
Quality of Herbal Tea Combination Between Corn Silk and Mint Leaf in a Variation of Temperature and Drying Duration

Imroatul Husna, Titik Suryani*

Biology Education Department, Faculty of Teacher Training and Education, Universitas Muhammadiyah Surakarta.
Jl. A. Yani Tromol Pos I, Pabelan, Kartasura, Surakarta 57162, Jawa Tengah, Indonesia

*Corresponding Author. E-mail address: ts169@ums.ac.id

ABSTRACT

KEYWORDS:

Antioxidant activity

Corn silk

Herbal Tea

Mint leaf

Organoleptic qualities

Corn silk has high antioxidant activity so that with a combination of mint leaf it can be made into herbal tea which is beneficial for health. This research aims to determine the antioxidant activity and organoleptic quality of herbal tea combination between corn silk and mint leaf in a variations of temperature and drying duration. The method in this research used a completely randomized design (CRD) with 2 factors, factor 1 were drying temperature (J) (45 °C, 50 °C, and 55 °C) and factor 2 were drying time (K) (2 hours and 4 hours). The results of this study showed that the highest antioxidant activity of the herbal tea combination between corn silk and mint leaf on J_1K_2 treatment (temperature 45 °C and drying time 4 hours) of 85.375 %, while the best organoleptic quality of herbal tea between corn silk and mint leaf was in the J_1K_1 treatment (temperature of 45 °C and drying duration of 2 hours) with a fresh taste, mint tea aroma, and yellowish color.

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1. INTRODUCTION

Herbal tea has numerous health benefits and is one of the most popular beverages. Herbal tea constituents can be derived from spices, fruits, or other medicinal plants (Dusun, 2017). Herbal tea is included in the category of functional beverages because it contains healthful polyphenol compounds. Functional beverages are one form of functional consumables that provide nutritional value and sensory loading, such as a pleasant flavor and texture (Herawati et al., 2012). Both functions can be obtained from herbal tea drinks based on corn silk with a combination of mint leaf.

The hair of corn is the head and roof of the fruit of *Zea mays* L. (Syawal & Laeliocattleya, 2020). Compounds in corn silk can be used as herbal tea such as alkaloids, flavonoids, phenolics, beta-cytosterols, and glycosides. Fresh corn silk contains 23.58 Ggae/G of phenolics and 50–83.54 percent antioxidant activity (Salsabila et al., 2021). Antioxidants are substances capable of preventing lipid oxidation (Nabila & Hendriani, 2018). Therefore, with the abundance of compounds, especially antioxidant in corn silk, it can be used as the main ingredients for making of herbal tea. The content of these compounds is not much known to society so they only regard it as waste. However, corn silk tea has an unpleasant acidic taste, making it less acceptable in society (Rohmadianto, 2019). For that, it is necessary to add other alternative ingredients such as mint leaf to produce a delicious taste and smell.

Mint leaf contain essential oils (0,5 – 4 %), menthol (14 – 32 %), and menthol (30 – 55 %) (Rizqa, 2019). Menthol is a chemical that has many benefits for the intestinal tract such as relaxing smooth muscles in the digestive tract, and also as an anti-inflammatory that can inhibit the

metabolism of arachidonic acid into leukotrien B4 and prostaglandin E2 (Selina et al., 2019). According to Anggraini's (2014) study, if more peppermint leaf is added to the herbal beverage, the better of aroma, taste, color of the steeping, and antioxidant activity will increase.

In the process of making herbal tea, it is necessary to pay attention to the determination of the drying temperature which will affect the antioxidant activity. The temperature and drying duration of production of tortured leaf tea (*Coleus amboinicus*) using temperatures of 45 °C, 50 °C, and 55 °C with long variations of 2 hours, 3 hours, and 4 hours. At a temperature of 50 °C with a drying time of 3 hours is the best treatment because in addition to being the most preferred treatment of panels, at that temperature it also has an antioxidant activity of 18,033% (Saragih, 2014). In order to manufacture herbal tea of high quality, drying techniques must also be considered. One of the finest techniques for drying is using the oven since it quickly lowers the water content (Winangsih et al., 2013). The oven-drying technique produces a higher total phenol concentration than the sun-drying method. This is because the enzyme becomes inactive when the dehydration process is accelerated (Bernard et al., 2014).

