

FORMULATION AND PHYSICAL QUALITY TESTING OF MORINGA LEAVES AND GINGER COMBINATION TEA BAGS IN AN EFFORT TO LOWER BLOOD PRESSURE

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ABSTRACT

Functional foods, including functional beverages, play a crucial role in public health, including lowering blood pressure. In addition to health and nutritional aspects, food quality can be determined by its taste and the quality of natural ingredients. One such product is tea bags made from moringa leaves and ginger. Flavonoids, a secondary metabolic compound in moringa leaves and ginger, can be beneficial for health. This study aimed to determine the optimal formulation and to conduct physical quality tests on a combination of moringa leaves and ginger tea bags using two formulas. The tea bag formula used was a combination of moringa leaves and ginger with a ratio of F1 (2:1) and F2 (1:2). Physical quality tests were conducted in the form of pH, water content, organoleptic, and hedonic tests on 20 respondents. The results of the organoleptic test showed that F1 had a brown color, a moringa flavor with a ginger sensation, and a distinctive moringa odor, while F2 had a brown color, a ginger flavor with a moringa sensation, and a distinctive moringa odor. The pH test showed that F1 had a pH of 6.07, while F2 had a pH of 6.52. The water content test showed F1 results of 0.91% and F2 1.45%. The hedonic test showed that F1 preferred color, F2 preferred aroma, and F2 preferred taste. This study concludes that the physical quality tests of F1 and F2 are in accordance with the established quality standards, while the hedonic test preferred F2 with a percentage of color, aroma, and taste of 52.27%.

Keywords: antihypertensives, ginger, moringa, physical quality tests, tea bags.

INTRODUCTION

Hypertension is currently a major challenge in Indonesia because it is a common condition encountered in primary healthcare settings. According to the 2018 National Basic Health Research (Riskesdas), hypertension has a high prevalence of morbidity and mortality, at 34.1%. (Kemenkes RI, 2018). *Moringa oleifera* is a nutrient-rich plant known for its potential in traditional medicine for various conditions, including hypertension. Several preliminary studies have shown that moringa leaves extract may lower blood pressure. The flavonoids in moringa leaves have a mechanism for lowering blood pressure by improving blood circulation and preventing blood vessel blockages, allowing blood to flow normally (Nur *et al.*, 2019). A total of 250 ml of boiled moringa leaves water was administered daily for 7 consecutive days. Based on the results of toxicology studies of oral administration in mice, moringa leaves were found to be safe, well-tolerated, and showed no mutagenic or genotoxic effects (Aulia, Safitri and Adi, 2020).

Ginger (*Zingiber officinale*) contains many chemical compounds, such as gingerol, zingerone, flavonoids, potassium, and essential oils, which have positive effects in lowering

blood pressure in hypertensive patients. The compounds in ginger have a mechanism that can inhibit the activity of the angiotensin-converting enzyme (ACE) (Nadia, 2020). Flavonoids have a hypotensive effect by inhibiting ACE activity and as a diuretic (Nadila 2014). Tea is a popular beverage enjoyed by people all over the world. It has been proven safe and has no negative side effects when consumed in appropriate amounts. This is one reason tea remains a favorite beverage enjoyed by many, especially in Indonesia (Britany and Sumarni, 2020) (Rahim, Herlianti and Rostiati, 2019). Therefore, researchers want to make a tea preparation from moringa leaves and ginger, which can be useful in helping to lower blood pressure.

METHOD

A. Tools and Materials

The tools used were a tray, grinder, 40-mesh sieve, 60-mesh sieve, tea bags, sealer, filter paper, porcelain cup, oven, Pyrex stirring rod, Pyrex beaker, Pyrex measuring cup, Ohaus analytical balance, aluminum foil, pH meter, desiccator, and glass.

The materials used in this study included Moringa leaves simplicia, ginger rhizome simplicia, and distilled water (Brataco).

B. Determination

Moringa leaves and ginger rhizome simplicia were collected from Karanganyar. Samples were then subjected to test at the UPF Yankestrad Tawangmangu RSUP Dr. Sardjito in Tawangmangu, Karanganyar, Central Java.

C. Making Simplicia Powder

The obtained moringa leaves and ginger rhizomes were sorted and then ground using a grinder. The powdered moringa leaves were sieved through a 40/60 mesh sieve and then weighed.

D. Making Tea Bags

Tea bags are made with a size of 4.5 x 5.5 cm. Moringa leaves powder and ginger rhizome powder are then placed into the tea bags in a specific combination according to Table 1 and pressed using a press and then packaged. Each tea bag contains 3 grams of powdered moringa leaves and ginger rhizome combination. The tea bag formula can be seen in Table 1.

Table 1. Formula for Tea Bag Preparation

Simplicia	Formula I	Formula II
Moringa leaves	2 g	1 g
Ginger rhizome	1 g	2 g
Total	3 g	3 g

E. Brewing Tea Bags

Place the tea bag in a glass, then add 100 ml of water at 100°C for 10 minutes. Remove the tea bag from the glass and let it cool to room temperature (Sasmito, S and D, 2020).

