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Characteristics of Herbal Tea Bags From a Mixture of Pandan Leaf Powder (*Pandanus amaryfolius* Roxb.) and Red Ginger (*Zingiber officinale* var. Rubrum)

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ABSTRACT

This study investigated the effect of a mixture of pandan leaves and red ginger on the characteristics of herbal tea bags. Utilizing a completely randomized design (CRD) with 5 treatments and 3 replications, the data were statistically analysed using ANOVA, followed by Duncan's New Multiple Range Test (DNMRT) at a 5% significance level. The treatments involved varying ratios of pandan leaves to red ginger: A (90:10 g), B (80:20 g), C (70:30 g), D (60:40 g), and E (50:50 g). Observations included tests for water content, ash content, polyphenol content, IC50 antioxidant activity, total plate count, and organoleptic properties. The results demonstrated that the mixture of pandan leaves and red ginger significantly affected water content, ash content, total polyphenols, and IC50 antioxidant activity. Based on chemical, microbiological, and organoleptic analyses, treatment D (60:40 g) was identified as the optimal formulation, yielding the following values: water content (6.55%), ash content (4.44%), total polyphenols (28.63 mg GAE/g), antioxidant IC50 (100.31 ppm), total plate count (6.4 x 10^2), and organoleptic scores for color (3.70%), aroma (3.40%), and taste (3.10%).

1. INTRODUCTION

1.1 Research Background

Currently, many functional drinks are being developed using tea plants and other natural ingredients, resulting in beverages known as herbal teas. Herbal teas are concoctions made from flowers, leaves, seeds, roots, or other parts of plants, excluding the traditional tea plant, Camellia sinensis. Regular herbal tea consumption can provide various health benefits and serve as an alternative for disease prevention.

One plant commonly used for making herbal tea is pandan (Pandanus amaryllifolius Roxb.). Pandan leaves contain several bioactive compounds, including alkaloids, saponins, flavonoids, tannins, and polyphenols, which function as antioxidants [1]. According to Angraiyati [2], pandan leaf tea produced with a drying time of 150 minutes exhibited a water content of 5.17%, an ash content of 3.30%, and high antioxidant activity, with an IC50 value of 5.68 ppm. This high antioxidant activity is potent enough to combat free radicals linked to various diseases by potentially deactivating enzymes, oxidizing fats, and disrupting DNA. However, the resulting tea is often astringent, making it less palatable to consumers.

To enhance the taste and increase the antioxidant content of pandan leaf tea, red ginger (Zingiber officinale var. Rubrum) can be added. Red ginger contains active compounds such as gingerol, which provides a spicy flavor and has antioxidant properties. It also has a high essential oil content, commonly used for medicinal purposes. The active ingredients in red ginger include oleoresin components, essential oils, and flavonoids [3].

1.2 Research Objective

The study aims to evaluate the organoleptic properties of herbal tea bags made from a mixture of pandan leaves (*Pandanus amaryllifolius* Roxb.) and red ginger (Zingiber officinale var. Rubrum) and to determine the optimal ratio of pandan leaves to red ginger that enhances the overall characteristics of the herbal tea bags, including their chemical and sensory properties.

2 MATERIALS AND METHODS

2.1 Research Design

The design in this research was a simple, Completely Randomized Design (CRD) with 5 treatment levels and 3 replications. The observation data were analyzed using analysis of variance (ANOVA) with the F test and further tests Duncan's New Multiple Range Test (DNMRT) at a significance level of 5%.

The treatment in this study was a comparison of a mixture of pandan leaf powder and red ginger, namely as follows:

A = (90:10g)
B = (80:20g)
C = (70:30g)
D = (60:40g)
E = (50:50g)

2.2 Preparation of pandan leaf powder

Pandan leaves are withered for 18 hours at room temperature, turned 3 times so that they wither evenly, then crushed and dried using a food dehydrator at a temperature of 50˚C for 6 hours; after the pandan leaves are dry, they are crushed using a blender and sieved through a 20 mesh sieve.

2.3 Preparation of red ginger powder

Clean the red ginger from soil and dirt, peel the skin, and cut it into small pieces. Then, dry it using a food dehydrator at 55 55˚C for 6 hours. After drying, reduce it in size using a blender and sieve it using a 20 mesh sieve.

2.4 Preparation of herbal tea bags with red ginger and pandan leaf powder

Pandan leaf powder is mixed with red ginger powder according to the specified treatment and then packed in a 5.5x7.5cm tea bag. The herbal tea bag formulation can be seen in the following table.