The purpose of this research is to determine the antioxidant activity and organoleptic qualities of herbal tea combination between corn silk and mint leaf in a variations of temperature and drying duration.

2. MATERIALS AND METHODS

2.1. Place and Time

The research was conducted at the Biological Laboratory of UMS, Jl. Ahmad Yani Tromol Pos 1, Pabelan, Kartasura, as a place to make herbal tea. While to test of antioxidant activity was carried out in the Laboratory of the Faculty of Food Technology, University of Slamet Riyadi, and testing of organoleptic quality was conducted in the area of the campus Muhammadiyah University of Surakarta. The research has been carried out since the issuance of the permit in less than two months, namely from February to March 2023.

2.2. Materials

The equipment used in the making of an herbal tea combination between corn silk and mint leaf are pans, oven, analytical scales, tea bags, gloves, beaker glasses, 360 ml plastic glass, aluminum foil, UV-Vis spectroscopic photometer, reaction tube, reacting tube shelf, micropipette, vortex, and observation sheet. The ingredients used were fresh eight-week-old sweet corn hair (*Zea mays saccharata*), mint leaf (*Mentha piperita*), aquades, DPPH test solution, and ethanol.

2.3. Research Procedure

This research procedure consists of the following steps: 1. Preparation: preparing apparatus and ingredients, sorting corn silk and mint leaves to remove damaged pieces, and then washing them clean. 2.) Implementation stage: squeeze corn silk and mint leaves at room temperature (27 °C) in conditions not exposed to sunlight, then dry with a measurement of 1: 1 (50g: 50g) in the oven on each treatment, the corn silk and mint leaves that have been dried are cut into a powder then weighs a weight of 2 grams on each treatment, packaging of corn silk and mint leaves that have been mixed is 5.5 x 7 cm tea bags, then brew herbal tea combination between corn silk and mint.

2.4. Research Design

The research was conducted using the experimental method and Completely Randomized Design (CRD) with two factors. Factor 1 variation of the drying temperature ($J_1 = 45^\circ\text{C}$, $J_2 = 50^\circ\text{C}$, $J_3 = 55^\circ\text{C}$) and factor 2 drying duration (2 hours and 4 hours), so that with 6 treatments (J_1K_1 = temperature 45°C and drying duration 2 hours, J_1K_2 = temperature 45°C and drying duration 4 hours, J_2K_1 = temperature 50°C and drying duration 2 hours, J_2K_2 = temperature 50°C and drying duration 4 hours, J_3K_1 = temperature 55°C and drying duration 2 hours, J_3K_2 = temperature 55°C and drying duration 4 hours), each treatment was repeated 2 times. The antioxidant activity test used by DPPH method with the final percentage result, while the organoleptic quality test (taste, aroma, color, and receptivity) involved the filling out the questionnaire sheet by 15 panelists.

2.5. Data Analysis

The research used qualitative descriptive analysis techniques for organoleptic testing, while for the testing of antioxidant activity used quantitative descriptive methods. Quantitative data testing analysis using the Kruskal-Wallis test and qualitative data testing analysis using Excel. Data collection is carried out using experimental methods, the observation method, the library method, documentation of the duration of research, measurement of antioxidant activity, and organoleptic quality testing.

3. RESULTS AND DISCUSSION

Herbal tea is one of the highest quality drinks (Zainuddinnur et al., 2017). Consuming herbal tea regularly can improve health and even be an alternative to preventing various diseases (Santi et al., 2022). In order to get a good tea product, it is necessary to pay attention to the process of managing the heat supply in the dryer. Tea will become excessively dry and damaged if the heating process is overheated, and it will take longer to dry if the heat source is insufficient, so the resulting tea does not meet the standard of tea drying. Therefore, in this research used 3 temperature variations (45°C , 50°C , 55°C) and 2 drying duration (2 hours and 4 hours) to know the best treatment for the making of herbal tea combination between corn silk and mint leaf.

