



Research Article

Organoleptic and Chemical Properties of SERANGI Herbal Drink: A Blend of Lemongrass (*Cymbopogon nardus L.*) and Holy Basil (*Ocimum sanctum L.*) as Immune Booster.

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ABSTRACT

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Herbal drinks have therapeutic and refreshing properties. Some plethora of botanicals are used as herbal drink ingredients, including simplicia from lemongrass (*Cymbopogon nardus L.*) and holy basil (*Ocimum sanctum L.*). This research was performed to assess the organoleptic and chemical characteristics of lemongrass and holy basil simplicia herbal drink named *Serangi*. The research underwent two phases: organoleptic testing in the first stage and chemical analysis in the second stage to evaluate pH, vitamin C levels, and total phenols in *Serangi* herbal drink. Three repetitions had been performed to gain data mean values and standard deviation before being analyzed using General Linear ANOVA model (GLM) on the Minitab 20 software. Results revealed panelists' preferences for F3 in terms of color, aroma, and taste, with ratings of 4.12, 4.02, and 4.05, respectively. All *Serangi* drink samples met the pH requirements, falling within the 3-8 range, where F3 exhibited the highest vitamin C content of 1.224% and total phenol content of 122.10 mg GAE/100g/ml. *Serangi* herbal drink is rich in vitamin C and secondary metabolites and it offers immune-boosting benefits.

1. Introduction

Human health relates to the quality of food and beverages being consumed. Medicinal plants contain some active compounds that promote wellness. For instance, lemongrass and holy basil (*kemangi*) offer variety of secondary metabolites, including phenols, polyphenols, flavonoids, alkaloids, steroids,

triterpenoids, tannins, and saponins which can boost the immune system (Yanti et al., 2022 ;Wahid et al., 2020). Lemongrass and holy basil (*kemangi*) can be produced as herbal drinks for more convenient, effective, and safe consumption.

Functional drinks promote hydration and provide protection against diseases by improving the immunity (Ryadha et al., 2021). Herbal teas also offer nutritional benefits and palatable flavors while also containing probiotics, vitamin, stamina enhancer and immune system booster properties (Nawir et al., 2021). In this research, lemongrass and holy basil (*kemangi*) are used as ingredients of herbal drink.

Lemongrass has traditionally been recognized solely as a culinary spice, renowned for its aromatic qualities. Lemongrass plants yield an essential oil rich in citronellal (7-15%) and geraniol (55-65%), alongside an array of other components including citral, citronellol, pinene, camphene, sabinene, myrcene, β -felandrene, p-cymene, limonene, cis-ocimene, terpinol, borneol, terpinen-4, α -terpineol, farnesol, methyl heptenone, n-decenaldehyde, dipentene, bornyl acetate, geranyl formate, terpinyl acetate, citronellyl acetate, geranyl acetate, and β -caryophyllene oxide. Moreover, lemongrass contains variety of secondary metabolites such as flavonoids, saponins, alkaloids, polyphenols, and essential oils (Fadhlorrohman et al., 2023). Sangi and Katja (2011) found a phenol extract content of 42.959 mg/kg in lemongrass, while Najmah et al. (2023) found a phenol content of 81.67 mg GAE/g sample. In addition to its chemical composition, lemongrass offers numerous health benefits, including cancer prevention, blood pressure regulation, analgesic properties, and overall health maintenance.

In addition to lemongrass, holy basil (*kemangi*) has a total phenolic content of 34.38 mg/kg. Sangi and Katja's (2011) research even showed higher total phenol content of 37.347 mg/kg extract. Holy basil (*kemangi*) is used as food spice that also supports cancer prevention, cardiovascular health, anti-aging effects, and free radical protection (Putri, 2019). In this research, lemongrass and holy basil were dried, blended, and packaged as herbal drinks/herbal tea blends suitable for consumption. Raw ingredients were dried at an optimal temperature of 60°C for 10 hours to maintain the quality of the herbal tea product and ensures that the physicochemical and immunomodulator properties are preserved. This research examined the organoleptic properties of herbal beverages infused with lemongrass and holy basil (*kemangi*) and analyzed their chemical characteristics, including pH, vitamin C, and total phenolic content.

