

Complete novel review on *Selenicereus undatus*

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Abstract

Hylocereus undatus is characteristically the most cultivate vine cactus belonging to the family of Cactaceae, originating natively from Mexico and America. Commonly, it is well acknowledged under the name of “dragon fruit” Or “pitaya”. It is also called ‘buahnaga’ in Malaysia gives the meaning of dragon fruit. Dragon fruit is reported to have numerous health imparting phytochemicals such as polyphenols, flavonoids, and vitamin C which bestow strong antioxidant potential to dragon fruit. Betacyanin present in the red pulped dragon fruit protect the mice from diet-induced obesity and its related metabolic disorders. The consumption of dragon fruit by type 2 diabetics substantially reduced the levels of total cholesterol, triglycerides, and LDL cholesterol while it increased the levels of Dicholesteryl. It also significantly improves the insulin resistance in rats and decreases the blood glucose level in type II diabetic subjects. Our nature is surrounded with wide variety of plants and many of them are having medicinal properties. They contain the substances that provide nourishment essential for maintenance of life and for growth. The dragon fruit is a relatively super fruit on the Indian mark. Because of its appealing fruit color and mouth- watering pulp, nutraceutical value, excellent export potential, and highly remunerative in nature, it is gaining tremendous popularity among growers. Currently, several technologies can extend the shelf life of dragon fruit, such as coating it with wax or cassava starch and applying the Modified Atmospheric Packing.

Keywords: Antioxidant; Betalains; Dragon fruit; Pitaya; Polyphenol

1. Introduction

Genus *Hylocereus* belongs to the vine cactus from the subfamily of Cactodieae within the family of Cactaceae. It is a native fruit from Mexico, central and South America [1], And has been cultivated in Vietnam for at least 100 years, following by the French [2]. There are three cultivars of Dragon fruit: *Hylocereus undatus*, red-colored pericarp with white flesh; *Hylocereus polyrhizus*, red skinned with red flesh and Seline, yellow coloured with white flesh [3]. Typically, *Hylocereus undatus* is a cactus plant which possesses fruit as the Red Dragon fruit or Red pitaya fruit, the most widely cultivated vine cactus. In addition, it known as red pitaya or Straw berry pear cactus fruit well. Commonly, thus fruit is named as pitaya because of the bracts or scale sonthe fruit skin and hence the name of pitaya meaning “the scaly fruit” [4]. with the unique properties of Crassulacean acid metabolism (CAM), members of family Cactaceae exhibit extraordinary high water- use efficiency with low water requirements [5]. In addition, as a response to high carbon dioxide (CO₂) atmospheric concentration, CAM plants increase the production of their biomass [6]. The fruit consists of red peel covered with green tripped over lapping scales and white flesh dotted with numerous edible soft black seeds. It also classified as a night-blooming flower which only flowers at night and blooming with huge fragrant blooms that typically last for one night only [7]. Over past decades, this fruit is cultivated commercially in Malaysia, Vietnam, Thailand, Nicaragua, Colombia, Australia and the USA [8]. Dragon fruit, otherwise called *pitaya* or *pitahaya*, is an edible fruit of the *Hylocereus* genus. *Hylocereus* species are herbaceous perennial climbing cactus mainly distributed in subtropical and tropical regions, and highly tolerant to drought. It is a native of the crop has about 20 years of life span and, start yielding fruits two years after planting and attain yield stability in 3 to 5 years. It is commercially cultivated in

