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The Effect of Long Drying on the Chemical and Organoleptic Characteristics of Excelsa Coffee Skin Tea *(Coffee liberica var.dewevrei)*

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ABSTRACT
Handling coffee skin waste has caused problems because it is left to rot, stacked, and burned which can cause negative impacts on the surrounding environment so it needs to be overcome. One way that can be done is to utilize these natural resources by processing coffee skin waste into processed or other products with high economic value, namely coffee skin tea. This study aims to determine (1) the effect of drying time on the chemical characteristics of coffee skin tea products (cascara) and (2) the effect of drying time on the organoleptic of coffee skin tea which includes color, aroma, and taste. The method used in this study is an observation method with a qualitative data approach. This method used two subjects, namely chemical and organoleptic characteristics in tea, to be observed within one month. The results showed that different drying times can have a noticeable effect (P<0.05) on tannin and caffeine levels and changes in color, aroma, and taste in tea steeping. The ideal drying time treatment is 5 hours with a caffeine content of 0.26 grams, tannin content of 283.33 ppm, dark red steeping color, a very inactive aroma, and a delicious tea taste.

Keywords: *cascara; coffee skin; chemical; drying; tea*

INTRODUCTION
Coffee is Indonesia's flagship product which is a mainstay commodity that is exported abroad. Coffee is one of the most widely used plantation commodities around the world with significant commercial potential and value (Nadhiroh, 2018). In addition, coffee is a significant source of income for nearly 1.5 million coffee producers in Indonesia.The amount of coffee husk that is wasted when processing coffee beans is directly proportional to the growth of coffee yields. The de-pulping procedure yielded 28.4 kg of coffee beans and 21.6 kg of coffee skin and flesh for every 50 kg of coffee (Supeno et al., 2018). There needs to be a solution to the problem of handling coffee husk waste that has been neglected because it decays, accumulates, and burns, all of which pose environmental risks. Manufacturing processed goods or other goods with high economic value from coffee husk waste, such as coffee husk tea (cascara), is one of the approaches to utilize these natural resources. The outer layer of coffee beans is called "cascara" and is used to make a drink with a different flavor from the taste of coffee in general and a color that is more reminiscent of tea (Carpenter, 2015).

Cascara is a dried coffee husk. An oven with a temperature control is used to dry the cascara. The 50°C temperature used in this study prevents damage to coffee pods' tannin, caffeine, and antioxidant content. Sorting and cleaning coffee fruits and peeling and drying fruit skins are steps in making coffee peel tea (Souilem, 2017). There are several advantages to using coffee husk waste processing, including: producing high-value coffee husk tea products and coffee husk waste so that it does not accumulate and is wasted. With this, farmers and the public will directly get an increased income.

This study has several objectives, to determine the effect of drying time on the characteristics of caffeine and tannin levels of Excelsa coffee skin tea products, to determine the effect of drying time on the color, aroma, and taste of Excelsa coffee skin tea.

METHOD

The research was conducted in July 2023. To obtain data and be able to find out, researchers need to make observations in the Wonosalam Jombang coffee plantation. Laboratory tests on tannin and caffeine levels are carried out at the Integrated Laboratory and Halal Center (THC) of the Islamic University of Malang. The location is located on Jl. Mayjen Haryono No. 193 Malang 65144 East Java, Indonesia.

Tools and Materials

The materials used in this study are coffee husks, chloroform, water, ethanol, aquades, and DPPH solution. The tools used are pots, stoves, porcelain beakers, elmeyers, spatula, tongs, baking sheets, basins, rotary steamers, funnels, test tubes, 100 ml measuring flasks, vortexes, desiccants, analytical scales, electric ovens, filter paper, blenders, and spectrophotometers.

Method

At this stage of the tea bag-making process, coffee fruits are obtained from the Wonosalam Jombang coffee plantation, namely 1-year-old excelsa coffee with a red benchmark that is still in the form of a cherry fruit. Which is then washed clean with running water and separated from the coffee beans from the skin and through the process of sorting coffee beans. After that, the wilting process is left for ten hours at room temperature. Furthermore, the coffee pods are dried at a temperature of 50℃ with varying drying durations in an electric oven, namely P: 3 hours, Q: 4 hours, and R: 5 hours. Coffee husks that have gone through the drying process, are then mashed using a blender until they become powder. Coffee husk tea (cascara) was tested for caffeine, tannins, and organoleptic levels. This chemical level testing was carried out at the Integrated Laboratory and Halal Center (THC) of the Islamic University of Malang.

