A Comprehensive Review on Phytochemical Constituents, Medicinal Applications, and Economic Significance of Orange Peels

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Abstract:

The current review included Citrus sinensis synonyms from India and other countries, information on the plant's origins, taxonomy, phytoconstituents, pharmacological profile, nutritional value, commercial production and applications, sweet orange nutrient composition, and the plant's significance in the global market. A little, evergreen tree reaching 7.5 m in height, and sometimes up to 15 m, is the sweet orange. Ruby is a member of the Rutaceae family. Rutaceae plants are classified as shrubs, trees, and herbs with glandular punctate leaves that are sometimes intensely scented. The family has around 1,500 species and 150 genera. Their frequent presence of spines and winged petioles serves as another distinguishing feature. Citrus is the genus and sinensis is the species of orange. Oranges most likely originated in South East Asia and were first grown in China about 2500 BC. Oranges' high vitamin and mineral content has been scientifically shown to provide several health advantages. Furthermore, it is recognised that other physiologically active, non-nutritional components present in citrus fruits, such as soluble and insoluble dietary fibres and phytochemical antioxidants, may help lower the risk of cancer and a number of chronic illnesses, including obesity, arthritis, and coronary heart disease. Over the last several years, industrial wastes have received more attention, particularly those that include leftover phenols from the utilised plant raw material. One of the major dietary sources of the antioxidant phenolic is orange peels. The orange fruit has 1.5% essential oil in it. There are the following ingredients: 90% D-limonene; citral; sinesal; n-nonanal; n-decanal; n-dodecanal; geranyl acetate; anthranil acid; citronellal; linalyl acetate; methyl ester. Arthritis, asthma, Alzheimer's disease, Parkinson's disease, macular degeneration, diabetes mellitus, gallstones, multiple sclerosis, cholera, gingivitis, cataracts, ulcerative colitis, and Crohn's disease may all be effectively treated with citrus sinensis. One orange provides 12.5% of the daily required amount of fibre. One of the most important fruit harvests in the world, oranges (Citrus sinensis) are widely available and a staple of diets worldwide. Brazil is the world's top producer of orange juice, followed by the United States, Spain, China, and India. 49.6 million metric tonnes of citrus sinensis were produced worldwide in 2016–2017.

Keywords: Fibre, Nutritional Value, Orange, Phenolic, Phytochemical, Production, Antioxidant, Citrus Sinensis.

INTRODUCTION:

A plant is a kind of living organism that may grow in the ground, in water, or on other plants. It typically consists of a stem, leaves, roots, flowers, and seeds. Plants started and developed between

480 and 360 million years ago, in the midst of the Paleozoic epoch (Kenrick P. and Crane P. R., 1997). Oranges are thought to have originated in South East Asia and were first grown in China about 2500 BC (Nicolosi et al., 2008). In China, they were known as Chinese apples (Ehler, 2011). Although the origin of most citrus varieties may not be known, the old cousin of citrus is native to China, Southeast Asia, Australia, New Caledonia, and the Malay

Archipelago (Atta et al., 2012). Although the genetic origin's clearance is unknown, it's thought to have resulted from some ancient Citrus species' interspecific hybridization (Xu et al., 2013). Today, it is cultivated all over the globe because to its high A values, vitamin content, and other purposes. With almost 108 million tonnes produced (according to FAO figures from 2006), citrus is the second-most popular fruit crop worldwide, behind bananas. Oranges are a fruit crop with significant economic value (Etebu, et al., 2014).

Growing to be a tree, it has white blossoms. It takes around six years for fruit to germinate from a seed (Valentina P., 2016–17). Important micronutrients, such as vitamins C and E, carotenoids, and flavonoids, are found in the human diet and are necessary for maintaining good health. Almost every plant material contains these chemicals from diverse dietary sources (Di Majo et al., (2005)). Citrus fruits have long been prized for their healthful, nutrient-dense, and antioxidant qualities, and they are the primary source of significant phytochemical nutrients (Etebu, et al., 2014). Oranges' high vitamin and mineral content has been scientifically shown to provide several health advantages. Furthermore, it is recognised that other physiologically active, non-nutrient compounds present in citrus fruits, such as soluble and insoluble dietary fibres and phytochemical antioxidants, may help lower the risk of cancer and a number of chronic illnesses, including obesity, arthritis, and coronary heart disease (Crowell, 1999).