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various parts of the world such as Vietnam, China, Mexico, Colombia, Thailand, Malaysia, Indonesia, Australia, USA, etc. Five major types of *Hylocereus* species are available which are mainly differentiated based on their fruit characteristics. *Hylocereus undatus* is characterized with white pulped fruits and pink skin, *Hylocereus polyrhizus* have red pulped fruits and pink skin, *Hylocereus costaricensis*, which have violet-red pulp and pink skin, *Hylocereus guatemalensis*, which have red pulp with reddish-orange skin, and *Hylocereus megalanthus* have white pulp and yellow skin. The fruit pulp of all dragon species is interspersed with edible black seeds, and is sweet in taste, abundant in nutrients such as soluble sugars, proteins, and minerals like potassium, magnesium, and calcium along with other bioactive compounds (Tran et al., 2015). The red color of the pulp is mainly due to the presence of water-soluble nitrogen-containing pigments called betanin's such as isobetanin, phyllostactic, phyllotactic, and hylocerenin, which are antioxidants with radical scavenging ability (Stint zing et al., 2003). Dragon fruit is reported to have numerous Herbal Medicine has now become an integral part of standard healthcare, as well as in ongoing scientific research. Herbal medicine is rich in natural substances that can promote health and reduce illness. The fruit *Hylocereus undatus* is also known as Dragon fruit and Pitaya belonging to the family cactaceae. *Hylocereus undatus* fruit is commonly used as a food. It is a native fruit originating from Mexico and Central and South America.[9] It has been cultivated in Vietnam for at least 100 years, following by the French.[10] There are three types of dragon fruit: *Hylocereus undatus*, pink skin with white flesh; *Hylocereus polyrhizus*, red flesh with pink skin; *Hylocereus costaricensis*, violet red flesh with pink skin and *Hylocereus(selenicerus) megalanthus*, white flesh with yellow skin.[11]

1.1. Common/Vernacular Name:[12]

Chinese	Huolongguo(firedragon fruit)
French	<i>Cierge-lezard, pitha yarouge, pitaya</i>
Mexico	<i>Junco, Florde caliz, pita java, pitahay aroja</i>
English	Strawberry pear, Dragon fruit, red pitaya, Night Blooming Cereus, Belle of the Night, Cinderella Plant, Queen of the Night, Jesus in the cradle
German	Distelbirne, Echtestachelbrin
Spanish	Flor de caliz, Junco <i>tapatio</i> , <i>pitahaya orejona</i> , <i>pitajaya</i> , <i>Reinade lanoche</i>
Hindi	Dragonfruit

The Dragon fruit, a newly introduced super fruit in Indian, is seen as a promising and profitable fruit crop. Fruit has a very appealing color and mellow mouth melting water pulp with black color edible seed embedded in the pulp, as well as tremendous nutritive properties, which attracts growers from all over India to cultivate this fruit crop that originated in Mexico and Central and South America. It is long-day plant with a lovely night-blooming flower known as "Nobel Women" or Queen of the Night. Straw berry Pear, Seed, Pithaya, Night Blooming Cereus, Belle of the Night, *Cinderella Vine*, and Jesus in the cradle are some of the other names for the fruit.[13] Plants contain abroad range of organic molecules that do not directly contribute to the plant's growth and development. Secondary metabolites are the names for these molecules Food additives, flavorings, pharmaceuticals, and other synthetic products have all been derived from secondary metabolites from plants.[14] The red dragon is one of the fruits widely consumed. Dragon fruit or pitaya is a tropical fruit under the cactus family and cactaceae. It is native to Mexico, Central America, and South America. However, it is also cultivated in Asia, such as Taiwan, Vietnam, Philippines, Malaysia and Indonesia. Dragon fruit is non local fruit much flavored by the public because it has efficiency, benefits and high nutritional value. Dragon fruit is consumed directly or processed dragon fruit produce a peel that has been optimally utilized even through it takes 22% proportion compared to the whole fruit. Dragon fruit peel contains the most polyphenols source of antioxidants.

2. Phyto chemical composition of *Hylocere usundatus*

In recent years, the fruits its attractive colors, sweet, juicy pleasant taste and have been considered the most beautiful in Cactaceae family. Besides its red-purple coloration, the fruits of *Hylocereus* cacti are being highlighted by global cultivators because of its rich source of polyphenolic components and their antioxidant activity [15]. Polyphenolic compounds are an excellent antioxidant and bio-active free radicals scavengers, playing an important role in protecting humans [16]. Antioxidant refers to a compound that is capable of retarding the oxidation of lipids, nucleic acids and proteins by hindering the initiation and propagation of oxidative chain reactions, and hence preventing oxidative damage towards body's cells [17,18]. This can Bebe achieved through the mechanisms of reduction, free radical scavenging, potential complexing of pro-oxidant metals and quenching of singlet oxygen [19]. The antioxidant potential of polyphenolics depends on the number of hydroxyl groups in the compound. With the higher number of hydroxyl