F. Physical Test of Simplicia Powder and Tea Bag Preparations

1) Organoleptic Test

The tea bags were directly observed for color, odor, and taste. The purpose of the test was to determine whether the tea bags were suitable for distribution to respondents (Yanti, Surhaini and Suseno, 2022).

2) pH Test

The acidity of the tea bag solution, which has been steeped or dissolved, is checked by inserting a pH meter into the solution. This is to determine whether the pH of the tea bag matches the specified pH of the beverage.

3) Water Content Test

The water content test was conducted using the gravimetric method by heating 1 gram of powdered herbal medicine placed in a cup in an oven at 105°C for 30 minutes. The heated

sample was then cooled in a desiccator for 15 minutes and weighed at constant weight. The water content formula used is:

$$\text{Water content} = \frac{b - (c - a)}{b} \times 100\%$$

Information:

a : weight of the cup (g)

b : initial sample weight (g)

c : weight of cup + sample after heating (g) (Gurning et al., 2020)

G. Hedonic test of tea bags

The method used in the sensory test is a preference test. This method aims to determine the level of respondents' liking and acceptance of the moringa leaves and ginger rhizome tea bag product with the resulting combination preparation. The parameters tested include color, taste, and aroma.

H. Data Analysis

The results obtained were analyzed evaluatively with a questionnaire using a hedonic scale, namely (1) very dislike, (2) dislike, (3) neutral, (4) like, (5) very like. The number of respondents used was 20 people, the data obtained were entered into a table and then compared to determine the level of respondents' liking for the tea bags that had been made.

RESULTS AND DISCUSSION

Hypertension is a major challenge in Indonesia because it is a common condition encountered in primary healthcare settings. According to the 2018 National Basic Health Research (Riskesdas), hypertension has a high prevalence of morbidity and mortality, at 34.1% (Kemenkes RI, 2018). Moringa leaves is a nutrient-rich plant known for its potential in traditional medicine for various conditions, including hypertension. Ginger contains numerous chemical compounds which have positive effects in lowering blood pressure in hypertensive patients. Tea preparations made from Moringa leaves and ginger can help lower blood pressure. Based on the formula in Table 1, physical quality tests were conducted, including organoleptic, pH, and water content tests, with results shown in Tables 2 and 3.

Table 2. Physical Quality Test Results of Formula 1 Moringa-Ginger Tea

	Organoleptic Test	pH Test	Water Content Test (%)
Replication 1	Color: Brown Flavor: Moringa with a ginger flavor Odor: Distinctive moringa Texture: Liquid	6.09	1.38
Replication 2	Color: Brown Flavor: Moringa with a ginger flavor Smell: Distinctive moringa Texture: Liquid	6.11	0.99
Replication 3	Color: Brown Flavor: Moringa with a ginger flavor Smell: Distinctive moringa Texture: Liquid	6.00	0.37
Average ± SD		6.07 ± 0.06	0.91 ± 0.51

Table 3. Physical Quality Test Results of Formula 2 Moringa-Ginger Tea

	Organoleptic Test	pH Test	Water Content Test (%)
Replication 1	Color: Brown Flavor: Ginger with Moringa flavor Smell: Distinctive Moringa flavor Texture: Liquid	6.49	1.77
Replication 2	Color: Brown Flavor: Ginger with Moringa flavor Smell: Distinctive Moringa flavor Texture: Liquid	6.47	0.74
Replication 3	Color: Brown Flavor: Ginger with Moringa flavor Smell: Distinctive Moringa flavor Texture: Liquid	6.60	1.84
Average ± SD		6.52 ± 0.07	1.45 ± 0.61

The tea bag preparations that have been made were physically tested in the form of pH tests, water content tests, and organoleptic tests. Organoleptic tests were carried out to determine whether the tea bags that have been made are suitable for consumption or not, which is done by observing using the five senses. Table 2 and Table 3 show that the tea bag preparations that have been made in FI have a brown color, moringa flavor with ginger sensation, a distinctive smell of moringa, and a liquid texture. While in FII it has a brown color, ginger flavor with moringa sensation, a distinctive smell of moringa, and a liquid texture. In terms of taste, the two tea bag formulas have differences, namely, in FI tea bags have a ginger sensation and moringa flavor because in the formula, the ratio of moringa is more than ginger, and vice versa, in FII the taste that arises is a ginger sensation and moringa flavor because there is more ginger than moringa in the formula.

The pH value is used to indicate the acidity or alkalinity of a product to ensure that the product can be used by the public and is safe for the stomach. The pH value is related to the product's shelf life because it affects the microbial content and sensory assessment. This is in accordance with the opinion of Siagian et al. (2020), who stated that a lower pH value indicates a longer shelf life (Siagian, Bintoro and Nurwantoro, 2020).

