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The Benefits and Uses of Red Dragon Fruit in Food Consumption

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Abstract. Red dragon fruit is a fruit that contains a lot of benefits. Dragon fruit can be consumed in various forms, such as yogurt, juice, and syrup. This article is a literature review, where the researcher collects several relevant articles, then they are reviewed, analyzed, and discussed systematically, to be able to make conclusions from the analysis. Based on several articles analyzed, it can be concluded that the way to consume the red dragon fruit are to make it into yogurt, fruit juice, syrup, *dodol*, sticks, jam, juice, candy, and ice cream. Red dragon fruit has positive effects on health, including blood circulation, neutralizes toxins in the blood, prevents cancer, lowering level of fat in the blood, as antioxidant, balancing blood sugar levels, and treats vaginal discharge.

Keywords: Red Dragon Fruit, Processed Foods, Fiber, Thrombocyte, Antioxidants.

1 Introduction

Indonesia is a country that has a tropical climate. In addition, land in Indonesia is fertile and has abundant natural resources. The soil fertility and good climate factors make Indonesia to be one of the countries that has tremendous potential in the fields of agriculture, plantations, forests, and matters related to farming. Because of Indonesia is one of the countries with a tropical climate, so it has the potential to produce typical fruits that grow in the tropics. One of the fruits that can thrive in tropical areas is dragon fruit [1]. Dragon fruit is a fruit that has oval shape or slightly round. It has skin with dragon-like, and has a red color. There is also dragon fruit which has yellow skin. Because of this fruit has fins similar to a dragon, so it known as the dragon fruit [2].

Dragon fruit is a fruit that is very suitable to be cultivated in areas that have tropical climates. Dragon fruit has many benefits, one of which is to improve blood circulation, reduce plaque, and also neutralize toxins in the blood. In addition, other benefits of dragon fruit are to prevent colon cancer and reduce levels of fat in the blood. Based on the results of the study, dragon fruit contains many nutrients, including flavonoids, polyphenols, and C vitamins which is quite high, where C vitamins is effective as an antioxidant, even though each dragon fruit species has different nutritional levels. Apart from the fruit, dragon fruit skin is also very useful, including as a natural dye for food and beverages. In the world of health, dragon fruit peel can be used as herbal medicine which has natural antioxidant properties [3]. This is supported by Rakhmadhan & Riki's research which states that the red dragon fruit peel extract with a concentration of 1 gram can provide a percentage of antioxidant activity of 20.867% with an IC value of 3.14 grams / 100ml or 31.040 ppm. Rakhmadhan & Riki's research proves that red dragon fruit skin has potential as an antioxidant, because based on their research, dragon fruit peel has antioxidant activity, where super dragon fruit peel waste has higher antioxidant

compounds compared to ordinary red dragon fruit peel [1]. So far, the skin of dragon fruit has been underutilized by the community, and has only been disposed of as waste.

2 Methods

This article is a literature review, where the researcher collects several relevant articles, then they are reviewed, analyzed, and discussed systematically, to be able to make conclusions from the analysis. In conducting article searches, researchers used google scholar, with the keyword "Dragon Fruit". At the first stage search, 516 articles were found. Then the researchers narrowed the scope of time, by selecting articles published in 2016-2021. From this second stage search, there were 53 articles. From the 53 articles, the researchers manually selected articles that discussed the use of dragon fruit in food consumption, and obtained 25 articles. Then the researchers sorted the articles based on the quality of the articles. The final step, the researcher reviews, analyzes, and synthesizes the article to make conclusions from the analysis.