groups, the tendency of chain breaking antioxidant behavior of the compound increases[20]. Phenolic is found in abundant in plants which is the major secondary metabolites of plants, serving in plant defense mechanism for counteracting reactive oxygen species (ROS) [21, 22]. In cacti, red-violet betacyanin's and yellow betaxanthins are the most important fruit pigments, belonging to betalain pigments [23]. Betalain is a class of water-soluble pigments that provide the colors in a wide ranging of flowers and fruits [24]. Moreover, betacyanin's that are attached to n-heterocyclic compounds are a class of compounds that can also be employed as antioxidants, with radical scavenging activities. Antioxidant activity of dragon fruit is mainly due to the content of ascorbic acid (vitamin C) [26]. In living organisms, ascorbic acid serves in many physiological functions, such as acts reductant to prevent cellular components from oxidative damage [27]. This is because ascorbic acid has the capability of serving as a scavenger in the oxidation of free radicals and oxygen-derived species, e.g., singlet oxygen, hydrogen peroxide and hydroxyl radicals [28]. Hence, ascorbic acid is found to be very useful in the treatment of photo-aging[29]. Instead, pro-oxidant properties of ascorbic acid also contribute to its antibacterial effects[30]. In the human body, the formation of free radicals is regulated by various enzymes and antioxidants in response to exogenous stimuli. In the case of extensive production of free radicals, it could lead to traumatic injury, inflammation and other chronic events, such as cancer and degenerative disease, due to the oxidant stress[31]. Over last few decades, few antioxidant vitamins which have the ability of limiting oxidative damage, have been introduced such as beta-carotene, vitamin C and vitamin E, thus minimizing the threats of particular chronic disease [32]. This can be observed from the closely association of heart diseases and low plasma levels of beta-carotene, tocopherol and L-ascorbic acid in epidemiological studies[33].

2.1.1. Synonyms: *Cereus undatus* Haw.[34]

2.1.2. Propagation

The *Hylocereus undatus* is most often propagated through cuttings, obtained by severing foot long lateral branches at a stem segment. Making a slant cut on the stem end to be inserted into the soil improving rooting. Cutting should be cured in a cool, dry area for 5-7 days before planting. Mature stems are preferred for cutting, as they are more resistant to insect and snail damage. Cutting may be planted directly in the field or in potting well drained potting medium.[35]

2.1.3. Cultivation

Commercial plantings can be done at high density with between 1100 and 1350 plants per hectare. Plants can take up to five years to come into full commercial production, at which stage yields of 20 to 30 tons per hectare can be expected [36]. *Hylocereus* has custom-made to measure in dry tropical climates with a moderate quantity of rain. The dragon fruits set on the cactus-like trees 30-50 days once flowering and might typically have 5-6 cycles of harvests each year. In various regions, it's free cultivation to become a weed and is assessed as a cuckoo invasive weed in some countries.[37]

2.1.4. Taxonomical position:[38]

Kingdom	Plantae
Order	Caryophyllales
Family	Cactaceae
Subfamily	Cactodieae
Tribe	Hylocereus
Genus	Hylocereus
Species	<i>Hylocereus undatus</i>

3. Botanical description

3.1. Fruit

The fruit is a fleshy berry which is oblong and about 4.5 inches (11 cm) thick with red or yellow skin/peel with scales and with or without spines. The color of pulp may be pink, white, red, or magenta depending on the species. Seeds are very small, numerous, and black embedded among the pulp. [39]



Figure 1 *Hylocereus undatus*, white-fleshed



Figure 2 *Hylocereus polyrhizus*, red-fleshed



Figure 3 *Hylocereus megalanthus*, yellow pitahaya fruit with spines removed

3.2. Flowers

Flowers are unit herma phroditic, however, some pitaya species and cultivars are self-incompatible. The extremely showy, edible white flowers are very large, very fragrant, nocturnal, bell formed and may be inches long (36cm) and 9 inches wide (23cm). The statements and lobed stigmas are cream colored .3 to 5 spherical buttons ordinarily merge on

the stem margin; two to three of those could change into flower buds in about 13 days. The light green, cylindrical flower buds reach approximately 11 inches after 16-17 days, when anthesis occurs. [40]



Figure 4 *Hylocereus undatus* with both carpels and stamens



Figure 5 *Hylocereus undatus* flowers on plant

3.3. Phytochemistry

Hylocereus undatus is a rich source of nutrients and minerals such as vitamin B1, vitamin B2, vitamin B3 and vitamin C, proteins, fat, carbohydrate, crude fiber, flavonoids, thiamine, niacin, pyridoxine, cobalamin, glucose, phenolic, betacyanin's, polyphenol, carotene, phosphorus, iron and phyto albumin [41]. It is rich in phyto albumins which are extremely valued for its anti-oxidant properties [42].

