



Review Article

**A REVIEW ON ETHNOBOTANY, PHYTOCHEMISTRY AND PHARMACOLOGY OF
CITRULLUS LANATUS L.**

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Abstract: *Citrullus lanatus* well known fruit as Watermelon of family Cucurbitaceae. The fruit is consumed for cooling effect. Moreover, so many literature suggests that it contain important phytoconstituents like vitamin C, minerals etc. Moreover, literature available for its pharmacological activities like anti-oxidant, laxative, antimicrobial, diuretic etc. Its seeds contain fatty acids and have phenolic and triterpenoids. The seeds extract showed so many pharmacological activities. In conclusion, it can say that this review is an over all collective information about ethnobotany, phytochemistry and pharmacological activities of *Citrullus lanatus*

Keywords: *Citrullus lanatus*, Review, Laxative activity, ethnobotany

INTRODUCTION

Watermelon (*C. lanatus*) is an important cucurbit crop, accounting for 7% of the worldwide area devoted to vegetable production.¹ Watermelon (*Citrullus lanatus* L.) is a fruit crop of the family Cucurbitaceae, along with other cucurbit crops including the melon, cucumber, and zucchini. Watermelon thrives in the temperate regions of Africa, central Asia, and the Mediterranean. Fruit of *Citrullus lanatus* L consumed in the summer season and it gives chilling effect and reduce thirst. The fruit contains so many active phytoconstituents and minerals. The seeds contain fatty acids and have good activities. Different literature reveals medicinal the importance fruit as well as seeds.

Present review is a collection of information regarding the ethnobotany, phytochemistry and pharmacology of *Citrullus lanatus* L.

ETHNOBOTANY OF CITRULLUS LANATUS



Fig-2.1: Fruit of *Citrullus lanatus* L.

Botanical classification²

Citrullus lanatus belongs to the family Cucurbitaceae.

Kingdom: Plantae
Division: Magnoliophyta
Order: Cucurbitales
Family: Cucurbitaceae
Genus: *Citrullus*
Species: *lanatus*
Botanical name: *Citrullus lanatus*

Indian Local Names³

Sanskrit- Kharabūja; Bengali –Tormuj; Hinditartarbooz; Manipuri - tarbuj; gujrati –Indrak; Kannada-Kallangadi balli; Marati-Kadu vrindavana; Urdu –Tarbooz ; Punjab – tarabuuja ; Tamil- palam ; Telugu-puchakaya.

Foreign Names³

English - watermelon; German - wassermelone (east Germany), wassermelone (Switzerland); Afrikaans-waatlemoen; Greek-karpusi; Arabic-battikh ahmar; Danish-vandmelon; Dutch-watermeloen; Persian-tarbuz; Chinese-xigua; Japanese-shokuyou suika; Vietnamese : dưa hấu Indonesian; Spanish – sandia.

Habitat and Economic Value

Watermelon (*Citrullus lanatus* L.) is a fruit crop of the family Cucurbitaceae, along with other cucurbit crops including the melon, cucumber, and zucchini. Watermelon thrives in the temperate regions of Africa, central Asia, and the Mediterranean.^{4,5} World-wide production of watermelon fruits has increased steadily during the last century. Today, watermelon accounts for 6.8% of the world area devoted to vegetable production. In 2008, net production value of the top 20 countries cultivating watermelons was \$ 8.6 billion and the amount of fruit production was 89 million tons; South Korea was the eighth largest watermelon producing country following China, India, and the United States (FAO,

2009). Watermelon is a major vegetable crop in South Korea, accounts for a farm production value of \$ 930 billion

with a cultivation area of 20,750 hacter in 2009.⁶

Table-1: Characteristics of various species of Water Melon from Different region⁶

Species	Origin	Fruit weight (kg)	Fruit shape	Flesh color	Rind color	Seed size	Seed color
<i>C. lanatus</i> var. <i>lanatus</i>	Korea	7.0	Round	Red	Black	NS	Black
<i>C. lanatus</i> var. <i>lanatus</i>	Korea	7.0	Elongated	Red	Jubilee stripe	TS	Black
<i>C. lanatus</i> var. <i>lanatus</i>	Korea	7.0	Oblong	Deep red	Dark green	SS	Black
<i>C. lanatus</i> var. <i>lanatus</i>	China	6.0	Round	Red	Jubilee stripe	NS	Black
<i>C. lanatus</i> var. <i>lanatus</i>	India	6.0	Round	Red	Crimson stripe	NS	Dotted brown
<i>C. lanatus</i> var. <i>lanatus</i>	USA	12.0	Elongated	Red	Crimson stripe	NS	Dotted brown
<i>C. lanatus</i> var. <i>citroides</i>	Zambia	3.0	Round	White	Green	GS	Black
<i>C. colocynthis</i>	Iran	0.1	Round	White	Dotted green	SS	Grey

