

The Effect of Drying Methods on The Quality of Dragon Fruit Skin Tea

Adzani Ghani Ilmannafian*, **Mariatul Kiptiah**, **Muhammad Indra Darmawan**,
and Ridho Saputra

Department of Agroindustrial Technology, Politeknik Negeri Tanah Laut, Jl. A. Yani Km 6, Desa Panggung, Pelaihari, Kabupaten Tanah Laut, Kalimantan Selatan
Email: adzani@politala.ac.id*

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Abstract

As a co-product, dragon fruit peels still contain polyphenols that can be used as a tea product alternative, requiring an appropriate drying process. Therefore, it is necessary to find a suitable drying method to obtain high-quality dragon fruit peels as tea product ingredients. The aim of this research is to determine the quality of dragon fruit skin tea with different drying methods. This research used an experimental method by using sun drying against the oven as a drying method in the drying stages of the dragon fruit tea skin making process. The dried fruit peels were then characterized by their tannin, flavonoid, vitamin C, and water contents, as well as their hedonic test scores. The results showed that the qualitative results of tannins and flavonoids in dragon fruit peel tea were positive (+), and the vitamin C content of the peel tea was higher when produced in sun-dried (6.6 mg/100g). On the contrary, the water content of dragon fruit peel tea was higher (7%) by oven drying. Based on hedonic tests, the panelists preferred dragon fruit peel tea produced by the sun drying.

Keywords: *dragon fruit skin, drying, oven, tea*

1. INTRODUCTION

Dragon fruit is a fruit where only the flesh is consumed, and the skin is only thrown away as waste. Dragon fruit skin has advantages that have not been utilized properly. As much as 30-35% of a whole dragon fruit is the skin of the fruit (Nazzarudin et al., 2011). Raudhatul (2017) stated that dragon fruit skin is much more beneficial than the flesh because dragon fruit skin contains antioxidants that can ward off free radicals.

Substances contained in the red flesh of dragon fruit skin in 100 g of dragon fruit include calories 60 kcal, protein 0.53 g, carbohydrates 11.5 g, fiber 0.71 g, calcium 134.5 mg, phosphorus 87 mg, iron 0.65 mg, vitamin C 9.4 mg, anthocyanins, antioxidants, phenols, flavonoids, proteins, fats, carbohydrates, and water content of 90% (Anzharni, 2016). Many people do not know the benefits of dragon fruit skin. Based on the content contained in dragon fruit skin, research was carried out to make dragon fruit skin tea as well as an innovative approach to utilize dragon fruit skin and further increase its added value.

The drying method is an important factor that affects the quality of the tea. If it's too high, it can damage some of the antioxidant compounds (Kusuma, 2019). Therefore, research was carried out on making dragon fruit peel tea using different drying methods to find out the best way.

2. MATERIAL AND METHODS

2.1 Tools and materials

The tools used were an oven (Yamato), hotplate (Thermo), measuring flask (Iwaki Asahi 100 ml), and volume pipette (Iwaki Asahi 25 ml). The ingredients used in making dragon fruit peel tea were rose-type red dragon fruit peel, which has been cut into small 1 cm pieces, as well as the ingredients used in the tannin test, flavonoid test, vitamin C test, and distilled water, iron (III) chloride solution (FeCl₃) 1% (Merck), 96% alcohol (Merck), concentrated HCL (Merck), Mg powder (Merck), 0.01 N iodine solution (Merck), 1% starch (Merck).

2.2 Samples preparation

Rose-type dragon fruit skins (300 g) were purchased in Tajau Pecah village, and they were cut into small pieces with the size of approximately 1 cm. The cutted fruit skin was then dried using an oven (15°C, 18 h) and sun drying (24 h) to see the difference in the tea content. According to Nasir (2020), the use of temperature and time variations has enabled the researcher to assess the differences in the quality of the leather samples in two different drying methods.

2.3 Chemical analysis

The dragon fruit peel tea was tested for tannin and flavonoid qualitatively. Vitamin C content was determined by the iodimetry, and water content was determined by the thermogravimetry.

2.4 Hedonic Test

The hedonic test was carried out using panelists, which tested for the tea's taste, color and aroma. The SNI calculation for Organoleptic and/or Sensory Testing Instructions 01-2346-2006 was used to calculate the average quality value interval for each panelist.