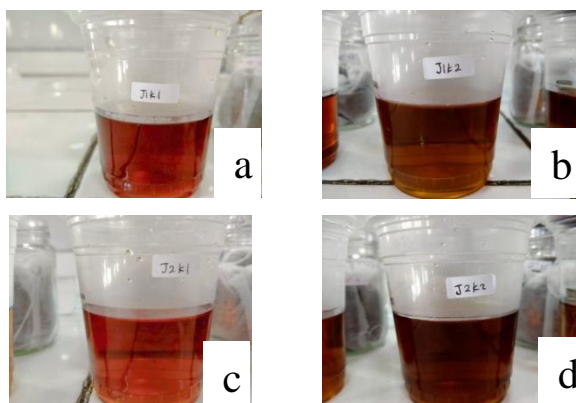
Table 1. Results of Antioxidant Activity and Organoleptic Quality of Herbal Tea Combination Between Corn Silk and Mint Leaf

Drying Treatment	Antioxidant Activity (%)	Kualitas Organoleptik			
		Color	Aroma	Taste	Receptivity
J_1K_1 (Temperature 45°C + 2 hours)	85.021	Yellowish	Mint tea	Fresh	Like
J_1K_2 (Temperature 45°C + 4 hours)	85.375	Brown-yellow	Rather mint tea	Fresh	Rather like
J_2K_1 (Temperature 50°C + 2 hours)	83.597	Yellowish	Rather mint tea	Fresh	Unlike
J_2K_2 (Temperature 50°C + 4 hours)	82.955	Brown-yellow	tidak Khas teh daun mint	Unfresh	Unlike
J_3K_1 (Temperature 55°C + 2 hours)	81.688	Brown-yellow	Untypical mint tea	Unfresh	Unlike
J_3K_2 (Temperature 55°C + 4 hours)	80.725	Brown-yellow	Untypical mint tea	Unfresh	Unlike

The results of the research on herbal tea combination between corn silk and mint leaf in a variation of temperature drying duration using the DPPH method showed quite high antioxidant activity ranging from 80.725 % to 85.375 %. Based on table 1. shows that he highest antioxidant activity was found in the treatment of J_1K_2 (temperature 45 °C and drying duration 4 hours) and the lowest was found in the J_3K_2 treatment (temperature 55 °C and drying duration 4 hours). An analysis of the antioxidant activity of herbal tea combination between corn silk and mint leaf showed that duration factors, temperature, and the interaction between duration and drying temperature affect antioxidant activity. It can be seen in Table 1. that the value of antioxidant activity in 6 different treatments is accurate, and with each increase in the temperature of the drying treatment obtained the result of its antioxidant activity is lower. This is consistent with the research (Sayekti, 2016), one of the causes of low antioxidant activity is that the high drying temperature used can even cause damage to the activity of those antioxidants. According to Dewi's (2017) study, the antioxidant activity in grapefruit leaf herb tea will decrease when the drying temperature is too high. This happens because the secondary metabolite compounds that act as antioxidants become broken if the heating temperature increases.

The drying duration can affect the content of food. This is in line with the study of Yulianti (2019), which found that the drying duration of corn barley flour has a natural effect on the chemical, phytochemical, and organoleptic properties. In addition, the drying method used on a food ingredient has a different effect. According to the results of research Saragih (2014), stated that the longer of drying duration used the more antioxidant activity will decrease, this is due to the antioxidant properties that are not resistant to the heating process. That aligns with this research that found that two-hour drying results in higher antioxidant activity than four-hours drying. There are numerous error-causing factors in antioxidant activity testing. For instance, DPPH compounds are extremely light-sensitive, which will result in their degradation. In addition, DPPH compounds are susceptible to injury from excessive temperatures. When extract/sample weighing does not match the evaluation, which can compromise the accuracy of the results, is an additional factor that is not less essential (Nahat, 2017).