The pH test was conducted on both formulas and replicated three times. Tables 2 and 3 show that the pH of the tea bag formulations with the results of FI pH 6.07 and FII with pH 6.52, so both tea bag formulations that have been made have met the pH requirements for tea bag preparations. This is supported by research by Yuliastuti et al., which states that the pH of a good tea bag preparation is between 3 and 8 (Yuliastuti, et al., 2022).

The pH value of FI is more acidic than that of FII, because the amount of moringa leaves in FI is greater than in FII, resulting in a more acidic pH for the tea bag. This is consistent with research by Wahyudi et al. (2018), which demonstrated that moringa leaf extract generally has a pH ranging from 4.6 to 6.0. This pH value is acidic to nearly neutral (Wahyudi, et al., 2018). And based on research by Tetelepta (2024), ginger extract (including elephant ginger used in this study) tends to have a higher pH, ranging from 6.7 to 7.0, which is neutral (Telelepta, 2024).

Physical testing in the form of water content testing is one of the most important things in testing tea bags because high water content makes it easy for bacteria, mold and yeast to grow, which will cause changes to the tea bag preparation (Nurcahyani, 2022). The method used to determine water content is the drying method (gravimetry). Drying is a preservation method that reduces the water content of food ingredients to extend their shelf life. Therefore, the gravimetric method can be used by heating the sample in an oven at 105 degrees C, causing it to lose its water content. When the sample loses its water content, the

water content of the tea sample being tested can be determined (Fikriyah and Nasution, 2021). The weight of the sample calculated after being removed from the oven must be constant, that is, the weight of the material that will not decrease or remain the same after being placed in the oven. The weight of the sample after being constant can be interpreted as meaning that the water contained in the sample has evaporated and what remains is only the solid and water that is truly strongly bound to the sample (Nurcahyani, 2022).

The water content test was conducted on both formulas with three replications. Tables 2 and 3 show that the water content obtained in F1 was 0.91%, while in F2 it was 1.45%. The water content of the tea bags complies with SNI 4324:2014, which is less than 10%. The water content of the tea bags in F2 was higher than that of F1. This is in line with previous research, which found that the water content in moringa leaf powder processed by drying (sunlight or oven) generally ranges from 4.5% to 7.68% in Kurniawati's research (Kurniawati et al., 2018) The water content of moringa leaf powder is 6.64%. Meanwhile, the water content of elephant ginger powder is 7.315% (Maisyah, Khiong and Jafar, 2024).

Organoleptic tests were conducted to determine whether the tea bags that had been made were suitable for giving to respondents, which was done by observing using the five senses. Table 4 shows that F1 preferred the color of the tea bag preparation, F2 preferred the aroma, and F2 preferred the taste. While the total percentage showed that F2 was preferred, as indicated by the total percentage of F2, which was 52.27%, while F1 was 47.73%.

Table 4. Organoleptic Test Results of Moringa-Ginger Tea Bags

Hedonic Test	F1	F2
Color	52.50 %	47.50 %
Smell	45.81 %	54.19 %
Flavor	44.88 %	55.12 %
Total	143.19	156.81
Total Percentage	47.73 %	52.27 %

In Table 4, the color test showed that F1 was preferred because the majority of the Moringa leaves were brownish green, giving them a more attractive color than F2, which contained more ginger. In terms of aroma and taste, F2 was preferred because the higher ginger content provided a fresher aroma and taste and could mask the bitter or unpleasant aroma and taste of Moringa leaves. This is in accordance with research by Fatima et al. (2020) that the addition of ginger powder to Moringa leaves tea bags significantly affected the taste, aroma, and overall taste of the tea bags and Moringa, but did not affect the color and clarity of the tea. The addition of ginger powder to moringa leaves tea significantly increased panelist acceptance, with 8% ginger being the best treatment. The ginger masked the unpleasant aroma and enhanced the tea's distinctive aroma, making the blend more palatable than moringa leaves alone. The more ginger powder added to Moringa leaves tea, the higher the organoleptic value from the panelists (Fatima, Masriani and Idrus, 2020).

CONCLUSION

The tea bag formula used is a combination of the ratio of Moringa leaves: ginger with the formula F1 (2:1), F2 (1:2). The physical quality test of the preparation was in the form of pH, water content, organoleptic, and hedonic tests on 20 respondents. The results of the organoleptic physical quality test showed that F1 showed a brown color, Moringa taste with a ginger sensation, a distinctive moringa odor, while F2 showed a brown color, ginger taste with a moringa sensation, a distinctive moringa odor. The pH test showed that F1 had a pH of 6.07 while F2 had a pH of 6.52. The water content test showed that F1 was 0.91% and F2 was 1.45%. The hedonic test showed that F1 preferred color, F2 preferred aroma, and F2 preferred

taste. It can be concluded that the physical quality tests of F1 and F2 were in accordance with the established quality standards, while the hedonic test preferred F2 with a percentage of color, aroma, and taste of 52.27%.

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