

A Phytopharmacological Review on a Medicinal Plant: *Citrus Medica* L. (Citron)

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Abstract: From classical times, plants are wealthy source of effective and safe medicines. Herbal medicines have been the main source of primary health maintenance in many nations. The benefits of natural products with medicinal properties is as ancient as human advancement and, for a long time, mineral, plant and animal products were the main origin of drugs. The reasons for these were that pure compounds were easily obtained, structural moderations to manufacture potentially more active and safer drugs could be easily executed and the commercial power of the pharmaceutical companies was increasing. Citrus fruits are surrounded by the most extensive horticultural products enjoying universally as item of diet. They are rich in vitamin C, minerals and carries distinct flavors. *Citrus Medica* L. Generally called as a Citron in English and Bijapura in Ayurvedic literature is member of Rutaceae family. Several parts of Citron are generally used in Indian traditional system of medicine. Leaves are useful to induce sleep. In earliest literature citron was observed as an antidote of each kind of poison. *Citrus Medica* L. leaves carry anthelmintic and estrogenic activities; fruit has analgesic, anticancer and antiulcer activities; peel carry many characteristics including hypoglycemic, anti - cholinesterase, hypocholesterolemic, hypo - lipidemic, antimicrobial and anthelmintic properties; seed has anti - diabetic, hypocholesterolemic, hypolipidemic and estrogenic activities. Apart from medicinal uses, the plant has high scale value because of its edible and nutritive fruit, useful wood, latex and bark and provides generous occupations support to local citizens.

Keywords: Citron, *Citrus Medica* L., Rutaceae, Propagation, Phytochemistry, antioxidant, phytochemicals

1. Introduction

The citron is an aromatic fruit with the botanical name *Citrus Medica* L., which spreads to both the Swingle & Tanaka system. It is a extended member in the genus Citrus, belonging to Rutaceae or Rue family, sub - family Aurantioideae (A. K. Meena, et al., 2011). Citron developed in Assam, central India & Western Ghats of India (Kalpesh Panara, et al., 2012). It is more often present in the

Mediterranean region, Central & Southern part of America. It is also available in Japan, China, Bangladesh, Arabia, Australia, tropical & subtropical areas, in the month October to January (Beatriz AA, et al., 2005). *Citrus Medica* L. is formed by a slow - growing shrub or small tree reaching 8 - 15 ft (2.5 - 4.4 m) high with rigid branches & rigid shoots & short or long needles in the leaf axils (Morton, et al., 1987).



Figure 2.1: *Citrus Medica* L. plant

Citron is a small tree with yellowish orange round or oval fruit, size 8 - 12 cm in length. The leaflets are evergreen, lemon fragrant, ovate - lanceolate or ovate - elliptic, 2.5 - 7 inch long, rough with short wingless or nearly wingless petioles. The flower buds are large with white or purplish on

the outside, the fragrant flowers about 4cm wide, numerous, 4 - 5 petalled, raceme white, generally pinkish or purplish on the outside commonly unisexual with more no. of male flowers. The fruit is large aromatic hesperidium, essentially oblong, oval, and sometime trigonal with nipple at one end.

Volume 10 Issue 9, September 2021

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Size alters greatly from 3.5 - 9 inch or even 1 ft in some varieties. Peel is dark green when immature & yellow when mature. The seeds are white coloured with dark inner shell & red – purplish spot for the acidic varieties & colourless for the sweet ones (Morton, et al., 1987). *Citrus Medica* L. is an indigenous small tree or shrub. Its seeds are as in the orange, but smaller upto 12 - 15 seeded in a one fruit (SJ Patil & SB Patil, 2010).



Figure 2.2: Ripped fruit of plant



Figure 2.3: Seed of plant *Citrus Medica* L

2. Origin and Distribution

The citron is an ancient and native citrus species. There is molecular conformation that largest grown citrus species originated by hybridization of a small number of familial types, including citron, pomelo, mandarin and to a minor extent, papedas and kumquat. The citron is generally fertilized by self - implantation. This results in them exhibit a high degree of genetic homozygosity, and it is the male parent of any citrus hybrid instead of a female one (Nicolosi E, et al., 2000, Noelle A, et al., 2006, Asad Asadi Abkenar, et al., 2004). Archaeological conformation for Citrus fruits has been restricted, as neither seeds nor pollen are likely to

be generally recovered in archaeology. The citron is belief to have been native to India, in valleys at the knobs of the eastern Himalayas (Krug C. A, 1943, Carvalho R, et al., 2005, Wu Guohong Albert, et al., 2018).

