

LEMON

Document: Monographs on selected medicinal plants
Date: August, 2024
Type: Internal document

Dr. B.C. Roy College of Pharmacy
and Allied Health Sciences

Botanical Nomenclature (As per ICBN)

Kingdom	Plantae
Division	Magnoliopsida
Class	Dicotyledons
Order	Sapindales
Family	Rutaceae
Genus	Citrus
Species	limon
Botanical Name	<i>Citrus limon</i> (L.) Burm



Definitions

It is the outer part of the pericarp of the ripe or nearly ripe fruits of *Citrus limonis*. It should not contain less 2.5% of the total volatile oils.

Synonyms	• <i>Citrus aurantium</i> subsp. bergamia (Risso & Poit.) Engl. • <i>Citrus aurantium</i> subsp. bergamia (Risso) Wight & Arn. • <i>Citrus aurantium</i> var. bergamia (Risso) Brandis • <i>Citrus aurantium</i> var. mellarosa (Risso) Engl. • <i>Citrus bergamia</i> Risso & Poit. • <i>Citrus bergamia</i> subsp. mellarosa (Risso) D.Rivera & al. • <i>Citrus bergamota</i> Raf. • <i>Citrus limodulcis</i> D.Rivera, Obón & F.Méndez • <i>Citrus limonelloides</i> Hayata • <i>Citrus limonia</i> Osbeck • <i>Citrus limonia</i> var. digitata Risso • <i>Citrus limonum</i> Risso • <i>Citrus medica</i> var. limon L. • <i>Citrus medica</i> f. limon (L.) M.Hiroe • <i>Citrus medica</i> f. limon (L.) Hiroë • <i>Citrus medica</i> subsp. limonia (Risso) Hook. f. • <i>Citrus medica</i> var. limonum (Risso) Brandis • <i>Citrus medica</i> subsp. limonum (Risso) Engl. • <i>Citrus medica</i> var. limonum (Risso) Brandis • <i>Citrus mellarosa</i> Risso • <i>Citrus meyeri</i> Yu.Tanaka • <i>Citrus vulgaris</i> Ferrarius ex Mill. • <i>Limon vulgaris</i> Ferrarius ex Miller
-----------------	--

Vernacular Names	Hindi: Bara nimbu, Jambira, Pahari nimbu Telugu: Nimma
-------------------------	---

Description	Growth Form	The lemon plant forms an evergreen spreading bush or small tree, 3–6 metres (10–20 feet) high if not pruned.
	Foliage	Lemon leaves are small to medium in size and are ovate, oblong, and taper to a point on the non-stem end. The vibrant green leaves grow alternately along the branches, and they have fine-toothed edges with a slight rippling. There is also a prominent central stem with some small veins spreading throughout the leaf. Lemon leaves have a glossy finish on the green topside and a matte finish on their lighter green underside. When young, Lemon leaves are red and as they mature turn to a deep green.

	Stems	The stems are bushy, hard, and woody, with various branches. Despite their hardness, stems are bendable but not fragile.
	Flowers	The flowers have a sweet odour and are solitary or borne in small clusters in the axils of the leaves. Reddish-tinted in the bud, the petals are usually white above and reddish purple below.
	Fruit	The fruit is oval with a broad, low, apical nipple and forms 8 to 10 segments. The outer rind, or peel, yellow when ripe and rather thick in some varieties, is prominently dotted with oil glands. The white spongy inner part of the peel, called the mesocarp or albedo, is nearly tasteless and is the chief source of commercial grades of pectin. The seeds are small, ovoid, and pointed; occasionally fruits are seedless. The pulp is decidedly acidic.
	Cultivation	Lemons thrive in warm climates with temperatures between 20°C to 30°C (68°F to 86°F). They require full sunlight. They prefer well-drained, sandy-loam soil with a pH of 5.5 to 6.5 to avoid water-logging. The fruits are harvested once they turn yellow from green.
	Ethnobotanical Uses	Apart from being used as a flavouring agent in various culinary preparations, lemon was extensively used as epilepsy remedy. It was also used as a toothpowder due to its bleaching property.

Geographical Distribution

The plant is indigenous to Northern India but extensively cultivated in countries like Spain, Italy and Sicily. In the United States, California and Florida are the major source of Lemon. In India, the cultivation primarily takes place in Uttar Pradesh, Punjab, Maharashtra, Karnataka and Madhya Pradesh.

Growing Condition and Habitat

Light Preference

Lemon trees will grow best when positioned in full sunlight.

Water Preference

Citrus trees require critical stage watering in the initial year. It further reduces fruit drop and increases the fruit size. Diseases like root rot and collar rot occur in flooded conditions. Light irrigation with high frequency is beneficial.

