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 antimicrobial 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, flavonoids, 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 hypolipidimic 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 mai cracantha Hassk.[9].

- **International Common Name**
  English: orange, sweet orange , Valencia orange
  Spanish: naranja , naranjo dulce
  French: orangier , orangier doux , sanguine
  Portuguese: laranjeira[10].

- **Local Common Names**
  Germany: Apfelsine; Orangenbaum
  Italy: Arancio dolce
  Netherlands: Sinaasappelboom

- **TAXONOMIC TREE:**
  Domain: Eukaryota
  Kingdom: Plantae
  Phylum: Spermetophyta
  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 petiols (3-5mm wide, 6.5-15 cm long);[7]. The shapes of blades ranges from elliptical, oblong to oval, bluntly toothed and they emit a strong characteristic citrus order due to the presence of copious oil[8]. Flower are axillary borne singly or in a whorls of 6 (5cm wide) and ripens to orange to yellow[9]. The albedo or mesocarp lying beneath the flavedo consist of tubular like cells joined together to constitute the tissue mass compressed into the intracellular area. The fruit usually contain 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, hiccoughs 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 strain of bacteria tested this 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 nano particles synthesized at 25 degree C. and 60D Celsius using Citrus sinensis peel aqueo 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
subtis 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 dimethylsulfoxide (DMSO) Displayed MICs for listeria monocytogenes and 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 Morazzoni, 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 scavenge 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 flavus. 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.sinesis 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 meu bacteria and yeast broth suspension respectively. The Gram-positive Bacteria were susceptible to the extract with inhibition 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 therapeutic agent. 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 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.

**REFERENCES:**


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