3 Result and Discussion

After researchers browsed through several research articles on the utilization of dragon fruit and dragon fruit parts, we synthesized and analyzed some of these articles. One of the articles we analyzed was an article written by Rakhmadhan & Riki, who examined super quality red dragon fruit skin extract as an antioxidant using the DPPH method to determine % antioxidant activity and IC50 in super red dragon fruit peel extract grown in South Kalimantan. This study aims to determine the % antioxidant activity and the IC50 value contained in the super red dragon fruit peel extract. This research was conducted using a spectrophotometric technique with DPPH reagent on viscous extracts which were divided into several concentrations, namely 1%, 0.5%, 25%, 0.125%, and 0.0625%. Measurement of antioxidant activity is measured until IC50 is obtained by entering the y value ($y = 50$) in the line equation $y = bx + a$. Based on the results of Rakhmadhan & Riki's research, it was found that the greatest % activity value was at a concentration of 1%, which was 36.73%, while the lowest % activity value was at a concentration of 0.0625% which was 10.48%. The IC50 value obtained was 1.583% or 15,830 ppm with a very weak category of antioxidant activity. Even though it is very weak, we can say that in the super red dragon fruit peel extract grown in the plantation of Tajau Pecah Village, Tanah Laut Regency, there is antioxidant activity [4]. Based on field observations, dragon fruit peels constitute thirty-five percent of the total dragon fruit parts. It can be said that dragon fruit culture is a byproduct that has not been used optimally and in society it is usually only thrown into garbage or waste, even though dragon fruit skin actually has large levels of flavonoids such as fruit flesh which can be used as antioxidants [5].

Table 1. Research about the benefits of dragon fruit

Authors	Title	Result
Rakhmadhan Niah, Riki Nirwan Baharsyah	Uji Aktivitas Antioksidan Ekstrak Etanol Kulit Buah Naga Merah Super (<i>Hylocereus costaricensis</i>)	There is antioxidant activity in the super red dragon fruit peel extract grown in the plantation of Tajau Pecah Village, Tanah Laut Regency
Hernawati, N A Setiawan, R Shintawati, D Priyandoko	The Role of Red Dragon Fruit Peel (<i>Hylocereus polyrhizus</i>) to Improvement Blood Lipid Levels of Hyperlipidaemia Male Mice	Dragon fruit skin has large levels of flavonoids which can be used as antioxidants
Siti Rofiatun Nisa, Hari Santoso, Ahmad Syauiq	Analisis Kadar Vitamin C pada Selai Stroberi (<i>Fragaria</i> sp.) - Buah Naga (<i>Hylocereus costaricensis</i>)	Dragon fruit has great benefits for health to balance blood sugar levels, preventing diabetes and colon cancer, and reduce cholesterol levels in the body
Reni Heryani.	Pengaruh Ekstrak Buah Naga Merah Terhadap Profil Lipid Darah Tikus Putih Hiperlipidemia	Dragon fruit can be processed into various processed products including fruit juice, syrup, jam, <i>dodol</i> , sticks, jam, and ice cream
M. Ilmi Hidayat, Inda Ilma Ifada, Gusti Khairu Ni'mah	IbM Pengolahan Buah Naga Sebagai Upaya Meningkatkan Nilai Tambah Dan Pengendalian Harga Buah Naga Di Kabupaten Tanah Laut	Dragon fruit can be made into various kinds of processed products, namely various dragon fruit snacks, dragon fruit juice, dragon fruit sticks, dragon fruit jam, and dragon fruit ice cream
Nia Rochmawati	Utilization of Red Dragon Fruit (<i>Hylocereus polyrhizus</i>) Peel as Flour for Making Cookies	The content of crude food fiber in red dragon fruit is 10.1 grams per 100 grams. The content of vitamins A, C and E in this fruit were 102.13 μg , 540.27 μg and 105.67 μg per 100 grams of dry weight. Red dragon fruit is usually consumed directly or processed as juice, candy, ice cream, syrup, and so on
Suci Nur Nur Laxmi, Tjandrakirana, Tjandrakirana, Nur Kuswanti	Pengaruh Filtrat Kulit Buah Naga Merah (<i>Hylocereus polyrhizus</i>) terhadap Kadar Glukosa Darah Mencit <i>Mus Musculus</i> yang Diinduksi Glukosa	The skin of white dragon fruit was used 15% as a substitute for wheat flour. The dragon fruit peel will affect the fiber, ash, and carbohydrate content of the cookies. The protein, fat, ash, and fiber content of the red dragon fruit skin were 8.98%, 2.60%, 18.76% and 25.56%
Ni Made Indah Ayuni	Efek Buah Naga Merah (<i>Hylocereus polyrhizus</i>) Terhadap Penurunan Kadar Glukosa Darah Pada Diabetes Tipe 2	The red dragon fruit has benefits for lowering blood glucose levels
Kresto Ratimba, Valen Ruterlin, Joni Tandi	Uji Aktivitas Fraksi Buah Naga Merah Terhadap Penurunan Glukosa Darah Tikus yang Diinduksi <i>Streptozotocin</i>	Red dragon fruit (<i>Hylocereus polyrhizus</i>) is believed to balance blood glucose levels
Yuska Novi Yanty, Vetria Ade Siska	Ekstrak Kulit Buah Naga Merah (<i>Hylocereus polyrhizus</i>) Sebagai Antioksidan dalam Formulasi Sediaan Lotion	Dragon fruit has a fairly high antioxidant content, including flavonoid compounds, vitamin C, and polyphenols. In addition, dragon fruit also has color pigments in the form of anthocyanins which also function as antioxidants

