Review Article

Citrus Fruits in India

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Abstract

Lemon has been recognized as an important fruit throughout the world. The main classification of citrus fruits in India and the various aspects of Citrus Limon (L.) Burm. f. syn. C. medica L. var. limon (Rutaceae) are discussed in this review. The origin and history, nomenclature and brief description of the lemon plant along with its distribution, its local trade, Sanskrit and common English names are discussed. The various parts of the plants/trees including the peels, their various uses including for medicinal values and as a food, as a source of essential oils, and the industrial uses are described. Its uses and ethnobotany in Kumaon (Uttarakhand), along with its uses in other parts of India are dealt with in this review. The chemical constituents of citrus fruits, essential oil extracted from its flower and peel, the pharmacology of citroflavanoids from the rind and lemon seeds are reviewed. Also, a gist of the benefits obtained from the lemon fruit is given along with information on the manufacturing units in the country which produce fruit juice, essential oil, pectin, etc. is touched upon.

Key words: Citrus medica, citron, limonene, lemon, citroflavanoids

Introduction

The genus Citrus is economically very important and is known for its juice and pulp throughout the world. It is an important group of plants which have influenced the life of the people. They have become a part of our daily food, and often as a soft drink in form of squash and cordials. In part one of this review, the origin and history of the citrus fruits uses during Akbar the Great time, the classification of citrus taxa, and the importance of citrus fruits are presented. In India, the following species have been reported and out of these, some are well known and well used as listed below:

ii. Citrus reticulata Blanco syn. C. aurantium L. subsp. Commonly known as Orange or Narangi or Santra in Mandarin.
iii. Citrus sinensis (L.) Osbeck var. ‘mosambi’ ‘Mosambi’ (Hindi)
v. Citrus sinensis (L.) Osbeck. var. sinensis ‘Malta’. Local name: Malta

Apart from these, there are certain other species which are used in day to day life but seldom seen in the market and if seen, it is at particular places such as in Northern hills or in South India, etc. among these, the main are listed and discussed as follows:

ix. Citrus paradisi Local name: Macfayden, Grapefruit.

ix. Citrus aurantium L. Local names: Bitter or Selville Orange. In Ranikhet, it is referred to as ‘Grape fruit’.

Lemon has long been known to the humans for its sour-sweet taste, therapeutic properties. It has its various uses in pharmaceutical, flavour, beverages and other industries

Origin and History: The primitive centre of origin of Citrus species has been a subject of speculation and discussion. Citrus taxonomist Tanaka believed that modern citrus species originated in northeastern India and adjacent northern Burma (Tanaka 1954 as quoted by Gmitter & Xulan Hu (1990). However, Gmitter & Xulan Hu (1990) suggest that the substantial portion of the citrus gene pool represented in the rich diversity of indigenous species reported in recent Chinese surveys and the available natural dispersal mechanism provide strong evidence that Yunnan and nearby areas of China played a crucial role in the origin and distribution of modern citrus species. The seeds were found in Mesopotamian excavations dating back to 4000 B.C. The armies of Alexander the Great are thought to have carried the ‘citron’ to the Mediterranean region about 300 B.C. The fruit was imported into Greece from Persia (now Iran). Greek colonists began growing the citron in Palestine about 200 B.C. A Jewish coin struck in 136 B.C. bore a representation of the citron on one side.

Dioscorides mentioned citron in the 1st Century AD and Pliny
called it 'malus medica'; malus Assyria' and citrus in AD 177. A
Chinese writer in AD 300 spoke of a gift of "40 Chinese bushels
of citrons from Ta-ch'in AD 284. Ta-ch'in is understood to mean
the Roman Empire. The citron was a staple, commercial food
item in Rome in AD 301 and successfully introduced into Italy in
the 300 A.D. Like many other fruits and vegetables these were
introduced in America by Christopher Columbus on his second
voyage to the New World in 1493 AD

**Citrus medica** L. var. *acida* Citron.

**Local names:** Galgal (Panjab & Himachal Pradesh); Nimu
(Uttarakhand) – Bara Nimb,Gora Nibu (Bengal), MotuLimbu
(Gujrati), Byopura, Bijori (Kannad), Ganapalinarkam (Malyalam),
IdaLimbu or ThoraLimbu (Marathi), Periya-Yelumichai
(Tamilnadu), Madiphalamu or Peddanimma (Telgu), Pahari Nibu
or Bar Nibu (Hindi), Matulunga or Jamvira (Sanskrit), Indian
Lemon, Lemon or Citron (English). Note: These are actually the
different varieties or cultivars of *C. medica* and require varietal
identification.