Based on the statistical test results on factor 1 (drying temperature) obtained the Asymp value. Sig is 0,180 > 0,05, so it can be stated that the drying temperature has no real effect on antioxidant activity. In the statistical test factor 2 (drying duration) results asymp values. Sig is 0.513 > 0.05, so it can be stated that the drying duration has no natural effect on antioxidant activity. Then the interaction between factor 1 and factor 2 has an Asymp result. Sig is 0.416 > 0.05, which means that the temperature and drying duration have no natural effect on antioxidant activity.



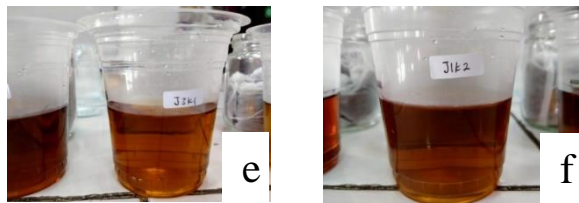


Figure 1. J₁K₁ (a), J₁K₂ (b), J₂K₁ (c), J₂K₂ (d), J₃K₁ (e), J₃K₂ (f)

Based on the Figure 1, organoleptic quality results of the herbal tea combination between corn silk and mint leaf which has been brewed showed a yellowish color in the J₁K₁ and J₂K₁ treatments, and the brown-yellow color in J₁K₂, J₂K₂ and J₃K₁. From the above results can be assured that the temperature and drying duration influence the color of herbal tea combination between corn silk and mint leaf. Herbal tea that uses a drying duration 4 hours has a seductive color result that tends to be brown-yellow compared to herbal tea with a drying duration of 2 hours. In addition, if the drying temperature is higher, the color produced by herbal tea will be more concentrated. That statement is consistent with the study of Fitrayana (2014), which found that using a higher drying temperature might result in a reduction in the herbal tea's natural color. This is because drying can harm the color pigments like chlorophyll on the leaves. Strengthened by the Wadi (2021) study, based on the results of the drying of herbal tea leaves of buni, the higher temperature of drying than the degradation of the color of the tea will occur.

The aroma in the treatment of J₁K₁ is typical herbal tea mint leaf, the treatment of J₁K₂ and J₂K₂ has a rather typical aroma of herbal tea mint leaf, and the treatment of J₂K₂, J₃K₁, J₃K₂ there is an untypical fragrance of mint tea leaves. The results showed that the higher of drying temperature will get lessen the smell of herbal tea leaf of mint produced. Meilgard (2000) stated that the smell in food will appear because there are components of volatile compounds that have easily evaporative properties, but the compound will disappear during the heating process. Strengthened by Patin et al., study (2018) that increasing drying temperatures result in volatile compounds in vaporizing food being carried by a flow of hot gases.

The taste of the herbal tea combination between corn silk and mint leaf in the treatments of J₁K₁, J₁K₂, and J₂K₁ has a fresh taste, while in the treatments of J₂K₂, J₃K₁, and J₃K₂ has an unfresh taste. Based on the results, it can be identified that the higher drying temperature used will make the resulting taste more unfresh or the characteristic taste of the tea will decrease. The statement is consistent with the Wijaya's study (2015), which found that the higher of drying temperature, the taste of herb tea mint leaf increasingly decreases, this is due to the reduced oil content during the drying process. Essential oils can evaporate at high drying temperatures. According to SNI 01-3836-2013, the seductive taste of good tea is characteristic of the product itself.

According to a study by Taufik et al. (2016), the distinctive flavor and aroma of tea can be created through the proper dehydrating method. The dehydrating procedure increases the concentration of the phenolic compounds that give tea its flavor, aroma, and hue. In addition to the dehydrating procedure, the quantity of tea used on the sample has an effect on the organoleptic qualities of herbal tea. The drying process and presentation of dried tea can substantially alter the flavor parameters of the presented sample (Adhamatika & Murtini, 2021).