Propagation Method	In India citrus trees are propagated both by seeds and vegetative means. Seed propagation is still practiced in the case of acid limes and to produce rootstocks for budding purposes. Shield or T budding is the most commonly used method of vegetative propagation. Budding is generally done either in spring or in September. Shield or T Budding In this method of propagation, a bud from desired variety (scion) is transferred on the rootstock with an objective of utilising the vigorous root system of the rootstock and combining the best characters of both. A plump, but not too elongated bud is selected from the middle section of the scion shoot. It is removed by making an incision around the bud with the help of sharp budding knife. On the selected rootstock T-shaped incision is made just enough to accommodate the bud. The bud is inserted in the incision and tied with a strip of plastic film in such a way that the tip of the eye remains open. Budding should be preferably done as low as possible on the rootstock. It takes three to four weeks for the bud to unite when the new shoot from the grafted bud is about 10 cm long the top portion of the stalk above the union is cut off and the plastic film is removed. For budding, proper selection of the rootstock is very important as it contributes to the vigour, productivity and quality of fruits. It also influences resistance and tolerance to certain diseases and pests and plays a major role on agro-climatic adaptation.
Seed / Spore Germination	Under optimal conditions, lemon seeds typically germinate within 1 to 3 weeks.
Duration	• Temperature: 21-29⁰C
Habitat	• Light: The seeds should be planted in a place to receive sufficient indirect sunlight • Soil: The soil should have good draining capacity.

Plant Material of Interest:	Fresh lemon fruits
	The fruits are generally spherical in shape and have pointed ends. The outer peel is yellow in colour while the inner peel is somewhat pale in comparison. The fruits contain juicy pulp with thin sacks. The seeds are ovoid in shape and are hard in nature. The most significant attribute of the fruits is its characteristic odour accompanied by sour taste.
	Transverse section of the fruits primarily shows four distinct layers associated with lemon fruits that are flavedo (exocarp), albedo (mesocarp), juice vesicles and segment walls. Apart from the above-mentioned characters, it also contains epidermis, columella, pulp and seeds.

Chemical Constituents

Citrus limon contains a wide range of bioactive compounds that contribute to its medicinal, cosmetic, and nutritional uses. Flavonoids, such as eriocitrin, hesperidin, and quercetin, are found throughout the fruit, juice, and peel, offering antioxidant and anti-inflammatory properties. Phenolic acids like ferulic and synapic acids, along with limonoids such as limonin and nomilin, provide additional health benefits. The essential oil of *C. limon* is rich in monoterpenoids, especially limonene, β -pinene, and γ -terpinene, which are known for their antimicrobial and anti-inflammatory effects. Coumarins and furanocoumarins, such as bergamottin and bergapten, are present in the peel and essential oil, contributing to the plant's photoprotective and therapeutic qualities. The fruit is also a rich source of vitamin C, B-vitamins, amino acids, and minerals like calcium and magnesium. Additionally, the seed oil contains essential fatty acids, tocopherols, and carotenoids, further enhancing its nutritional and cosmetic value.

Medicinal uses

(Therapeutic indications)

1. Lemons are high in heart-healthy vitamin C and several beneficial plant compounds that may lower cholesterol.
2. Animal studies show that lemon extract and plant compounds may promote weight loss, but the effects in humans are unknown.
3. Lemon juice may help prevent kidney stones.
4. Lemons contain vitamin C and citric acid, which help in absorbing non-heme iron from plants. This may prevent anaemia.
5. The soluble fibres from the pulp in lemons could help improve digestive health.

According to Ayurvedic Pharmacopoeia

1. Trsna
2. Vatika Sula
3. Chardi
4. Vibandha
5. Krmi
6. Aruci
7. Agnimandya
8. Udara Roga
9. Visucika

References

1. India Biodiversity Portal. *Citrus limon* (L) Burm. India Biodiversity. Available from: <https://indiabiodiversity.org/species/show/281230>. Accessed August 13, 2024.

2.	Britannica, The Editors of Encyclopaedia. Lemon. Encyclopaedia Britannica. Available from: https://www.britannica.com/plant/lemon . Accessed August 13, 2024.
3.	Klimek-Szczykutowicz M, Szopa A, Ekiert H. <i>Citrus limon</i> (Lemon) Phenomenon-A Review of the Chemistry, Pharmacological Properties, Applications in the Modern Pharmaceutical, Food, and Cosmetics Industries, and Biotechnological Studies. Plants (Basel). 2020 Jan 17;9(1):119.