3. Propagation

The tree is usually propagated by rooting. A cutting is a section of the part of plants used to propagate which recreate there missing part is termed as cutting. Stem cutting can be classified as follows: hardwood cuttings, semi hardwood cuttings, softwood cutting and herbaceous cuttings. But in propagation of *Citrus Medica* L. Semi hardwood method is often used (Platt RG, 1973; Debnath S, et al., 1986; Singh KK, et al.2013, Singh K. K, 2017).

4. Plant Profile

English: Citron, Wild lemon

Sanskrit: Matulunga

Hindi: Bijoura, Bijapura, Leemoo, Bara nimbu, Limbu, Nimbu

Gujarati: Bijora, Turanj

Urdu: Turunj

Chinese: Chu Yuan

French: Cedrat, Cidratier, Citronnier

Spanish: Cidra, poncil, Cedro limon

Italian: Cedro, Cedrone

Portuguese: Cidrao

Scientific Classification

Kingdom: Plantae

Subkingdom: Tracheobionta

Super division: Spermatophyta

Division: Magnoliophyta

Class: Magnoliopsida

Order: Sapindales

Family: Rutaceae

Genus: Citrus

Species: medica L.

5. Phytochemistry

The chemical constituents reported in specific parts of *Citrus medica* L. are stated below:

- The fruits are termed to consist of flavonoids as hesperidin; 3, 5, 6 - trihydroxy^{4'}, 7 - dimethoxyflavone; 3, 5, 6 - trihydroxy - 3', 4', 7 - trimethoxyflavone (Albach & Redman, 1969; Anonymous, 1992); Vitamin C is also specified from fruits (Ajaiyeoba et al., 2003).
- Seeds contained some tetranortriterpenoids as limonin, limonol and nomilinic acid (Govindachari et al., 2000). Limonin gives the completely bitter taste to seeds.
- The pollens of its flowers are included to consist of purine alkaloids caffeine and theophylline (Kretschmar & Baumann, 1999).
- The roots composed of campesterol, stigmasterol, sitosterol and cholesterol (Douglas & Illman, 1985; Anonymous, 1992).
- The peel contained citroflavonoids consisting of a mixture of hesperidoside (rhamnoglucoside of hesperetol), naringoside and ecyrodietyoside

(flavanones). Essential oils and vitamin C are also present, in enlargement to glucosides herperidin and rutin (Andrews, 1961; Fleisher & Fleisher, 1991; Fleisher & Fleisher, 1996). The peel composed of coumarins, limettin, scoparone, scopoletin and umbelliferone; also nobiletin, limonin, diosmin, β - sitosterol and its β - D - glucoside (Mizuno et al., 1989).

- Two new cyclic peptides were insulated from the fruit peels of *C. medica* var. *sarcodactylis* Swingle. Their constitutions were illuminated as cyclo (- Gly - AspLeu - Thr - Val - Tyr - Phe -) and cyclo (- Gly - Leu - Pro - Trp - Leu - Ile - Ala - Ala -) (Matsumoto et al., 2002).

6. Traditional Uses

Most of the plant parts of *Citrus medica* L. are used in traditional system of medicine of India & other countries. Some essential uses are: -

- **Flowers:** - Flowers are beneficial as Antidepressant, Astringent to the bowels, rise appetite, cure vomiting, effective in tumours, Asthma, cough & hiccough (Kirtikar & Basu 1993).
- **Roots:** - Root is Antiparasitic, used in constipation & in tumours, treat stomachache, beneficial in vomiting, renal stone & carries of the teeth (Kirtikar & Basu 1993).
- **Peels:** - The peel of the fruit is pungent, sharp, oily, stimulant, freezed peel is used in Dysentery (Anonymous 1992) & is taken to lower bad breath (Morton 1987). The essential oil of the peel is studied as an Antibiotic, Fresh peel is used as Stomachic, Stimulant, expectorant & Tonic.
- **Seeds:** - Seeds are pungent in taste & are non digestive, enormous heating to the body, Stimulant & Tonic, cure inflammation (Kirtikar & Basu 1993). To conceive, five seeds are ground & given with cow milk early in the morning for one month. Seeds are also used as antiparasitic.
- **Shoots:** - A decoction of the shoots of wild plant is carrying out to enhance appetite, cure stomachache & remove intestinal worms (Morton, 1987).
- **Leaves:** - The leaf juice mixed with that of Polygonum & Indigofera is taken after child birth. A leaf admixture is used as an antispasmodic. Leaves are also eaten as a vegetable to treat liver troubles (Grosvenor et al.1995).
- **Fruits:** - The ripe fruit is sweet & sour, Stimulant, digestible, tonic, relieves leprosy, cure sore throat, cough, asthma, hiccough, good for throat & the juice decreases earache (Kirtika & Basu 1993).

