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EFFECT OF CINNAMON (Cinnamomum bermanni) ADDITION ON ANTIOXIDANT ACTIVITY AND ORGANOLEPTIC PROPERTIES OF MORINGA LEAF TEA (Moringa oleifera)

Nurlaila Syafitri, Veni Rori Setiawati, and Jenri Parlinggoman Hutasoit*
Department of Agricultural Product Technology, Faculty of Agriculture, University of Technology Sumbawa, NTB, Indonesia
*Email: jenri.parlinggoman@uts.ac.id

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Abstract: The study aims to determine the organoleptic characteristics and antioxidant activity of the tea leaves of moringa that are added to moringa using the DPPH method. (1-difenil-2- pikrildihidrazil). This type of study is an experimental study with variations in the addition of moringa of 20 g, 30 g, 40 g, and 50 g on each treatment. Data analysis is carried out using ANOVA variance analysis at the 5% level using the SPSS software application. If there is a real effect, continue with the further Duncan test. The study results show that adding peppermint extract positively affects the tea leaves' organoleptic and antioxidant properties. The most preferred sample by the panelists for texture, color, taste, and aroma is the P4 sample (50 g of moringa + 50 g of cinnamon). Based on the antioxidant activity properties of tea leaves of moringa with the addition of moringa samples whose IC50 value is the highest is the P4 sample (50 g moringa + 50 g moringa) which is 70.55 ppm.

Keywords: *Antioxidant, Moringa Leaves, Cinnamon, Organoleptic*

INTRODUCTION

Moringa oleifera is a tropical plant that grows and grows in tropical areas such as Indonesia. This plant grows 7-11 meters high and spreads from lowlands to 700 meters above sea level. Pearls can grow on all soil types, resist drought, last up to 6 months, are generally easy to grow, and do not require intensive care [1].

Moringa plants have been developed into modern food products such as moringa flour, moringa fertilizer, color cake, color candy, and moringa leaf tea. The plant has benefits, including strengthening bone health, preventing hypertension, increasing milk production, treating anemia, anti-aging and skin care, protecting nerves, and preventing and treating diabetes[2,3].

Tea is a drink widely consumed and commonly consumed in Indonesian society. The leaves of moringa are suitable for processing into herbal tea products because, besides antioxidants, moringa also contains protein, vitamin A (β-carotene), and high iron, which is good for consumption. It can meet nutritional needs[1]. However, it has a languid, fragrant taste and smell, making it less attractive to consume. Therefore, additional ingredients are needed to improve the organoleptic quality of herbal tea leaves of moringa [4].

Moringa tea has a faint taste and is not too attractive to the public, so there is a need to add moringa as a natural flavor. According to [5], using cinnamon as a natural flavor in herbal drinks has many benefits. It contains a distinctive flavor, alkaloid compounds, and polyphenols that are beneficial for health because they can lower cholesterol levels.

Cinnamon has a natural antioxidant activity because, in the cinnamon extract, there are compounds of cinnamaldehyde, eugenol, trans cinnamate acid, phenol compound, and tannins. It is expected to be effective as an antioxidant and antibacterial, so that it can be applied as a natural antioxidant. Essential oils and phenol content can inhibit the damage process and can enhance better flavor or taste [6].

The study of Septiwi et al. on the preparation of tea preparations of salmon leaves (Syzygium polyanthum) with red ginger rump (Zingiber officinale Rosc. by Var. Rubrum) concluded that the public liked the preparation of tea bags formulated with the addition of red ginger, in addition to the stabilized preparation in storage for 3 weeks at room temperature.

It has a strong antioxidant activity and contains total phenolic and total flavonoids in high amounts, potentially as a food additive (antioxidant) in the food and pharmaceutical industry. Previous research by Herawati et al. [7], on testing the antioxidant activity of red ginger extract was performed using the DPPH method. The IC50 value of red ginger extract is 57.14 ppm. The level of red ginger bark flavonoids in the ethanol solvent is 96%:HCl 12N (98:2) is 0.0068%. Identification of flavonoid compounds in red ginger extract suggests that the flavonoid composite found in red ginger is 7-4'-dihydroxyphlavone.

Based on the content of the active components of shrimp leaves and wood. The Unpleasant taste on the leaves of moringa can be addressed by adding cinnamon. In this study, peppermint will be added to improve the taste, aroma, color, and texture of the tea leaf to know the best concentration of peppers preferred by consumers and its influence on the antioxidant activity of tea leaves. From the above explanation, the researchers took the title of the study "The Effect of the Addition of Cinnamon (Cinnamomum bermanni) On the Antioxidant Activity and Organoleptic Properties of Leaf Tea Moringa (Moringa oleifera)" to improve the quality and know the antioxidant activity in the leaf tea.

