



# Article Review: Commodity of Dragon Fruit (*Hylocereus Polyrhizus*)

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**Abstract.** Red dragon fruit (*Hylocereus polyrhizus*) is one of Indonesia's commodities widely consumed and developed nowadays. Dragon fruit or pitaya is a non-local fruit that is much favored by the public because it has efficacy, benefits, and high nutritional value. The most well-known efficacy of dragon fruit is its antioxidant content. This article aims to explain the characteristics and postharvest handling of dragon fruit. Dragon fruit can be consumed directly or processed into juice, jam, syrup, and other products. These preparations of processed dragon fruit have a by-product, namely dragon fruit peel, that has not been used optimally. Dragon fruit peel is 22% compared to whole fruit and contains the most polyphenols, a source of antioxidants. Furthermore, every 100 g of dragon fruit peel contains 150.46 mg of betacyanin pigment. Dragon fruit peel also contains vitamins C, E, and A, alkaloids, terpenoids, flavonoids, thiamine, niacin, pyridoxine, cobalamin, phenolic, carotene, and Phyto albumin. Dragon fruit is a non-climacteric fruit, so it must be harvested at the right level of maturity. Dragon fruit is harvested 28 to 30 after the flowers bloom. After harvesting, the dragon fruit is sorted by color and shape, followed by cleaning, grading, labeling, and distributing. Currently, several technologies can extend the shelf life of dragon fruit, such as coating it with wax or cassava starch and applying the Modified Atmosphere Packaging (MAP).

**Keywords:** *Dragon Fruit · Dragon Fruit Peel · Modified Atmosphere Packaging (MAP)*

## 1 Introduction

The red dragon is one of the fruits widely consumed and developed in Indonesia today. 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 favored by the public because it has efficacy, benefits, and high nutritional value. Dragon fruit is consumed directly or processed into juice, jam, syrup, and other products. The preparations of processed dragon fruit produce a peel that has not been optimally utilized even though it takes 22% proportion compared to the whole fruit. Dragon fruit peel contains the most polyphenols, a source of antioxidants.

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The pigment betacyanin is present in dragon fruit peel in amounts of 150.46 mg per 100 g. Because it contains nutrients, dragon fruit peel can be used to herbal teas that are partially fermented [1]. Dragon fruit peel contains vitamins C, E, and A, alkaloids, terpenoids, flavonoids, thiamine, niacin, pyridoxine, cobalamin, phenolic, carotene, and Phyto albumin. The advantage of dragon fruit peel is that it is rich in polyphenols and is a source of antioxidants. In addition, the antioxidant activity in the dragon fruit peel is greater than the antioxidant activity in the flesh, so it has the potential to be developed as a source of natural antioxidants. So this article aims to explain the characteristics and postharvest handling of dragon fruit, as well as its processing to extend the shelf life.

## 2 Dragon Fruit Characteristics

According to [2], Sorting dragon fruit with the aid of our senses based on its color, size, and physical flaws does not accurately reflect the fruit's nutritional value. The nutritional content of dragon fruit has been determined by damaging the fruit (destructive). Destructive testing that can be done on dragon fruit components is color, size, weight, and physical defects. Non-destructive Color measurement using a chromameter can predict fruit age. Dragon fruit quality can be predicted using a regression model between fruit age and each quality parameter. Dragon fruit of various ages was used as a sample to determine changes in quality, and a regression equation was drawn up between fruit age and quality. Due to its high anthocyanin pigment content, dragon fruit has the potential to be used as a natural dye and a source of antioxidants [3]. Dragon fruit peel also contains about 10.8% pectin, which is a thickening, stabilizer, and gelling ingredient in the food sector [4]. According to [1], 22% of fruit peels contain polyphenols, which have the potential to be used as antioxidants in herbal tea beverages. The longer withering time and shorter rolling time used in the partial fermentation process of processing dragon fruit peel tea would increase the total phenol content, antioxidant activity, and color brightness while lowering the acidity of the tea infusion. In addition, according to [5], The peel of dragon fruit has a high anthocyanin content. Due to the presence of anthocyanins, which contribute to the red color of the fruit and can serve as a natural food dye or an environmentally and healthy substitute for synthetic dyes, dragon fruit has the potential to be used as a natural dye.

