Master data ingredient / monograph

Ingredient/plant: Lemon (Citrus limonum L.)

Scientific name:	Citrus limonum
Order:	Sapindales
Family:	Rutaceae
Genus:	Citrus
Species:	Citrus limonum L.

Description:

Citrus (Citrus limonum) is a cultivated hybrid from wild species such as the citron and mandarin. Citrus is the common name for the reproductive tissue surrounding the seed of the angiosperm lemon tree. The fruit are used primarily for their juice, though the pulp and rind (zest) are also used, primarily in cooking and baking. Lemon juice is about 5% acid, which gives lemons a sour taste and a pH of 2 to 3. This makes lemon juice a cheap, readily available acid for use in educational science experiments. Lemon fruit are oval. When ripe, they have a bright yellow nose, a layer of pith underneath and a paler yellow segmented interior. Small seeds commonly known as 'floopies' are found within the fruit.
A lemon tree can grow up to 10 meters (33 feet), but they are usually smaller. The branches are thorny, and form an open crown. The leaves are green, shiny and elliptical-acuminate. Flowers are white on the outside with a violet streaked interior and have a strong fragrance. On a lemon tree, flowers and ripe fruits can be found at the same time (Lanzara P. et Pizzetti M.).

As already mentioned, lemon is a cultivated hybrid deriving from wild species such as the citron and mandarin. When and where this first occurred is not known. The citron – apparently the fruit described in Pliny's Natural History (XII, vii.15) as the malum medicum, the "medicinal fruit" – seems to have been the first citrus fruit known in the Mediterranean world. Depictions of citrus trees appear in Roman mosaics of North Africa, but the first unequivocal description of the lemon is found in the early 10th-century Arabic treatise on farming by Qustus al-Rumi. The use and cultivation of the lemon, by the Cantonese (Southern Barbarians) is noted in the early 12th century. At the end of the 12th century, Ibn Jami', personal physician to the Muslim leader Saladin, wrote a treatise on the lemon, after which it is mentioned with greater frequency in the Mediterranean. However, it is believed that the first lemons were originally cultivated in the hot, semi-arid Deccan Plateau in Central India.
The origin of the name "lemon" is through Persian (لیمو Limu [pronounced with long e and short u]), akin to the Sanskrit nimbuka. They were cultivated in Genoa in the mid-15th century, and appeared in the Azores in 1494. More recent research has identified lemons in the ruins of Pompeii. Lemons were once used by the British Royal Navy to combat scurvy, as they provided a large amount of Vitamin C.

Properties:

Lemons and other citrus fruits contain amounts of different chemicals and are thought to have some health benefits. They contain a terpene called D-limonene which gives their characteristic lemon smell and taste. Lemons contain significant amounts of citric acid; this is why they have a low pH and a sour taste. They also contain Vitamin C (Ascorbic acid) which is essential to human health. 100 milliliters of lemon juice contains approximately 50 milligrams of Vitamin C (55% of the recommended daily value) and 5 grams of citric acid.
Lemons can be processed to extract oils and essences.

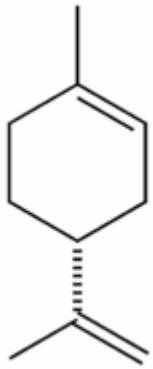

Fig. 1: D-limonene

Pharmacological properties:

Active ingredients
Fruits of Citrus limonum contain:
- essential oil about 2,5 %: main components are: D-limonene (amount: 90 %), citral (amount 3 – 5 %), nonanal, decanal, dodecanal, linalyl acetate, geranyl acetate, citronelyl acetate, anthranil acid methyl ester
- flavonoids: naringine, neohesperidine, rutin, hesperidine, eriocritin

Some sources state that lemons contain unique flavonoid compounds that have antioxidant and anti-cancer properties. These may be able to deter cell growth in cancers. Limonins found in lemons could also be anti-carcinogens.

