

Persimmon (*Diospyros kaki*): Apple of the Orient: A Review

Jyoti Pachisia

Consultant Dietician, Genesis Hospital, Kolkata, West Bengal, India

ABSTRACT

Fruits and vegetables are important component of human diet and play important role in maintain the human health. The health promoting potentials associated with their consumption are mainly due to presence of bioactive components and these phytochemicals are distinct bioactive molecules widely acknowledged for their beneficial roles in human physiology. Number of plants gained popularity as wholesome food entities but still many horizons demand researchers' attention. Amongst, persimmon (*Diospyros kaki*) is one of these nutritious fruits bestowed with strong antioxidant activity. The bioactive components present in it especially carotenoids and tannin are helpful in quenching free radicals, decreasing cardiovascular risk factors (blood pressure & cholesterol) and reducing the risk of diabetes mellitus along with effectiveness against cancer insurgence. These bioactive components plays an important role in reducing arterial stiffness and prevent oxidation of low-density lipoproteins (LDL) thus resulting in the prevention of atherosclerotic plaque formation. Many phytochemicals also possess anti-mutagenic effects and regulate and trigger the immune system thus resulting in the normal functioning of metabolism. The antioxidant potential of persimmon can be exploited to cure various maladies including degenerative disorders, cancer, and improving the skin tone. Persimmon is high in vitamin A and a moderate source of ascorbic acid, calcium and potassium.

Keywords: persimmon, carotenoids, antioxidants, phytochemicals, health, cancer, diet

INTRODUCTION

Diospyros kaki L commonly called as persimmon or Japanese persimmon is a deciduous plant native to China, Korea and Japan (Persimmon is traditionally used for medicinal purposes), however now it is grown in many East Asian countries and Southern Europe. The persimmon (*Diospyros kaki*), locally called Japani phal is the most important temperature deciduous tree. Ancient references to the persimmon as "food for the gods" have led to its classification in the genus *Diospyros* of the Ebony family (*Dios* means God, *pyros* means grain or food). The English word persimmon is derived from the Algonquian language of the eastern United States meaning "dry fruit". According to Food and Agriculture Organization Statistics (FAO-STAT) department of United Nations, 5.191 million tons of *Diospyros kaki* was

produced globally in 2014 with 73.27% share of China alone in 2014. In India, persimmon was introduced by European settlers around twentieth century and is grown in the states like Himachal Pradesh, Jammu and Kashmir, Uttarkhand and Tamil Nadu. The fruit in Indian markets is limited for a number of reasons mostly because of low demand and paucity of supply. The relative awareness of persimmon in India means that the country still lacks organization and technology for broad cultivation (since they are grown in orchards). The most common variety available here is "Hachiya".^{[3][11]}

Persimmons are harvested in the autumn season. Proper handling at harvesting is essential to achieve good quality persimmons and to determine marketability and profit. The recommended procedure to follow when harvesting

persimmons is to clip fruits from trees with small secateurs, and to leave the calyx and a short stem attached to fruits. It is possible to snap fruits from trees, but this requires skill and increases its susceptibility to injury and subsequent decays. Generally, two to three picks are required depending on the cultivar and seasonal conditions. October month is the right time for harvest when the fruit is soft but not completely ripe. A fully grown tree yields around 150-200kg fruit annually, but yield varies with the cultivar and the cultural practices adopted. [11]

Classification of persimmon according to astringency and pollination

An important feature of the some important persimmon cultivars is the high soluble tannin content responsible for astringency. Astringency is the sensation that results when tannins bind salivary proteins and cause them to precipitate or aggregate, which leaves a rough “sandpapery” or dry sensation in the mouth. According to the level of astringency upon harvest, persimmon cultivars can be classified into general categories: astringent and non-astringent persimmons (also called sweet persimmons). The astringency among different varieties of persimmon mainly depends on the concentration of water-soluble tannins that are present in large tannin cells in fruit flesh and peel and the level decreases as the fruit matures. Mopan (*Diospyros kaki* L.cv.Mopan) is the main cultivar of astringent persimmon produced in Northern China especially around Beijing. Hachiya is another variety of persimmon that cannot be consumed until being fully ripened because of its astringency. During the course of ripening, soluble tannins polymerize into insoluble ones resulting in reduced astringency. Non-astringent varieties include Izu, Fuyu (flat), Maekawa Jiro, and Fuyu Hana (pomelo). These are sweet in taste and must be eaten before full maturation; otherwise they become too soft to eat. In non-astringent types of persimmon, water soluble tannins completely disappear at maturity. Their

flesh is dark in colour due to higher levels of β -cryptoxanthin and total carotenoids.