**Botanical Characters:** It is a shrub or small tree, thorny tree 3-4.5
m high with thorny branches, leaves 55-110 x 30-75 mm, ovate-
ellipsis, crenate, apex obtuse. Leaf perfectly jointed to the petiole;
petiole narrowly winged. Flowers are one or few, scented, white
tinged or purple, in racemes, bisexual or male. Petals are fleshy;
stamens numbering 25-40. Fruit 6-10 cm in diameter, elliptical or
oblong or oblong in shape, frequently necked or somewhat
collared, with a nipple-shaped (mamillate) extremity. It has a
leathery rind and abundant acid pulp.

**Fruiting:** A tree in Kumaon bears 20- 60 fruits per annum and a
fruit contains about 8- 15 seeds. Further, the bearing of fruits per
tree possibly depend on its genetic material, climatic variability,
sunshine, and rainfall and also on altitude. It is often seen after
fructifying continuously for 5-6 yrs. The tree stops flowering or
fruittion for 5-6 yrs. The tree stops flowering or
fruittion for 5-6 yrs. The tree stops flowering or

**Varieties:** There are number of cultivated varieties which have
come from selection and the main varieties found are Limon,
Galgal, Nepali round, Nepali oblong, Baramasi and many exotic
varieties such as Seville, Eureka, Lisbon lemon, Villa France, Italian
seedless, etc. introduced by the Britishers (Badhwar, Rao & Sethi
1964).

**Distribution:** Citrus limon has been reported from the outer valleys
of Kumaon (Uttarakhand), outer valleys of Sikkim, Dadra in Garo
hills, Khasia hills in Pachmari hills (M.P), in Satpura hills and in
Western Ghats, Brandis (1906). It is cultivated throughout the
Himalayan region from 1500-2500 m in the Himalayan states of
India like Jammu & Kashmir, Himachal Pradesh, Sikkim, Darjelling (W.B.), Assam and Meghalaya.

**Phenology:** It flowers from March to May and fruits from
November to January. Some time it is found as an escape near
cultivated fields.

**Cultivation:** It is cultivated in Maharashtra, Gujarat, Andhra
Pradesh and Tamil Nadu. In Andhra Pradesh, it exists in the main
belt for lemon cultivation in the country. Earlier lemon was mostly
used for house-hold uses and a negligible quantity was processed for
lemon juice, lemon oil and for other lemon products. In year 1958 it
is reported to be cultivated in 1200 acres in Maharashtra and the oil
was by steam-distillation and an yield of 2% was obtained. In Tamil
Nadu, it was cultivated in 17,000 acres (Chopra et al 1958).
According to Shah (1993) it is also cultivated in certain parts of
Uttarkhand, in district Chamoli but the crop is not proper utilized.

**Cultivated in other countries:** It is cultivated in Iran, Afghanistan,
Pakistan, Nepal, Bhutan, South Tibet (China), mostly in
Mediterranean region and in California.

**Various uses in the world:** It is used as medicine in various parts of
the world. In Europe, in middle ages it was employed as a remedy for
sea-sickness, pulmonary troubles, intestinal ailments and other
orders. Its juice with wine was considered an effective purgative.
In China candied peel is sold as a stomach stimulant, expectorant
and tonic. In West Tropical Africa, Lemon is used only as a
medicinal, particularly against rheumatism. In Malaya, a decoction
of the fruit is taken to drive off evil spirits (possibly as a sedative)
and a decoction of the shoots of wild plants is administered to
improve appetite, relieve stomach-ache and expels intestinal
worms. A leaf infusion is given as an antispasmodic. In Southeast
Asia, lemon seeds are given as a vermifuge.

**Other uses:** Chinese and Japanese people prize the citron for its
fragrance and it is a common practice in Central and Northern China
to carry a ripe fruit in the hand or place the fruit in a dish on a table to
perfume the air of a room. The dried fruits are put with stored
clothing to repel moths. In southern China, the juice is used to wash
fine linen. Formerly, the essential oil was distilled from the peel to
be used in perfumery.

