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ORIGINAL ARTICLE

Dragon Fruit [*Selenicereus undatus* (Haworth) D.R. Hunt] for Vigour and Vitality

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ABSTRACT

Dragon fruit is an incredible tropical cactus that produces strange looking fruit resembling a magical dragon egg. The vibrant pinkish red skinned fruit is gaining importance due to its nutritional qualities and peculiar taste. The taste is hard to pin down with some saying it's a sweet mix of mild kiwi fruit, watermelon, strawberry and pear flavours. Others describe it as only vaguely sweet or even savoury. Well growing conditions and ripeness of the fruit can impact taste but nonetheless it's visually impressive and packed full of nutrients, like Vitamin C, calcium, iron and phosphorus. Fruits are rich in pectin and betalins making it natural food. It is said to lower blood sugar in type 2 diabetes. Antioxidants present in the fruit makes it suitable to prevent cancer like diseases.

***Keywords**: Nutrition, Super food, Dragon fruit, antioxidants, Betalins, Diabetes, Cancer*

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INTRODUCTION

Fruits are rich in nutritious elements and minerals. Dragon fruit, also known as pitaya or strawberry pear, on the outside, it's a pink oval with green scales (hence the "dragon" name). Inside, it has white flesh with tiny black seeds. The fruit's strange appearance also gives off "psychedelic artichoke" vibes. "It's a tropical fruit that comes from a cactus. It's available everywhere around the world, but it's indigenous to Mexico and South America." If the fruit isn't enough to you tempt you then don't forget the flowers. Their stunning large flowers are easily over 20cm wide and appear in summer. They are yellowy green on the outside and open to a scented white, lily like bloom. Flowers open in the evening and only last one night. It's the perfect excuse to host an evening cocktail party and enjoy their blooms. Dragon fruits come from Mexico and Central and Southern America.

BOTANICAL ASPECTS

Dragon fruit refers to fruit of the genus *Selenicereus* (formerly *Hylocereus*), of the family Cactaceae. It is a climbing cactus called *Hylocereus*, which you'll find in tropical regions around the world. The plant's name comes from the Greek word "hyle," which means "woody," and the Latin word "cereus," which means "waxen." Dragon fruit is cultivated in Peru; the plant prefers warm conditions with mild winters and no frost. They can tolerate the occasional short burst of cold weather but ideally they should be kept above 10 degrees. They can handle heat, drought, humidity and poor soils but will grow tastier fruit

with regular watering and rich soil. Choose a sunny spot and then boost the soil with compost, manure and certified organic pelletized fertilizer. A dose of lime is also beneficial. Soil needs to be free draining as these plants rot easily if the roots sit in water. Clay soils are not ideal. Alternatively they will happily grow in a large pot. Plants are grown with a thick support and tie one or two main stems to the support to encourage vertical straight growth. Trim away any other side shoots. Once the stems have reached the desired height cut off their ends to encourage new branching shoots. These can then be allowed to spread out and hang downwards. Commercial growers often use a rose wheel and encourage side way branches to grow over the wheel making it easier for picking fruit. Every two three weeks fertilizer is applied. Periodically remove some of the longer shoots to keep it under control and allow space for new growth to develop. This is important because flowers form on the ends of new season growth so each year you need new growth to get fruit. Less congestion tends to lead to bigger fruit as well. Plants are grown in Kuchh area in Gujarat. Fruits ripen approximately a month after flowering but this can vary with local conditions. Fruit will not continue to ripen once picked so you need to look for other signs before picking. Check that the colour of the fruit is bright and even all over and the small "wings" on the fruit are starting to wither. Lightly press the fruit in your hand and if ripe it will give just a little push. Pick fruit by twisting it off the plant or cut with secateurs.

Fig. 1: (A) Plants of Dragon fruit, **(B)** and **(C)** Red coloured fruits of dragon fruits, **(D)** A cut dragon fruit with white flesh and small black seeds.