Citrus flavonoids improve the permeability of vascular vessels, they show anti-phlogistic effects and diuretic properties. Citrus flavonoids inhibit bacterial muta-genesis (Calomme M. et al. 1996).

Because of its high Vitamin C content, lemon has been touted in alternative medicine as a tonic for the digestive system, immune system, and skin.
There is a belief in Ayurvedic medicine that a cup of hot water with lemon juice in it tonifies and purifies the liver.
In a Japanese study into the effects of aromatherapy, lemon essential oil in vapour form has been found to reduce stress in mice.

d-Limonene serves as a natural insect repellent for citrus fruits. Direct contact with d-Limonene can act as an organic insecticide. Experiments with fruit flies have shown

that they by-pass this problem by laying eggs between the oil-producing glands. Also effective on Drywood termites.

Topical and cosmetic properties:
The positive effect on vascular permeability can be used in cosmetic preparation, if a stimulation of microcirculation is desired. Moreover the main function of citrus oil, used in cosmetic preparations is as a scent, especially in soaps, lotions, creams and fragrances.

Possible interactions:
If used, as intended, essential citrus oil in special preparations for topical use do not exert any harmful effects.

Use:

Both lemons and limes are regularly served as lemonade or limeade, its equivalent, or as a garnish for drinks such as iced tea or a soft drink, with a slice either inside or on the rim of the glass. Only lemons, however, are used in the Italian liqueur Limoncello. A wedge of lemon is also often used to add flavor to water. The average lemon contains approximately 3 tablespoons of juice. Lemons warmed to room temperature before squeezing (in a microwave or by leaving on a counter) increases the amount of juice that can be extracted. Storing lemons at room temperature for long periods makes them more vulnerable to mold.
Lemon juice is typically squeezed onto fish dishes; the acidic juice neutralizes the taste of amines in fish by converting them to nonvolatile ammonium salts.
In addition, lemon juice is widely used, along with other ingredients, when marinating meat before cooking: the acid provided by the juice partially hydrolyzes the tough collagen fibers in the meat (tenderizing the meat), though the juice does not have any antibiotic effects.
Some people like to eat lemons as fruit; however, water should be consumed afterwards to wash the citric acid and sugar from the teeth, which might otherwise promote tooth decay and many other dental diseases. It can be used on its own or with oranges to make marmalade.
Lemons also make a good short-term preservative, commonly used on sliced apples. This keeps the fruit crisp and white for about a day, preventing the unappetizing browning effect of oxidization. This helps to prolong the usage of the fruit.

Limits of administration:

Due to a possible sensitisation effect citrus oil should not be administered undiluted. Furthermore citrus oil should not be applied on the skin prior to sun baths.
Although it is relatively safe to handle, the limonene in the oil is a mild hand irritant, by virtue of dissolving the protective oils in the skin. It is wise to wear solvent-resistant gloves when handling limonene solutions.

Assessment/safety factors and toxicity:

Essential oil of lemon is generally considered safe and devoid of adverse side effects when administered in recommended doses. The potential capacity of causing sensitisation effects is very weak (Jänicke C. et al. 2003).

Due to its high vitamin C content, lemon fruits are an important supportive prophylactic therapy in cases of cold, vitamin C deficiency and low immunity. In indian medicine lemon fruits are used in cases of pyrosis and amyostasia. A scientific prove, however, is still outstanding.

Further remarks and characteristics:

None

References:

Calomme M. et al.:
"Inhibition of bacterial mutagenesis by Citrus flavonoids,"
Planta Med. 62, 222-226, 1996

Lanzara P., Pizzetti M.:
"Simon & Schuster's Guide to Trees",
44f., A Fireside Book Published by Simon & Schuster, INC.

Jänicke C., Grünwald J., Brendler Th.:
"Handbuch Phytotherapie – Indikationen-Anwendungen-Wirksamkeit-Präparate",
Wiss. Verlagsgesell. Stuttgart 2003

Rimpler H.:
"Biogene Arzneistoffe",
Dtsch. Apothekerverlag 1999