Experimental Design and Data Analysis

This research uses a qualitative approach. The sampling technique used the purposive sampling method with the Complete Random Design (RAL) method with 3 treatments with 3 replicates and using an oven at 50℃ with different variations in drying time, namely T1 3 hours, T2 4 hours, and T3 5 hours. Each treatment weighs 200 grams of cascara. This research was conducted at the At-Taufiq Sambongdukuh Islamic Boarding School in Jombang as a place for organoleptic testing of coffee peel tea.

ANOVA (Analysis of Variance) is used to analyze the results of testing for caffeine, tannins, and organoleptic levels at a significance level of 5%. A second double-area test of the Smallest Real Difference (BNT) test should be performed to ascertain whether there is a difference between treatments and whether there is indeed a therapeutic effect. Descriptive analysis was carried out on organoleptic, caffeine, and tannin test findings.

RESULT AND DISCUSSION

Result

The following table displays the findings of chemical analysis tests performed on coffee husk tea at varying drying times:

Table 1. Chemical Analysis Test Results on Coffee Peel Tea with Different Drying Time Lengths Benchmarks

Test Indicator	Unit	Treatment		
		P	Q	R
Caffeine content	Mg/g	0,06	0,20	0,26
Tannin content	ppm	6,38	10,92	16,81

Information:

*Caffeine and tannin content data are shown from descriptive tests

*P, Q, and R are the drying time lengths of 3 hours, 4 hours, and 5 hours

Organoleptic tests are carried out on taste, color, and aroma. After the organoleptic test was carried out, the following results were obtained.

Table 2. Average Results of Coffee Skin Tea Organoleptic Test Score

No	Treatment	Color	Aroma	Flavor
1	P	8,47	8,68	11,25
2	Q	10,54	11,61	12,99

3	R	12,74	15,55	15,92

Based on the results of the variegated fingerprint analysis (ANOVA), it was shown that there was a real difference in the color, aroma, and taste scores of cascara tea bags with several treatments. It indicates that the R treatment in each indicator has the highest score compared to the P and Q treatments which have higher scores. So it can be concluded that this R treatment is very preferred in terms of organoleptics.

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Figure 1. Results of Coffee Skin Tea Color Analysis

Figure 1 shows the color of coffee and tea skins is significantly affected by the varying drying duration. It is visible that the color of the coffee husk tea brew P, Q, and R becomes darker/browner. This is because the tannin concentration increases with increasing drying time.

Discussion

Based on the results of the caffeine content research in Table 1, it can be seen that the drying time may impact the caffeine content of tea. The longer the drying process, the more caffeine is contained in Cascara tea bags. This is the result of the wilting process before drying. Tea caffeine is broken down during the wilting process so that when heated in the oven, the tea is hydrolyzed into compounds easily soluble in water and evaporates (Hutasoit, 2021). SNI 01-7152-2006 states that a serving of food or beverage may contain no more than 50 mg of caffeine. In moderation, caffeine can stimulate the heart muscle and increase alertness, drowsiness, excitement, and relaxation of smooth muscles, especially in the smooth muscles of the bronchi. The R treatment, which has a drying time of 5 hours and a caffeine content of 0.26 mg/g, is the most effective method for cascara tea bags.

Table 1 displays the findings of tannin content research that show that drying time can affect tannin levels. When cascara tea bags are allowed to dry for a longer time, the tannin concentration increases. The reason behind this is that unlike regular tea, coffee husk tea is processed rather than fermented, which means that the tannin concentration remains unchanged. Hutasoit (2021) states that tannins, one of the main components of tea, have a strong power to influence color and taste perception (bitter, bitter, and astringent). Among the many benefits of tannins-containing tea include its ability to relieve diarrhea, stop bleeding and canker sores, neutralize dietary fats, lower cholesterol levels, improve airflow, and act as an astringent (Hutasoit et al., 2021). The R treatment which requires a drying time of 5 hours (16.81 ppm) is optimal for the tannin content of cascara tea bags.

