

# A Review on citrus: Medicinal activity of *Citrus X sinensis* (orange)

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**Abstract:** *Citrus sinensis* (orange) is the citrus plant belonging to family "Rutaceae". Orange originates from south east Africa but it is consumed all over the world as an excellent source of vitamin C, a powerful natural antioxidant that build the body immune system. They are good source of bio-active compound due to rapid growth of food processing industry and the consumption processed food the demand for natural anti-microbial agent is on the rise the synthetic preservative used in food .Hence these natural ant microbial or anti-oxidant are developed from the plant orange or their part. These biologically active compound prevent cancer, kidney stone, stomach ulcer and reduction in cholesterol level and high blood which promote human health. These disease can be control through chemical treatment of fruit of orange.This study is focused on highlighting the medicinal activity and pharmacological activity of *Citrus x sinensis*.

**Keywords:** *Citrus sinensis*, bioactive compound, orange, medicinal activity.

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## INTRODUCTION:

Plant existed on the face of this earth since time immemorial and from ancient times Human being and Animals are getting benefits from them .The WORLD HEALTH ORGANIZATION [WHO] estimates that about 80% of the popular of world still depends on the herbal medicine for treatment of various disease [1].

The orange is the fruit of various citrus species in the family Rutaceae it Primarily refers to citrus x sinensis which is called sweet orange. *Citrus sinensis* orange or sweet orange distinguish it from related species such as sour orange , *C. aurantium* and mandarin orange , *C. reticulata* is a small tree it the Rutaceae [ citrus family] [2].

Orange probably originated from south east Asia and cultivated in China by 2500 BC [ Nicolosi et al, 2008]  
Today it grown almost all over the world as a source of medicinal activity [3].

Orange are an excellent source of phenolic compounds especially flavonoids, which contribute to most of their antioxidant properties. Hesperidin a citrus flavonoid that is one of the main antioxidant in orange .Citrus fruit and their by products are of high economic and medicinal value because of their multiple use such as in the food industry, cosmetics and folk medicine [4].

The antioxidant property of the plant material is due to the presence of many active phytochemicals including vitamins, flavanoids , terpenoids , carotenoids , saponin plant and sterol etc.[5].

Citrus flavonoids, especially Hesperidin have a wide range of therapeutic properties including anti-inflammatory and anti-hypertensive, diuretic, analgesic and hypolipidemic activities [8] . The concentration of antioxidant component vary among the different parts of the orange. Epidemiological studies on dietary citrus flavonoids reduce the risk of coronary heart disease [5].

Sweet orange citrus x sinensis is belonging to family Rutaceae is grown across the world it is a highly preferred fruit and has a range of nutritive and disease preventing substances. There is a great demand of orange fruit and orange fruit juices in the treatment of various illness such as arthritis, heart disease, muscle aches and drug addiction it is use as anti-diabetic and also as an anti-microbial the medicinal potency of citrus sinensis is due to its high content of vitamin C which is believed to stimulate the production of white blood cells primarily neutrophils which attack the foreign antigens such as bacteria and viruses [6].

## ● SCIENTIFIC CLASSIFICATION:

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Subclass: Rosidae

Order: Sapindales

Family: Rutaceae

Genus: Citrus[7].

- **Preferred Common Name**

Navel orange[8].

- **Other Scientific Names**

Citrus aurantium sinensis  
Citrus aurantium var. sinensis L  
Citrus ma cracantha Hassk.[9].

- **International Common Name**

English: orange, sweet orange , Valencia orange  
Spanish: naranja , naranjo dulce  
French: oranger , oranger doux , sanguine  
Portuguese: laranjeira[10].

- **Local Common Names**

Germany: Apfelsine; Orangenbaum  
Italy: Arancio dolce  
Netherlands: Sinaasappelboom  
Sweden: Apelsi[11].

- **TAXONOMIC TREE:**

Domain: Eukaryota  
Kingdom: Plantae  
Phylum: Spermatophyta  
Subphylum: Angiospermae  
Class: Dicotyledonae  
Order: Rutales  
Family: Rutaceae  
Genus: Citrus  
Species: Citrus sinensis[12].

### **BOTANICAL DESCRIPTION:**

C. Sinensis is native to Asia and is now widespread throughout the Pacific and warm areas of the world. C. sinensis is an evergreen flowering tree. The height of orange tree is generally 9-10m, with large spines on branches. Leaves are alternate, with narrowly winged petioles (3-5mm wide, 6.5-15 cm long); [7]. The shapes of blades range from elliptical, oblong to oval, bluntly toothed and they emit a strong characteristic citrus odor due to the presence of copious oil [8].