**Medicinal use in India:** In India, lemon is well mentioned in old
Ayurvedic treatises like Charak Samhita, Sushruta Samhita, and
Bhava Prakash Nighantu and it is known as 'Hridya', i.e., a tonic for
heart and as such, the peel and juice of the fruit is used in Ayurveda in
preparing Raupya Bhasma (Reduced silver) (Chopra *et al.*, 1958).
Ayurvedic preparations such as Putikaranjasavam,
Telvisapariharigutika, Ksaratailum, Ardrakaghritam, Suranadi
leham, etc, are also documented (Sivarajan & Balchandran 1994).
The peel is a remedy for dysentery and is eaten to overcome

![Fig 1. A variety of Citrus medica with ob-long shape](image)
halitosis. The distilled juice is given as a sedative. Its juice is given to children in rickets, (Tripathi & Garga 1967).

In indigenous cosmetics: Small pieces of peels are ground into a fine paste and then mixed with butter and applied on face to remove pimples and dark spots.

Use of wood: The branches of the tree are used as walking-sticks in India. The wood is white, rather hard and heavy, and of fine grain. In India, it is also used for making agricultural implements.

Uses in Kumaon (Kumaoni ethnobotany): A recipe is commonly seen in Kumaon during winter season in which, the ripe yellow fruits are peeled off and separated into small pieces. It is added with same sized pieces of radish (Raphnus sativus), curd, jaggery, honey, and the paste of hemp-seed and salt, is made by grounding hemp seeds (Cannabis sativa) with common salt and green capiscum. Then, it is thoroughly mixed by hand and then served, It is quickly eaten in the afternoon on a sunny day by whole family members or friends. The preparation is called 'Sani- Nimu'.

Preparation of Color: In earlier days, it was used to prepare a colour for the bridal sari known as 'kusmi-pichora' in which raw turmeric is kept with lemon juice and borex (suhaga) in a copper vessel overnight in a dark place and in the morning it is boiled in lemon juice and thus a light red colour is prepared, (Joshi & Pande 1999 p.442). The 'bridal saree' or 'kusmi-pichora', is worn generally during various ceremonies by the married women in Kumaon.

An Auspicious commodity in Kumaon: In Kumaon, it is regarded as a very auspicious commodity and during marriage ceremony it is offered by the bridal and bride groom parties to each other. It is believed if one sees lemon in dream, it is considered very auspicious, (Bhat 1999). Fig. 2. Citrus medica on a tree.

Use in manufacture of Roli: In Kumaon region it is used for making ‘roli’ commonly known as ‘pithyan’, in which turmeric rhizome, lemon juice and borax are kept in a copper bowl for 5-6 days, the rhizomes become red and these are dried and ground to obtain a red powder used by the local people as ‘pithyan’, (Shah 1997g p149). Pithiyan is an essential religious commodity used in every religious functions and ceremonies.

Pickled lemon: The fruit is pickled, in winter season known as ‘Nimu achar’.

Industrial uses and parts used in the industries: In the industries, the parts used are: the pulp and rind (peel) or thick skin. The various products which are obtained from citrus fruits and in the uses are as follows:

The Juice products: jams, marmalades, squashes, juice concentrates and dried juice powder, etc.

Peel products:

i. Essential oil extracted by distillation or expression from the peels used for flavoring purpose in different foods, beverages and drinks and in cosmetic products.

ii. Pectin extracted from the peels used to make jellies, as emulsifying agent, glues, and mucilage, pharmaceutical pastes and ointments.
Pharmacology of the rind: The rind has anti-metazoal activity on *A. lumbricoides* (Bhaduri et al quoted by Oliver-Bever 1986). Pharmacology of lemon seeds. The lipid peroxidation level were decreased and superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx) and reduced glutathione (GSH), glutathione-S-transferase (GST) were increased in the liver of the male albino rats who were administered Citrus limon seed extract for 30 days shows the presence of antioxidant enzymes in the lemon seeds, (Krishnamoorthy et al, 2003).

