <https://images.app.goo.gl/mTHTby5vgxaXguqx9>
2. Vijayalaxmi k. Selvaraj CI (2018) Medicinal Plants and their Phyto-Constituents with potential antidiabetic activity – A review Res J Biotechnol Link: <https://bit.ly/3cYYpEY>

3. G. Kamal, F. Anwar, A. Hussain, N. Sarri, M. Ashraf. Yield and chemical composition of Citrus essential oils as affected by drying Pretreatment of peels. International Food Research Journal, 2011; 18(4): 1275.
4. E. Nicolosi, Z. Deng, A. Gentile, S. La Malfa, G. Continella, E. Tribulato. Citrus phylogeny And genetic origin of important species as Investigated by molecular markers. Theoretical and Applied Genetics, 2000; 100(8): 1155-1166.
5. Silalahi. Anticancer and health protective Properties of citrus fruit components. Asia Pacific Journal of clinical nutrition, 2002; 11(1): 79-84.
6. M. Saidani, W. Dhifi, B. Marzouk. Lipid Evaluation of some Tunisian Citrus seeds. Journal Of Food Lipids, 2004; 11(3): 242-250.
7. Makni M, Jemai R, Kriaa W, Chtourou Y, Fetoui H (2018) Citrus limon from Tunisia: Phytochemical and physicochemical properties and biological Activities. Biomed Res Int Link: <https://bit.ly/2zY3dvF>
8. Dhanavade MJ, Jalkute CB, Ghosh JS, Sonawane KD Study antimicrobial Activity of lemon (Citrus lemon L.) peel extract. Br J Pharmacol Toxicol, 2011; 2: 119-122. Link: <https://bit.ly/2ZoDkzX>
9. Mshelia BM, Adeshina GO, Onaolapo JA () The antibacterial activity of Honey and lemon juice against Streptococcus pneumoniae and Streptococcus Pyogenes isolates from respiratory tract infections. Acta Sci Microbiol 1. Link: <https://bit.ly/3eeeRBz>
10. Ali J, Das B, Saikia T. Antimicrobial activity of lemon peel (Citrus limon) Extract. International Journal of Current Pharmaceutical Research, 2017; 9: 79-81. Link: <https://bit.ly/2TxLx10>
11. <http://interscience.org.uk/index.php/ijahm> HEALTH AND MEDICINAL PROPERTIES OF LEMON(CITRUS LIMONUM)M.Mohanapriya*, Dr. Lalitha Ramaswamy** and Dr.R. Rajendran***
12. Mohanapriya M, Ramaswamy L, Rajendran R. Health and medicinal Properties of lemon (Citrus limonum). International Journal of Ayurvedic and Herbal Medicine, 2013; 3: 1095-1100.
13. <https://images.app.goo.gl/VrvXwZMfCiXh3RLS7>
14. <https://images.app.goo.gl/sWDKkPiabosFAYEB7>
15. Khatoon, N. Jahan, S. Ahmad, and A. Shahzad, "In vitro Evaluation of antifungal activity of aerial parts of medicinal Plants Balanites aegyptiaca Del. And Spilanthes acmella Murr.," J. Appl. Pharm. Sci., 2014, doi: 10.7324/JAPS.2014.40121.

