

Environmental Management and Utilizing Dragon Fruit Peel Waste as Natural Food Coloring

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Abstract— In the current environmental management there are a lot of obstacles faced, one of which is the garbage that has accumulated and prolonged so that it requires efforts to overcome it. Dragon fruit skin waste is an alternative to be utilized as a natural food coloring agent. With food coloring and beverages will be more attractive to consumers. This study aims to obtain natural dyes from dragon fruit peel waste, through natural extraction, and comparison using soxhlet, using the ethanol petroleum assistants, then conducted with food staining and organoleptic tests. This research uses extraction method. Dragon fruit is taken its skin then dried, the next process is drying and flouring. After the flouring, an anthocyanin stability test is obtained, then applied to food and organoleptic tests. The results showed that served in food and the color generated from the skin of dragon fruit for food coloring, the resulting color is very bright, so it is very interesting in terms of the texture of the food served.

Keywords— Dragon fruit, Environment, management, waste utilization.

I. INTRODUCTION

The current environment condition makes us worried with the impact caused in the future, when the environment is not clean, flies and mosquitoes will grows rapidly, and the most chronic impact is its impact on human health. By utilizing the organic and inorganic waste, we can create a clean and attractive environment as well as reduce the environmental burden.

The achievement of harmony and balance between humans and environment as well as the realization of Indonesian as environmental human who have attitudes and actions to protect the environment. With the burden on the environment that is getting more complicated in the future, and its accumulation, the writer raises one of the environmental wastes, dragon fruit peel waste as a natural food coloring agent.

The exotic red color and the taste of the fruits are very sweet and very delicious, especially when we eat them in the hot weather, these facts about dragon fruit make them very attractive. Dragon fruit plants are prickly sharp, but the color emitted from flowers to the fruit which make them very interesting.

Dragon fruit is one of the exotic plants that are quite popular in the world, especially in Southeast Asia. Although very popular in Southeast Asia, this plant actually originated from Mexico, South America. In Indonesia, currently dragon fruit is cultivated and the results are imported to abroad, and lately there are many who research about dragon fruit, because it is known that dragon fruit has many benefits. In order to grow Dragon fruit plants, they need to be supported to straighten the plant up, by helping to make a place so that growth.

All dragon fruit plants are very valuable, their flesh, peel, stems and flowers, each part has a different function and can be made into enzymes. Dragon fruit contains anthocyanin, a water soluble fiber and albumin which are difficult to find in other plants. In addition to its high oxidative agent, its anti-

aging and detoxification agents also add to the dragon fruit. The flesh of the fruit has a sweetness level of around 13-18 briks, 90% content of water and other advantages this fruit also contains microorganisms that are beneficial to the endocrine system.

According to Tia Nanda, et al. (2016), they state that dragon fruit has many benefits both its flesh and peel. Dragon fruit can be used in food production as a natural food coloring, because dragon fruit peel contains of antioxidants, one of which is anthocyanin.

Most consumers only eat the flesh of the fruit then thrown up the peel so it causes unpleasant odors at the dump or in the household environment. So the authors conducted study by utilizing waste dragon fruit peel into natural food coloring.



Figure 1. The inside of the dragon fruit

According to a clinical trials conducted by Artiningsih & Purwaningtyas (2016) shows that not only dragon fruit flesh holds a lot of benefit and function. Bright peel tends to be scaly also known to contain active compounds such as *pentacyclic trlyepene taraxast 20ene 3aol*, *taraxast 12.20 (30)* and *3aol*. Both of these compounds are very effective to protect the flexibility of blood vessels. In fact, this efficacy equals the Troxerutin, a medicine which is known as a chemical substance used to protect micro blood vessels. This medicine is widely distributed in the market and is known to reduce the potential for ruptured blood vessels. Based on that clinical trial, it turns out that it is not only dragon fruit flesh that stores a lot of benefit and function.

This study was conducted by extracting the fruit peel by doing an extraction. The red color that come from dragon fruit peel shows that it is contain of anthocyanin. The natural color is carried out by the extraction process. Extraction is a process of separation, from a component of the material by smoothing and then dissolving it with one of the components in accordance with the dissolved material. Where the usual and commonly used solvents are: water, ethanol and petroleum ether. According to a study which is conducted by Endang Kwartiningsih, *et al.* (2009), the solvents greatly affect the extraction process. The selection of solvents is generally influenced by some factors: (1) the solvent must be able to dissolve all substances, which will be extracted quickly and perfectly, (2) the solvent must have a low boiling point, so that the solvent is easy to vaporize without using high temperature, (3) the solvent must be inert so that it does not react with other components, (4) the solvent must have same boiling point and if it is vaporized, it does not lag behind in the product, (5) the price of the solvent must be as cheap as possible, (6) the solvent must not flammable.