More watering will cause splitting of outer skin hence avoided. The skin is not edible but the seeds are just like a kiwi fruit. Dragon fruit grow easily from seed or cuttings. To grow from seed, squash some flesh onto paper towel and keep moist in a warm position but away from direct sunlight. Seeds will sprout 2-3 weeks later and can be potted up into punnets. Water weekly with fertilizer to develop strong seedlings and pot into individual pots once large enough. Seedlings will take several years to reach fruiting size.To take a cutting simply break off a segment 30-50cm long and leave in a dry shady spot for a week. This allows the cut end to seal and prevents rotting. Plant into a pot and keep in a bright shady spot while roots are forming before then moving into the sun. Don't over water during this time. Cuttings can be taken at any time but will grow faster if done during the warmer months.

On the outside, the fruit has the appearance of a hot pink or yellow bulb with spike-like green leaves shooting up like flames around it. Fleshy white fruit has dotted black seeds. This fruit comes in red- and yellow-skinned varieties. The seeds have a nutty flavour. Peel and cut it into sections when you're ready to eat it. Much like a guava, you eat the flesh and discard the skin. You could also cut it in half and scoop out the flesh with a spoon.Dragon fruit is best eaten raw, but you can throw it on the grill like some other fruits. Enjoy it on its own or add it to: Cocktails, desserts, fish especially cod, tuna and mahimahi, salads, smoothies. Toss it into a fruit salad along with other tropical fruits like pineapple and mango.

PHYTOCHEMICALS PRESENT IN DIFFERENT VARIETIES

Dragon fruits may have following varieties:

- **Pink skin with white flush (*Hylocereus undatus*):** This is well known variety, it is the least sweet. It is sold under the names including Alice, Cosmic Charlie and Guyute.
- **Pink skin with red or pink flush (*Hylocereus costaricensis,* H. *polyrhizus)*:** It is bigger and sweeter than its white-fleshed variety. It is sold in stores under names such as Red Jaina and Bloody Mary.
- **Pink skin with purple flesh (*Hylocereus guatemalensis*):** It is known as American beauty.
- **Yellow skin with white flesh (*Hylocereus megalanthus*):** Yellow dragon fruit is uncommon to find, also the sweetest.

Table 1: Presence of nutrients per 100g fruit pulp

Nutrient	Amount per 100 g fruit
Water	87 g
Protein	1.1g
Fat	0.4g
Carbohydrates	11 g
Fibre	3g
Vit. B1 (Thiamine)	0.04mg
Vit. B2 (Riboflavin)	0.05mg
Vit. Niacin	0.16 mg
Vit. C (Ascorbic acid)	20.5 mg
Calcium	8.5 mg
Iron	1.9mg
Phosphorus	22.5 mg
Magnesium	68mg
Zinc	ND
Calories	102

ND= Not detected

The flesh of the dragon fruit is low in calories and fat-free. It also contains plenty of fibre. Dragon fruit is an excellent source of fibre. The daily recommendation for adults is at least 25 g and dragon fruit packs 7 g in a single 1-cup serving. It may benefit gastrointestinal and cardiovascular health. Fibre helps in weight loss. Dragon fruit has a ton of beneficial vitamins and minerals, including:

- Carotenoids are present, which may reduce cancer risk.
- Lycopene - improves heart health and reduce cancer risk.
- Magnesium is important for cell function, and dragon fruit provides 18% of the recommended daily amount.
- Iron is important component of blood and energy, and dragon fruit contains 8% of the recommended daily intake.
- Vitamin C helps to boost immune system.
- Dragon fruit improves gut flora and improves colon cancer risk.

