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The Pharmacological and Phytochemical Potentials of *Citrus medica* Linn



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ABSTRACT

Natural source like plants gives various important benefits for human health. The *Citrus medica* Linn has worldwide known for their valuable benefits to human. In ayurvedic literature the *Citrus medica* is known as *Bijapura*. Now a days many studies have been done to know the potentials of *Citrus medica* Linn to give it a tag of multipurpose medicinal plant. The present review is an effort to give a look on pharmacological and phytochemical potentials of *Citrus medica* Linn.



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INTRODUCTION:

Citrus medica Linn which is also termed as Citron and traditionally known as *Bijapura/ bijorain* ayurveda. It is a small shrub, with leaflets of size ranging in 3-5 inch long, elliptic-ovate with sort, wingless petioles. The one fruit contains near about 12-15 seeds. This plant mainly located in Kumaonpachamorhu, Sikkim, Khasia Hills, Garo Hills, Chittagong, Upper Yunzalin Valley, the western ghats and Satpura range in central India. Different parts such as ripe fruits, seeds, flowers, leaves. Fruits of *Citrus medica* Linn are great antiscorbatic, stomachic, cardia tonic, stimulant, sedative, analgesic and used in dyspepsia, bilious, vomiting, cold, fever, palpitation, sore throat, cough, asthma, thirst, hiccough, earache ⁽³³⁾. Root shows analgesic activity, antispasmodic used in diarrhea, piles and constipation. Seeds are having anthelmintic, stomachic, sedative, cardiac tonic capabilities and are useful for palpitation. Flowers and buds are astringent and are good candidate in treatment of various blood disorders. To induce the sleep, leaves of *Citrus medica* Linn are useful. Fruit extract are reach source for antioxidant activity ⁽⁵⁾.

Vernacular Names:



Hindi:	Bijoura, bijapura, lemoo, bara limbu, nimbu
English:	Citron, wild lemon
Sanskrit:	Matulunga
Gujrati:	Bijora, turanj
Urdu:	Turanj
Chinese:	Chel, Yuvan
French:	Cedrat, Cidratiev, Citronner
Spanish:	Cidra, poncil, Cedro limon
Italian:	Cedro, Cedrone
Portuguese:	Cidrao

Botanical Classification:

Family: *Rutaceae*

Kingdom: *plantae*

Division: *Magnoliophyta*

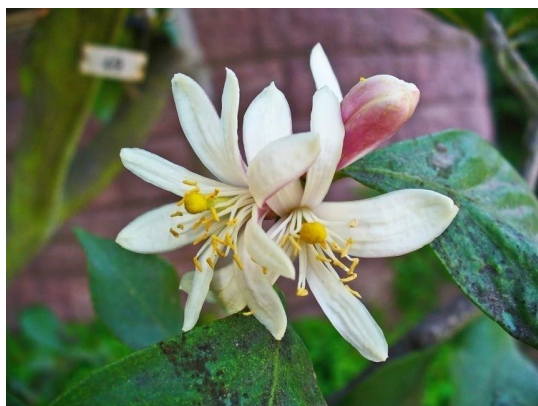
Class: *Magnoliopsida*

Order: *Sapindales*

Genus: *Citrus*

Species: *Medica L*

Botanical glanicals:



Flowers



Fruits



Branches



Ripened Fruits

Traditional uses of *Citrus medica* Linn

This *Citrus medica* is a potent source of numerous pharmacological and phytochemical constituent which shows various benefits to humans. Various parts of *Citrus medica* plant are famous for their traditional use, which are as follows:

- **Flowers:** Flowers are potent source and good candidate for antidepressant, astringent to the bowels, rise in appetite, to cure vomiting, effective for the treatment of tumors, asthma, cough, hiccough⁽³¹⁾.
- **Root:** Roots shows antiparasitic capabilities and are beneficial in treatment of constipation and also in tumours, stomach, vomiting, renal stone, and carries of teeth⁽⁶⁾.
- **Seeds:** Seeds of *Citrus medica* L cannot be digested. These are pungent in taste and causes extensive heating to body. Seeds act as stimulant and tonic. It cures inflammation. To devise five seeds are grounded and given with cow milk at early morning for 1 month⁽³⁾.
- **Shoots:** To enhance appetite, cure stomach-ache and to remove the intestinal worms, decoction of shoot of wild plant is carried out⁽²⁰⁾.
- **Peel:** Peels are most commonly pungent, sharp, oily. Stimulant, in dysentery and to lower bad breath, freeze, peels are used. The essential oil of peels are used as antibiotic and the fresh peel is good agent as expectorant and tonic⁽³¹⁾.
- **Leaves:** A leaf admixture shows antispasmodic activity. Leaves are also administered as vegetable to treat liver troubles⁽²⁹⁾.
- **Fruits:** The ripe fruits have sweet and sour taste. It acts as stimulant. It relieves leprosy, also cure sore throat, cough, asthma, hiccough and good for throat, it is also used to treat renal stone⁽¹⁹⁾.