Through apoptosis, selective cytotoxicity, and anti-proliferative effects, citrus flavonoids may prevent cancer (Elangovan et al., 1994; Hirano et al., 1994). Because flavonoids are anti-mutagenic and can absorb UV radiation, they shield DNA from oxidative damage (Stapleton and Walbot, 1994). Citrus flavonoids have been shown to prevent the growth of rat malignant cells and their ability to form tumours in the heart and liver tissue of syngenetic rats (Bracke et al., 1989). Additionally, flavonoids may shield DNA by directly interacting with tumor-inducing chemicals, such as in the case of bleomycin-induced chromosomal damage (Heo et al., 1994).

Iron, chlorine, manganese, zinc, salt, phosphorus, iodine, calcium, folic acid, potassium, beta-carotene, amino acids, pectin, and fibre are other nutrients that oranges are high in. About 170 phytonutrients and more than 60 flavonoids with antioxidant, anti-inflammatory, anti-tumor, and blood clot-inhibiting qualities may be found in a single orange. Every one of these attributes contributes to general health (Cha et al., 2001). Citrus sinensis L., or sweet oranges, are very beneficial to human health. They are used to treat high blood pressure, arteriosclerosis, stomach ulcers, kidney stones, cancer prevention, cholesterol reduction, and immune system strengthening. Vitamins, particularly vitamin C, and phytochemical compounds such as synephrine, liminoids, hesperidin flavonoids, polyphenols, pectin, etc. are responsible for these health advantages (Etebu E. and Nwauzoma A. B., 2014). Orange helps to maintain your skin radiant and youthful-looking while shielding it from harm (Tsuda et al, 2004). Although citrus fruits are mostly utilised in industry, the peels are often thrown

away. Appropriate procedures must be used in order to use orange peel and pulp for the conversion into value-added products.

Reducing environmental pollution is another option (Arora M., & Kaur P., 2013). The last several years have seen a rise in interest in industrial wastes, particularly those that include leftover phenols from previously utilised plant raw materials. One of the major dietary sources of the antioxidant phenolic is orange peels (Hegazy A. E. and Ibrahium M. I., 2012).

Orange peel is the byproduct obtained from processing fruit. Research indicates that they are an excellent source of bioactive substances. An enormous quantity of garbage from orange byproducts, such peels, is produced annually. India produces 25 lakh oranges annually. Punjab, Madhya Pradesh, Andhra Pradesh, Maharashtra, Rajasthan, Assam, and Karnataka are India's major orange-producing states. The peels from oranges are full with nutrients. It is packed with phytochemicals. They are helpful because of this. They may be found in a variety of foods and medications. Determining the use for these peels is crucial. Orange peels gather in large quantities during the manufacture of orange juice and other orange goods, which will have an adverse effect on the environment. Utilising fruit byproducts is hence beneficial. Orange peels include flavonoids, terpanoids, tannins, and saponins (Gotmare S. and Gade J., 2018).

Without a doubt, oranges (Citrus sinensis) are the most popular fruit in the world, yet many people don't realise how beneficial the orange peel is. In the past, orange peels were highly valued and their essential oils could be used in many medications and therapies. Even now, citrus sinensis peels are often consumed as part of a Mediterranean diet. Although oranges are thought to be a fruit rich in health benefits, there are still some unanswered questions about orange peels. It is important to acknowledge that orange peels provide around three to four times the amount of fibre and flavonoids as the genuine fruit. They support a strong heart. Orange peels contain a flavonoid known as hesperidin, which has anti-inflammatory qualities. A recent analysis found that since citrus sinensis peels contain folate, eating a diet high in citrus fruits, such oranges, protects against cardiovascular damage. It is required to reduce the degree of cardiovascular risk factor. Orange peels contain properties that prevent cancer. Orange peel flavonoids have the ability to inhibit the RLIP76 protein. Obesity and cancer are associated to the RLIP76 protein.