Propagation; Cuttings of the *H. undatus* are most commonly obtained by severing foot-long lateral branches at a stem segment. Making a slant cut on the end of the stem that will be inserted to improve rooting in the soil. Cutting should be cured for a minimum of 24 hours. Before planting, keep it in a cool, dry place for 5-7 days. Cutting mature stems is preferable because they are more resistant to insect and snail damage. Cuttings can be planted directly in the ground. Use a well-drained potting medium in the field or in the pots. [43]



Figure 6 *H. undatus*

3.4. Common/Vernacular name

Chinese huolongguo (fire dragon fruit), French Cierge-lezard, Pithayarouge, Pithaya, Mexico Junco, Flor de caliz, Pithajava, Pithayaroja, English Strawberry Pear, Dragon fruit, Red pitahaya, Night Blooming Cereus, Belle of the Night, Cinderella plant, Queen of the Night, Jesu sin the cradle, German Distelbrine, Echtstachelbrin, Spanish Flor de caliz, Junco tapatio, Pithayaorejona, Pitahaya, Reina de lanocha, Hindi Dragon Fruit.[44]

4. Taxonomical position

Table1 Taxonomical classification of dragon fruit

Kingdom	Plantae
Order	Caryophyllales
Family	Cactaceae
Subfamily	Cactodieae
Tribe	Hylocereus
Genus	Hylocereus
Species	<i>H. Undatus</i> 5

4.1. Nutritional and Pharmacological aspects of Dragon fruit

The pitaya fruit, which has a lot of potential in Brazilian cuisine because of its sweet taste, can be used in jams, juices, ice creams, and candy, or it can be eaten plain in the wild. The pitaya fruit, which has become popular due to its sweet flavor, with a lot of potential for use in Brazilian cuisine, Jams, juices, ice cream and candy can all be made with it, or it can simply be eaten, in its natural state investigated the wound-healing properties of aqueous extracts from *H. undatus* leaves, shells, fruit pulp, and flowers, and found promising results. All parts of the fruit have healing effects on mice. Healing takes longer India beticanimals, and topical applications of *Undatus* resulted in significant increases in hydroxyproline, tensile strength, total protein and phospholipids. Improved epithelization and DNA collagen content as a result, healing is made easier. However, in this study, the *H. hypoglycemia* activity was not observed by the authors. *Undatus* is the Latin word for “without” investigated the antiproliferative activity of red pitahaya in melanoma cells to see if the fruit could be used to treat the cancer. It is thought to be a promising anticancer agent.

4.2. Phytochemicals present in Dragon fruit (*Hylocere usundatus*)



Figure 7 *Hylocere usundatus*

Table 2 Phytochemicals present in Dragon fruit

Components	Reagent	Note	Results of fruit extract text
Protiens	Biuret test	Purple blue	Positive
Steroids	Liebermann Burchard test	Yellow ppt	positive
Carbohydrates	Molisch test Benedicts test	Voilet ring Orange ppt	positive
Alkaloids	Mayers reagent Wagner's reagent	White ppt Brown ppt	positive
Phenolic compounds	Ferric chloride test	Green ppt	positive
Tannins and Flavonoids	Lead acetate	Yellow white ppt	positive
Saponins	Fast stirring	Dense foam longtime	Positive [45]

4.2.1. Note

Positive 67 Vitamin B1, vitamin B2, vitamin B3, and vitamin C, as well as protein fat, carbohydrate, crude fiber, and other nutrients and minerals, are abundant in *Hylocereus undatus*. Thiamine, niacin, pyridoxine, cobalamin, glucose, flavanoid betacyanin's, polyphenol, carotene, phosphorous, phenolic phyto albumin and iron