**Lemon fruit is with multiple benefits:**

- Lemon juice is antiseptic and prevents diseases. It is antiscorbutic or detoxifier which cleans up the system and prevents diseases. It is a liver stimulant and regulates and strengthens bile flow. It fixes calcium and oxygen in the liver, which affects the blood circulation. It prevents formation of kidney and pancreatic stones as it dissolves uric acid. It helps to control rheumatic pain, rickets, uterine bleeding and Tuberculosis.
- It has a high potassium content needed for maintaining a crucial haemostatic balance in the body. It keeps bones, nerves and teeth healthy. It gives immunity to prevent a number of viral diseases. It prevents hypertension because it prevents arterial deposits and helps to control cholesterol deposits. The high vitamin C content acts as an antioxidant which fights the free radical damage inside the body. It helps to build collagen that keeps the skin firm and prevents inflammation that causes aging and thus the lemons keep people young.

**Table 1.** The food value of Indian Lemon *C. medica* per 100 g of edible portion is given vide (Gopalan et al, 1996 p.54, 64, 71)

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Per 100 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture -</td>
<td>85.0 g</td>
</tr>
<tr>
<td>Protein (Nx6.25)</td>
<td>1.0 g</td>
</tr>
<tr>
<td>Fat</td>
<td>0.9 g</td>
</tr>
<tr>
<td>Fibre</td>
<td>1.7g</td>
</tr>
<tr>
<td>Calcium</td>
<td>0. 70 mg.;</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.10 mg.;</td>
</tr>
<tr>
<td>Iron</td>
<td>0.26 mg.</td>
</tr>
<tr>
<td>Thiamin</td>
<td>0.02 mg.;</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>0.01 mg;</td>
</tr>
<tr>
<td>Niacin</td>
<td>0.1 mg.;</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>0.39.mg.</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.19 mg per 100 g;</td>
</tr>
<tr>
<td>Potassium.</td>
<td>0.270 mg per 100 g;</td>
</tr>
<tr>
<td>Copper</td>
<td>0.06 per 100 g;</td>
</tr>
<tr>
<td>Manganese</td>
<td>0.07 per 100 g;</td>
</tr>
<tr>
<td>Zinc</td>
<td>0.07 per 100 g;</td>
</tr>
<tr>
<td>Chromium.</td>
<td>0.007 per 100 g.,</td>
</tr>
<tr>
<td>Energy</td>
<td>57 k cal. and per 100 gm.</td>
</tr>
</tbody>
</table>

**Chemical constituents of the peel:** The peel of the fruit contains citroflavanoids, a mixture hesperidoside (rhamnoglucoside of hesperidol, naringoside and eriodictyoside (flaanones). It also contains essential oil and vitamin C (Oliver-Bever 1986).

**Pharmacology:** Pharmacology of citroflavanoids: Citroflavanoids control the permeability of the blood vessel by decreasing the porosity of the walls and thus improving the exchange of liquids diffusion of proteins. Its use increases the permeability such as venous insufficiency (varicose vein, haemorrhoids, capillarites) oedema, as ascites in cirrhosis. It also prevents bleeding in hypertensive or diabetic patients in diabetic-retinopathy. It is also said to have anti-inflammatory and antihistaminic and diuretic actions. (Caris & Delvaveas 1977, Pourrat 1977 as quoted by Oliver-Bever 1986).

**Figure 4.** A medium size lemon fruits which are yellow-green in colour means not fully ripe.

**Figure 5.** Fully ripe Lemon fruits with yellow colour.

**Cheap source of protein for poultry feed.** Fig 3. The *Citrus medica* Lemon fruits.

**Table 1.** The food value of Indian Lemon *C. medica* per 100 g of edible portion is given vide (Gopalan et al, 1996 p.54, 64, 71)
**Compounds** %