The reception of this herbal tea combination between corn silk and mint leaf involves 15 panelis. From the results of the research carried out, if the higher of temperature and the longer of drying duration, resulted in the receptive capacity of society decreased. In the treatment J₁K₁ shows the receptivity is like. In the case of the J₁K₂ treatment, the effect of receiving power is less

favorable. Then, the treatment of J₂K₁, J₂K₂, J₃K₁, and J₃K₂ had unlikely results. This is because the drying process causes the taste of fresh mint leaf to decrease more and more, so that the reception capacity at temperature treatments of 50 °C and 55 °C will decline further. According to the recognition of several panelists, treatments that have high temperatures have a slightly smooth taste and the smell of mint leaf is reduced. This is in line with the Mardiana et al. study (2022), which states that the use of temperature during drying can cause the natural ingredients in herbal tea to undergo biochemical changes, thereby reducing the quality of the product. Panelists most preferred herbal tea is on treatment J₁K₁ (temperature 45 °C and drying duration 2 hours) with the result of fresh sweetness, a yellowish color, and a typical smell of mint tea.

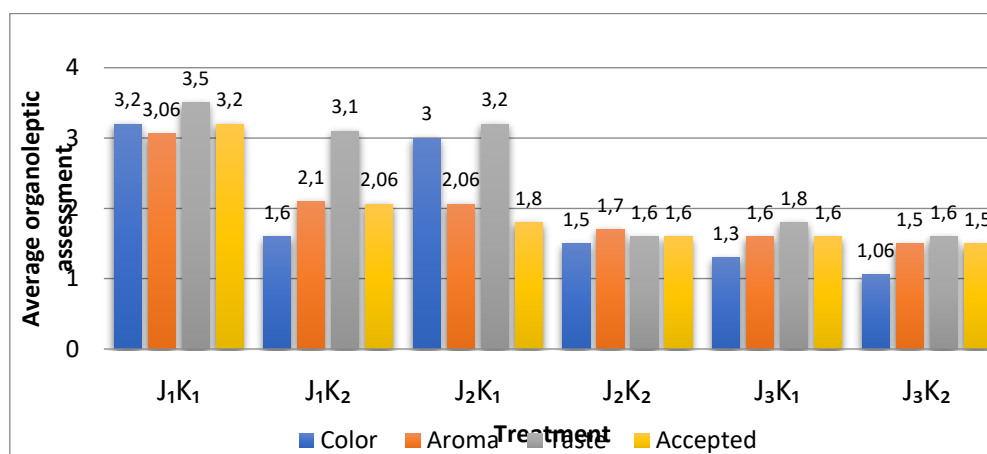


Figure 2. Histogram of organoleptic quality tests

The results of organoleptic testing of color, aroma, taste, and receptivity of a herbal tea combination between corn silk and mint leaf in a variation of temperature and drying duration can be seen in Figure 2. Increasing temperature diminishes a substance's organoleptic qualities. Panelis prefers herbal tea blended with maize hair and mint leaves dried at low temperatures because the flavor and aroma of the mint remains robust. According to Sucianti's study (2021), the scent of menthol on the herbal tea mint leaves diminishes as the dehydrating temperature rises, thereby making the panelis more offensive.

4. CONCLUSION

The results of this research showed that the highest antioxidant activity of the herbal tea combination between corn silk and mint leaf on J₁K₂ treatment (temperature 45 °C and drying duration 4 hours) of 85,375 %, while the organoleptic quality of the herbal tea combination between corn silk and mint leaf was the best on J₁K₁ treatment (temperature 45 °C and drying duration 2 hours) with a fresh taste, mint tea aroma, and light yellow color. Temperature variations and drying duration have no significant effect on the antioxidant activity of the herbal tea combination between corn silk and mint leaf. Further test is needed regarding the glucose content in herbal tea of corn silk and mint leaf.

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