Table 1. Formulation of herbal tea bags from a mixture of pandan leaf powder and red ginger powder.

Material	unit	Treatment				
		A	B	C	D	E
Pandan Leaf	g	90	80	70	60	50
Red ginger	g	10	20	30	40	50

2.5 Analysis

The herbal tea bags were manufactured using a combination of pandan leaf powder and red ginger powder. Observations were conducted regarding the water and ash contents, antioxidant activity (IC50), total polyphenols, total plate count test, and organoleptic test.

3 RESULTS AND DISCUSSION

3.1 Raw Material Analysis

The results of the analysis of raw materials in the form of pandan leaves and red ginger can be seen in Table 2 as follows.

Table 2. Chemical Characteristics of Herbal Tea Raw Materials

Parameter	Pandan leaf	Red ginger
Water content (%)	4.21 ± 0.18	9.32 ± 0.33
Ash content (%)	3.45 ± 0.24	4.18 ± 0.11
Total polyphenols (mg GAE/g)	29.57 ± 0.76	91.44 ± 2.14

Compared to SNI 03-3836-2013 regarding packed dry tea, the water content of pandan leaf powder is 4.21%; nonetheless, it still satisfies SNI regulations up to 8% water content. Red ginger, on the other hand, has a water content value of 9.32%. As determined by SNI 01-3393-1994, red ginger's water content indicates that its dry ginger content satisfies the maximum standard of 10%. Red ginger has a rating of 4.18%, and pandan leaf powder has a value of 3.45% in ash content. Because more water evaporation occurred from red ginger than from pandan leaves, the ash content derived from red ginger is higher. The total polyphenol concentration in red ginger is 91.44 mg GAE/g; in pandan leaf powder, it is 29.57 mg GAE/g. This is consistent with a study by Wirzan, Ayu, and Hamzah [4], which indicates that red ginger powder contains between one and two per cent polyphenols.

3.2 Characteristics of Herbal Tea Bags

Table 3. Results of analysis of water content, ash content and total polyphenols of herbal tea bags

Comparison Pandan leaves: red ginger	Water content (%)	Ash content (%)	Total polyphenols (mg GAE/g)
A = (90:10 g)	$5,22 \pm 0,19^{a}$	$3,11 \pm 0,19^{a}$	$20,30 \pm 0,81^{a}$
B = (80:20 g)	$5,56 \pm 0,20^{ab}$	$3,50 \pm 0,17^{a}$	$22,90 \pm 0,75^{b}$
C = (70:30 g)	$5,89 \pm 0,19^{b}$	$4,00 \pm 0,33^{b}$	$24,10 \pm 0,86^{b}$
D = (60:40 g)	$6,55 \pm 0,39^{c}$	$4,44 \pm 0,20^{c}$	$28,63 \pm 0,91^{c}$
E = (50:50 g)	$6,89 \pm 0,38^{c}$	$5,11 \pm 0,19^{d}$	$37,47 \pm 2,21^{d}$

Note: Lowercase letters that follow numbers in the same column indicate that the numbers are not the same and are significantly different at the 5% level, according to DNMRT.

3.2.1 Water content

Water content is a chemical property that can be used to determine the amount of water in a material. Testing water content during drying is very important. Water content can affect appearance, texture, and flavour [5]. If an herbal tea product contains a lot of water, it will quickly become damp and easily break down, accelerating the growth of bacteria and fungi [6].

Table 3 shows that the water content increases with the addition of red ginger powder to herbal tea; the resulting water content becomes higher because the raw material for red ginger powder has a higher water content than pandan leaf powder. The water content of the resulting tea complies with the SNI 03-3836-2013 standard for packaged dry tea, with a maximum water content of 8%, while the water content of the herbal tea resulting from this research ranges from 5.22% to 6.89%.

3.2.2 Ash content

Ash content shows the amount of minerals that are not burned into volatile substances, so the higher the ash content, the higher the mineral content of the material [7]. The research results show that the higher the ratio of red ginger to herbal tea, the

higher the ash content produced; apart from that, in the raw materials analysis, pandan leaves have an ash content value of 3.45%, and red ginger is 4.18%. % . According to Farrell, Aulawi and Darmawi [8], the determination of ash content is influenced by the type of material, time and temperature used during processing. If the material is processed by drying, the higher the temperature used, the higher the percentage of ash in the product because more water comes from the food. Ginger rhizomes also contain magnesium, phosphorus, zinc, folate, vitamin B6 and vitamin A [9].