RESEARCH METHODS

Materials and Tools

The substances used in the study were the moringa leaves, cinnamon, DPPH (1,1-diphenyl-2pikrilhydrazil), methanol solution, quercetin, and water. The instruments used are, among others, blenders, measuring tubes, reaction tubing, filters, analytical scales, vortex, measurement glasses, and UV-Vis spectroscopes.

Process of Sampling

The process of making moringa tea leaves began with the preparation of fresh moringa leaves that were spotted directly from its trees from Pernek Village, Moyo Hulu Prefecture, Sumbawa District, that is, from the fourth leaf, because the fourteenth leaf is usually old. The leaves are sorted manually by separating the leaves from the stick, the blender material, and the small animals that stick. Wash and then dry in the sun for 2-3 days. The leaves that have been dried are smoothed by blender and tailored with a leak of 100 mesh. Then, weigh 50 grams of powder in each treatment. On the other hand, cinnamon powder weighs 50 g, 40 g, 30 g, and 20, according to the experimental design. The latter mixed the dried leaf powder with dried wood powder for P1 (50 g dredge + 20 g dried wood), P2 (50 g of dredg + 30 g of redwood), and P3 (50 g cried wood + 40 g of carved wood 50 g of firewood + 50 g dirtywood), and 1 sample as a control (without additional cinnamon) [8].

Organoleptic Test of Moringa Leaf Tea with the Addition of Cinnamon

Organoleptic testing in this study was carried out using the hedonic scale method. The hedonic test is used to determine the level of preference of a panelist for a presented product. In the hedonic trial, 20 untrained panelists were asked to assess the tea product with the addition of moringa. The desired response is the aroma, taste, texture, and color [9].

Table 1. The hedonic test scale on the panel assessment

The Hedonic Scale	Explanation
1	very disliked
2	did not like it
3	Litle like
4	Likes
5	Very liked

Testing of antioxidant activity

1. Manufacturing of DPPH

DPPH powder of 0.4 g is dissolved into methanol p.a. and then inserted into a 10 mL volumetric flask. The volume is supplemented with methanole p. a. (DPPH 0,1 M). The DPPH solution is absorbed in 200 μL, inserted in a 200 mL measuring tubule, and then supplemented with methanol p.a [10].

The dilution is carried out using the maceration method, i.e., soaking the material using a water solvent corresponding to the active compound to be taken or without the heating process.

2. Maximum wavelength of DPPH

A 0.1 mM DPPH solution of 12 mL is inserted into the reaction tube. Then, 2 mL of methanol is added, matched with the vortex to be homogeneous, poured into the cuvette, and measured at a 400-800 nm wavelength using a spectroscopic photometer. The maximum wavelength is 515,4 nm.

3. Solution of Blanco

A 0.1 mM DPPH solution of 12 mL is inserted into the reaction tube, and 2 mL of p.a methanol is added and matched using a vortex to be homogeneous, incubated in a dark space for 30 minutes followed by absorption measured at a wavelength of 515,4 nm. The preparation of a quercetin solution as a ratio series solution comparator is made using quercetin as a standard (100 ppm) of 1 mL of a standard DPPH solution of 0.4 mM DPPH, the standard solution of quercetin is added to the limit mark on the 5 mL measure labyrinth, then inhibited during the operating time and the absorption is read at the maximum wavelength obtained.

4. Inhibisi Percentage of inhibition

Free radical inhibitor activity is explained in the form of a percentage of inhibition that can be calculated using the formula below:

$$\% \text{ Inhibition of radical DPPH} = \frac{\text{absorbance control} - \text{absorbance testing}}{\text{absorbed control}} \text{x } 100$$

Determination of value IC_{50} (Inhibitory Concentration)

The sample concentration and its inhibition percentage are dispersed on the axes x and y on the linear regression equation. The equation is used to assess the IC50 of each sample expressed by the y value of 50 and the x value obtained as the IC_{50}.

5. Value of AAI (Antioxidant Activity Indeks)

The DPPH concentration used in the test (ppm) is divided by the obtained IC50 value. (ppm). AAI value < 0.5 is a weak antioxidant, AAI > 0.5-1 is a moderate antioxidant, AAI > 1-2 is a strong antioxidant, and AAI> 2 is a very strong antioxidant.

Statistical analysis

The design method used in this study is the Complete Random Planning method. (RAL). Then, test the diversity of the treatment rate values using ANOVA. A comparative test will be carried out using the further Duncan test if there is a real impact. In this study, three repetitions were performed using 4 test samples and 1 control test sample with three treatments (20 g, 30 g, 40 g, and 50 g). There are 15 units of testing.