MEDICINAL AND NUTRITIVE VALUE

The heavenly dragon fruit has a lot of medicinal values**.** According to the paper, previous animal studies had shown a potential link between dragon fruit consumption and better control of diabetes. The consumption of dragon fruit encourages the growth of pancreatic cells that produce insulin (*Sonawane 2017)*. The analysis examined multiple clinical trials comparing the effects of dragon fruit with a placebo in people with type 2 diabetes or prediabetes. The dragon fruit's effect on fasting plasma glucose in people with pre-diabetes. They also reported that the more dragon fruit a person eats, the greater is the control of blood sugar, however, the study did not find a correlation between eating dragon fruit and improved control of type 2 diabetes. The researchers recommended need of more studies regarding prediabetes and dragon fruit consumption to determine whether eating dragon fruit can help stabilize blood sugar levels (Soryono 2006; Sonawane 2017). Nutrient value per 100g is mentioned in table 1.

Dragon fruit lowers the cholesterol concentration, to balance blood sugar concentration, to prevent colon cancer, to strengthen kidney function and bone, to strengthen the brain working, increasing the sharpness of the eyes as well as cosmetic ingredients (Suryono 2006). The fruit is rich in antioxidants and vitamins C, and B, carotene, polyunsaturated fatty acids, protein and minerals like Ca, Fe, K, Na etc (Table 1).

Super red dragon fruit from Pasuruan district of Jakarta contains the highest Vitamin C compared to the three other locations. Kristanto (2003) suggests that the content of vitamin C in dragon fruit ranges from 8-9 mg/100 g. The result of this study shows that vitamin C content is lower. This is possible because the fruit is too ripe, resulting in lower amount of vitamin C. According to Winarno (1995) and de Man (1999), the content of vitamin C in raw fruit is higher than in a mature one, and the more mature the fruit is the lesser the vitamin C content (Rahmawati and Mahajoeno 2009). It can boost your iron levels. Iron is very important for moving oxygen through your body and giving energy, and dragon fruit has high iron content. And the vitamin C in dragon fruit helps your body take in and use the iron. It is rich in antioxidants like flavonoids, phenolic acid, and betacyanin. These natural substances protect your cells from damage by free radicals, the molecules that can lead to diseases like cancer and premature aging. The dragon fruit helps in getting rid of toxic heavy metals. It helps in improving eye sight. Lycopene, responsible for the red color in dragon fruit has shown to be linked with a lower prostate cancer risk. Vitamin C accumulates in phagocytic cells, such as neutrophils, and can enhance chemotaxis, phagocytosis, generation of reactive oxygen species, and ultimately microbial killing. It is also needed for apoptosis and clearance of the spent neutrophils from sites of infection by macrophages, thereby decreasing necrosis and potential tissue damage. The role of vitamin C in lymphocytes is less clear, but it has been shown to enhance differentiation and proliferation of B- and T-cells, likely due to its gene regulating effects. Vitamin C deficiency results in impaired immunity and higher susceptibility to infections (Carr and Maginni 2017). In turn, infections significantly impact on vitamin C levels due to enhanced inflammation and metabolic requirements. Furthermore, supplementation with vitamin C appears to be able to both prevent and treat respiratory and systemic infections. Prophylactic prevention of infection requires dietary vitamin C intakes that provide at least adequate, if not saturating plasma levels (i.e., 100-200 mg/day), which optimize cell and tissue levels. In contrast, treatment of established infections requires significantly

higher doses of the vitamin to compensate for the increased inflammatory response and metabolic demand.

The seeds of dragon fruits are high in polyunsaturated fats (omega-3 and omega-6 fatty acids) that reduce triglyceride and lower the risk of cardiovascular disorders (Sonawane 2017). Health benefits of dragon fruit are also rich in flavonoids that act against cardio related problems, also dragon fruit aids to treat bleeding problems of vaginal discharge. Dragon fruits are rich in fibers; however, it aids in digestion of food. 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 the loss of appetite. And 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. Dragon fruit is also helpful in reducing blood sugar levels in people suffering from type 2 diabetes, studies suggest that the glucose found in Dragon fruit helps in controlling the blood sugar level for diabetes patients. It contains high level of phosphorus and calcium. It helps to reinforce bones and play an important role in tissue formation and forms healthy teeth (Perween *et al*. 2018).

