

The Pharmacognostic Standardization, Phytochemistry and Phytopharmacological Potential of *Citrus maxima*- an Overview

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Abstract: *Citrus maxima* plant is a medicinal plant belongs to the family Rutaceae. A genus of Citrus (Linn) of Rutaceae an evergreen aromatic shrub and small trees occupies an important place in the medicine and also in the fruit economy of India. *Citrus maxima* are a native plant of Malayu Island and East of India. It is wide spread in China, Japan, Philipines, Indonesia, USA and Thailand. It has been used as a source of medicine to treat different disease and ailments including epilepsy, chorea and convulsive coughing chronic dysentery, blood complaints ulcer, headache, cancer. Extensive research works have been carried out on the chemical constituent, biological and pharmacological activities of the *Citrus maxima*. The Pharmacognostic study shows that those leaves are the compound type, 5-20 cm length, shape: lanceolate, apex: acute and having the entire margin. Stomata present in the leaf are the anomocytic type of stomata. These pharmacological activities mainly due to the presence of coumarin, flavanoids, phytosterol, phenol, tannins, triterpenes and anthraquinones.

Keywords: *Citrus maxima*, pharmacognostic standardization, phytochemistry and phytopharmacological potential.

INTRODUCTION

Citrus maxima Burm. Syn. *Citrus decumana* Watt. *Citrus grandis* Osbeck. (Family – Rutaceae) Is also known as (English) Chinese grape fruit, Pomelo, Jabong, Pummelo, (Hindi) Sadaphal and (Sanskrit) Madhukarkatika. Its leaves are traditionally used to produce a sedative effect in cases of epilepsy, chorea and convulsive coughing. The essential oil from fresh leaves exhibits dermatophytic and fungistatic activity. The hot leaf decoction is applied to swellings and ulcers. Its leaves have anti-tumour activity [44, 2, 45].

A genus of Citrus (Linn) of Rutaceae an evergreen aromatic shrub and small trees occupies an important place in the medicine and also in the fruit economy of India. Scientifically it is also known as *Aurantium maximum* Burm. Ex Rumph, *Citrus aurantium* L. Var *Grandis* L. *Citrus Decumana* L, *Citrus*

grandis Osbeck & *Citrus pamplemos*. *Citrus grandis* (Linn) Osbeck is a crop plant of India, China, Indonesia, America, Thailand etc. The pummelo tree is normally about 16 to 50 ft tall. Pomelo is a native plant of Malayu island and East of India. It is wide spread in China, Japan, Philipines, Indonesia, USA and Thailand. *Citrus maxima* are a perennial shrub commonly known as Papanus, distributed throughout India. Bark and root of *Citrus maxima* contain β -sitosterol, acridone alkaloid. Essential oil from the leaves and unripe fruits contain limonin, nerolol, nerolyl acetate and geraniol.

METHODS

The information about the plant was gathered using SciFinder, and it was then searched for its phytopharmacological and the phytochemistry. Data was collected from journals accessible in databases such as ScienceDirect, Medline, Pub Med etc.

Table-1: Taxonomic classification of *Citrus maxima*

Taxonomic classification	<i>Citrus maxima</i> M.
Kingdom	Plantae
Sub-Kingdom	Tracheobionta
Superdivision:	Spermatophyta
Division	Magnoliophyta
Class	Magnoliopsida
Order	Sapindales
Family	Rutaceae
Genus	Citrus L.Citrus
Species	<i>Citrus maxima</i>

RESULTS

Pharmacognostical features

Tree of 16-50 ft (5-15 m) tall, with the somewhat crooked trunk of 4-12 inches. North eastern

region up to 1,500 m in Assam and Triupura. It is indigenous to East of India.

Evaluated characteristics	<i>Citrus maxima</i>
Stem	
Shape	Cylindrical
Size	3-5 cm long
Colour	Yellowish brown
Leaf	
Shape	Ovate-lanceolate
Size	5-20 cm long
Colour	Green
Margin	Entire
Flower	
Calyx	4-5 united green colour sepals
Corolla	4-5 free yellowish white petals
Fruit	
Shape	Round to pear shape
Size	10-30cm diameter
Colour	Orange or pale yellow

PHYTOCHEMICAL SCREENING

Alkaloids

5-hydroxyacronycine, acgrinine A, Atalafoline, Baiyumine A & B, Buntanine, Buntanmine, Grandisine I & II, Pumiline, honyumine, natsucrin, Prenyl citpressine, Citropon A & B, Glycocitrine I are present in the roots and the bark of the plant. Whereas the caffeine is present in the flowers of the *Citrus maxima*.

Amino Acids

Alanine, Asparigine, Aspartic acid, Coline, Glutamic acid, Glycine And proline are present in the leaves.

Carbohydrates

Phytol, Synephrine, Methyl antralinatate, Fructose, Glucose and Pectin are present in the Leaf, peel and flowers.

Carotenoids

Carotene and Roseoside present in the peels.