RESULTS AND DISCUSSION

Organoleptic tests

The purpose of organoleptic testing is to evaluate the organoleptic attributes of tea leaves. Organoleptic assesses properties that can be perceived through human senses, such as smell, taste, texture, and color. The addition of moringa really impacts the hedonic test of the teas of the broken leaves. The analysis of grape stamps showed that adding moringa had a real effect on the texture parameters of the tea powder of the resulting leaves. (F-table 0,022). Next, a further duncan test is carried out to find out what factors influence. The relationship between the influence of the sugar tree addition on the texture parameters can be seen in Figure 1.

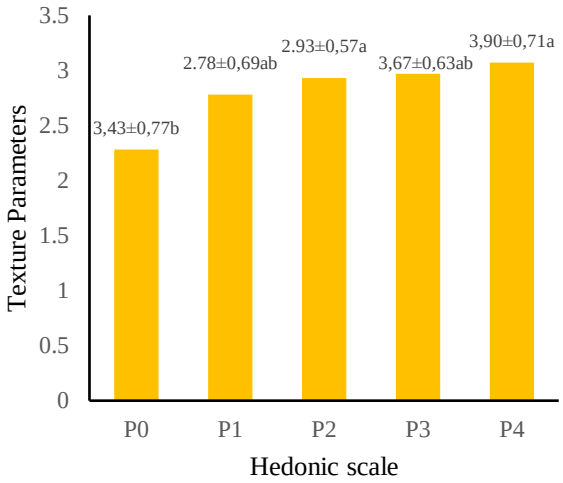
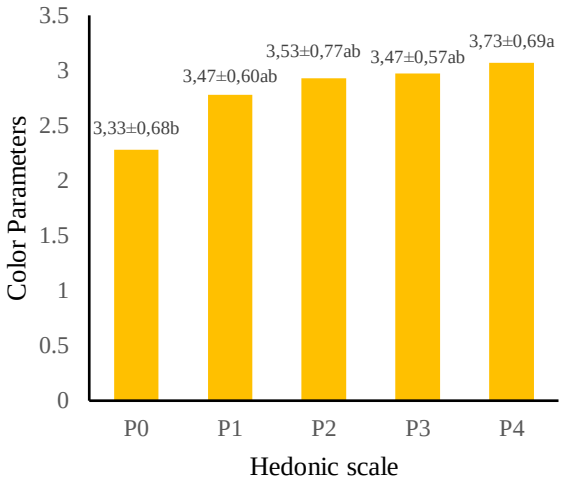


Figure 1. The effect of the addition of cinnamon extract on the texture of the moringa leaves with the hedonic test

Figure 1 shows that the average scores of panelists' preference for the texture of moringa tea vary significantly on treatment P0 with treatment P1, P2, P3, and P4. The panelists gave Treatment 5 the highest score of 3.9 while Treatment 2 the lowest score of 2.78. This suggests that adding cinnamon results in a higher or rougher texture score. These results are the same as other research [11] containing high fiber content that acts as a texture booster.

The addition of cinnamon really influences the color parameters of the tea leaves of the resulting moringa. (F-table 0,044). The relationship between the influence of the addition of cinnamon on color parameters can be seen in Figure 2.



Gambar 2. The effect of the addition of cinnamon extract on the color of the tea moringa leaves with the hedonic test

Figure 2 shows that the panelist's preference ratio to the color of tea leaves of moringa was the highest in the P4 sample (50 g moringa + 50 g cinnamon) with a value of 3.73. At the same time, the lowest was obtained on the P0 sample (without adding cinnamon), which was 3.33. The ratio of the panelist's preference for the tea leaves color increases with the addition of moringa. This suggests that the more cinnamon is added to the leaf tea, the greener the green moringa tea leaf is produced. This is influenced by cinnamaldehyde compounds in cinnamon, giving color changes to the tea produced.

This is consistent with research by Anjani et al. [12] that this color change occurs when the base ingredients of chlorine are mixed with cinnamon at each treatment, and this explains that moringa can give a significant color influence due to the effect of the anthocyanin content in it. The color of the leaves of moringa that is produced is green, and cinnamon has a red-yellow color, so the mixture of the two ingredients will affect the color of moringa tea leaves to the yellow-green color.

Based on the results of ANOVA testing, it was obtained that adding cinnamon influences the taste parameters of the leaves of the moringa produced. (F-table 0,00). The relationship between the influence of the cinnamon addition and the texture parameters can be seen in Figure 3.