ASSOCIATED HEALTH RISK

Studies conducted on dragon fruits have revealed that it can cause allergic reactions. The symptoms caused as swelling of the tongue, and vomiting. Excessive use of fruits may turn color of urine red or pink. The color returns normal once the fruit is out of our system.

GENETIC DIVERSITY

Selenicereus megalanthus H. is a tropical fruit belonging to the family Cactaceae, is rich in essential nutrients, antioxidants and bioactive components. It presents wide variability in different characteristics and a great demand in the market. The main focus of the study was to characterize the genetic diversity of 76 yellow pitahaya genotypes with eight ISSR markers. Genetic parameters expected average heterozygosity (He), percentage of polymorphic loci, genetic distances and Fst were estimated with TFPGA. As a result, 225 alleles were generated and the number of polymorphic loci ranged 85 (CT, AG) to 90 (GT). High genetic diversity was found; with an average value of heterozygosity was 0.34 with a genetic differentiation coefficient (Fst) of 0.26, indicating that there was a great genetic diversity, similar values than those reported in other studies of pitahaya genetic diversity in Colombia. The 76 genotypes were grouped into K=3 according to geographic location, however, in some groups a mixture of individuals from different origins were observed. The analysis of molecular variance (AMOVA) showed higher variation (75%) within groups than among groups (25%). These results provide information that can be used to develop conservation strategies for dragon fruit and breeding programs to obtain more productive pitahaya genotypes with superior quality, high yield and with resistance to biotic and abiotic factors (Morillo *et al*. 2022).

COMMERCIAL APPLICATIONS

Use of Pectin:

Dragon fruit is rich in pectin. It contains 14.96 to 20.14 per cent pectin of the dried peels (Izalin *et al*. 2016). About 7.5 per cent of the pectin is extracted by microwave assisted extraction method (Thirugnanasambandham *et al*. 2014). It was revealed that dragon fruit could be substantial source of pectin in fruit production. Izalin *et al*. (2016) recommended using dragon fruit peel pectin as a thickener in food products such as low viscous food and beverages.

Use of Betalins as Natural Food Colour:

Betalains are plant derived natural pigments that are presently gaining popularity for use as natural colorants in the food industry (Gengatharan *et al*. 2015). The growing interest of consumers in the aesthetic, nutritional and safety aspects of food has increased the demand for natural pigments. These are used as alternative colorants in food products. Although betalins from red beetroot are one of the most widely used food colorant, betalins are not as well studied as compared to other natural pigments such as anthocyanins, carotenoids or chlorophylls. Pigments betalins comprising of betacyanins and betaxanthins are present in sufficient amount in peel of dragon fruit. These pigments were extracted by Rebecca *et al*. (2008). These pigments are tolerant to colour loss during processing (Harivaindaran *et al*. 2008; Ruzainah *et al*. 2009; Woo *et al*. 2011). Dragon fruit peel dye can be preserved at 4^0 C without light for 3 weeks. Rodriguez *et al*. (2016) showed that the antioxidant, anti-inflammatory, antiangiogenic and GST inducing activities of betalins from peels were enhanced through carbohydrate encapsulation. Pharmacological properties, such as antioxidant, anti-cancer, anti-lipidemic and antimicrobial activity of betalins are reported from sources such as red beetroot, amaranth, prickly pear and red pitahaya, for potential application as functional foods.

Use of Dragon fruit as Natural Probiotics:

Dragon fruit contains small seeds which have been made to determine the composition of linoleic acid. Xu *et al*. (2016) found flesh rich in polysaccharides which help in growth of bacteria Lactobacilli. The gastrointestinal microflora helps to suppress the pathogens and act as natural probiotic (*Sonawane 2017)*. Having more prebiotics in your system can improve the balance of good to bad bacteria in our intestine. Specifically, dragon fruit encourages the growth of the probiotics lactobacilli and bifido-bacteria. In your gut, these and other helpful bacteria can kill disease-causing viruses and bacteria, and help in digestion of food.

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