Phytochemical Potentials:

Fruit decoction contains alkaloids, flavanoids, phenols, carbohydrates and mucilage. Peels are rich source of alkaloids, flavanoids, steroids, phenols and carbohydrate⁽¹¹⁾. Leaves contain alkaloid, flavanoid, steroids and glycosides. Whereas the flavanoids found in fruits are

hesperidin: 3,5,6-trimethoxyl-4,7-dimethoxy flavone; 3,5,6- trimethoxy flavone. Umbelliferone, scopoletin, scoparone, limettin, coumarin found in peel of *Citrus medica* L. while limonin, limonol, nomilinic acid was found in seeds and citronellal, citronellol, limonene, citrinelly, acetate, isopulegol and linalool are the major constituents in leaf oil⁽³⁴⁾. There are 19 & 43 constituents have been till identified in leaf and peel essential oil respectively. It is noteworthy here that there is a huge variation in chemical composition of the leaf and peel essential oil of *Citrus medica*. *Erucylamide* and *isolimonene* are the most important and main component in leaf and peel oil of bangladesh variety of this fruit. On the other hand the above mentioned phytoconstituents are totally absent in other reported oil. So it resembles that *erucylamide* and *isolimonene* are the first reported components in *Citrus medica* leaf and peel oils. To exhibit fungitoxicity, the high concentration of *Erucylamide* and *Isolimonene* in leaf and peel oil make it potentially useful in the medicines⁽¹²⁾.

Pharmacological potentials:

- **Analgesic Activity:**

All the three doses i. e 1, 2 and 4 ml/kg of fruit decoction of *Citrus medica* Linn were found to be beneficial in hot plate method. While on the other hand dose of 2 and 4 ml/kg of decoction are make their effective presence in tail immersion method. Whereas in analgesic model for evaluating centrally acting drugs, 1ml/kg dose was found to be effective⁽³⁵⁾. 4ml/kg dose of decoction of *Citrus medica* Linn gives the action of inhibition of pain produced by hot plate and tail immersion method with equal potency to diclofenac sodium injection. The flavanoids and phenolic components are the main reason for the analgesic potential of *Citrus medica* Linn⁽²⁸⁾.

- **Anticancer Activity:**

Number of fruits and vegetables which contains antioxidants such as lipotene, phenols, vitamin E, vitamin C, beta-carotene are good agent as anticancer. Among all the anticancer fruits of *Citrus medica* Linn is more interesting. For testing anticancer potential of *Citrus medica*, vital capacity test and Ames test were performed. And it gives effect with special importance on application of *Salmonella typhimurium* to known the antimutagenesis and anticancer level of chemicals. The half riped and fully riped fruit juice are responsible for anticancer activity, where the juice of half riped fruit is more capable than that of riped fruit juice⁽²⁶⁾.

- **Antidiabetic, hypocholesterolemic and hypolipidemic activity**

Citrus flavonoids are found in *Citrus medica* which are responsible for antidiabetic activity. *Citrus medica* l. cv Diamante comprises the capability to lower plasma glucose concentration and reduces level of cholesterol and triglyceride *in vivo* metabolic effect in mice ⁽²²⁾. The petroleum ether extract of weight 200 and 400 mg/kg shows significant reduction $P < 0.05$ fasting blood glucose serum cholesterol, serum triglyceride, LDL and VLDL with dose dependent manner after 15 days of drug administration⁽²⁹⁾. No change in no change in HDL level was observed by 200 mg/kg/day Seed extract for 15 days. While increase in HDL level was noticed at doors of 400mg/kg per day. So, by this study, we can state that *Citrus medica* Linn seeds have outstanding antidiabetic, hypocholesterolemic and hypolipidemic activity ⁽³¹⁾.

- **Hypoglycemic and anticholinesterase activity**

Citrus Medica is named as a good candidate of anthelmintic agent against Indian earthworms i.e *Pheretima posthumad*. *Citrus medica* L gives effect on inhibition of glucose uptake in parasites and depletion of ots glycogen synthesis, and thats why the possible mechanism of the anthelmintics activity of *Citrus medica* L cannot be explained ⁽²³⁾. Middling *In vitro* anthelmintic activity againts human *ascaris lumbricoides* was noticed by alcoholic extract of the rind of *Citrus medica*. To point out more active costituent which are responsible for anthelmintic activity, more study should be needed ⁽³⁰⁾.