3.2.3 Total polyphenols

Polyphenolic compounds are natural antioxidants because they can produce antioxidant activity, which acts as a hydrogen atom-donating antioxidant. Polyphenols can inhibit, prevent, or reduce oxidation caused by free radicals. Total polyphenol testing aims to determine the amount of phenolic compounds in the materials used. This analysis uses a standard curve constructed using gallic acid, and the maximum wavelength used is 725 nm.

This study's highest total polyphenols in herbal tea were treatment E (50% pandan leaf powder and 50% red ginger), 37.47 mg GAE/g. This was due to the polyphenol content of the pandan leaves and red ginger. The more red ginger is added, the higher the total polyphenols in the product. This can be seen from the results of the raw material analysis: pandan leaves have a polyphenol value of 29.57 mg GAE/g, and red ginger has a value of 91.44 mg GAE/g. According to Wirzan et al. [4], the polyphenolic compounds or phenolic derivatives found in red ginger powder are gingerol and shogaol in red ginger oleoresin. Gingerol and shogaol are non-volatile compounds that can act as antioxidants and prevent free radicals in the body. Pandan leaves contain alkaloids, flavonoids, saponins, tannins, and polyphenols that act as antioxidants [1].

3.2.4 Antioxidant activity (IC50)

Antioxidant activity can be expressed by an inhibition concentration value of 50, IC50. IC50 indicates the concentration that can reduce free radical activity by 50%. Based on the IC50, antioxidant activity can be classified as strong or weak. The lower the IC50, the stronger the antioxidant properties [10]. Based on the analysis of herbal tea from a mixture of antioxidant activity, Table 4 shows the following.

Table 4. Antioxidant activity (IC_{50})

Comparison Pandan leaves: red ginger	Antioxidant Activity$_{50}$ (ppm)
E = (50:50 g)	81.69 ± 3.53 [a]
D = (60:40 g)	100.31 ± 13.71[b]
C = (70:30 g)	117.98 ± 5.28[c]
B = (80:20 g)	122.34 ± 3.21[c]
A = (90:10 g)	140.14 ± 4.50[d]

The highest value was found in treatment E (50:50 g ratio) with 81.69 ppm, while the treatment had IC50 antioxidant activity. The lowest value was found in treatment A (90:10 g ratio) with 140.14 ppm. This is based on the assumption that the lower the value obtained, the greater the antioxidant activity. According to Widyasanti et al. [10], a compound is said to have a very strong group antioxidant activity if the IC50 value is less than 50 ppm. Strong (50-100 ppm), moderate (100-150 ppm) and weak (150-200 ppm). The lower the IC50, the higher the antioxidant activity.

Red ginger contains gingerol and shogaol, which have antioxidant activity. Red ginger contains secondary metabolites in flavonoids and phenols, which have antioxidant activity that is useful for scavenging free radicals [11]. In addition, pandan leaves contain alkaloids, flavonoids, saponins, tannins, and polyphenols that act as antioxidants [1].

3.2.5 Total plate counts

Colony counts are made by counting all colonies growing on the surface of the media used. Calculating the total plate count in herbal tea made from a mixture of pandan leaf powder and red ginger indicates the total number of microbes in herbal tea products. The results show that the total plate count is below the quality requirements for herbal tea SNI for dry tea in packaging 3836:2013, which has a maximum total of 3x103 colonies/g.

Table 5. Calculation results of total plate numbers for herbal tea bags

Comparison Pandan leaves: red ginger	Total Plate Count (colonies/g)
E = (50:50 g)	5.3 x 10^2
D = (60:40 g)	6.4 x 10^2
C = (70:30 g)	7.2 x 10^2
B = (80:20 g)	9.0 x 10^2
A = (90:10 g)	9.3 x 10^2

This is because chemicals in pandan leaves, including flavonoids, alkaloids, saponins, and tannins, may have antibacterial properties [12]. In addition, red ginger includes antibacterial substances that can prevent the growth of microorganisms, including phenols, flavonoids, terpenoids, and essential oils [13].

3.2.6 Organoleptic test

Colour

Colour is one of the most important parameters in determining consumer acceptance, as colour is a person's first indicator when evaluating a product. The results of the herbal tea's colour test are shown in Table 6.

Table 6. Colour test score for herbal tea.