3. RESULTS AND DISCUSSION

Dragon fruit skin is dried using an oven at 50°C for 18 hours. The drying method using an oven has the advantage of a relatively short time required, and the heat provided is relatively constant. However, the method was quite expensive (Bambang, 2016). Meanwhile, sun drying for 24 hours has the advantage of being economical. However, the drying time depends on weather conditions. (Mukhti, 2016).

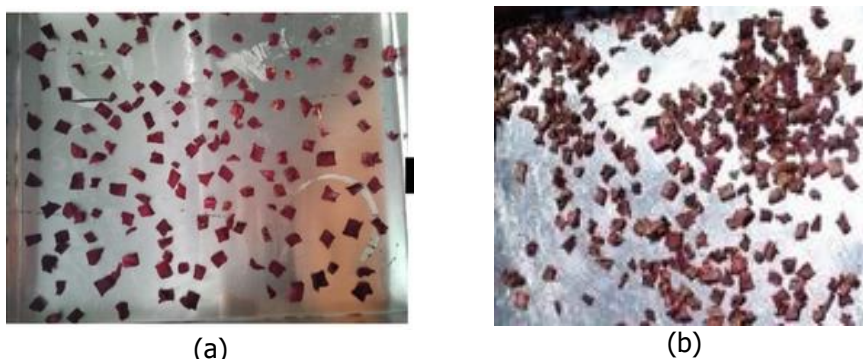


Figure 1 (a) Oven drying and (b) sun drying processes of dragon fruit peels

When dragon fruit was dried using an oven, its skin had a drier and harder texture due to the higher temperature of the oven. This resulted in a lower water content and a redder color compared to drying in sun drying (Figure 1). Sun drying could fade the color of dragon fruit skin due to the presence of ultraviolet rays, which could break down the chemical bonds in the skin. The characteristics of dragon fruit tea are summarized in Table 1.

Table 1. Characteristics of Dragon Fruit Peel Tea

Method	Water content (%) Maks 8% (SNI 3945:2016)	Vitamin C (mg/100g)	Tannin Compounds	Flavonoid Compounds
Oven	7.0 ± 1.04	3.31	+	+
Sun drying	9.2 ± 0.58	6.60	+	+

3.1 Water content

Water content is a very important characteristic of food ingredients because it can affect the appearance, texture and taste of food ingredients. According to Bambang (2016), dried tea is hygroscopic so it is very susceptible to damp conditions. Likewise, dried dragon fruit peel tea has hygroscopic properties so their water content needs to be considered to maintain the quality of the tea.

The water content of dragon fruit skin tea dried using an oven, and sun drying has a water content of 7% and 9.2%, respectively. It is observed that dragon fruit skin contains the highest average water content when dried at high temperatures in sun drying. This is because the higher the drying temperature, the more water molecules will evaporate from the dried dragon fruit skin tea. The longer the drying time and the higher the drying temperature, the lower the water content of dragon fruit peel tea. This condition is also supported by the surface area of the dried dragon fruit skin which has a relatively equal skin surface area, making it easier for water to evaporate in the dragon fruit skin. A thin layer will reduce the distance between heat energy moving towards the center of the material so that the water will come out from the material. It was shown that the water content of dragon fruit skin produced by oven drying meets the dry tea quality requirements, (SNI 3945:2016 green tea) of a maximum of 8%.

3.2 Vitamin C content

Vitamin C is known by its chemical name from its main form, namely ascorbic acid. Vitamin C is classified as a water-soluble vitamin. Sources of vitamin C are mostly vegetables and fruits, especially fresh fruits. The average daily nutritional intake of around 30 to 100 mg of vitamin C is recommended for adults (Angelia, 2017).

The vitamin C content in dragon fruit skin is 9.4 mg. The vitamin C was detected by using the Iodimetry method (direct titration). Vitamin C reacts with iodine to produce dehydroascorbic acid, and iodine acts as an oxidizer using a starch indicator; during titration, it reacts with the starch indicator solution to form blue iod-amylum. The formation of a blue color indicates that the titration process has been completed because all the vitamin C has been added to iodine so that the volume of iodine needed during the titration is equivalent to the amount of vitamin C (Nurdin, 2015).

The vitamin C content of dragon fruit peel tea produced by oven drying and sun drying were 3.31 and 6.6 mg/100g, respectively. The difference in the vitamin C content of dragon fruit peel tea products was due to the different thickness positions of the fruit peel slices. During the drying process, which causes the heat received by each product to be different, resulting in differences in damage to vitamin C due to heating in each product. Therefore, the vitamin C levels of each product become unstable.