Orange peel has anti-inflammatory and anti-allergic properties. Citrus sinensis peels are a highly antiallergic meal because they contain components that inhibit histamines, which are the molecules that trigger allergic responses. They are in favour of natural weight loss. Orange peels and extract may provide additional advantages to diabetics and others who are interested in losing weight. This is because citrus sinensis peels naturally contain pectin, a natural fibre that lowers the spike in blood sugar that occurs after meals.

Kidney stones are made possible by them. Kidney stones may be dissolved by the biochemical D-limonene found in orange peels. Using orange peel extract and milk on the skin helps to lighten black spots. You may also use it as a skin toner. They enhanced metabolism and digestion. Orange peel, according to Ayurveda, speeds up metabolism and aids in better digestion. Orange peels may be chewed or rubbed inside teeth to whiten and soothe discomfort. They can also be used as a mouth freshener. Citrus sinensis contains a molecule called D-limonene, which peels stomach acid and

promotes regular peristalsis.

CLASSIFICATION OF CITRUS SINENSIS

Domain: Eukarya
Family: Rutaceae
Division: Magnoliophyta
Class: Magnoliopsida
Subclass: Rosidae
Order: Sapindales
Genus: Citrus
Species: sinensis
Genetic group: Citrus Fruit
Kingdom: Plantae
Subkingdom: Tracheobiontas
Scientific name: Citrus sinensis L Osbeck
Local name: Sweet orange

PLANT DESCRIPTION:

Citrus sinensis belongs to the family Rutaceae. The Rutaceae family comprises around 150 genera and 1,500 species of herbs, shrubs, and trees with glandular punctate, typically highly scented foliage. These are further distinguished by the frequent appearance of spines and winged petioles (Valentina Perea, 2016–17). To differentiate it from closely related species such as sour orange, C. aurantium, C. reticulata, and mandarin orange, sweet orange (Citrus sinensis L. Osbeck) is a tiny evergreen tree that grows to a height of 7.5 m, and in certain circumstances, up to 15 m (Etebu, et al., 2014).

Figure 1: Citrus sinenis

GEOGRAPHICAL DISTRIBUTION:

Fossil Record:

Citrus was referred to by Carl Linneaus in 1753 as the genera of the orange species. Chloroplast DNA tests showed that the sweet orange's chloroplast genome originated in the pummelo. Orange's mother parent is a plummelo. Mandari is the closest paternal father (Valentina Perea, 2016–17).

Source:

The Pomelo and Mandarin come together to generate two distinct varieties of Citrus in 314 B.C. Two types of oranges: bitter and sweet. Both of them originated in southern Asia 7,000 years ago, travelled across the Silk Road to reach west Asia, and eventually arrived in Europe. Their primary goal in the fifteenth century was to assist with medical needs there. By the sixteenth century, Spanish explorers had made them well-known, and they had transported them to the "New World" (America), where missionaries planted a large number of orange trees in Florida and later in California, which is today famous for its orange plantations. Before the 20th century, citrus sinensis was already a prominent and well-liked plant. They were then only observed on significant occasions, such as Christmas Eve's Thanksgiving. Oranges are really popular right now, everywhere in the globe. Their immense popularity stems not from their nutritional value, but rather from their abundance of vitamins that support human immunity (Valentina Perea, 2016–17).

Current Distribution:

The primary orange-producing areas are in the United States (led by Argentina, Brazil, and Mexico), South and East Asia (headed by China, India, and Japan), and the Mediterranean Basin (led by Spain, Italy, Turkey, and Egypt) (Milind P. and Dev C., 2012). Approximately 98.7 million tonnes of fresh fruit are produced worldwide each year, with oranges accounting for 62% of the total (FAOSTAT, 2001; Valentina Perea, 2016–17).