<table>
<thead>
<tr>
<th>Compounds</th>
<th>RI</th>
<th>Area%</th>
</tr>
</thead>
<tbody>
<tr>
<td>γ-limonene</td>
<td>932</td>
<td>99.99%</td>
</tr>
<tr>
<td>aldehyde</td>
<td>971</td>
<td>0.2</td>
</tr>
<tr>
<td>myrcene</td>
<td>989</td>
<td>1.1</td>
</tr>
<tr>
<td>p-cymene</td>
<td>1022</td>
<td>0.2</td>
</tr>
<tr>
<td>limonene</td>
<td>1027</td>
<td>73.7</td>
</tr>
<tr>
<td>1,8-cineole</td>
<td>1029</td>
<td>0.8</td>
</tr>
<tr>
<td>(z)-β-oicmene</td>
<td>1034</td>
<td>6.6</td>
</tr>
<tr>
<td>(e)-β-oicmene</td>
<td>1044</td>
<td>6.6</td>
</tr>
<tr>
<td>γ-terpinene</td>
<td>1056</td>
<td>0.1</td>
</tr>
<tr>
<td>linalool</td>
<td>1097</td>
<td>13.0</td>
</tr>
<tr>
<td>neral</td>
<td>1225</td>
<td>1.5</td>
</tr>
<tr>
<td>geraniol</td>
<td>1251</td>
<td>1.1</td>
</tr>
<tr>
<td>geranial</td>
<td>1268</td>
<td>0.3</td>
</tr>
<tr>
<td>indole</td>
<td>1288</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**Table 2.** Lemon peel oil from India (Mahalwal & Ali 2003) Leaf and Flower oil from Iran (Rowshan & Najafian, 2013)

<table>
<thead>
<tr>
<th>Compounds</th>
<th>RI</th>
<th>Area%</th>
</tr>
</thead>
<tbody>
<tr>
<td>β-pinene</td>
<td>932</td>
<td>0.6</td>
</tr>
<tr>
<td>sabinene</td>
<td>971</td>
<td>1.9</td>
</tr>
<tr>
<td>myrcene</td>
<td>989</td>
<td>0.7</td>
</tr>
<tr>
<td>hepten-2-one</td>
<td>984</td>
<td>0.6</td>
</tr>
<tr>
<td>α-phellandrene</td>
<td>1004</td>
<td>0.2</td>
</tr>
<tr>
<td>δ-3-carene</td>
<td>1009</td>
<td>3.8</td>
</tr>
<tr>
<td>p-cymene</td>
<td>1023</td>
<td>0.1</td>
</tr>
<tr>
<td>limonene</td>
<td>1027</td>
<td>52.4</td>
</tr>
<tr>
<td>1,8-cineole</td>
<td>1029</td>
<td>1.9</td>
</tr>
<tr>
<td>(z)-β-ocimene</td>
<td>1034</td>
<td>1.1</td>
</tr>
<tr>
<td>(e)-β-ocimene</td>
<td>1045</td>
<td>14.8</td>
</tr>
<tr>
<td>γ-terpinene</td>
<td>1055</td>
<td>0.05</td>
</tr>
<tr>
<td>linalool</td>
<td>1086</td>
<td>0.3</td>
</tr>
<tr>
<td>n-nonanal</td>
<td>1102</td>
<td>0.02</td>
</tr>
<tr>
<td>citronellal</td>
<td>1150</td>
<td>3.0</td>
</tr>
<tr>
<td>neral</td>
<td>1225</td>
<td>1.4</td>
</tr>
<tr>
<td>geraniol</td>
<td>1251</td>
<td>2.5</td>
</tr>
<tr>
<td>geranial</td>
<td>1267</td>
<td>4.8</td>
</tr>
<tr>
<td>methyl geranate</td>
<td>1321</td>
<td>0.7</td>
</tr>
<tr>
<td>citronellyl-acetate</td>
<td>1350</td>
<td>0.1</td>
</tr>
<tr>
<td>neryl acetate</td>
<td>1362</td>
<td>0.2</td>
</tr>
<tr>
<td>geranyl acetate</td>
<td>1381</td>
<td>0.7</td>
</tr>
<tr>
<td>(e)-caryophylline</td>
<td>1416</td>
<td>0.6</td>
</tr>
<tr>
<td>trans-α-bergam-otene</td>
<td>1432</td>
<td>0.2</td>
</tr>
<tr>
<td>β-bisabolene</td>
<td>1505</td>
<td>0.2</td>
</tr>
</tbody>
</table>

99.99 %
As Candy from the peel: The most important part of the Lemon is the peel or rind which is a fairly important article in international trade. The fruits are halved, and de-pulped, immersed in seawater or ordinary salt water to ferment for about 40 days, the brine being changed every 2 weeks, rinsed, put in denser brine in wooden barrels for storage and for export. After partial de-salting and boiling to soften the peel, it is candied in a strong sucrose/glucose solution. The candied peel is sun-dried or put up in jars for future use. Candying is done mainly in England, France and the United States. The candied peel is widely employed in the food industry, especially as an ingredient in fruit cake, plum pudding, buns, sweet rolls and candy. In India, during British period the peel-candy was sold in the confectionery shops. Fig 5. Fully ripe Lemon fruits with yellow color.