According to [16], Dragon fruit is a good source of minerals, carbs, and vitamins A and C. Dragon fruit has sufficient amounts of potassium, iron, protein, and calcium to improve endurance. Overall, each red dragon fruit contains protein that can reduce the body's metabolism and maintain heart health. Therefore, not a few dragon fruits are processed into food and drinks that are beneficial to the health of the body. Meanwhile, according to [18], dragon fruit skin is known to have a natural source of the red dye called Betacyanin. Betacyanin is a group of betalain compounds. Betacyanin dyes can give red color and are soluble in polar solvents, such as methanol, ethanol, water, and chloroform. The betacyanin extraction process can be influenced by pH stability. Betacyanin as a natural dye is often used as a colorant for food products.

### 3 Post-harvest Handling of Dragon Fruit

Dragon fruit is harvested 28 to 30 after the flowers bloom. Dragon fruit is a non-climacteric fruit, so it must be harvested at the right level of maturity. The color of dragon fruit changes very quickly due to physical influences such as sunlight and cutting, as well as the biological influence of mushrooms, so they are easy to rot. Post-harvest handling is critical to maintaining dragon fruit's freshness and shelf life. According to [6], Following harvest, dragon fruit is cleaned, graded, labeled, and sorted by color and for. The harvest period for white dragon fruit is 6 months, from November to May. Workers' harvesting of white dragon fruit is done manually according to the characteristics of harvest age. Dragon fruit sorting is done visually based on the physical appearance of color and shape. Dragon fruit that is good or worth selling has the color of the fruit peel and tassels according to the characteristics of the harvest and smooth fruit peel. Cleaning the harvested dragon fruit is done using a brush and pruning shears. Classification of dragon fruit is carried out into four classes: superclass, class A, class B, and class C. Super class is a class of white dragon fruit with > 700 g in weight, while class A is a class of white dragon fruit with 600–700 g in weight. Class B white dragon fruit with 500–600 g in weight and class C white dragon fruit with 400–500 g in weight. The label used is a small round sticky paper label with a company stamp. Crop damage occurs due to pests such as rats, birds, and chickens.

Harvesting is done when the fruit demonstrates a full-color transition from green to bright pink or crimson which is usually 30–35 days after flowering. Pruning shears are used to harvest the fruits, which are then gathered in plastic containers and transported to the packing facility. Following sorting, fruits that meet the buyer's quality requirements are packaged in fiberboard boxes or cartons and delivered to the neighborhood market. Even at low temperatures, the fruit has a rather short shelf life, making one of the key obstacles extending its marketability after harvest. Modified atmospheric packaging (MAP), the application of edible coatings, and 1-methyl cyclopropane (1-MCP) for storage life extension are some of the technologies to be exploited [17].

According to [2], sorting dragon fruit yields is based on color, size, and physical defects using the human senses. However, measurements using the human senses cannot reflect the nutritional content present in the fruit. Non-destructive approach to sorting the dragon fruit by color using a chromameter, fruit age can be predicted using a regression model that shows the correlation between fruit age and color. Moreover, according to [7], the optimum and recommended shelf life based on the observed variables is 35 DAA (Day After Anesthesia). The treatments used were storing the dragon fruit at a temperature of 15 °C and room temperature with differences in harvest ages of 33, 35, and 37 DAA. Super Red dragon fruit has a longer shelf life at a storage temperature of 15 °C for 14 days with uniform fruit color and high total dissolved solids compared to storage at room temperature for 7 days.

According to [19], the effect of hot water treatment (HWT) at 50 °C for 5 min followed by 1.0% chitosan and 0.2%  $\kappa$ -carrageenan-based composite coating to counter the issues. HWT at 50 °C for 5 min followed by 1% chitosan- and 0.2%  $\kappa$ -carrageenan-based composite coating is a potential strategy to maintain the overall quality of dragon fruit during storage at 10 °C. Meanwhile, the coating following HWT helped maintain

the bract quality of dragon fruit. Furthermore, HWT alone or HWT combined with the composite coating improved the edibility of the fruit in terms of phenolic content and antioxidant activity.