2. Materials and Method

Method

In this research, experiments were conducted in the chemistry laboratory of the Academy of Pharmaceutical and Food Analysts. Samples of fresh lemongrass and holy basil (*kemangi*) plants were obtained from Balai Materia Medika Batu.

Tools and Materials

Tools

The research employed several essential tools and equipment, including an oven (Memmert Type IN55) for drying, a Vortex mixer (Banstead Thermolyne) for sample mixing, scales (Mettler Teledo ME204) for precise measurements, and a Genesys 10s UV-Vis spectrophotometer for analyzing chemical compositions.

Additionally, a stirrer, thermometer, stove, 100 mL Pyrex measuring cup, Herma 250 mL Erlenmeyer flask, various containers, volumetric pipettes, dropper pipettes, cotton, brown paper mixer, and a Digital pH meter KL-03(II) were utilized throughout the experimental procedures.

Materials

The materials utilized in this research comprised dried holy basil (*kemangi*) leaves and lemongrass simplicia, Aquadest, 15% H₂SO₄, 10% FeCl₃, 1% starch, 0.01 N iodine, and 10% Folin-Ciocalteu's reagent. The formulation for the *Serangi* drink is detailed in Table 1.

Table 1. The Formulation of *Serangi* Herbal Drink

Ingredient	Formulation (%)		
	F1	F2	F3
Lemongrass Simplicia	50 %	75 %	25 %
Holy Basil Simplicia	50 %	25 %	75 %
Total	100 %	100 %	100 %

The Production of *Serangi* Herbal Drink

Each portion of dried and ground simplicia was accurately weighed and subsequently enclosed within a 3-gram tea bag. Tea bags corresponding to each formulation were steeped in 250 mL of hot water, maintained at a temperature of 90°C. Following the brewing process, each test parameter was meticulously conducted.

Organoleptic Test

The *Serangi* herbal drink formula underwent an organoleptic assessment utilizing the hedonic test methodology as outlined by Wulansari et al., (2023). This test aimed to evaluate the level of preference for each formula based on aroma, color, and taste attributes. The hedonic test employed a scale ranging from 1 to 5, where 1 represented "dislike very much," 2 denoted "dislike," 3 indicated "somewhat like," 4 signified "like," and 5 reflected "like very much." Furthermore, panelists were encouraged to provide subjective feedback or evaluations regarding the formula on the provided form sheet.

Panelists were selected based on specific criteria and expertise, including good health, absence of allergies, prior experience in organoleptic testing, and familiarity with the test materials. The panel comprised 25 semi-trained individuals, primarily students from the Nutrition Department of Politeknik Kesehatan Putra Indonesia in Malang.

pH Test

As suggested by Dwiloka et al., (2022), pH meter was used for pH analysis. The pH meter probe was submerged into the sample solution within brief period for stabilization. Subsequently, the pH value of the sample shown on the screen was recorded.

Vitamin C Test

Vitamin C levels of the samples were measured using the iodometric titration method proposed by Ariani & Muhsin, (2023) in two standardization titrations. The first standardization involved titrating between

$\text{Na}_2\text{S}_2\text{O}_3$ 0.01N and KIO_3 0.9N, while the second standardization was conducted between $\text{Na}_2\text{S}_2\text{O}_3$ 0.01N and I_2 0.01N. Each standardization procedure was replicated three times to ensure accuracy.

The Titration End Point (TAT) during standardization was identified by a distinct color change from blue to colorless. Following the standardization process and obtaining titration results, the vitamin C content in the lemongrass and holy basil (*kemangi*) tea samples was determined. This determination was achieved by titrating the tea sample solution with I_2 0.01N until the TAT was reached, characterized by a color transition from colorless to blue.