4.3. Health benefits of Dragon fruit

In addition to being used as a food Coloring agents, Consumption fruit mostly as fresh fruit as relieving high water level compared with other nutrients levels for typical nutritional value per 100g of Dragon fruit [46]. Dragon fruit can also take the form of juice, jam, or preserves according to the taste needed. Regular consumption of Dragon fruit helps in fighting against cough and asthma; also it helps for healing wounds and cuts quickly due to it contains high amount of vitamin However, the high level of vitamin C found in Dragon fruit plays an important role to enhance immune system and also to stimulate the activity of other antioxidant in the body [47]. Moreover, Dragon fruit is also rich in flavonoids that act against cardio related also dragon fruit aids to treat bleeding problems of vaginal discharge. As Dragon fruit rich in fibers, however it aids in the digestion of food [48]. Dragon fruit is also packed with B vitamin group (B1, B2 and B3) which possess an important role in health benefit. Vitamin B1 helps in increasing energy production and in carbohydrate metabolism, vitamin B2 in Dragon fruit acts as a multivitamin; however, it aids to improve and recover of appetite. Abs Vitamin B3 present in dragon fruit plays an important role in lowering bad cholesterol levels; it provides smooth and moisturizes skin appearance. As well as it improves eye sight and prevent hypertension [49,50]. Dragon fruit is also helpful in reducing blood sugar levels in people suffering from type2 diabetes studies suggest that the

glucose found in Dragon fruit helps in controlling the blood sugar level for diabetes patients. Dragon fruit contains high level of phosphorus and calcium; it helps to reinforce bones and play an important role in tissue formation and forms healthy teeth [51].

4.4. Medicinal uses:[52]

The fruits are used as hypocholesterolemia, anti-microbial, antioxidant, in constipation. Anti- cancer, to boost immune system, in diabetes, to maintain cholesterol level, to promote healthy hair and skin, to prevent anemia, to improve appetite, vision and brain function.

5. Pharmacological activities

5.1. Antioxidant activity

Ethanol extract of the *Hylocereus undatus* peel and flesh were proposed to have different antioxidant capacities because peel contain more flavonoids than flesh. [53] Exploitation of natural antioxidant substrates in medicinal plants with pre-ventive influences on cellular damage caused by free radicals, which are involved in many diseases like cancer, has been increasing (Young and Woodside 2001). us, the popularity of many plants in disease prevention could be attributed to the anti-oxidant (radical scavenging) properties of their constituent phenolic compounds (such as flavonoids, phenolic acids, stilbenes, lignans and tannins), alkaloids and vitamin C (Pietta2000; Nyamaietal.2016; Ganetal.2017; Pehlivan2017; San Miguel-Chavez2017). Several studies link the scavenging activity of antioxidants.

5.2. Anti-cancer activity

The anticancer properties of *Hylocereus undatus* was recently studied. Several evidences showed that polyphenols, flavonoids and betanin's that present in the *Hylocereus undatus* are responsible for the anticancer effects. *Hylocereus undatus* peel extracted by ethanol-water (50:50, v/v) solvent system showed anti - proliferative activity.[54] Some studies have shown the anti-cancer potential of dragon fruit. Divakar an et al. aimed to evaluate the ability of this fruit to produce nano particles and found they can significantly inhibit the growth of MCF-7breast cancer cells. Another study showed that the fecal fermentation of pitaya oligosaccharides augmented the populations of Lactobacillus and decreased the populations of Bacteroides and Clostridium, and resulted in the production of lactic acid, acetic acid, propionic acid butyric acid that can inhibit Caco-2cells and has a potential for risk reduction in colon cancer.

5.3. Antimicrobial activity

The antibacterial activity of ethanol chloroform and hexane extracts from *Hylocereus undatus* peel was studied. From the disc diffusion assay results ,exhibited inhibition zone of about 7 to 9mm against Gram-positive and Gram-negative bacteria.[55] In a study to investigate the antimicrobial effect of red pitaya peels, Temak etal.found that the extract has efficient in vivo and in vitro effects against several microorganisms, such as *Escheria coli* and *P. aeruginosa*. Susmitha et al. investigated the effects of *H. undatus* seeds in Gram-negative and Gram-positive bacterial species and found that the minimum inhibitory concentration is 50 µL for Staphylococcus aureus and Escherichia coli. Tenoreetal. [80] also found antimicrobial activity for hexane, chloroform and ethanol extract of the growth of Gram-negative and Gram-positive bacteria

5.3.1. Hypocholesterolemia Effect

Polyphenols contents in *Hylocereus polyrhizus* flesh were proven to be able to reduce cholesterol level in the body.[56]