- **Antimicrobial activity:**

By using agar cup method, *In vitro* antibacterial activity of ethanolic extract of peel was studied and the performed study gives an idea that extract of peel was shown effect against *Staphylococcus aureus*, *Proterus vulgaris*, *Klebsiella pneumonia*, *Eschheria coli*, *Bacillus substilis* and *Pseudomonas aeruginosa* ⁽²¹⁾.

- **Cytotoxic activity:**

Two coumarins i.e *bergapten* and *citropten* and peel essential oils can be obtained by hydrodistillation method, and are analyzed by GC and GC/MS are responsible for photo induced cytotoxic activity. Photo toxicity may be used as treatment option in some cases of lentigomaligna or lentigomaligna melanoma ⁽²⁰⁾.

- **Antihypertensive activity:**

Citrus medica leaves was tested for its antihypertensive capability. The testing investigation was done against acute response of blood pressure to Angiotensin II administration ⁽¹⁹⁾. The above investigation comes at the conclusion that different concentration of the aqueous extract prevents the raise of systolic and diastolic blood pressure and mean blood pressure with a dose dependent effect for diastolic pressure. The inhibition of action of angiotensin II was done at dose of 500 and 1000mg/kg. The inhibition of action is similar extent to Telmisartan ⁽¹⁵⁾.

- **Antithyroid activity:**

Absorption of L-14 well by gut results in increase in thyroid hormone level. The absorption of L-14 also results in rise level of thyroxine (T4) in circulation, which is furtherly converted into triiodothyronine (T3) by iodothyronine deiodinases. When the extract of *Citrus medica* leaves administered with L-T4, it results in decrease in level of both thyroid hormones with increasing TSH ⁽¹⁹⁾ which shows that leaves extract of *Citrus medica* are useful for antithyroid activity. *Citrus medica* leaves extract possesses capability of inhibiting thyroid function, both at glandular as well as the peripheral level of T4 to T3 conversion, i.e the principle pathway of T3 generation ⁽¹¹⁾.

- **Antianxiety activity:**

Aromatherapist uses the Citrus fragrance for the treatment of anxiety condition ⁽⁶⁾.

- **Prevention of anaemia:**

It is very common in premenopausal women. *Citrus medica* contains irons at some amount, but they are rich source of Vitamin C and Citric acid which helps to increase the absorption of iron from other foods and indirectly prevents from anemia ⁽⁵⁾.

- **Central nervous effect:**

Fibroblast growth factors (FGF-2) are one of the important factors in origin and growth. Neuronal and glial cells through autocrine and paracrine signaling. Aqueous extract taken from *Citrus medica var sarcodactylis* was responsible to activate FGF-2 promotor in transgenic luciferase expression models. Treatment on Schwann cells transfected with luciferase reporter

reporter plasmid under a FGF-2 promoter was noticed to induce FGF-2 promoter and showed enhanced luciferase expression ⁽⁹⁾.

- **Toxicity and side effect:**

For testing toxicity study of *Citrus medica* leaves, rats are used. *Citrus medica* oil was non toxic to test animal and did not show or produces or gives any side effect to the blood, liver function, kidney function, protein, carbohydrates, lipid metabolism ⁽⁵⁾.

- **Anti-implantation activity:**

This anti-implantation activity was studied on female-wistar rats. Oil with dose 100mg/kg, ethanolic extract with dose 2.5mg/kg and chloroform extract with dose of 19mg/kg of *Citrus medica* peel when administered orally, used for anti-implantation activity. Thus, *Citrus medica* peel is a good candidate for anti-implantation activity ⁽¹⁾.

- **Other activities:**

Citrus medica Linn also displays many activities like:

1. Insulin secretagogue activity
2. Antioxidant activity
3. Insecticidal
4. In the treatment of migraine
5. Cardiotonic
6. As nutraceuticals
7. Antinociceptive activity



CONCLUSION:

Citrus has a prolonged history of cultivation which is more than 4000 years. *Citrus medica* L is the most bygone wild crop of Citrus family known to have various pharmacological and nutraceutical properties. The appearance of phytochemicals in various part of plant are

accountable for exhibiting various activities like antioxidant effect which have shielding effect against many diseases like diabetes, cancer, hypercholesterolemia and various other oxidative stresses included chronic disease etc. Antianxiety effect, antihypertensive, antiulcer disease caused by production of free radicals. It is also important point to note that *Citrus medica* may be effective not only in isolation, but may actually have a potentiating effect when administered in combination with other herbs or drugs.

FUTURE SCOPE:

We are interested to do a more brief study on the phytochemicals and pharmacological potentials of *Citrus medica* Linn, to unfold new capability of *Citrus medica* Linn.

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