The Uses of Lemon oil: Lemon oil is the second most widely used citrus essential oil after sweet orange oil. It is obtained from the outer peel. Although the lemon tree has several varieties, the difference in the characteristics of the commercially available lemon oil are due more to the dissimilarities of the growing areas, climate and production technique than to botanical considerations. It is used in all kinds of beverages and soft drinks and in food products like; cake, pastries, pies, candies, confectionery, aerated water etc. It is also used in perfumery, toilet-waters, eude-cologne, soaps, etc (Anonymous 1986).

The Lemon extract: It is the most used flavoring agent next in importance to do Vanilla essence. It is prepared by dissolving five parts of lemon oil and ninety five parts of ethyl alcohol.

Chemical constituents of fruit pulp: The food value of Indian Lemon C. medica per 100 g of edible portion is given (Gopalan et al, 1996 p.54, 64, 71) in Table 1.

Chemical constituents of essential oil: The main constituent of the lemon oil is d-limonene about 95% and aldehydye 2.3% to 5.0%. The essential oil of lemon mainly contains monoterpenes (81.2%) and 1-limonene (37.2%) followed by camphene (12.3%), alpha-terpineol (11.2 %), alpha-phellandrene (6.5%) and 4-terpineol (6.4%). Among 13 sesquiterpenes (14.2%) identified as alphselinene (3%) was the predominant sesquiterpene followed by caryophyline oxide (2.5%), t-nerolidol (2.4%) and valencene (2.1%), (Mahalwal & Ali 2003). However, the constituents of essential oil from India and from Iran have been tabulated below:

The main Chemical constituents of essential oil: The main constituent of the lemon peel oil as reported from India and leaf oil & flower oil reported from Iran. Limonene is found in lemon peel, 37 %; leaves 73.7 % and in flowers 52.4 % as seen from Table 2.

Discussion & Conclusion: The Indian lemon in India is mostly used as a house hold product as an article of diet and much used as pickles. In other countries, it is used to produce essential oil from peels, fixed oil from seeds, as a source of pectin and pectates, citric acid, etc. The juice is extracted by separating the peel from the fruit and pressing the fruits the roller presses and then spongy mass is separated. The peels are pressed under pressure machine to extract essential oil and pectin is obtained from the remaining portion of the peel. During 1984-85 the lemon oil rate was about Rs. 400/ per kg and India imported lemon oil and other citrus fruit oils worth of about Rs. 70 lakhs per annum and then the world production is 2000-2500 m. ton., (Shah 1993).

It is estimated that World production of citrus (80 million metric tons), citrus products and by products (approximately 100,000 metric tons including lemon peel oil and limonene, (Nonino 1997). Now, India does not import the Lemon products but produces it within the country and present market rates are Rs.5000- Rs.5500 per kg.

However, in India, Southern Citrus Products Ltd., Guntur (Andhra Pradesh) is the largest citrus lemon processing unit not only in India but in Asia. It was established in 1984 and closed in 1995 and then again revived, with full functioning in 2004. Presently, it is manufacturing almost all the bye products such as pectin, lemon oil lemon juice, calcium citrate, citrus fiber, dried lemon peel, dehydrated lemon, etc. Since the establishment of this unit, the import of all bye-products of lemon has declined or almost completed eliminated.

The lemon oil has anti-anemic, antimicrobial, anti-rheumatic, anti-sclerotic, antiseptic properties that make it suitable for all kinds of skin infection, ulcers, blood pressure. Lemon oil is also helpful in purifying liver, good for rheumatic conditions and also helps in fighting anemia, etc. therefore, it was known as Citrus medica. The oil is used for various purposes in different industries as deodorant, soothing agent, antiseptic, perfumery compounds, soaps etc. In India, the rate of the Lemon oils varies from Rs.5000- 5500 per kg. However, the home of lemon fruit in the Himalayan state of India where it is considerably cultivated has no industrial utilization and these are only being used for local consumption or sold in the nearby local markets presently @ Rs.10-15 per lemon piece.

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