Flowers are axillary borne singly or in whorls of 6 (5cm wide) and ripen to orange to yellow [9].

The albedo or mesocarp lying beneath the flavedo consists of tubular like cells joined together to constitute the tissue mass compressed into the intracellular area. The fruit usually contains a sweet pulp and several to numerous seeds within [10]. The fruit pulp is typically formed of eleven segments of juice filled with flavor that goes from sour to sweet [11].

### **TRADITIONAL USE:**

C. Sinensis is consumed all over the world as an excellent source of vitamin C, which is a powerful natural antioxidant that builds the body immune system [12]. It has been used traditionally to treat asthma, to reduce vomiting, to purify the blood, for cough, fevers, thirst, hiccups and for indigestion. It also has been shown to be cooling, digestive and carminative (relieves wind) and has an tonic preparation [13].

### **MEDICINAL ACTIVITY:**

- **Anti-bacterial Activity**

For determination of antibacterial activity of the extracts the Agar well diffusion method was used. An exponentially growing culture was spread onto Agar for development of lawn of all strains of bacteria tested. These plates were incubated for 30 minutes inside the bio-safety cabinet [14]. The antibacterial activity of essential oil, crude extract and pure compounds of C. Sinensis has been demonstrated in several studies. Silver nanoparticles synthesized at 25 degree C and 60D Celsius using Citrus sinensis peel aqueous (25 °C 12.5 mm, 60 °C 16.0 mm), *Pseudomonas aeruginosa* (25 °C 11.7 mm, 60 °C 13.4 mm) and *Staphylococcus aureus* (25 °C 7.8 mm, 60 °C 9.2) [15]. Another study showed that silver nanoparticles synthesized by mixing silver nitrate solution with C. sinensis juice for 2 h at 37 °C displayed minimum inhibitory concentration (MIC) values of 20 µg/ml for *Bacillus*

*subtilis* and *Shigella* and 30µg/ml for *S. aureus* and *E. coli*. Antibiofilm activity of 80% to 90% was observed at 25 µg/ml [16]. Cold-pressed terpeneless (CPT) *C. sinensis* oil dissolved in ethanol or dimethylsul [DMSO] Displayed MICs for listeria monocytogenes at 0.3% and 0.25% for salmonella typhimurium at 1% v/v. Both ethanol and DMSO oil dispersion system exhibited an intermediate MICs of 0.75% v/v for lactobacillus plantarum. Above lines clearly indicate wide anti-bacterial spectrum of citrus sinensis thus justify its use as anti-bacterial agent.[14].

- **ANTIOXIDANT:**

A high quality orange is one of that mature with good color intensity uniformity distributed over the surface. The biological activity and the healthy effect of citrus flavanoids as antioxidant have been reported ( Tripoli et al, 2007) [15].

These group of pigments as found in plants and together with anthocyanin play a role in flower and food colouration. Also their antioxidant activity in several ways including the activities of metal chelation ( Bombardelli and Morzzoni, 1993) studies indicate that flavanoids are excellent radical – scavengers of the hydroxyl radical ( collard and collard 1988 Darmon et al 1990) . The total antioxidant activity of Moro *C. sinensis* crude juice was evaluated on the basis of its ability to scavenges 2,2-diphenyl-1-picrylhydrazyl (DPPH) OH AND 2,2-azino-bis ( 3 ethylbenzothiazoline-6-sulphonic acid (ABTS) Radicals and reduce iron. The orange juice showed the best activity. The antioxidant activity of the methanol and ethanol extracts of *C. Sinensis* Peel showed a significant free radical scavenging activity generated by ABTS of 55.5 % and 60.7% respectively. The current state of knowledge shows the benefits of *C. sinensis* as antioxidant therapeutic agent[15].