7. Research Work Carried Out in *Citrus Medica* L.:

Its extract of seeds, root & leaves were used to search *antibacterial and antioxidant activity* on human Pathogenic bacteria. Agar diffusion assay was applied, and the antioxidant properties of extracts were concluded by DPPH assay. Total phenolic and flavonoid contents as well as some compounds such as alkaloids, saponin, and tannin were further determined (Alamholo Mostafa et al.2020).

- Its Fruit Juice was used to study the Kinetics of *Antioxidants Degradation* and *Quality changes Concentration* during storage. The results showed that

degradation kinetics of ascorbic acid during storage was followed by the first - order kinetics. The amount of total phenolic content was decreasing at the first few weeks of storage, but later period of storage it was in gradually increasing trend (Md. Dey Pappu, et al.2019).

- The fruit extracts of *Citrus wilsonii* Tanaka and *Citrus medica* L. was used to study the *Chemical and biological* comparison. The quantitative results obtained by HPLC coupled with diode array detector method demonstrated that naringin was present in the highest amounts in *Citrus wilsonii* Tanaka, whilst nomilin was the most dominant constituent in *Citrus medica* L. (Zhao Pan, et al., 2015).
- Its Fruit essential oil was used to examine Variation in the *constituents* and *antioxidant activity* at various stages of development. The ingredients of some components, particularly α - thujone, 3 - carene, α - pinene, β - pinene and γ - terpinene, varied significantly during ripening stages. Growing maturity of fruit at harvest reduced antioxidant activities of finger citron EOs (Wu Zhen, et al.2013).
- Its Aqueous Extract of Fruit was used to examine the *Antiulcer Activity* against Ethanol - Induced Ulcer in Rats (Nagaraju B, Ahmed Nazeer, et al.2012).
- Its fruit, juice and ethanolic extracts of root, leaf, bark, peel and pulp were used to examine the *Antimicrobial activity* against seven bacteria (*Bacillus subtilis*, *Staphylococcus aureus*, *Enterococcus faecalis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa* and *Proteus vulgaris*), two fungi (*Aspergillus flavus* and *A. niger*) and a yeast *Candida albicans* of clinical origin (Shah A. N, et al.2011).
- Its flowers, leaves, and fruits were used to examine the *chemical constitute* and the *antioxidant, anti - inflammatory and hypoglycemic potential* at two maturity stages. Flowers and leaves were identified by the highest total phenol and flavonoid content (Menichini F, et al.2011).
- Its stem, root and barks were used to evaluate bioassay - guided *anti - inflammatory* principles to conduct the isolation of a new coumarin, namely citrumedin - B and thirty known components. The anti - inflammatory compounds were xanthyletin, nordentatin, atalantoflavon and lonchocarpol A, which showed potent nitric oxide (NO) - reducing activity in microglial cells. These results can be concluded from the treatment of allergic reaction and inflammatory properties of *Citrus medica* L. var. *sarcodactylis* Swingle in traditional Chinese medicine (Yi CY, et al.2010).
- *Citrus bergamia* and *Citrus medica* L. cv. Diamante peel essential oils were used to investigated *photo - induced cytotoxic activity* and two coumarins, bergapten and citropten. Essential oil was attained by hydro - distillation and examined by GC and GC/MS. The most generous compounds analyzed in *Citrus medica* L. cv. Diamante were limonene, γ - terpinene, citral, geranial, β - pinene and α - pinene (Menichini F, et al.2010).
- Its fruits were used to study the main components in its essential oil were d - limonene (51.24%), γ - terpenene (33.7 %), α - pinene (3.40%) and β - pinene (2.88%). By kinetic analysis on the hypoglycemic patterns of the *intrapertoneal glucose tolerance (IPGTT)* and the *insulin - glucose tolerance tests (IGTT)*, its insulin secret a gouge effect was confirmed (Peng CH, et al.2009).

- Its peel extract was used to investigate investigated the *antioxidative, anti - inflammatory and analgesic potential* (Sood S, et al., 2009).
- Its leaves essential oil was used to study the *physicochemical properties* and in vitro *antifungal effect* on storage fungi of *Arachis hypogea* L. (groundnut) stored for 6 months using disc diffusion agar method. They recommended that oil could be used as a fumigant against storage fungi for the conservation of stored herb seeds due to its wide range of activity, non - phytotoxicity and long - term persistence of fungitoxicity (Essien EP, et al., 2008).

8. Conclusion

Citrus medica L. is the most ancient wild crop of citrus family known to have various pharmacological and nutraceutical properties. The presence of phytochemicals in different parts of plant are responsible for showing various activities like; antioxidant effects which have protective effect against many diseases like diabetes, cancer, hypercholesterolemia and various other oxidative stresses induced chronic diseases etc, antianxiety effect, antihypertensive effect, anti - thyroid activity, estrogenic activity, antiulcer activity, prevention of anemia, C. N. S effect, insecticidal effect, anthelmintic and repellent effects & antifungal effect.

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