GS, giant size;; NS, normal size; SS, small size;TS, tomato seed size

Historical Background

Watermelon is thought to have originated in southern Africa, where it is found growing wild, because it reaches maximum genetic diversity there, resulting in sweet, bland and bitter forms. Though *citrullus colocynthisis* often considered to be a wild ancestor of watermelon and is now found native in north and West Africa, fenny Dane and Jiarong Liu suggest on the basis of chloroplast DNA investigations that the cultivated and wild watermelon appear to have diverged independently from a common ancestor, possibly *C. Ecirrhosus* from nambia.⁷

By 10th century AD, watermelons were being cultivated in china, which is today the world single largest watermelon producer. By the 13th century, Moorish invaders had introduced the fruit to Europe.

Description

Watermelon is an annual herbaceous vine with long (up to 10 m) stems lying or creeping on the ground, with curly tendrils. Leaves are 5-20 by 3-19 cm, and hairy, usually deeply palmately lobed with 3-5 lobes. Leaf stalks are 2-19 cm long. Male flowers on 1.2-4.5 cm long pedicels. Flowers 1-2.5 cm long, pale green. Flowers monoecious, solitary, on pedicels up to 4.5 cm long; with 5 shortly united petals, pale green. Fruit of wild plants 1.5-20 cm in diameter, nearly spherical, greenish, mottled with darker green; of cultivated plants up to 30x60 cm, spherical or ellipsoid, green or yellowish, evenly colored or variously mottled or striped. Fruits vary considerably in morphology like color, odour and taste.⁷

REVIEW ON PHYTOCONSTITUMETS OF CITRULLUS LANATUS

The large edible watermelon fruits contribute to the diets of consumers throughout the world. Although comprised mainly of water (often over 90%), watermelon also contains important nutritional compounds, including sugars, lycopene and cardiovascular health-promoting amino acids, such as citrulline, arginine and glutathione.^{8,9}

Watermelon is an excellent source of vitamin A, B & C necessary for energy production. Pink watermelon is also a source of the arginine, Carotenoids, lycopene, ,carbohydrate, ,sodium, ,magnesium, ,potassium ,& ,water.¹⁰ Cucurbitaceae plants are known to contain bioactive

compounds such as cucurbitacin, triterpenes, sterols and alkaloids.¹¹

Watermelon is rich in Carotenoids. Some of the Carotenoids in watermelon include lycopene, phytofluene, phytoene, beta-carotene, lutein, and neurosporene. Carotenoids have antioxidant activity, free-radical scavenging property.¹²

Watermelon seeds are excellent sources of protein (both essential and non-essential amino acids) and oil. Watermelon seed is about 35% protein, 50% oil, and 5% dietary fiber. Watermelon seed is also rich in micro- and macro-nutrients such as magnesium, calcium, potassium, iron, phosphorous, zinc etc.^{8,12}

Watermelon seeds are a source of healthy fat (unsaturated), almost 90%, vitamins, antioxidants, minerals, proteins and phytochemicals, which is very good.

Watermelon rich in water, citrulline, deiminase, Alanine, Glutamic Acid, Fructose, sugarcane, Glucose, Vitamin C, Calcium, Potassium, Phosphorus and other minerals.¹²

Water Melon Seed contains minerals like magnesium (11.4 mg), calcium (16.8mg), potassium (7.8 mg), Sodium (5.7 mg), Zinc (1.2 mg) and a few others present in mg/kg of seed analyzed by Okunrobo O *et al.*,(2012).