- **ANTIFUNGAL ACTIVITY:**

The compound 3-[4-hydroxy,3-(3-methyl-2-butenyl)-phenyl]-2-(E) propenal isolated from hexane extract of peel of orange L. Osbeck cv. Valencia or *C. paradise* MacFaden cv. Marsh showed activity against penicillium digitatum and against cladosporium cucumerinum. Another study showed that an oil combination (1:1) of *C. sinensis* L. Osbeck cv. Obtained by hydrodistillation caused 100% inhibition of the mycelia growth of *Aspergillus fumigates*, The hydrodistilled essential oil of six different varieties of *C. sinensis* showed antifungal efficacy against *p. digitatum* and *P. italicum*. Essential oil from peels obtained by cold pressing method showed activity against *Mucor hiemalis*, and *F. poliferatum* having inhibition of 36.7% and 60% using the Agar dilution technique. The worldwide incidence of fungal infection has created the need to search for new antifungal agents, and *C. sinensis* offers a variety of compounds with Antifungal activity[16].

- **HYPOCHOLESTEROLEMIC ACTIVITY:**

The *C. sinensis* orange possesses beneficial properties related with cholesterol which is a health problem. The administration of lyophilized *C. sinensis* juice at a dose of 5g/kg in aqueous vehicle in a volume of 0.5ml / 100 g body weight for 15 days on wistar rats, decreased plasma levels of cholesterol LDL [17].

- **HYPERGLYCEMIA:**

Citrus flavanoids play important role in preventing progression of hyperglycemia, partly by binding to starch increasing hepatic glycolysis and the glycogen concentration and lowering hepatic gluconeogenesis. Hesperidine and naringin both significantly lower the blood glucose level[18].

- **ANTIMICROBIAL ACTIVITY:**

One of the properties of flavanoids with their physiological action in the plants is their antifungal and antiviral activity. Antimicrobial activity of the essential oil was evaluated with disc diffusion method. Sterile nutrient agar and yeast extract-Glucose-Chloramphenicol-agar. Plates were inoculated with 100 µg bacteria and yeast broth suspension respectively. The Gram-positive Bacteria were susceptible to the extract with inhibitory concentration ranging from 0.05mg/ml to 1.65 mg/ml. The MICs recorded were: *S. aureus* 001 (1.65) *S. aureus* ATCC (0.69) *Enterococcus faecalis* 002 (0.09) . The gram negative bacteria have MIC ranging from 0.82 mg/ml. the activity against the fungus proved that the orange oil extract was potent *Candida albicans* 010 with MIC of 0.02 mg/ml[19] .

- **ANTIPARASITIC ACTIVITY:**

Parasite diseases are serious worldwide public health problems and *C. sinensis* is an alternative in the treatment and control of these diseases. Extracts of *C. sinensis* peel, displayed moderate antimalarial activity against chloroquine (CQ) Sensitive strain of *Plasmodium falciparum*. In this study, various standard drugs were used: artemisini (3D7) strain IC50 0.0045 UG/ML) and methanol. *C. sinensis* peel, displayed moderate showed antimalarial activity against *p. falciparum* FCK 2 strain having IC50 value respectively. *C. sinensis* essential oil showed that a dose of 0.4g/ml caused death of *Trypanosoma evansi* in 3 min, and death of *Trypanosoma brucei* in 5 min[20].

- **ACTIVITY IN CARDIOVASCULAR SYSTEM:**

Citrus are rich source of dietary flavanoids which reduce the risk of adverse cardiovascular events. The drinking of orange juice decreased diastolic and systolic blood pressure in 5.13% and respectively in healthy volunteers using 500ml/day of orange juice twice a day during 4 weeks. The water – ethanol and acetone leaf extracts of *C. sinensis* showed inotropic depression on the atria of guinea pig of both sexes. Cardiovascular medications are indicated for or used to treat many different disorder[20].

### • ANTIOSTEOPROTIC ACTIVITY:

Problems related with osteoporosis, characterized by a loss of bone mass, are a major health problems that affect persons of advanced age.

Citrus showed a potential protective activity against osteoporosis administration of ethanol extracts of leaves and peel of *C. sinensis* on ovariectomized rats, increased trabecular bone mineral density of tibia as well as improved the levels of phosphorus and calcium reducing the bone loss. The effect of pulp of orange on bone with rats improved some characteristics of bone structure. The activity of *C. sinensis* showed that it could be beneficial safe and effective in management of osteoporosis[20].

### CONCLUSION:

Natural products have been and will be important sources of new pharmaceutical drug. And compounds

There has been renewed interest in natural product research due to the failure of alternative drug discovery methods to deliver many lead compounds in key therapeutic areas. *C. sinensis* has excellent benefits and safe for treating or helping in a various kind of disease like antioxidant antibacterial and in cardiovascular system, due to its bioactive compound that show important activities or for developing new products .So this review represent an excellent source of information about this natural product.

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