Aim of the Study

This study aims to obtain natural food coloring from dragon fruit peel waste, through natural extraction, and compared to Soxhlet, assisted by ethanol petroleum, food staining and organoleptic tests.

Basic Theory of the Study

According to Wikipedia, dragon fruit (English: Pitaya) is kind of cactus fruit from the genera *Hylocereus* and *Selenicereus*. This fruit comes from Mexico, Central America and South America but now it is also cultivated in Asian countries, such as Taiwan, Vietnam, Philippines, Indonesia and Malaysia. This fruit can also be found in Okinawa, Israel, Northern Australia and Southern China. *Hylocereus* only blooms at night.

According to Wikipedia, the morphology of dragon fruit plants consists of roots, stems, thorns, flowers and fruit. Dragon fruit root is just a fibrous root that grows in soil on the upper stem as a hanging root. The roots grow along the stem on the dorsal fin at the corner of the stem. In the thorns, roots grow flowers that look like "Wijayakusuma" flowers. Flowers that do not fall develop into fruit. Dragon fruit shape is round rather than oval, about the size of an avocado. The peel is bright red, for both types of fruit, white and red dragon fruit. The trunk is in the form of a triangle, its thorn is very short and inconspicuous, so it is often considered a "thorny cactus". The flowers bloom at the beginning of dusk, the flower buds are about 30 cm long.

According to Emilda (2016) Dragon fruit pulp porridge was extracted using water solvent and citric acid for three days. Dragon fruit peel extract can be applied directly into food such as wet noodles. The extraction process is done by boiling dragon peels and then blended them until smooth, then filtered. This extract directly added to the dough.

A. Total anthocyanin tends to decrease due to rays treatment that emit energy in the visible spectrum of photons and are absorbed by atoms or anthocyanin molecules will encourage photochemical reactions that damage the

anthocyanin structure. The process results in the degradation which causes anthocyanin to lose red color. Anthocyanin decomposition due to sunlight and UV is able to change the form of *aglycones* into *chalcones* (colorless) and eventually form a brown *alfadaketone* (Budiarto, 1991).

B. Temperature impacts the presence of anthocyanins in food ingredients. The mechanism by which temperature can degrade anthocyanin cannot be explained. The possibility of color degradation of the anthocyanin pigment is caused by the change in red flavones cation to carbinol and finally to a colorless calcone and ends in a brown color degradation product (Puspita *et al.*, 2004).

II. METHOD

The material used is waste dragon fruit peel waste. The tools used are blenders, traditional scales and centrifugal scales, porcelain cups, ovens for drying, knives, vacuum filters, spectrophotometers, PH meters, pipettes.

Dragon fruit was collected from around Semarang, and then peeled off from it flesh, the peel is \ dried. The next process is drying and flouring. After the flouring, an anthocyanin stability test is obtained, and then applied to food staining test and organoleptic tests.

III. RESULT AND DISCUSSION

The implementation of the dragon fruit color analysis test, obtained data as follows:

1. Test the heating temperature of dragon fruit waste flour

Heating process on dragon fruit waste flour, has an influence on anthocyanin, the heating time affects the anthocyanin pigment. Warming at a temperature of 50°C, 60°C, 90°C of 40, 50 and 60 minutes, the anthocyan is still high, but once heating is done for more than 60 minutes, the anthocinin has shown low conditions. According to (Puspita *et al.* 2004), temperature has an influence on the presence of anthocyanin in food. The mechanism by which temperature can degrade anthocyanin cannot be explained. The possibility of color degradation of the anthocyanin pigment is caused by the change in the red cation flavon to carbideol and finally to a colorless calcone and ends in a brown color degradation product.