PHARMACOLOGICAL ACTIVITIES OF CITRULLUS LANATUS

Laxative activity

Swapnil Sharma *et al.*,¹³ studied for laxative effect of aqueous fruit pulp extract of *citrullus lanatus* at doses of 250, 500 and 1000mg/kg body weight. The laxative activity was determined based on the weight of the faeces matter. The effects of the aqueous fruit pulp extract of *Citrullus lanatus* administered orally at three different doses produced significant laxative activity and, reduced loperamide induced constipation in dose dependant manner. The same doses of the extract (500 and 1000 mg/kg, p.o.) produced a significant increase (p < 0.01) of intestinal transit in comparison with castor oil (2 ml) (p < 0.01). The results showed that the aqueous fruit pulp extract of *Citrullus lanatus* has a significant laxative activity.

Antimicrobial Activity

Loiy EA *et al.*,¹⁴ studied for antimicrobial activity of chloroformic, hexane and ethanolic extracts of leaves, stem, fruits and seeds from *Citrullus lanatus* var. Citroides (CL) against bacteria (*Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aureginosa*, *Bacillus subtilis* and *Proteus vulgaris*) and fungi (*Aspergillus nigar* and *Candida albican*). Antimicrobial CL was tested using cup-plate diffusion method and disc diffusion method. Analysis of the data revealed that, the chloroform extract of the fruit exhibited the highest antibacterial activity. It showed antibacterial activity against *S. aureus*: 36mm, *B. subtilis*: 38mm, *E. coli*: 37mm, *P. vulgaris*: 23mm, *P. aeruginosa*: 19mm. The ethanolic extract of the fruit pulp and stem showed the highest antifungal activity on *C. albican* (41 mm). *A. nigar* was very sensitive to the chloroform extract of the seed (37 mm) and the ethanolic extract of the leaves (37 mm). Results were compared concurrently to standard drugs; clotrimazole and gentamicin.

Anti-giardial activity

Loiy EA *et al.*,¹⁵ studied for anti-giardial activity of *Citrullus lanatus* var. Citroides (wild watermelon) fruits, petroleum ether, ethyl acetate; butanol crude extracts as well as Cucurbitacin E and Cucurbitacin L 2-O- β -glucoside pure isolated compounds from *C. lanatus* var. *citroides*. Cucurbitacin E and Cucurbitacin L 2-O- β -glucoside were revealed to have strong potent anti-giardial activity against *Giardia lamblia* *in vitro* with IC₅₀ = 2 and 5 ng/ml after 5 days respectively. The ethyl acetate extract was the best among all examined extracts followed by petroleum ether and butanol with IC₅₀ 0.1 and 0.2 and 0.5 μ g/ml respectively. The crude extracts and isolated compounds were active against *G. lamblia* and shows anti-giardial activity.

Antioxidant activity

Naresh Singh G *et al.*,¹⁶ studied for antioxidant activity of *Citrullus lanatus* of chloroform, ethyl acetate and methanol extracts. Antioxidant activity of all the extracts (chloroform, ethyl acetate and methanol) was measured by DPPH method. Methanolic extract of *Citrullus lanatus* (MECL) seeds showed maximum antioxidant potential.

Anti ulcer activity

Naresh Singh Gill *et al.*,¹⁷ studied for anti-ulcerative of *Citrullus lanatus* of Methanolic extract. Methanolic extract of *Citrullus lanatus* (MECL) seeds was evaluated for its anti-ulcerogenic activity by pyloric ligated (PL) and water immersion stress (WIS) induced ulcer models in rat. Gastric volume and free and total acidity were measured in PL model whereas; ulcerative index was measured in both the models at 100, 200 and 300 mg/kg doses of MECL. Rats treated with MECL (300 mg/kg) showed significant decrease in the gastric volume, free acidity and total acidity in case of PL model and showed significant percentage inhibition of ulcer as indicated by decrease in ulcerative index in both the models. The extract of *Citrullus lanatus* seeds possesses good anti-ulcer activity.

Hepatoprotective Activity

Sevcian Altas *et al.*,¹⁷ studied the effect of Diyarbakır watermelon (*Citrullus lanatus* cv: Sürme) juice on lipid peroxidation states in rat liver, kidney and brain.

administration of carbon tetrachloride along with watermelon juice or ursodeoxycolic acid (UDCA) significantly reduces serum markers of liver damage, aspartate aminotransferase (AST), alanine aminotransferase (ALT), total bilirubin (TB) and decrease in albumin when compared to the control group.