#### 4 Preservation of Dragon Fruit

Handling after harvest and storing dragon fruit in a modified environment Packaging is a substitute technique for distributing and storing goods to lengthen their shelf lives [8]. The recommended gas composition for dragon fruit MAP packaging is 2–4% O<sub>2</sub> and 6–8% CO<sub>2</sub> at 10°C, extending the shelf life to 25 days, using stretch film plastic and Styrofoam cups with dimensions of 12 cm x 18 cm. Storing dragon fruit at a temperature of 6 °C began to experience chilling injury. In addition, according to [9], The shelf life of dragon fruit might be increased by 6 weeks by packing using the MAP method and non-perforated PE and PP plastic bags held at a low temperature of 5 °C. It can be concluded that when dragon fruit is not in season, MAP packing can help fix the issue. However, dragon fruit packed in PE was firmer, had a greater total dissolved solid titrated acidity, and a higher total phenolic content despite sharing aesthetic qualities with other treatments.

According to [10], using candles as the coating can extend red dragon fruit's shelf life. The coating uses a solution of beeswax and night wax to prevent water evaporation so that it can slow down withering, inhibit respiration rate, and make the fruit's peel shiny so that it adds to the attractiveness of consumers. Six percent of wax emulsion coating is the best treatment for maintaining the quality of dragon fruit based on weight loss, dissolved solids, and respiration rate parameters. The higher wax concentration that coats the surface of the fruit can prevent water loss so because the stomata of the fruit have been closed to the maximum. Meanwhile, [11] stated that applying cassava starch-based edible coating also effectively extends the shelf life of dragon fruit. The best concentration of cassava starch obtained was 4%, a temperature of 5 °C and a storage atmosphere composition of 2–4% O<sub>2</sub> and 7–9% CO<sub>2</sub> resulted in the lowest weight loss reduction, the color of dragon fruit remained fresh, and the highest total dissolved solids.

In addition, dragon fruit processing is used to extend its shelf life. [12] process the dragon fruit into a jelly product with the addition of citric acid, sugar, and pectin. The formula of 1000 ml of dragon fruit extract, 550 g of sugar, and 11 g of pectin produces the best organoleptic properties. According to [13], dragon fruit peel can be used in making herbal teas with the addition of ginger. With increasing ginger composition, betacyanin content, total soluble solids, and antioxidant activity decreased. Meanwhile, based on [14], the shelf life of dragon fruit is extended by making jam, adding sugar, and its peel. Dragon fruit peel contains 10.97% pectin, affecting its organoleptic properties. The addition of dragon fruit peel increases the water content due to it has a higher water content than the water content contained in the dragon fruit. The addition of dragon fruit peel also resulted in a lower ash content than the ash content in dragon fruit jam without adding fruit peel.

According to [15], dragon fruit turn in into snacks, whether syrup, candy, tea, or chips. Through this processing it is hoped can be stored for a longer time. The processed dragon fruit product has advantages compared to similar products on the market, namely the use

of real fruit and without artificial sweeteners so that it is safer for health. Meanwhile, based on [16], the processing of various processed dragon fruit products such as dodol, jam, and tea is an effort made to overcome the problems of dragon fruit farmer groups. Dragon fruit skin contains a natural dye, namely betacyanin which can be used as a natural dye for food products such as jelly [18]. By analyzing the scent, texture, and flavor of jelly, natural dyes from dragon fruit skin have a profound impact on the organoleptic features of jelly goods. In the meantime, according to [20], red dragon fruit juice is used as a natural dye for nata de coco. The findings indicated that the addition of super red dragon fruit juice had an impact on the physical quality of nata de coco, with a 50% addition resulting in a yield of 86.3%, a thickness of 1.5 cm, and a nata de coco that was well-liked by the panelists in terms of aroma, color, taste, and texture.

## 5 Conclusion

Dragon fruit is a fruit that contains various benefits from the fruit and the peel of the fruit. Dragon fruit has a characteristic red color, has a soft, scaly peel, and has a considerable number of black seeds. 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. Using the human senses, sorting dragon fruit crops is based on color, size, and physical defects. Dragon fruit can last up to 10 days at room temperature. After two weeks of storage, dragon fruit is still in reasonably good condition at a temperature of 14 °C. The flesh on the skin of dragon fruit can be used in making herbal teas, jelly, syrup, and various kinds of functional food products that are beneficial to the body.

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