Comparison Pandan leaves: red ginger	Colour	Aroma	Taste
A = (90:10 g)	3.30 ± 0.98	3.20 ± 0.77	3.00 ± 1.08
B = (80:20 g)	3.40 ± 0.99	3.20 ± 0.77	2.60 ± 0.75
C = (70:30 g)	3.70 ± 0.66	3.40 ± 0.60	2.90 ± 097
D = (60:40 g)	3.70 ± 0.86	3.40 ± 0.50	3.10 ± 0.79
E = (50:50 g)	3.85 ± 0.93	3.75 ± 0.91	3.00 ± 0.92

Based on the results of the colour tests, the average colour value of the herbal tea produced ranges from 3.30 to 3.85. The yellowish green colour produced in the herbal tea is due to the green colour of the pandan leaves being degraded by prolonged drying. The drying process causes the green colour of the leaves to oxidise to brown, so the chlorophyll in the pandan leaves

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becomes unstable and forms a brown colour (Angraiyati and Hamzah, 2017). However, adding red ginger to each herbal tea treatment produced did not significantly differ from the panellists' preferences. This is consistent with the statement of Muzaki and Wahyuni [14], that adding ginger does not affect the resulting appearance and has no effect on the resulting appearance. This means that each treatment makes no difference to the colour of the herbal tea produced. This is because red ginger contains oleoresin, which produces a yellowish colour that neutralises the brown colour. The panellists' liking for treatment E had a liking score of 3.85 (like). This shows that the panellists prefer green to brass tea bags. The colour of the herbal infusion is shown in Figure 1.

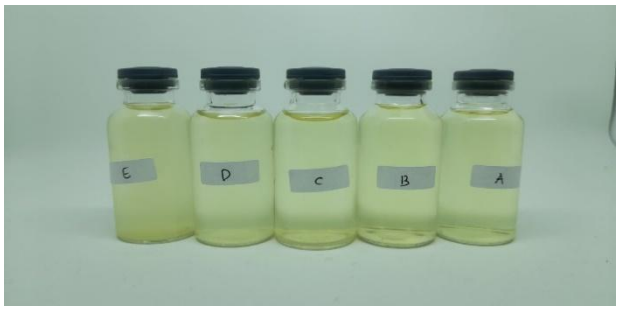

Figure 1. Brewing colour of herbal tea

Aroma

Aroma is also an important factor in assessing the parameters and determining the quality of a manufactured food product. The average value of the herbal tea aroma test is between 3.20 and 3.75. The treatment with the highest value is treatment E, and the treatment with the lowest value is treatment A. This is because pandan leaves have a distinctive aroma. Namely, they contain aroma components derived from the chemical compound 2-acetiy-1-pyrroline (ACPY). Red ginger then has the highest essential oil and oleoresin content compared to other types of ginger. According to the study by Wirzan et al. (2018), the more red ginger powder you add, the less unpleasant the aroma of the herbal tea will be. Red ginger contains gingerol and shogaol compounds, which give a distinctive aroma and a strong fragrant impression.

Taste

Taste is an important indicator that greatly influences consumer acceptance of a food and beverage product; even if the aroma, colour, and texture are good if they have an unpleasant taste, the food and beverage will not be accepted by consumers. It was found that the preference score for the taste of herbal tea mixed with pandan leaf powder and red ginger was in the range of 2.60-3.10. The treatment with the highest preference score is treatment D (with a ratio of 60:40 g). The taste test results on the herbal tea prepared with a mixture of pandan leaf powder and red ginger showed a distinctive taste. Pandan leaves contain chemicals, including tannin, a compound with an astringent taste. According to research by Angraiyati [2], tea made from pandan leaves has an astringent taste and is,, therefore,, less popular with panellists. A comparison was therefore made with the addition of red ginger. Red ginger contains an active compound in gingerol, which acts as a pungent flavour, so it can improve the taste of pandan leaf tea to make it more enjoyable to consume. Based on the overall evaluation results of herbal tea bags made from a blend of pandan leaf powder and red ginger, it can be concluded that the herbal tea bag treatment was acceptable to the panellists in terms of colour, aroma and taste. The most liked result by the panellists was the herbal tea bag in treatment D (60:40 g ratio) with a colour score of 3.70 (liked), taste score of 3.10 (liked) and aroma score of 3.40 (liked).