In both types of varieties, astringency decreases with maturation, resulting in about 70-90% decline in the total polyphenolic components like tannins. Antioxidant activities of astringent persimmon are higher as compared to non-astringent varieties. Astringent (A) type fruits remain rich in soluble Proanthocyanidins even after they reach the full-mature stage, whereas non-astringent (NA) type fruits lose these compounds before full maturation. In both categories, there are cultivars in which fruit astringency is influenced by pollination (pollination variant) and cultivars whose fruits are not affected by pollination (pollination constant) and so they are classified accordingly. [1][8]

Nutritional profile

Persimmon is enriched with many nutritious and bioactive components including proteins, sugar, vitamin A, vitamin B6, vitamin B12, vitamin D, ascorbic acid (AA), vitamin E, polyphenols, flavonols, flavonoids and carotenoids. Some components like phenolics, antioxidants, sterols, and flavonoids have a beneficial effect on human health owing to their ability to prevent or control various ailments. These bioactive components play an important role in reducing arterial stiffness and prevent oxidation of low-density lipoproteins (LDL) thus resulting in the prevention of atherosclerotic plaque formation. Many phytochemicals also possess anti-mutagenic effects and regulate and trigger the immune system thus resulting in the normal functioning of the metabolism. They also serve as chemopreventive, anti-cancer, anti-inflammatory and immunomodulatory agents Elemental micronutrients present in persimmon fruit include potassium, sodium, iron, calcium and many others. Not just the fruit, the leaves, calyx and other parts have importance in health. [3]

Persimmon fruit contains 79% water, 0.7% pectin, 0.4% protein, and crude

fibre. It is rich in Vitamin A compared to apple (5 RAE). Vitamin C content varies depending upon the variety. Some varieties are rich as Satsuma mandarin and strawberry in their vitamin C contents. It

also contains various bioactive components, nutrients like Vitamin A, B, C, E and K as well as minerals that are valuable for the proper physiology of human health. [5][7]

Table 1: Nutritional value of persimmon fruit (*Diospyros kaki*, raw) per 100g (3.5oz) [7]

Nutrient	Units	Persimmons (Japanese, dried)	Persimmons (Japanese, raw)
Water	G	23.01	80.32
Energy	Kcal	274	70
Energy	kJ	1146	293
Protein	G	1.38	0.58
Total lipid (fat)	G	0.59	0.19
Ash	G	1.59	0.33
Carbohydrate	G	73.43	18.59
Total dietary fibre	G	14.5	3.6
Calcium, Ca	Mg	25	8
Iron, Fe	Mg	0.74	0.15
Phosphorus, P	Mg	81	17
Potassium, K	Mg	802	161
Sodium, Na	Mg	2	1
Vitamin C, total ascorbic acid	Mg	0.0	7.5
Riboflavin	Mg	0.029	0.020
Niacin	Mg	0.180	0.100
Vitamin A, RAE	mcg_RAE	38	81
Carotene, beta	Mcg	374	253
Cryptoxanthin, beta	Mcg	156	1447
Vitamin A, IU	IU	767	1627

The fruit pulp is rich in nutrients such as Vitamin C (70mg/100g), Vitamin A (65mg/100g), Calcium (9mg/100g) and iron (0.2mg/100g). In the edible part (pulp) of the persimmon, the major phenolic acids are ferulic acid, *p*-coumaric acid, and gallic acid, and the antioxidant activity of these phenolic acids is affected by their chemical structures (number of hydroxyl groups attached). Carotenoids are the major pigment present in persimmon. They contribute to both colour and nutritional value. Carotenoid contents rapidly increase as green mature fruit changes to soft mature persimmon, except for lutein and lycopene that decrease during fruit maturation. Among them β -cryptoxanthin content is the highest (50%), followed by lycopene (10%), β -carotene (10%), zeaxanthin (5%) and lutein (5%). They are all excellent source of lipid-soluble antioxidants (especially lutein, zeaxanthin and astaxanthin) having the ability to scavenge free radicals in a lipid-soluble environment and thus preventing the oxidation of lipids. [13][14]

Role of Persimmon in the treatment of different diseases:

Persimmons are delicious and exotic fruits that do more than serving as a sweet and tasty treat; they have a wealth of health benefits packed inside them, including their ability to improve eye health, reduce signs of aging, prevent various types of cancer, improve digestion, boost immune system, lower cholesterol, increases metabolism, strengthens bones, boost cognitive function, lower blood pressure, and skincare. Furthermore, they help the body to heal faster, aid in weight loss, reduce inflammation, and increase blood circulation throughout the body. [2][4]

Persimmon is a fruit potent for obesity and diabetes. Proanthocyanidin is the major component isolated from persimmon peel and has been demonstrated to play a role in obesity and diabetes. Administration of proanthocyanidin from the peel of persimmon decreases the elevation of lipid peroxidation, suppresses generation of reactive oxygen species, decreases serum glucose, glycosylated haemoglobin (HbA1c), serum urea nitrogen, urinary protein, and renal advanced glycation end-products under diabetic conditions. It also provides an overall

protective effect against stress-related inflammatory processes and diabetes. Persimmon is rendered a hypoglycaemic effect from its antioxidant effect from its antioxidant defence mechanisms. Tannins derived from persimmon pulp have hydroxyl radical scavenging antioxidant capacities. [6]

Persimmon fruits enhance the bile acid excretion through faeces. The excretion of bile acids is closely linked with reduced concentration of lipids in liver and blood. The mechanism of action remained centred around up-regulation of expression of the sterol regulatory element-binding protein-2 gene, 7 α -hydroxylase, and the low-density lipoprotein receptor. The effectiveness of dietary persimmon prevented the incidence of stroke due to radical scavenging action and inhibition of lipid peroxidation. [9,10]

Persimmon is a fruit containing high levels of phenolics that could be used for making vinegar. Administration of persimmon vinegar provides a protection to metabolic disorders induced by chronic alcoholic ingestion. Not only it decreases serum triglycerides, it also reduces total cholesterol and liver total cholesterol levels. It also provides protection against lipid peroxidation by increasing liver non-esterified carnitine level. The extract from leaf and fruit suppresses alcohol-induced hepatotoxicity. [12]

Persimmon has been the focus of attention for potential medicinal applications for prevention of cancer. Carotenoids are nature's most widespread pigments and have also received substantial attention because of both their provitamin and antioxidant roles. Carotenoids possess antioxidant properties that have been associated with cellular protection, regulation of cell growth, differentiation and apoptosis. Not only carotenoid contents responsible for the superficial appearance (colour) and nutritional quality but they also provide potential health benefits and disease prevention by quenching singlet oxygen and scavenging free radicals. Chemopreventive effects of persimmon against various forms

of cancer are due to carotenoid contents. Persimmon was shown to be effective in the treatment of prostate and breast cancers, oral carcinoma cells, human lymphoid leukemia cells and precancerous colon polyps in women. The bioactive compounds in persimmon may also affect multidrug resistant (MDR) inhibiting activity. It enhances the accumulation of cancer cells due to the reduced activity of efflux pumps. MDR inhibitors from persimmon may help to treat non-curable cancer because of the modulating effects. [14]

Persimmon contains two ingredients- Lutein and Zeaxanthin that help keep the vision in perfect condition and prevent retina damage. Persimmon also contains Vitamin A, C and K, which are highly antioxidant in nature and that are critical to eye protection, particularly from retinal damage. Persimmon leaves shows beneficial effects on eye diseases in humans. It has protective effects on retinal degeneration induced by oxidative stress and optic nerve damage. [7][13]

Diospyros kaki is used as a medicinal plant in Chinese traditional medicine especially in cosmetics and dermatological applications. Traditionally this plant is used to treat different skin conditions including pimples, skin eruptions and eczema. Extracts from *Diospyros kaki* folium decreases number of skin pores' size, removes solidified sebum from the skin and can facilitate removal of *Demodex* mites (causative microbe for rosacea and seborrheic dermatitis) from the skin. The crude extracts, its purified fractions and various phytonutrients obtained from persimmon have a great potential for both dermatological and cosmetic application. [4]

CONCLUSION

Persimmon (*Diospyros kaki* L) is one of these nutritious fruits bestowed with strong antioxidant activity. It is a popular and widespread fruit that is enriched with many bioactive compounds, including polyphenols, terpenoids, steroids, flavonoids, carotenoids, minerals and

dietary fibre. Some components like phenolics, antioxidants, sterols, and flavonoids have a beneficial effect on human health owing to their ability to prevent or control various ailments.