Madhavi P *et al.*,¹⁸ studied protective effect of n-hexane extracted *Citrullus lanatus* seed oil against CCl₄ induced hepatic damage in rat. *Citrullus lanatus* seed oil; CLSO (125mg) and CLSO(250mg) were administered orally for 10 days in rats and compared with standard silymarin (100 mg/kg) orally. The results showed significant decrease in serum ALT, AST and ALP levels treated groups which were increased due to CCl₄ induced liver damage are comparable with standard drug. Histopathological study of liver tissue reveals the hepatoprotective activity of *Citrullus lanatus* seed oil.

Anti-inflammatory activity

Madhavi *et al.*,¹⁹ studied *in-vivo* and *in-vitro* evaluation of *Citrullus lanatus* seed oil for anti-inflammatory activity. The oil was screened for *in-vivo* anti-inflammatory activity by carrageenan-induced paw edema in rat model and *In-vitro* anti-inflammatory activity by human red blood cell membrane stabilization method. The potency of the oil was compared with standard diclofenac (10 mg/kg). The oil showed significant reduction of edema in carrageenan induced rat paw edema model maximum at 3 hr (percentage reduction in paw volume 44.44%, 55.56% and 63.11% for CLSO(50 mg/kg), CLSO(100mg/kg) and diclofenec(10mg/kg) respectively and CLSO at concentration of 100, 250 and 500 mcg/ml showed 42.35%, 68.48% and 78.50% protection of HRBC in hypotonic solution respectively.

Anti-ulcer activity

Alok Bhardwaj *et al.*,²⁰ has evaluated the anti-ulcerogenic property of crude methanolic extract of *Citrullus lanatus* seeds in two different ulcer models in albino Wistar rats. The extract at 300 mg/kg body weight, once daily orally for 7 days has a significant effect in pyloric ligation (PL, 4 h ligation) and in water immersion (WS, 25 OC for 3 h) stress induced ulcer model, as it showed protection index of 57.33% and 63.38% respectively which is comparable to the standard drugs (Ranitidine 50mg/kg) and Omeperazole (20 mg/kg body weight) that have shown protection index of 64.47% and 70.59% in PL and WS model respectively. Furthermore the *Citrullus lanatus* has significantly decreased the gastric volume (53.55%), free acidity (57.02%) and total acidity (36.53%) in case of pyloric ligation model.

Okunrobo O *et al.*,²¹ studied antiulcer potential of methanolic seed extract of *Citrullus lanatus* against acetylsalicylic acid induced ulceration of gastric mucosa of Wistar rats was evaluated at three doses (200mg/kg, 400mg/kg, and 800mg/kg). The ulcer parameters investigated included ulcer number, ulcer severity, ulcer index and percentage ulcer protection. The antiulcer activity was compared against ranitidine at 20mg/kg. The extract exhibited a dose related antiulcer activity with maximum activity at 800mg/kg (P<0.001).

Anti-hyperlipidemic

Aruna Poduri *et al.*,²² studied effects of *C. lanatus*, provided as an extract of the cultivar 'sentinel,' on hypercholesterolemia-induced atherosclerosis in mice. Male low-density lipoprotein receptor-deficient mice at 8 weeks old were given either *C. lanatus* 'sentinel' extract (2% vol/vol; n=10) or a mixture of matching carbohydrates (2% vol/vol; n=8) as the control in drinking water while being fed a saturated fat-enriched diet for 12 weeks ad libitum. Mice consuming *C. lanatus* 'sentinel' extract had significantly increased plasma citrulline concentrations. Systolic blood pressure was comparable between the two groups. Consumption of *C. lanatus* 'sentinel' extract led to lower body weight and fat mass without influencing lean mass. *C. lanatus* 'sentinel' extract administration decreased plasma cholesterol concentrations that were attributed to reductions of intermediate-/low-density lipoprotein cholesterol. Plasma concentrations of monocyte chemo attractant protein-1 and interferon-gamma were decreased and those of interleukin-10 were increased in mice consuming *C. lanatus* 'sentinel' extract. Intake of *C. lanatus* 'sentinel' extract resulted in reductions of atherosclerosis in both aortic arch and thoracic regions.

CONCLUSION

In conclusion, it can say that this review gives a collective information about *Citrullus lanatus*. This will help to gather about information regarding ethnobotany, phytochemistry and previous literature work done on *Citrullus lanatus*.

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