Taxonomy description:

Leaves

Citrus sinensis, or orange, yields leathery, evergreen leaves in a variety of forms, including elliptical

6.5–15 cm long and 2.5–9.5 cm broad, with oblong to oval shapes and often having slender wings on the petioles.

Flower

Beautiful white flower with five petals and twenty to twenty-five yellow stamens, either alone or in whorls of six. Its diameter is around 5 cm. The little, greenish-white flowers are present. Waxy flowers are.

Seeds

The colour of seeds ranges from green to light white. They are sharp and flattened. The embryos are either zygotic or nuclear, and the seeds are often polyembryonic. Zygotic embryos are produced by

ovarian pollination, whereas nuclear embryos are entirely derived from the mother plant and mostly resemble their parent plant in appearance.

Fruit

The fruit might be round or globose. Fruit ripens to an orange-yellow colour and is 6.5–9.5 cm broad. The fruit is divided anatomically into the pericarp and endocarp. The endocarp is sometimes referred to as pulp or juice sacs, whereas the pericarp is also known as the peel, skin, or rind. The skin has an epidermis of epicuticular wax that is covered in many tiny fragrant oil glands. The specific scent comes from this oil gland. The variety, growth rate, and environmental conditions all affect wax quality. The overflavedo, or epicarp, which is mostly composed of parenchymatous cells and cuticle, makes up the pericarp. Terpenoid aromatic compounds like valencene and alpha/beta sinsenal are produced by embedded oil glands. The flavedo, which lies under the epidermis, has an orange, yellow, or green colour. According to Webber (1989), the flavedo is a usually colourless, spongy inner layer of mesophyll that varies in thickness and character throughout fruit development. These characteristics affect how easy the fruit is to peel. The flavedo is very delicate and thin, with oliverous vesicles within that may be gathered by scarring the flavedo layer. The tissue mass crushed into the intercellular space is made up of tubular-like cells that are linked together to form the albedo, or mesocarp, which is located underneath the flavedo. Flavonoids, which are abundant in the albedo, give the juice a bitter flavour when added. Usually, the pulp is juicy and delicious. The pulp or meat is separated from ten to fourteen sections. The fully developed fruit is categorised as a hesperidium, a kind of fleshy berry with many seeds. Vibrant juice sacs hold onto a lot of water, organic acids, and carbohydrates. It is making it more difficult to extract proteins and nucleic acids (Etebu et al., 2014; Milind P. and Dev C., 2012).

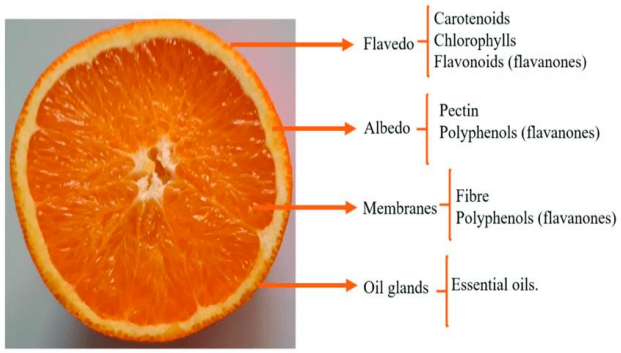

Figure 2: Structure of Citrus sinensis fruit

POLLINATION:

Citrus sinensis produces sticky, heavy pollen that is not carried by the wind. Cross-pollination requires the presence of honeybees. In general, honeybees are crucial insect pollinators for Citrus sinensis cross-pollination (Valentina Perea, 2016–17). Self-pollination is aided by citrus blossoms that have both saxes present on the same blossom.

Cross-pollination is only utilised in tangerine hybrids and only by certain cultivars. The morning is the best time of day for pollination. The amount of honeybee visits determines when fructification starts in delicious orange blossoms. Honeybee pollination affects both the quality and amount of fruit produced. Honeybee-visited flowers will produce fruit that is heavier, less acidic, and has fewer seeds per bud (Milind P. and Dev C., 2012).