Coumarins

5-Geranoxy-7-methoxy-Coumarin, Aurapte, Auraptene, bergamottin are present in the peels, and 5-methoxy seselin, 5-methyltodannol, 6-hydroxy methylherniarin are present in the roots and stem bark.

Flavonoids

Acacetin, rutin, tangeretin, cosmosiin, diosmetin, diosmin, eriocitrin, hespeidin, naringin.

Monoterpenes

α -pinene, α -terpineol, anethole, β -pinene, Camphene, camphor, citral, citronellal, citronellol, farnesol, geraniol, myrcene, neral, terpinene .

Sesquiterpenes

α -Bisabolol, α -cadinene, α -copaene, elemol

Steroids

β -Sitosterol, Campesterol, daucosterol, stigmasterol. Miscellaneous: α - tocopherol, ascorbic acid, chlorophylls, decyl acetate, Malonic acid, Fumaric acid, succinic acid and Citric acid .

Pharmacological activity of *Citrus maxima*

Antioxidant activity Anti-oxidant potential was tested for the juice of *Citrus maxima* in rats. The enhanced antioxidant status observed in *C. maxima* treated rats and its protective role against H₂O₂, STZ and nitric oxide generating system induced DNA damages might be due to the effect of different types of active principles acting individually or synergistically, each with a single or a diverse range of biological activities against oxidative stress.

Analgesic and Anti Inflammatory Activity Ethanolic, acetone and aqueous extracts were obtained by soaking the leaves, stem bark and fruit peel of citrus maxima for 72 hrs. These extracts were evaluated for the analgesic activity in Acetic acid induced writhing in mice, Tail flick method in rats, Hot plate method in mice and Acute and chronic anti-inflammatory activity was evaluated by Formalin-induced Paw oedema in rats. Ethanolic extracts citrus maxima leaf, stem bark, fruit peel showed a significant decrease in the writhes in comparison to control group in Acetic acid-induced model and a significant increase in the tail flicking time. Hot plate method showed the increase in the reaction time of the thermal stimulus. Anti-Arthritic and anti-inflammatory activity was studied using Formalin-induced paw oedemas in rats. The ethanolic extract was found to compatible with the standard drug diclofenac.

Anti-Diabetic Activity Ethanolic extract of stem bark of citrus maxima was obtained by continuous hot percolation method. Acute toxicity studies were done as per the OECD-425 Guidelines. Anti-diabetic activity was studied in the Alloxan induced anti diabetic activity; Streptozotocin induced anti diabetic activity and Oral glucose tolerance test. Acute toxicity study showed that LD₅₀ values were too high. Thus it showed the safety of the extract. Fasting blood glucose level in the Alloxan and Streptozotocin, induced rats were within the normal range, and Citrus maxima extracts showed an increase in the body weight in these models when compared to the diabetic control group. Oral glucose tolerance test in rats showed the significant decrease in the blood glucose level. Serum biomarker SGPT, SGOT were decreased significantly in the Glibenclamide treated, and citrus maxima extract treated animals.

Anti-tumour activity Citrus maxima leaves are tested for anti tumour activity in Ehrlich's Ascites carcinoma cell (EAC)-treated mice. EAC cells were obtained from Chittaranjan National Cancer Institute (CNCI), Kolkata, India and was transplanted into the Swiss Albino mice and maintained *in vivo*. Intraperitoneal administration Methanolic extract of Citrus maxima showed to increase the life span, nonviable tumour cell count and a decrease in the tumour volume. Hematological parameters were towards a normal level.

Hepatoprotective activity Leaves of Pomelo or *Citrus maxima* were studied for hepatotoxicity in rats against paracetamol induced hepatotoxicity. Successive extraction was done, and the methanolic extract was evaporated to get the crude extract. Paracetamol was used for liver damage in rats. Standard drug silymarin was compared with the methanolic extract of *Citrus maxima* leaves. The effect of the methanolic extract of *Citrus maxima* had a significant effect on thiobarbituric acid reactive substances. Reduced levels of the glutathione and catalase activity were restored to normal levels using a methanolic extract of *Citrus maxima* leaves. The histopathological studies have also shown that the hepatocellular vacuolization and focal hepatic necrosis in paracetamol control animals is significantly reduced in the MECM 400 mg/kg treated animals, and silymarin treated animals. CCl₄ induced hepatotoxicity model were used, and citrus maxima peels were found to possess the protective action against hepatic damage induced by CCl₄. Anti-oxidant compound like caffeic acid and epicatechin are found to be responsible for the effectiveness of Citrus maxima peel powder against liver disorder.

Anti-bacterial activity Anti-bacterial activity of Pummelo against *Escherichia coli* and *Salmonella typhimurium* were tested. Ethanolic extract of the Pericarp, Mesocarp, Segment membrane was prepared, and zone of inhibition of the various extracts using cup cylinder method was tested in the culture of *E.coli* and *S.typhimurium*. The pericarp, mesocarp and segment membrane extracts generated a zone of inhibitions measuring 17.10, 18.00 and 17.03 mm for *S. Typhimurium*, respectively at 100% concentration. *E. coli* was noted to be inactive in all three sample extracts at 100% concentration.

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