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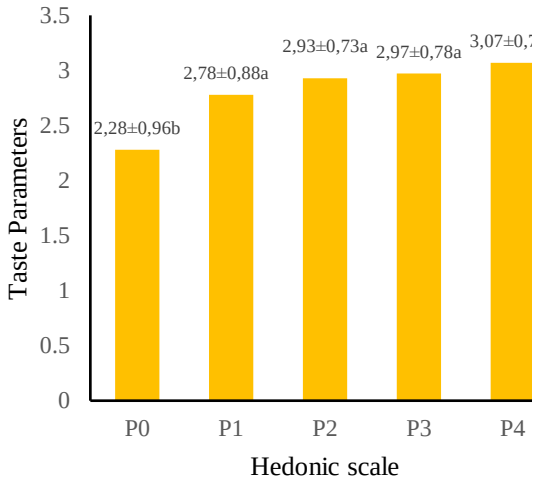

Figure 3. The effect of the addition of cinnamon extract on the flavor of the moringa tea leaves with the hedonic test

Figure 3 shows that the highest ratio of panelists' favorite to the flavor of moringa tea was obtained in the P4 sample (50 g of moringa + 50 g of cinnamon) of 3,07, while the lowest rate of the P0 sample (without the addition of cinnamon) of 2,28. In Figure 3, it is shown that the addition of moringa in P1 (20 g), P2 (30g), P3 (40 g), and P4 (50 g) differs really from P0 (without the addition of cinnamon).

Addition of cinnamon P1 (20 g), P2 (30 g), p3 (40 g), and p4 (50 g) stated like because the taste of the cinnamon can disguise the flavor and flavor on the leaves of the cello. Based on the addition of cinnamon, it was found that the P1, P2, P3, and P4 samples did not differ, but the difference in average values increased. This is due to the presence of cinnamaldehyde and eugenol compounds.

Moringa-leaf tea tends to have a less fresh and smooth taste. According to Yasir et al. [4,13]), cinnamon is a spice used as a flavoring and savoring ingredient in food and drink. Cinnamon is added to the beverage not only as a flavor but also to obtain the added functional value of the resulting drink.

Based on the results of ANOVA testing, it was obtained that the addition of cinnamon influenced the fragrance parameters of the tea leaves of the moringa produced. (F-table 0,05). The relationship between the influence of the addition of cinnamon on the flavor parameters can be seen in Figure 4.

The average preference score of the panelists for the aroma of moringa leaf tea is indicated in Figure 4 as being highest in sample P4 (50g moringa + 50g cinnamon) at 3.88 and lowest in sample P0 (without cinnamon addition) at 2.95. Treatment P0 differs considerably from the other samples, as does sample P1, sample P2, sample P3, and sample P4. Treatment P0 differs significantly from the other samples, as do samples P2, P3, and P4. With more cinnamon added, the panelists' average preference score for the aroma of moringa leaf tea rises. This demonstrates that the more cinnamon added to the moringa leaf tea, the more potent the aroma of cinnamon gets.

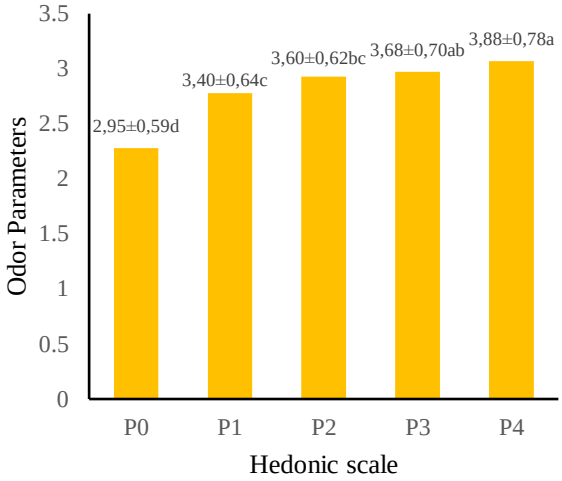

Figure 4. The effect of the addition of cinnamon extract on the scent of the moringa tea leaves with the hedonic test

The findings of a previous study [14], cinnamon added to moringa leaf tea produced a fairly aromatic scent, based on sensory rating by panelists. Since cinnamon is volatile and has a unique smell, adding it to a beverage might make its aroma more noticeable [11].

Antioxidant Testing

In the antioxidant testing of moringa leaf tea with the addition of cinnamon, the IC_{50} values were obtained as follows: 308.34 ppm for sample P0, 172.96 ppm for sample P1, 106.92 ppm for sample P2, 88.53 ppm for sample P3, and 70.55 ppm for sample P4. These results indicate that moringa leaf tea with cinnamon exhibits high antioxidant activity, particularly in sample P4, which recorded an antioxidant value of 70.55 ppm.