4 CONCLUSION

The following conclusions can be drawn based on the research: (1) The herbal tea bag resulting from a mixture of pandan leaf powder and red ginger significantly affected water content, ash content, antioxidant activity, total polyphenols, and aroma organoleptic tests. However, it had no real effect on organoleptic tests of colour and aroma; (2) Herbal tea bags made from a mixture of pandan leaf powder and red ginger with treatment D (ratio 60:40 g) are the best product based on organoleptic taste tests and seen based on chemical analysis with average values: water content 6.55%, ash content 4.44%, total polyphenols 28.63 mgGAE/g, antioxidant activity 100.31 ppm, ALT value 6.4 x 102 and organoleptic test scores with colour value 3.70, aroma 3.40 and taste 3.10. Treatment D also has results that are not very different from treatment E's. It can, therefore, be said that product D is the best product.

REFERENCE

[1] Margaretta, S., Handayani, S., Indraswati, N., & Hindarso, H. Extracting phenolic compounds from Pandanus amaryllifolius roxb. as a natural antioxidant. Widya Engineering Journal. 2011; 10(1), 21–30.

[2] Angraiyati, D., & Dan Hamzah, F. Drying Time in Making Wangi Pandan Leaf Herbal Tea (Pandanus amarylifolius Roxb.,) on Antioxidant Activity. JOM Faperta. 2017; 4(1).

[3] Hidayati, F., Agusmawanti, P., & Firdausy, M. Effect of Giving Red Ginger Extract (Zingiber officinale var. Rubrum) on the Number of Macrophage Cells in Traumatic Ulcers of the Oral Mucosa Due to Chemicals. ODONTO Dental Journal. 2015; 2(1), 51–57.

[4] Wirzan, A., Dewi, A., & Hamzah, F. Addition of Red Ginger Powder (Zingiber officinale var. Rubrum) in Making Avocado Leaf Herbal Tea (Persea americana Mill*)*. 2018; *4*(1)

[5] Widyanti, N. luh D., Yulianti, N. L., & Setiyo, Y. Drying Characteristics and Physical Properties of Dried Red Ginger Powder (Zingiber Officinale Var.rubrum) with Variations in Slice Thickness and Drying Temperature. BETA Journal (Biosystems and Agricultural Engineering). 2021; 9(2), 148.

[6] Kartika Dewi, B., Kencana Putra, I. N., & Ari Yusasrini, N. L. Effect of Temperature and Drying Time on Antioxidant Activity and Sensory Properties of Pohpohan Leaf Powder Herbal Tea (Pilea trinervia W.). Journal of Food Science and Technology (ITEPA). 2022; 11(1), 1–12.

[7] Wiratara, P. R. W., & Ifadah, R. A. Characteristics of Kalistemon Leaf Herbal Tea (Melaleuca viminalis) Based on Temperature Variation and Drying Time. Indonesian Journal of Agricultural Technology and Industry. 2022; 14(1), 16–22.

[8] Farrell, R., Aulawi, T., & Darmawi, A. Quality Analysis of Red Ginger Rhizome Simplicia (Zingiber officinale Var. Rubrum) with Different Drying Temperatures. 2020; 7(1), 136–143.

[9] Sari, D., & Nasuha, A. Nutrient Content, Phytochemicals, and Pharmacological Activity in Ginger (Zingiber officinale Rosc.): Review. Tropical Bioscience: Journal of Biological Science. 2021; 1(2), 11–18.

[10] Widyasanti, A., Rohdiana, D., & Ekatama, N. Antioxidant Activity of White Tea Extract (Camellia sinensis) using the DPPH (2,2 Diphenyl-1-Picrylhydrazyl) Method. Fortech Journal. 2016; 1(1), 1–9.

[11] Munadi, R. Chemical Component Analysis and Antioxidant Test of Red Rhizome Extract (Zingiber offinale Rosc.Var rubrum). Cokroaminoto Journal of Chemical Science. 2020; 2(1), 1–6.

[12] Juariah, S., Wiranda, J., & Sepryani, H. Test the Effectiveness of Pandan Wangi (Pandanus amaryllifolius Roxb) Leaf Extract on the Growth of Streptococcus mutans Bacteria. Journal of Indonesian Medical Laboratory and Science (JoIMedLabS). 2022; 3(1), 81–89.

[13] Purbaya, S., Aisyah, L. S., & Arianti, W. E. Antibacterial Activity of Ethyl Acetate Extract of Red Ginger (Zingiber officinale Roscoe var. sunti) Against Staphylococcus aureus and Escherichia coli bacteria. 2018; 1, 29–34.

[14] Muzaki, D., & Wahyuni, R. Effect of Adding Dried Ginger (Zingiber officinale) on the Quality and Acceptability of South African Leaf Herbal Tea (Vernonia amygdalina). Food Technology. 2015; 6(2), 67–75.

 https://doi.org/10.29165/ajarcde.v8i2.431