16. N. Jahan, R. Khatoon, S. Ahmad, and A. Shahzad, "Evaluation Of antibacterial potential of medicinal plant *Spilanthes acmella* Murr. And its in vitro raised callus against resistant organisms especially those harbouring bla genes," J. Appl. Pharm. Sci., 2013, doi: 10.7324/JAPS.2013.31021.
17. H. Sharma, G. Y. Yunus, R. Agrawal, M. Kalra, S. Verma, and S. Bhattar, "Antifungal efficacy of three medicinal plants *Glycyrrhiza glabra*, *Ficus religiosa*, and *Plantago major* against Oral *Candida albicans*: A comparative analysis," Indian J. Dent. Res., 2016, doi: 10.4103/0970-9290.191895.
18. H. Sharma, G. Y. Yunus, A. K. Mohapatra, R. Kulshrestha, R. Agrawal, and M. Kalra, "Antimicrobial efficacy of three Medicinal plants *Glycyrrhiza glabra*, *Ficus religiosa*, and *Plantago major* on inhibiting primary plaque colonizers and Periodontal pathogens: An in vitro study," Indian J. Dent. Res., 2016, doi: 10.4103/0970-9290.183135.
19. International Journal of Innovative Research in Computer Science & Technology (IJIRCST) ISSN: 2347-5552, September 2021; 9(5): <https://doi.org/10.55524/ijircst.2021.9.5.18> Article ID 219518: 87-91 www.ijircst.org
20. <https://images.app.goo.gl/Vzfe3AanCJGKVGmaA>
21. <https://images.app.goo.gl/TwBiDghS48Gd9EJf7>
22. <https://images.app.goo.gl/gygL4WSmkMT1hH4F9>
23. Dr. Shivani Pandey, Department of Biochemistry, K.G. Medical University, Lucknow
24. <https://images.app.goo.gl/LfNaDz7kmTj3fn7H8>
25. A Review Study on Nutritional and Medicinal Importance of Lemon Raju Singh Jakhar Assistant Professor, Department of Agriculture, Vivekananda Global University Jaipur, India.
26. A. Nayak and M. T. Nayak, "Oral squamous papilloma Occurring on the palate with review of literature," J. Exp. Ther. Oncol., 2016.
27. R. Rastogi, V. Budhiraja, S. K. Jain, N. Sharma, R. Garg, and H. Nafees, "Morphological pattern of *Crista terminalis*, *Musculi* and *Taenia sagittalis* with applied Significance," J. Morphol. Sci., 2016, doi: 10.4322/jms.092015.
28. N. Agarwal, J. Dhawan, D. Kumar, A. Anand, and K. Tangri, "Effectiveness of two topical anaesthetic agents used along With audio visual aids in paediatric dental patients," J. Clin. Diagnostic Res., 2017, doi: 10.7860/JCDR/2017/23180.9217.
29. A. L. Parker, M. Kavallaris, and J. A. McCarroll, "Microtubules and their role in cellular stress in cancer," Frontiers in Oncology, 2014, doi: 10.3389/fonc.2014.00153.

30. N. Swarup, M. T. Nayak, N. Arun, S. Chandarani, and Z. Chowdhary, "Chronic non-healing ulcer of the oral cavity: Tuberculosis or carcinoma?," J. Exp. Ther. Oncol., 2018.
31. J. Silalahi. Anticancer and health protective Properties of citrus fruit components. Asia Pacific Journal of clinical nutrition, 2002; 11(1): 79-84.
32. H. Garg, A. Shrivastava, A. Choudhary In Flavonoids from Lemon & Tea as Effective Inhibitors against Carcinogenesis, National Seminar on Innovations in Science & Technology For Inclusive Development, 2015; 2015.
33. M. Mohanapriya, L. Ramaswamy, R. Rajendran. Health and medicinal properties of lemon (*Citrus limonum*). International Journal Of Ayurvedic And Herbal Medicine, 2013; 3(1): 1095-1100.
34. M. Sawamura, U.-S. Son, H.-S. Choi, M.-S. Kim, N. Phi, M. Fears, C. Kumagai. Compositional changes in commercial lemon Essential oil for aromatherapy. International Journal of Aromatherapy, 2004; 14(1): 27-36.
35. V. ul Hassan, M. Saleem, N. Shaffi, K. ud Din. LEMON GRASS: BOTANY, ETHNOBOTANY AND.
36. M.N. Boukhatem, M.A. Ferhat, A. Kameli, F. Saidi, H.T. Kebir. Lemon grass (*Cymbopogon citratus*) essential oil as a potent Anti-inflammatory and antifungal drugs. Libyan Journal of Medicine, 2014; 9(1): 25431.
37. M.J. Dhanavade, C.B. Jalkute, J.S. Ghosh, K.D. Sonawane. Study antimicrobial activity of Lemon (*Citrus lemon L.*) peel extract. British Journal of pharmacology and Toxicology, 2011; 2(3): 119-122.
38. M.A. Hanif, M.Y. Al-Maskari, A. Al-Maskari, A. Al-Shukaili, A.Y. Al-Maskari, J.N. Al-Sabahi. Essential oil composition, antimicrobial And antioxidant activities of unexplored Omani Basil. Journal of Medicinal Plants Research, 2011; 5(5): 751-757.
39. M.A. Hanif, H.N. Bhatti, M.S. Jamil, R.S. Anjum, A. Jamil, M.M. Khan. Antibacterial and Antifungal activities of essential oils extracted from Medicinal plants using CO₂ supercritical fluid Extraction technology. Asian Journal of Chemistry, 2010; 10: 7787.
40. E.M. Abdallah, A.E. Khalid. A preliminary Evaluation of the antibacterial effects of *Commiphora molmol* and *Boswellia papyrifera* Oleo-gum resins vapor. International Journal of Chemical and Biochemical Sciences, 2012; 1: 1-15. [24] S.A. Jatoi, A. Kikuchi,
41. S.A. Gilani, K.N. Watanabe. Phytochemical, Pharmacological and ethnobotanical studies in Mango ginger (*Curcuma amada* Roxb.; Zingiberaceae). Phytotherapy Research: An