Based on Table 2. shows that, compared to the P and Q treatments which had lower color scores (yellowish brown), the R treatment had the highest color score (dark red). The color of a product is an important element that can give it an interesting meaning. The tannins in tea will oxidize and disintegrate during brewing, producing flavonoids and riboflavins that can change the color of cascara tea bags. The resulting color is strong and dark. This was later clarified by (Samanta et al., 2015) who stated that the component that causes the reddish-brown color in tea is flavin, while the component that causes the golden yellow color in tea is arubidine. Cascara tea bags in the R treatment showed dark red levels, while Q and R treatments showed yellowish-brown color levels. In the drying process, the longer the drying time, the more intense the color produced when the tea is brewed. This is due to the increasing tannin levels during drying. Thus, (Hutasoit et al., 2021) state that the higher the tannin content in the raw material, the stronger the tea brewed. Color is one of the quality parameters that can affect the intention to buy ready-to-eat drinks (Hidayati et al., 2021).

Based on Table 2. shows that compared to the P treatment which had a very pleasant aroma score, the Q and R treatments had a larger (very unpleasant scent score). Aroma is an essential component of any product, especially tea. The rest of the dried tea and coffee peels have a slightly different aroma when brewed. This is because when brewing cascara tea is added with hot water. The highest value obtained on

the aroma of brewed tea was 15.55. Compared to dried cascara tea, the average value of freshly brewed cascara coffee husk waste tea bags is higher when exposed to water at a temperature of 74℃ to 85℃, this is due to the action of thearubigin compounds in it resulting in higher aroma quality (Garis et al., 2019). The scent in the Q and R treatments had a higher aroma score (very intransigent) compared to the P treatment which obtained a very intransigence aroma score. Because the aroma of cascara tea bags made from leftover coffee husks is similar to excelsa coffee, the panelists are still unfamiliar with this aroma. Usually, the aroma of tea develops during the drying process. Galic acid undergoes oxidation during the drying process resulting in the chemical therubigin. The fragrant aroma of tea is due to the arubigin component. The volatile and reducible essential oils that aromatize tea are often the components that form this aroma (Garis et al., 2019).

Based on Table 2. shows that, compared to the P treatment which had a very low taste score, the Q and R treatments had a higher taste score (very pleasing). When assessing the level of consumer preference for a product, taste is the most important consideration. The value obtained in the taste level test on tea bags was 15.92. The taste in the Q and R treatments had a higher taste score (very good) compared to the P treatment which got a very unpleasant taste score. The taste produced in cascara tea is dominant with a sour taste which is a characteristic of cascara tea. Panelists are still not familiar with the sour taste in cascara tea brewing, some panelists do not like the sour taste in cascara tea, but some panelists like the sour taste in cascara tea brewing. According to research from (Garis et al., 2019) states that because cascara tea bags contain acids such as caffeic acid and chlorogenic acid, the tea has a sour taste. Excelsa coffee has a natural sour taste. Tea in general tastes quite sweet, and this cascara tea bag is no exception. The catechine component in tea gives it a spicy taste. Proteins containing catechins, compounds that contain tannins, thicken them and give them an astringent taste.

Based on figure 1. shows how the color of coffee and tea skins is significantly affected by the varying drying duration. It is visible that the color of the coffee husk tea brew P, Q, and R becomes darker/browner. This is because the tannin concentration increases with increasing drying time. This supports Hutasoit's (2021) statement that tannins, one of the main ingredients in tea, are what give it its distinctive color and taste (bitter, bitter, and spat). According to Hutasoit et al. (2021), the stronger the tea brewed, the higher the tannin content in the raw material. The tannins in the tea will oxidize and disintegrate during brewing, producing flavonoids and riboflavins that can change the color of cascara tea bags. The resulting hue is strong and dark. This was later clarified by Samanta et al. (2015) who stated that the component that causes the reddish-brown color in tea is flavin, while the component that causes the golden yellow color in tea is arubigin.

CONCLUSIONS

Based on the data, cascara tea bags can be said to be affected by a longer drying time, resulting in more tannins and lower caffeine levels. The drying time in the P treatment was 3 hours with a tannin content of 5.31%, the Q treatment for 4 hours with a tannin content of 6.60%, and the R treatment for 5 hours with a tannin content of 13.18%. Meanwhile, the drying time in the P treatment was 3 hours with a caffeine content of 35.57%, the Q treatment for 4 hours with a tannin level of 10.07%, and the R treatment for 5 hours with a tannin content of 4.94%. The longer the drying time, the more it can affect the color of the cascara tea bag which is getting darker. And gives an even more bitter taste to the cascara tea bags, as well as gives a lasting aroma to the cascara tea bags so that the panelists like the tea bag drinks. In the three treatments, the best treatment can be obtained, namely in the R treatment with a drying time of 5 hours with an average color yield of 12.74 (dark/dark), aroma of 15.55 (not long), and an average taste result of 15.92 (bitter).

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