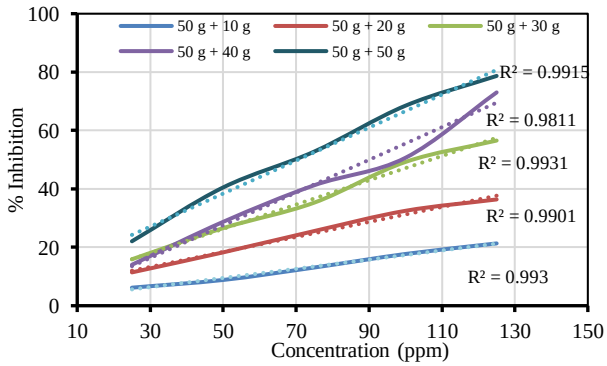

Figure 5. The Effect of Cinnamon Extract Addition on the Antioxidant Activity of Moringa Leaf Tea

In Figure 5, the curve represents the results of the moringa leaf tea's antioxidant test with cinnamon's addition. From the predetermined concentrations of 25, 50, 75, 100, and 125, varying inhibition percentages (%inhibition) were obtained. On the curve above, it can

be observed that samples P1, P3, and P4 have the lowest R^2 (coefficient of determination) values compared to P0 and P2. This implies that a higher coefficient of determination indicates a better fit of the proposed model [15]. The coefficient of determination is used to assess the contribution of independent variables to the dependent variable. Conversely, a lower coefficient of determination suggests limited explanatory power of the independent variable on the dependent variable, possibly influenced by sample absorbance when its decrease remains constant (e.g., 0.6, 0.4, 0.2, and so forth), resulting in the coefficient of determination approaching ±1. Meanwhile, the determination of the IC_{50} value in the antioxidant activity test is evaluated based on the % inhibition [15].

In the antioxidant testing of moringa leaf tea with the addition of cinnamon, IC_{50} values were obtained as follows: 308.34 ppm for the control sample, 172.96 ppm for sample P1, 106.92 ppm for sample P2, 88.53 ppm for sample P3, and 70.55 ppm for sample P4. This indicates that moringa leaf tea, with the addition of cinnamon, has high antioxidant activity, particularly in sample P4, with an IC_{50} value of 70.55 ppm.

The antioxidant test results shown in Figure 5 demonstrate that the five test samples provide varying IC_{50} values. Based on the categorization of cytotoxic activity levels, the strengths of antioxidant activity are classified based on IC_{50} values as follows: < 10, < 100, and > 100 ppm. According to this classification, three out of five moringa leaf tea samples with cinnamon addition have IC_{50} values exceeding 100 ppm. Sample P4, adding 50g of cinnamon, exhibits the highest antioxidant capacity compared to others, including the control sample. The elevated antioxidant capacity of moringa leaf tea with cinnamon addition is attributed to the interplay of compounds and hydroxyl groups secondary metabolites [2,16].

Hydroxyl groups or functional groups -OH are used as substitutes in organic compounds found in secondary metabolites, organic molecules that do not have a direct role in growth. Secondary metabolites can be synthesized by plant organs such as roots, leaves, and seeds, and they serve as defense mechanisms against other organisms.

Regarding its antioxidant test, this study concludes that the highest antioxidant value is achieved when the highest formulation of cinnamon is added to moringa leaf tea, specifically in sample P4 with the formula (50 g moringa + 50 g cinnamon). This is also attributed to the ingredients used, notably mature moringa leaves, which have a relatively high antioxidant content due to the presence of secondary metabolites that function as defense mechanisms to maintain their antioxidant levels. Cinnamon also contributes to this high antioxidant value due to the presence of antioxidant compounds like phenols, terpenoids, and saponins [3]. According to [14] cinnamon essential oil contains several phenolic components, such as eugenol, cinnamic aldehyde, and beta-caryophyllene, which have antioxidant potential.

CONCLUSION

In the organoleptic test, specifically the hedonic test (preference test), of moringa leaf tea with the addition of cinnamon, variations of 20 g, 30 g, 40 g, and 50 g of cinnamon were used in each treatment. The sample most preferred by the panelists was sample P4 (50 g moringa + 50 g cinnamon), followed by P3 (50 g moringa + 40 g cinnamon), and P2 (50 g moringa + 30 g cinnamon).In the antioxidant activity test of moringa leaf tea with the addition of cinnamon, the sample with the highest IC_{50} value was sample P4 (50 g moringa + 50 g cinnamon), which recorded a value of 70.55 ppm.

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