Table 1: Phytoconstituents present in various plant part

Sr.	PHYTOCONSTITUENTS	PLANT PART
1	**Flavone glycosides**	Fruit peel
	Neohesperidin, Naringin, Hesperidin, Narirutin	
	Triterpene	
	Limonene, Citrol	
	Pigment	
	Anthocyacin, Beta-cryptoxanthin, Cryptoxanthin,	
	Zeaxanthin and Rutin, Eriocitrin, Homocysteine	
	Polymethoxylted flavones	
	Tangeritin and Nobiletin	
	Flavonoids	
	Citacridone, Citabrsine and Noradrenaline	
2	**Terpenoids**	Leaves
	Linalool, β elemene	
3	**Triterpenes**	Flowers
	Limonene	
4	**Vitamins**	Fruits
	B1, B2, B3, B5, B6, and Vitamin C	
	Minerals	
	Calcium, Iron, Magnesium, Zinc, Phosphorus,	
	Potassium	

PHARMACOLOGICAL PROFILE:

It has anti-carcinogenic qualities. Oranges contain limonene, which lowers the risk of skin, oral, lung, breast, and colon cancer. It provides defence against heart-related conditions. Orange fruit contains heart-healthy ingredients such as flavonoids, carotenoids, and vitamin C. Oranges possess strong antioxidant qualities. Oranges are rich in flavonoids, pectin, vitamin C, and phenolic substances. It is an excellent resource for preventing ear infections, colds, and coughs.

Research that was published in the British Journal of Nutrition indicated that women who drank half a litre of orange juice a day had higher urine pH values and greater excretion of citric acid, which dramatically reduced the incidence of calcium oxalate stones. They reduced the possibility of kidney stones. A serious public health concern is typhoid fever, especially in underdeveloped nations. Citacridone, citbrasine, and the saponins found in orange fruit are flavonoids that have anti-typhoid properties. It has anti-typhoid properties. Oranges are consumed to curb fever. The roasted pulp is used into a poultice to treat skin conditions. The skin is scraped with the fresh peel to cure acne. An antispasmodic made from a decoction of dried flowers and leaves is used in France and Italy. Urinary tract disorders are treated in China using a decoction made from husked orange seeds. It possesses antimicrobial action as a result. Frequent orange juice drinking decreased the risk of Helicobacter pylori (H. pylori) infection, hence halting the development of ulcers. It has anti-ulcer qualities. Aromatherapists utilise Citrus sinensis oil as a sedative. Sweet orange oil has been shown by some researches to be an anxiolytic. It has an antidiabetic effect. Because saponins are present, it has larvicidal effect. Citrus fruit peels contain bioflavonoids, such as narangin and hesperidin, which have anti-diabetic properties. Citrus sinensis contains significant amounts of myrcene (4.1%), limonene (84.2%), and linalool (4.4%), which are all antifungals.

Orange essential oil is a potent inhibitor of fungi that include biodegradation and storage. It possesses antifungal properties as a result. Citrus sinensis contains polymethoxyflavones, which provide it anti-inflammatory properties. Citrus sinensis's extensive range of phytonutrients, including flavones, hydroxycinnamic acids, anthocyacin, and other polyphenols, are what give it its therapeutic properties. The most significant flavone found in oranges is hesperidine, which has been shown in animal experiments to lower cholesterol and high blood pressure. The majority of these phytonutrients are located in the peel and inner white pulp, not in the liquid orange centre. When oranges are processed to make juice, this beneficial substance is much too often eliminated. Zeaxanthin and betacryptoxanthin are phytonutrients that significantly lower the risk of rheumatoid arthritis since they include carotenoids. High zeaxanthin and cryptoxanthin consumption was associated with a 52% lower risk of rheumatoid arthritis. As such, it offers anti-arthritic and therapeutic properties (Milind P. and Dev C., 2012).