I Gede Gelgel Bayu Surya Putra, Dorta Simamora	Potensi Jus Buah Naga Merah (<i>Hylocereus polyrhizus</i>) terhadap Perbaikan Jaringan Organ Otak Tikus (<i>Rattus norvegicus</i>) Diabetes	Dragon fruit is rich in antioxidants and contains many other nutrients such as calcium, beta-carotene, B1 vitamins, B2 vitamins, C vitamins, phosphorus, and flavonoids
Rekna Wahyuni	Pemanfaatan Kulit Buah Naga Super Merah (<i>Hylocereus costaricensis</i>) Sebagai Sumber Antioksidan dan Pewarna Alami pada Pembuatan Jelly	Dragon fruit is also a potential free radical inhibitor because it contains betasianin and can help lower blood glucose levels and can prevent the risk of heart disease in diabetics
Sasi Gendro Sari, Susi, Nurlely	Komposisi Kandungan Gula Buah Naga <i>Hylocereus costaricensis</i> Yang Tumbuh Di Perkebunan Anorganik Banjarbaru, Kalimantan Selatan	Dragon fruit is believed to lowering blood glucose levels, because dragon fruit contains antioxidant compounds in the form of flavonoids which are protective against beta cell damage, which functions as a producer of insulin and can increase insulin sensitivity
Winda Agustina, Mustika Handayani	Pengaruh Penambahan Wortel (<i>Daucus carota</i>) terhadap Karakteristik Sensori dan Fisikokimia Selai Buah Naga Merah (<i>Hylocereus polyrhizus</i>)	Red dragon fruit (<i>Hylocereus polyrhizus</i>) contains vitamin C and a fairly high water content, which is around 9.4 mg or 90.20%
Siti Syariful Akhmad Khumaidi	Isolasi dan Identifikasi Senyawa Flavonoid Ekstrak Etanol Buah Naga	Dragon fruit contains flavonoid, phenolic, and polyphenol chemical compounds. The isoflavone content in flavonoid compounds can reduce the risk of heart disease, kidney diabetes, and osteoporosis

Increasing public knowledge about the use of dragon fruit can also be found in an article written by Ilmi Hidayat et al, where in the article, namely about dragon fruit processing as an effort to increase added value and control the price of dragon fruit in Tanah Laut Regency, explained that in South Kalimantan, cultivation Dragon fruit only started in 2007. The types of dragon fruit grown are mainly red dragon fruit. At first the people were not familiar with dragon fruit, but because of its sweet and fresh taste, and its benefits are quite high, so that this red dragon fruit is increasingly known in the community. The increasing public interest in dragon fruit has led to an increasing trend of dragon fruit cultivation [6]. In addition, dragon fruit cultivation is technically quite easy to develop, because dragon fruit plants can grow in any soil and altitude. The thing to note is that this plant is quite greedy for nutrients, so that if it is planted in soil that contains good fertilizer, it will grow well. According to research, dragon fruit has great benefits for health, namely being able to balance blood sugar levels, preventing diabetes and colon cancer, and being able to reduce cholesterol levels in the body [7].