- International Journal Devoted to Pharmacological And Toxicological Evaluation of Natural Product Derivatives, 2007; 21(6): 507-516.
42. A.A. Hamid, O.O. Aiyelaagbe. Pharmacological investigation of *Asystasia Calyciana* for its antibacterial and antifungal Properties. International Journal of Chemical and Biochemical Sciences, 2012; 1: 99-104.
43. G.O. Onawunmi. Evaluation of the Antifungal activity of lemon grass oil. International Journal of Crude Drug Research, 1989; 27(2): 121-126.
44. H.C. Su, R.D. Speirs, P.G. Mahany. Toxicity of citrus oils to several stored-product Insects: Laboratory evaluation. Journal of Economic entomology, 1972; 65(5): 1438-1441.
45. A. Salvatore, S. Borkosky, E. Willink, A. Bardon. Toxic effects of lemon peel constituents on *Ceratitis capitata*. Journal of chemical ecology, 2004; 30(2): 323-333.
46. <http://www.fruitdirectory.com/lemon/2010>
47. M. Mohanapriya International journal of ayurvedic & herbal medicine, Jan. 2013; 3(1): 1095-1100.
48. Ahmad, M.M., Z. Salim-ur-Rehman, F.M. Iqbal-Anjum and J.I. Sultan, "Genetic Variability To Essential Oil Composition in Four Citrus Fruit Species", Pak. J. Bot., 2006; 38(2): 319-324.
49. Al-Shuneigat, J., S.D. Cox and J.L. Markham, "Effects Of A Topical Essential Oil Containing Formulation On Biofilm-Forming Coagulase-Negative Staphylococci", Lett. Appl. Microbiol., 2005; 41: 52-55.
50. Aronson, J.K., (2001), Nature Publishing Group. Retrieved from: <http://medicine.nature.com>.
51. Burt, S.A., "Essential oils: Their antibacterial properties and potential applications in foods: A review", Inter. J. Food Microbiol., 2004; 94: 223-253.
52. Duthie, G. and A. Crozier, "Plant-derived phenolic antioxidants", Curr. Opin. Lipidol., 2000; 11: 43-47.
53. Indian Materia Medica Vol: 1 by, Dr. K.M. Nadkarani, Publisher: Popular Prakash, Mumbai.
54. Kawaii, S., T. Yasuhiko, K. Eriko, O. Kazunori, Y. Masamichi, K. Meisaku, Chihiro Ito and F. Hiroshi, "Quantitative study of flavonoids in leaves of Citrus plants", J. Agric. Food Chem., 2000; 48: 3865-8871.

55. Ortuno, A.A., P. Baidez, M.C. Gomez, I. Arcas, A.G. Porras and J.A. Del Rio, "Citrus Paradise and Citrus sinensis flavonoids: Their influence in the defence mechanism against *Penicillium digitatum*", Food Chem., 2006; 98(2): 351-358.
56. Pultrini, A.M., L.A. Galindo and M. Costa, "Effects of the essential oil from Citrus Aurantium L. In experimental anxiety models in mice", Life Sci., 2006; 78(15): 1720-1725.
57. Siddha Materia Medica (Medicinal Plants Division) by Murugesu Mudaliar, Published by the Directorate of Indian Medicine & Homeopathy, Chennai.
58. Sohn, H.Y., K.H. Son, C.S. Know and S.S. Kang, "Antimicrobial and cytotoxic activity of 18 Prenylated flavonoids isolated from medicinal plants: *Morusvalba* L., *Morus mongolica* Schneider, *Broussnetiavpapyrifera* (L.) Vent, *Sophora flavescens* Ait and *Echinosophora koreensis*", Nakai.Phytomedicine, 2004; 11: 666-672.