5.3.2. Cardio-protective Effect

Polyphenols contents in *Hylocereus polyrhizus* flesh also possessed anti- thrombotic effect which further enhance edits cardio-protective properties.[57]

5.3.3. Prebiotic Effect

The ethanolic extract of *Hylocereus* flesh was detected as approximately 85% of mixed oligosaccharides. These oligosaccharides had higher resistance towards the human salivary α - amylase compared to inulin. This is not digested in the stomach, but acts as prebiotics, which assists in the growth of lactobacilli and bifidobacteria, which are the healthy bacteria. The microorganisms will be assisting the digestion and keep the immune system strong.[58].

5.3.4. Anti-Diabetic Effects

Many studies have demonstrated that the consumption of red pitaya can reduce glycemia in humans. In a systematic review and meta-analysis, pools up et al. [8] found that dragon fruit can be. The study of Putri et al. showed that pitaya associated with metformin could significantly decrease glycemia and HOM-IR (homeostasis model assessment-Insulin Resistance) in type2 diabetic rats. The authors suggested that red dragon fruit could besides alternative to metformin due to its effectiveness in decreasing HOMA-IR (and thus, insulin resistance) and malondialdehyde levels. Moreover, the consumption of red pitaya promoted hypoglycemic effect in dyslipidemia C57BL/6 mice, contributing to reducing the risk of insulin resistance [85]. Fad Lilah and Sucipto found that pitaya (*H. polyrhizus*) effectively reduces fasting blood sugar levels in students who consumed high calories daily. Mariettaetal.[86]investigated the effects of red pitaya skin extract on glycemia and lipid profile of diabetic and dyslipidemia maleWistarrats and found no significant reduction in glycemia.

5.3.5. Anti-anemia activity

Pitaya contains essential nutrients, including precursors required for the erythropoiesis, such as iron (Fe), vitamins C, E, B12, thiamine, and riboflavin (Tenoret al.2012). Rahmawati et al. (2019) conducted a study to evaluate the effect of dragon fruit on post-partum mothers, who are considered susceptible to anemia. Post partum mothers were supplied with 400cc of Polyrhizus fruit juice (obtained from 500g of pitaya) for 14 days. results showed that levels of hemoglobin, hematocrit, and erythrocytes increased significantly in the treatment group, compared Anti-anemia to the control activity group. According Rahmawati et al. (2019), the high content of vitamin in the dragon fruit responsible for its anti-anemia activity, as it facilitates the absorption of iron needed in the production of blood and non-heme iron.

5.3.6. Anti-Lipidemic Effects

The use of red pitaya can improve lipid profile, decreases total cholesterol, LDL-c, and triglycerides, and increase HDL-levels in normal cholesterolemic subjects, pre-diabetic, and type2diabetic patients. The consumption of red pitaya also showed benefits in lipid levels in dyslipidemic C57BL/6mice, contributing to reducing cardiovascular diseases.

6. Conclusion

It is interesting to note that the cultivation of *Hylocereus undatus* is expanding in recent years due to its health and economic importance. Therefore, this could lead to utilization of dragon fruit as a source of functional materials to provide phytochemicals with the powerful antioxidant capability of preventing nutrition-related illnesses and enhancing human defense system of consumers. Apart from their attractive antioxidant properties, dragon fruit can also be incorporated as a food preservative owing to their effective antibacterial activity against some food-borne pathogens. The research and development of dragon fruit should be intensified and extended by emphasizing its value chain and production aspects for long-term perspective. The present study revealed that the dragon fruit started yielding from 12 to 15 months after planting, and attained yield stability from 3rd year onwards. A significant variation was observed for both yield and fruit quality parameters among the clones. White pulped fruits are superior in terms of yield and sugar content, while red pulped fruits are better for phenolics with high antioxidant potential. Since the calorie value of dragon fruit is very low compared to the other fruits. It is also rich in Phyto albumins which are highly valued for their antioxidant properties. Apart from these many researches have been done on this fruit and proven that the plant is having many pharmacological activities. The fruit peel that takes 22% of the whole fruit contains polyphenols as antioxidants and natural anthocyanin dyes which are pretty high. Dragon fruit has the potential for herbal tea, beverage products containing high antioxidants and natural dyes.

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

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