The cultivation of dragon fruit, which is getting more and more, causes the stock of dragon fruit is also quite a lot. This is detrimental to the farmers because the price is decreasing. This happens because many cultivate plant dragon fruit, but there is no further processing. This of course will be detrimental to farmers, so to overcome this problem it is necessary to design an appropriate post-harvest handling strategy from upstream to downstream so that farmers are not harmed. Apart from being marketed in fresh form, dragon fruit can also be processed into various processed products including fruit juice, syrup, jam, *dodol*, sticks, jam, and ice cream. Dragon fruit peel which weighs about 30-35% of the weight of the fruit with a red color with certain techniques can be processed into functional drinks, namely as a source of antioxidants that are useful for health and can be used as natural dyes. The business opportunity for dragon

fruit processed products is still wide open because dragon fruit has several advantages compared to other fruits, namely having properties that are beneficial to human health, including as a balancing of blood sugar levels, protecting oral health, preventing colon cancer, reducing cholesterol, preventing bleeding, and treating complaints of vaginal discharge, so that dragon fruit processed products can be used as functional food [8] [9].

In the article written by Ilmi Hidayat et al., it is known that the problems in the community are: 1. Not having skills and knowledge to increase added value in the form of processed dragon fruit products; 2. The price of dragon fruit and farmers' income continues to decline while the number of farmers cultivating it is increasing; 3. The need for innovation development in order to sustain their business and increase their income; 4. The absence of sufficient business capital and tools to make processed food products from dragon fruit. Based on these community problems, dragon fruit processing training activities were held by making several tiger products made from dragon fruit as raw material and business management training. The results of these activities indicate that: 1) Dragon fruit can be made into various kinds of processed products, namely various dragon fruit snacks, dragon fruit juice, dragon fruit sticks, dragon fruit jam, and dragon fruit ice cream; 2) Based on the level of consumer acceptance, processed dragon fruit products range from 'like' level to 'very like' for color and 'like' level for taste, aroma, and overall [6].

Based on the article from Nia Rochmawati, it is stated that dragon fruit, which is a cactus species, consists of red dragon fruit (*Hylocereus polyrhizus*), white dragon fruit (*H. undatus*), and yellow dragon fruit (*Selenicereus megalanthus*) [10]. Red dragon fruit has a high water and fiber content. The content of crude food fiber in red dragon fruit is 10.1 grams per 100 grams. In addition, the content of vitamins A, C and E in this fruit were 102.13 μg , 540.27 μg and 105.67 μg per 100 grams of dry weight, respectively. Red dragon fruit is usually consumed directly or processed as juice, candy, ice cream, syrup, and so on. While the by-product in the form of skin as much as 22% of the red dragon fruit is just thrown away. Red dragon fruit skin contains pectin, betasianin pigment, and dietary fiber with a soluble dietary fiber: insoluble dietary fiber ratio of 1: 3.8. A research on the use of cookies from white dragon fruit peel has been conducted by Suci et al. In that study, it was stated that the skin of white dragon fruit was used as much as 15% as a substitute for wheat flour. The results obtained indicate that the addition of dragon fruit peel will affect the fiber, ash, and carbohydrate content of the cookies. The protein, fat, ash, and fiber content of the red dragon fruit skin were 8.98%, 2.60%, 18.76% and 25.56%, respectively. Dietary fiber is a part of carbohydrates that cannot be digested by the body [11]. Dietary fiber is categorized into two based on its solubility in water, namely soluble dietary fiber and insoluble dietary fiber. The average adult fiber requirement is 30 g/d [12]. A food can be claimed as a source of fiber if it meets 3 g/100 g of solid weight of a food. Based on the article from Nia Rochmawati, it was found that dragon fruit skin cookies from a chemical perspective were obtained from the proportion of dragon fruit skin flour: wheat flour (90:10) had a water content of 8.06%, an ash content of 6.81%, a protein content of 5.63%, a fat content of 27.03%, carbohydrate content of 52.47%, and fiber content of 31.26%. Each serving also meets several requirements required as standard quality cookies except for water content standards [10].