Figure 2. Solvent treatment results



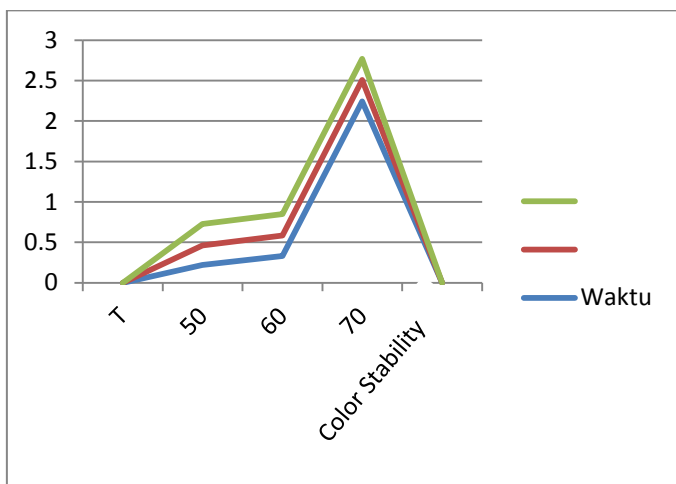
Photo 3. Deposition results



Photo 4. The stirring process

Table 1. Temperature of heating process of the dragon fruit peel waste flour

T	40 Minute	50 Minute	60 Minute
50	0.3122	0.3321	0.3423
60	0.3344	0.3521	0.3622
90	0.4121	0.4411	0.4621

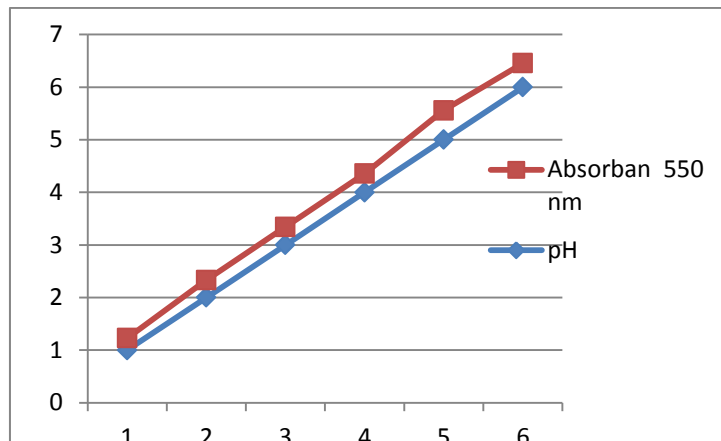


2. pH

The anthocyanin pH of dragon fruit peel waste greatly affects the color that appears and the stability of the color. After the heating process the pH listed below, higher the pH shows higher the absorbent level.

Table 2. pH test result

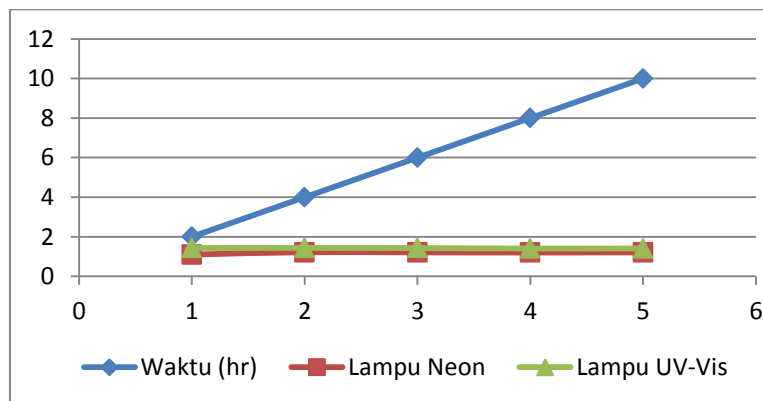
pH	Absorban 520 nm
1	0,2292
2	0,3322
3	0,3432
4	0,3552
5	0,3573
6	0,4553



3. Rays

Ultra Violet rays and laboratory rays (Neon light rays) were used to test the anthocyanins of dragon fruit peel waste are. If the ray is too long and too high it will damage the color in the dragon fruit peel waste. The anthocyanin pigment and yield will be damaged by too high ray. The result was show in the graph below:

Time (day)	Neon-light	Ultra violet
2	1.1011	1.4322
4	1.2180	1.4335
6	1.2085	1.4302
8	1.2026	1.4055
10	1.2088	1.4097



The graph shows that the UV rays used to produce damaged and faded the colors caused by high rays, compared to laboratory rays with neon- light, the results obtained to be better and brighter.

4. Favorite Test

People like the bright color from food that was obtained from natural food coloring from dragon fruit waste. Most people say that the food will look more delightful.

IV. CONCLUSION

The results presented in food and the colors arising from the peel of the dragon fruit for natural food coloring is very bright, so it is very interesting in terms of the texture of the food served. Because of the color already has its own allure for the appearance of the food. From the several opinions

about the food served, many people choose food which has color from dragon fruit, because it is more attractive and does not affect the taste. The natural fruit color does not make the food become dangerous for those who eat it.

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