Judging from the test results for vitamin C content, the higher the drying temperature, the more vitamin C will be damaged because vitamin C is easily oxidized. High drying temperatures will accelerate vitamin C oxidation. This is in accordance with the research of Yanti, et al, (2012) that if the vitamin C content is small and then heated, the resulting vitamin C levels will be smaller. Temperature influences vitamin C resistance, in which vitamin C resistance decreases with increasing temperature. In the drying process, water removal is important, because ingredients (fruit) that contain water and are processed at high temperatures will destroy all the vitamin C.

3.3 Tannin Content

Tannins are a group of polyhydroxy phenols that can be distinguished from other phenols because of their ability to precipitate proteins. This compound has antioxidant activity to inhibit tumor growth (Anggraeni & Oktadoni, 2016). Identification of tannin content in dragon fruit peel tea with the addition of FeCl_3 is positive (+) for the presence of tannin by forming a black color. The addition of FeCl_3 is used to determine the presence of phenol groups in the sample. The presence of a phenol group in a sample can be detected by observing a greenish-black or blue ink. A positive result from the tannin test with FeCl_3 suggests the presence of phenolic compounds, which may include tannin, a polyphenolic compound. Therefore, the presence of tannin may be indicated by the presence of a positive FeCl_3 tannin test and the simultaneous observation of a greenish-black or blue ink. The formation of a blackish green or inky blue color in the extract following FeCl_3 addition is because tannin will form a complex compound with Fe^{3+} ions (Ergina, 2014). From the human sight, oven drying of dragon fruit skin tea produces more black color than those by sun drying, this is because some of the active plant compounds are damaged due to the influence of ultraviolet (UV) from sunlight.

3.4 Flavonoid Content

Flavonoids are found in all green plants, so they can be found in every plant extract. Flavonoids are polar compounds because they have a number of unsubstituted hydroxyl groups. Polar solvents such as ethanol, methanol, ethyl acetate, or a mixture of these solvents can be used to extract flavonoids from plant tissue. Dragon fruit peel tea, which was dried by both oven and sun drying, showed that the dragon fruit peel tea, which was initially red, changed to yellow, indicated that it positively contained flavonoids with the type of flavon compound (Table 2).

The flavonoid content test showed that the ethanol and water extract of red dragon fruit peel tea were yellow and pink, respectively, and it was positive for flavonoids (Lanisthi, 2015). Magnesium and hydrochloric acid react to form bubbles, which are H_2 gas. At the same time, the concentrated Mg and HCL powders in this test had a function of reducing the benzopyrone nuclei contained in the flavonoid structure so that the colors become red, yellow, and orange.

According to Lilik (2013), if there is a color change from dark red to purple in the flavonoid test, then the extract contains flavonoids. Flavone compounds gave the red to orange color, the dark red color was given by flavanol or flavonoid compounds, and the green color was given by glycine or glycoside compounds.

3.5 Hedonic Test

The hedonic test is a test in organoleptic sensory analysis that is used to determine the magnitude of differences in quality by providing data from hedonic test results analyzed descriptively using the values given in accordance with SNI 01-2346-2006 Instructions for organoleptic testing and/or sensory assessment of certain properties of a product.

Table 2 Hedonic test results for dragon fruit peel tea

Drying Method	Color	Aroma	Flavor
Oven	6 (somewhat like)	6 (somewhat like)	4 (somewhat dislike)
Sun	7 (like)	6 (somewhat like)	4 (somewhat dislike)

The results of the hedonic test showed that the panelists had the highest level of preference for the color when dried in the sun, with a value of 7 (like). This was caused by the brown color of dragon fruit skin tea almost resembles the color of tea in general.

The aroma and color of dragon fruit skin tea dried in the oven and sun drying have the same favorability value, because it used the same type of red dragon fruit, and there weren't other mixed ingredients that affect the aroma and taste of the skin tea dragon fruit.

4. CONCLUSION

Dragon fruit peel tea produced by oven-drying and sun drying-drying contains positive tannins and flavonoids. The tea produced by sun drying contains 7%, which meets SNI No. 3945:2016. Vitamin C content in dragon fruit peel tea produced by sun-drying was highest (6.6 mg/100g). Dragon fruit peel tea produced by sun-drying exhibits an aroma, color, and texture better than those produced by oven drying.

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