COMMERCIAL PRODUCTION AND USES OF CITRUS SINENSIS:

Food uses:

Owing to their cool taste, oranges have gained popularity in hotter climates.

Fruit: Sliced, dried, and ground Citrus sinensis, for instance, may be used as a flavouring powder in baked products.

Skin: Peels are used to make soap and scent. Oranges are most known for their fragrance. Orange peels are utilised and have found widespread usage in skin care products to tone, cleanse, and detoxify the skin.

Juice: Oranges are often used as garnishes on cakes, meat and poultry dishes, salads, gelatins, and many other delicacies prepared at home. Pulp is used in the preparation of fresh juice. Protein is abundant in juice. Dehydrated orange juice was created in 1963 and is now marketed for use in food production, where it is used to enhance the flavour, colour, and nutritional value of baked goods among many other items. The juice from sweet orange leaves is also often used to treat wounds and

ulcers. The juice that is taken from the leaves has therapeutic properties.

Applications in medicine:

Citrus sinensis is used in the treatment of a number of conditions, including arthritis, asthma, diabetes mellitus, macular degeneration, multiple sclerosis, cholera, gingivitis, cataracts, ulcerative colitis, and Crohn's disease.

Nutrients: Orange fruit is high in dietary fibre and pectin but low in calories, saturated fats, and cholesterol. Due to its bilk laxative properties, pectin aids in the protection of the colon's mucosa.

Orange juice in particular has a very high content of vitamin C (48.5 mg/100 g, or 81% of DRI), which supports the immune system and provides antioxidant protection by assisting the body in creating resistant pathogenic agents that emerge from the blood. Compounds included in orange peel have the ability to reduce cholesterol and cleanse the inside of the human body. Orange fruit is also a good source of some nutrients including calcium and potassium. Potassium, which counteracts the pressing action of sodium, is an essential component of cell and body fluids that helps manage heart rate and blood pressure.

Skin: The skin of the Citrus sinensis plant is used to stimulate appetite, lessen phlegm, and cure intestinal gas, acid reflux, colds, coughs, and malignant breast sores.

Juice/Nectar: An orange may provide around 7% of the body's daily potassium requirements.

Citrus sinensis juice works best for clearing congestion and phlegm from the nasal and chest passageways. Vitamin C aids in the prevention of rheumatoid arthritis, osteoarthritis, and asthma. Oranges contain limonoids, which have been shown to help prevent certain cancers, including those of the skin, lungs, breast, stomach, and colon.

Customary applications: -

In Japanese culture, citrus blooms are associated with virginity. Arab ladies use it to dye their grey hair.

In other regions, cosmetics were made from orange pulp and blossoms. Orange juice is highly beneficial in situations of stress and anxiety disorders. Orange juice helps you stay hydrated. It functions as a general tonic. It is a traditional Mexican medication used to cure TB. In France, it is used to treat hypertension, angina, constipation, and menstrual disorders. It is used to avoid constipation. The common orange has long been used in Chinese medicine as a cooling remedy for respiratory conditions including colds and coughs. In China, it is regarded as a traditional lucky charm.

Enchantment/Secular importance:

Citrus sinensis is reported to have a high-energy aroma that conveys to people the happiness of angels.

Citrus sinensis is fantastic for representing the sun in a variety of forms, such as potpourri, tea, sachets, and charms.

Citrus sinensis peels uplift the lowly, much as the Sun does, aid the bewildered in finding their way, and revitalise spiritual aspirations.

(Valentina Perea, Milind P., Dev C., and 2016–17) (2012)

Nutritive value:

One orange supplies 12.5% of the recommended daily intake of fibre. It has been shown to lower elevated cholesterol levels, assisting in the prevention of atherosclerosis. Fibres also have a role in controlling blood sugar levels. That might help to explain why oranges can be a highly healthful snack for diabetics. The natural fruit sugar found in oranges, fructose, may help keep blood sugar levels from climbing too high after eating. Orange fibres shield colon cells from toxins that cause cancer. Citrus sinensis may help relieve constipation or diarrhoea in irritable bowel syndrome sufferers (Milind P. and Dev C., 2012).