Based on research from Ni Made Indah Ayuni, red dragon fruit is easy to find in various regions and tastes sweet. This causes dragon fruit to be very popular with the community. In addition to its delicious taste, red dragon fruit also has benefits for lowering blood glucose levels, so Ni Made Indah Ayuni wants to research the effect of red dragon fruit in reducing blood glucose levels in people with type 2 diabetes mellitus [13]. According to Kresto Ratimba, one of the traditional medicinal plants that can be used by the community is red dragon fruit

[14]. This is because red dragon fruit (*Hylocereus polyrhizus*) is believed to balance blood glucose levels. Red dragon fruit (*Hylocereus polyrhizus*) is a plant that comes from dry tropical climates. Dragon fruit has a fairly high antioxidant content, including flavonoid compounds, vitamin C, and polyphenols. In addition, dragon fruit also has color pigments in the form of anthocyanins which also function as antioxidants [15]. Dragon fruit is rich in antioxidants and contains many other nutrients such as calcium, beta-carotene, B1 vitamins, B2 vitamins, C vitamins, phosphorus, and flavonoids [16]. Dragon fruit is also a potential free radical inhibitor because it contains betasianin and can help lower blood glucose levels and can prevent the risk of heart disease in diabetics [17]. Based on research, dragon fruit is believed to have the effect of lowering blood glucose levels, because dragon fruit contains antioxidant compounds in the form of flavonoids which are protective against beta cell damage, which functions as a producer of insulin and can increase insulin sensitivity [18]. The way flavonoids work is by inhibiting the absorption of glucose in GLUT-2 and causing the major glucose transporter in the intestine to decrease, causing the glucose level in the blood to also decrease. It can be said that the flavonoids contained in dragon fruit can also prevent diabetes mellitus. Dragon fruit also contains high fiber which is important for digestive health. Dragon fruit also contains lycopene compounds, which are pigments that give red color. The function of lycopene can affect insulin hormone resistance, so that it can cause the body's tolerance to glucose to increase [19]. The fiber contained in dragon fruit can bind water, so that glucose is less likely to come in contact with the intestinal wall and enter the blood. This causes the pancreas to produce less insulin, because the level of glucose that enters the blood is low, resulting in a decrease in glucose levels in the blood [20].

Based on the research, it is known that the effect of dragon fruit with higher doses will have a tendency to decrease blood glucose is greater for people with type 2 diabetes mellitus. This is in line with research conducted by Siti, that red dragon fruit contains many bioactive compounds that have potential as anti-free radicals, for example betasianin [7]. In addition, according to Kristanto, 2013, red dragon fruit (*Hylocereus polyrhizus*) also contains vitamin C and a fairly high water content, which is around 9.4 mg or 90.20% [21]. Dragon fruit contains flavonoid, phenolic, and polyphenol chemical compounds. According to Asih, 2012, the content of flavonoid compounds in red dragon fruit can reduce glucose levels in the blood. In addition, the isoflavone content in flavonoid compounds can also reduce the risk of heart disease, kidney diabetes, and osteoporosis [22].

4 Conclusion

Based on the discuss above, it can be concluded that dragon fruit can be consumed directly in fresh form, or processed in various forms, including yogurt, fruit juice, syrup, *dodol*, sticks, jam, juice, candy, and ice cream. Dragon fruit peel can be processed into functional drinks. The benefits of consuming dragon fruit are to improve blood circulation, reduce emulsions, and neutralize toxins in the blood, prevent colon cancer and reduce fat levels in the blood. In addition, dragon fruit also contains antioxidants, balances blood sugar levels, prevents diabetes and colon cancer, lowers cholesterol levels in the body, protects oral health, prevents bleeding and treats vaginal discharge complaints. Dragon fruit is proven to be able to reduce blood glucose levels in people with type 2 diabetes mellitus, preventing the risk of heart disease, kidney diabetes, and osteoporosis. The nutrients contained in dragon fruit include calcium, beta-carotene, B1 vitamins, B2 vitamins, C vitamins, phosphorus, flavonoids, phenolic, and polyphenols. In addition, dragon fruit skin can also be used as a natural dye for food and beverages, natural antioxidants, and ingredients for making cookies.

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