REFERENCES

1. Abozaid Hala, Moawad Abeer, Amin Elham, Hetta Mona, Shabana Marawan, "Phytochemical and Biological Study of *Diospyros kaki* L in Egypt", World Journal of Pharmaceutical Research, 3(2), (2014):1786-1795.
2. Arsalan Seher and Bayrakei, "Physicochemical, functional and sensory properties of yogurts containing persimmon"; Turkish Journal of Agriculture and Forestry, 40, (2016) 68-74
3. Butt Massod Sadiq, Sultan M.Tauseef, Aziz Mahwish, Naz Ambreen, Ahmed Waqas, Kumar Naresh, Imran Muhammad, "Persimmon (*Diospyros kaki*) Fruit: Hidden Phytochemicals and Health Claims", EXCLI Journal, 14, (2015): 542-561
4. Kashif Muhammad, Akhtar Naveed, Mustafa Rehan, "An overview of dermatological and cosmeceutical benefits of *Diospyros kaki* and its phytonutrients: Review"; Brazilian Journal of Pharmacognosy, 27, (2017): 650-662
5. Lee Jin Hwan, Lee Yong Bok, Seo Woo Duck, Kang Su tae, Lim Jong Woo and Cho Kye Man, "Comparative studies of Antioxidant activities and Nutritional constituents of Persimmon Juice (*Diospyros kaki* l. cv. Gapjubaekmok)", Preventive Nutrition and Food Science, 17, (2015): 141-151
6. Liu Chinfang, Kurakane Shizue, Takita Jun, Itano Ruriko, Soga Tomoyoshi, Okawa Akira and Igarashi Kiharu, "Antihypertensive effects of Unripe Persimmon (*Diospyros kaki* L. cv. Jiratanenashi) fruit and its component in spontaneously Hypertensive Rats"; food Science Technological Research, 18(3), (2012): 391-398
7. Marques Alba-Mir, Domingo Ana, Cervera Luisa M, Guardia de la Miguel, "Mineral profile of kaki fruits (*Diospyros kaki* L.)"; Food Chemistry, 172, (2015):291-297
8. Nazir Amreen, Wani S.M., Gani Aditi, Masoodi F.A, Haq E, Mir S.A., Riyaz Umaya, "Nutritional, antioxidant and anti-proliferative properties of persimmon (*Diospyros kaki*) – a minor fruit of Jammu and Kashmir, India"; International Journal of Advanced Research, 1(7), (2013):545-594
9. Parfitt Dan E, Yonemori Keizo, Honsho Chitose, Nozaka Mitsunori, Kanzaki Shinaya, Sato Akihiko, Yamada Masahiko, "Relationships among Asian persimmon cultivars, astringent and non-astringent types"; Tree Genetics & Genomes, 11 (24), (2015):1-9
10. Park Su Bin, Park Gwang Hun, Song Hun Min, Son Ho-Jun, Um Yurry, Kim Hyun-Seok, Jeong Jin Boo, "Anticancer activity of calyx of *Diospyros kaki* Thunb. through downregulation of cyclic D1 via inducing proteasomal degradation and transcriptional inhibition in human colorectal cancer cells", Complementary and Alternative Medicine, 17(445), (2017):1-10
11. Singh Brajeshwar, Srivastava J.N, Verma V.S. and Razdan V.Z., "Cultivation of Persimmon in India", Rashtriya Krishi, 6 (2), (2011): 1-2
12. Wang Fang, Li Ya, Zhang Yu-Jie, Zhou Yue, Li Hua-Bin, "Natural products for the prevention and treatment of Hangover and Alcohol Use Disorder", Molecules, 21(64), (2016):1-21
13. Yaqub Shazia, Farooq Umar, Shafi Afshan, Akram Kashif, Murtaza Mian Anjum, Kausar Tusneem, Siddique Farzana, "Chemistry and Functionality of Bioactive Compounds present in Persimmon", Journal of Chemistry, 2016 (2016), (2016):1-13
14. Yokozawa Takako, Park Chan Hum, Noh Jeong Sook and Roh Seong Soo, "Role of Oligomeric Proanthocyanidins derived from an extract of persimmon fruits in the oxidative-stress-related aging process"; Molecules,19,(2014):6707-6726

How to cite this article: Pachisia J. Persimmon (*diospyros kaki*): apple of the orient: a review. Int J Health Sci Res. 2020; 10(3):129-133.