NUTRIENT COMPOSITION OF SWEET ORANGE:

Table 2: Nutrient composition of sweet orange

Composition	Amount
Energy	197 kJ (47 kcal)
Sugars	9.35 g
Dietary fiber	2.4 g
Fat	0.12 g
Protein	0.94 g
Water	86.75 g
Vitamin A equiv.	11 µg (1%)
Thiamine (Vitamin B1)	0.087 mg (8%)
Riboflavin (Vitamin B2)	0.04 mg (3%)
Niacin (Vitamin B3)	0.282 mg (2%)
Pentothenic acid (Vitamin B5)	0.25 mg (5%)
Vitamin B6	0.06 mg (%)
Folate (Vitamin B9)	30 µg (8%)
Choline	8.4 mg (2%)
Vitamin C	53.2 mg (64%)
Vitamin E	0.18 mg (1%)
Calcium	40 mg (4%)
Iron	0.1 mg (1%)
Magnesium	10 mg (3%)
Manganese	0.025 mg (1%)
Phosphorus	14 mg (2%)
Potassium	181 mg (4%)
Zinc	0.07 mg (1%)

VALUE OF CITRUS SINENSIS COMMERCIALLY:

Exporting and importing of the product:

These are the top 15 nations in terms of orange export value in US dollars in 2015.

Table 3: 15 major countries that exported highest dollar value of oranges in 2015

Sr.no.	Country	Cost
1	Spain	US$1.3 billion
2	South Africa	$589.6 million
3	United States	$568.6 million
4	Egypt	$492.7 million
5	Netherlands	$198.4 million
6	Turkey	$167.3 million
7	Australia	$143.6 million
8	Greece	$120.8 million
9	Italy	$99.6 million
10	Portugal	$94.6 million
11	Morocco	$86.4 million
12	China	$82 million
13	Hong Kong	$66.9 million
14	Chile	$62.3 million
15	Israel	$47.7 million

IMPORTANCE IN THE ECONOMY:

One of the most important fruit harvests in the world, oranges (Citrus sinensis) are widely available and a staple of diets worldwide. Orange juice was created by Albert Lasker to address the overproduction of oranges. Years later, other individuals created orange juice as a commercial commodity and began to market it. Brazil is the world's top producer of orange juice, followed by the United States, Spain, China, and India. 49.6 million metric tonnes of citrus sinensis were produced worldwide in 2016–2017 (USDA, 2017).

CONCLUSION:

Review results indicate that oranges are also high in calcium, folic acid, potassium, beta-carotene, amino acids, pectin, iron, chlorine, manganese, zinc, salt, phosphorus, and iodine. An orange contains more than 60 flavonoids with anti-tumor, anti-inflammatory, blood clot-inhibiting, and antioxidant qualities, and over 170 phytonutrients. These qualities all support general health. One orange

provides 12.5% of the daily required amount of fibre. Arthritis, asthma, Alzheimer's disease, Parkinson's disease, macular degeneration, diabetes mellitus, gallstones, multiple sclerosis, cholera, gingivitis, optional lung function, cataracts, ulcerative colitis, and Crohn's disease may all be effectively treated with citrus sinensis. Vitamins, particularly vitamin C, and phytochemical compounds such as synephrine, liminoids, hesperidin flavonoids, polyphenols, pectin, etc. are responsible for these health advantages. It is now cultivated all over the globe because to its high a values, vitamin content, and other purposes. With almost 108 million tonnes produced globally (according to FAO figures from 2006), citrus is the second-most popular fruit crop worldwide, behind bananas. Oranges are a fruit crop with significant economic value.

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REFERENCES:

1. Arora, M., & Kaur, P. (2013). Phytochemical screening of orange peel and pulp. International Journal of Research in Engineering and Technology, 2(12), 517-520.
2. Atta, S., ZHOU, C. Y., Yan, Z. H. O. U., CAO, M. J., & WANG, X. F. (2012). Distribution and research advances of Citrus tristeza virus. Journal of Integrative Agriculture, 11(3), 346-358.
3. Bracke, M. E., Vyncke, B. M., Van Larebeke, N. A., Bruyneel, E. A., De Bruyne, G. K., De Pestel, G. H., ... & Mareel, M. M. (1989). The flavonoid tangeretin inhibits invasion of MO 4 mouse cells into embryonic chick heartin vitro. Clinical & experimental metastasis, 7(3), 283-300.
4. Cha, J. Y., Cho, Y. S., Kim, I., Anno, T., Rahman, S. M., & Yanagita, T. (2001). Effect of hesperetin, a citrus flavonoid, on the liver triacylglycerol content and phosphatidate phosphohydrolase activity in orotic acid-fed rats. Plant Foods for Human Nutrition, 56(4), 349-358.
5. Crowell, P. L. (1999). Prevention and therapy of cancer by dietary monoterpenes. The Journal of nutrition, 129(3), 775S-778S.
6. Di Majo, D., Giammanco, M., La Guardia, M., Tripoli, E., Giammanco, S., Finotti, E., (2005). Flavanones in Citrus fruit: Structure antioxidant activity relationships, Food Research International, 38, 1161–1166.
7. Ehler, S. A. (2011). Citrus and its benefits. Journal of Botany, 5, 201-207.
8. Elangovan, V., Sekar, N., & Govindasamy, S. (1994). Chemopreventive potential of dietary bioflavonoids against 20-methylcholanthrene-induced tumorigenesis. Cancer letters, 87(1), 107-113
9. Etebu, E., & Nwauzoma, A. B. (2014). A review on sweet orange (Citrus sinensis L Osbeck): health, diseases and management. American Journal of Research Communication, 2(2), 33-70.
10. Hegazy, A. E., & Ibrahium, M. I. (2012). Antioxidant activities of orange peel extracts. World applied sciences journal, 18(5), 684-688.

11. Heo, M. Y., Lee, S. J., Kwon, C. H., Kim, S. W., Sohn, D. H., & Au, W. W. (1994). Anticlastogenic effects of galangin against bleomycin-induced chromosomal aberrations in mouse spleen lymphocytes. Mutation Research/Fundamental and Molecular Mechanisms of Mutagenesis, 311(2), 225-229.
12. Kenrick, P., & Crane, P. R. (1997). The origin and early evolution of plants on land. Nature, 389(6646), 33-39.
13. Milind, P., & Dev, C. (2012). Orange: range of benefits. Int Res J Pharm, 3(7), 59-63.
14. Nicolosi, E., Deng, Z. N., Gentile, A., La Malfa, S., Continella, G., & Tribulato, E. (2000). Citrus phylogeny and genetic origin of important species as investigated by molecular markers. Theoretical and Applied Genetics, 100(8), 1155-1166.
15. Perea, V., (2016-17). Citrus sinensis monograph. Agricultural science 2016-17.
16. Stapleton, A. E., & Walbot, V. (1994). Flavonoids can protect maize DNA from the induction of ultraviolet radiation damage. Plant physiology, 105(3), 881-889.
17. Tsuda, H., Ohshima, Y., Nomoto, H., Fujita, K. I., Matsuda, E., Iigo, M., ... & Moore, M. A. (2004). Cancer prevention by natural compounds. Drug metabolism and pharmacokinetics, 19(4), 245-263.
18. Webber, H. J., Walter, R., Harry, W. L., & Hodgson, W. (1989). The citrus industry, horticultural varieties of citrus. Riverside CA: University of California Division of Agricultural Sciences, 1967-1987.
19. Xu, Q., Chen, L. L., Ruan, X., Chen, D., Zhu, A., Chen, C., ... & Chen, J. (2013). The draft genome of sweet orange (Citrus sinensis). Nature genetics, 45(1), 59.