Subsequently, the percentage of vitamin C levels in the lemongrass and holy basil (*kemangi*) tea samples was calculated using the vitamin C content formula. This formula incorporates the titration results obtained during the iodometric titration process and allows for accurate quantification of the vitamin C content in the samples.

Total Phenol Test

The total phenol content analysis (Mahato et al., 2022) involved preparing a stock solution of gallic acid (100 ppm or 100 $\mu\text{g}/\text{mL}$) in 96% ethanol. Standard concentration series ranging from 0 to 100 ppm were prepared by transferring 0, 1, 2, 3, and 5 mL of the stock solution into 5 mL volumetric flasks and adjusting them to the mark with distilled water. Subsequently, 0.5 mL of each standard solution was mixed with 2.5 mL of 10% Folin-Ciocalteu reagent and incubated at room temperature for 5 minutes. Afterward, 2 mL of 7.5% Na_2CO_3 solution was added and the mixture was further incubated for 30 minutes at room temperature. The absorbance of the resulting mixture was measured using a spectrophotometer at a wavelength of 756 nm. Each measurement was performed in triplicate, and a standard curve correlating gallic acid concentration with absorbance was constructed.

Data Analysis

The obtained data include the mean \pm standard deviation of three replicates which were then statistically analyzed using the General Linear ANOVA model (GLM) to compare the mean values. The mean values of the groups were further compared using Tukey's test with a significance level of $p < 0.05$ on Minitab 20 software.

3. Results and Discussion

3.1 Organoleptic Test

Organoleptic test is able to evaluate the color, aroma, and taste characteristics of a food or beverage product. The outcomes of organoleptic tests conducted on *Serangi* herbal drinks in different formulations are presented in **Table 3.1**.

Table 3.1 The Results of Organoleptic Test of *Serangi* Herbal Drink

Formula	Mean ± SD		
	Aroma	Color	Taste
F1	3.2 ± 0.662	4.00 ± 0.425	2.75 ± 0.766
F2	3.9 ± 0.730	4.08 ± 0.482	3.65 ± 0.725
F3	4.02 ± 0.680	4.12 ± 0.512	4.05 ± 0.744
P	0.435	0.742	0.035*

Note:*) Significant (p<0.05) (Kruskal-Wallis test);

Aroma

The assessment of aroma relies on the sense of smell through the nasal cavity to gauge the scent emitted by a formulated product. In the test, F3 formulation exhibited a higher value compared to F1 and F2 formulations. However, statistical analysis of the aroma aspect yielded a p-value of 0.453 (p > 0.05), suggesting no significant differences among the three formulas. This outcome may be attributed to the consistent presence of the characteristic aroma of lemongrass and holy basil (*kemangi*) in each formula, regardless of composition or percentage. Such distinctive aromas can strongly influence the assessment, leading to comparable results as panelists typically share similar preferences for the three distinct aromas of *Serangi* drinks. The holy basil (*kemangi*) aroma is attributed to the essential oil content and the inclusion of oleoresin as a flavor enhancer in tea bags. The flavor profile comprises esters, terpenoids, alcohols, aldehydes, ketones, and furans, which collectively contribute to the unique aroma of herbal drinks (Adhamatica & Murtini, 2021).

Color

The assessment of the color aspect relies on visual perception, utilizing the sense of sight to evaluate preferences for the visual characteristics of the *Serang* herbal drink. Results from the color organoleptic tests indicate a nearly comparable outcome, with an average difference of 0.05 observed for formula F3, which is slightly higher than that of formulas F1 and F2. Upon statistical analysis, the p-value of 0.742 indicate no significant difference among the three color aspects. The color of *Serangi* drink formula is rather yellowish-green. This color consistency across formulas can be attributed to the consistent use of essential ingredients, namely lemongrass and holy basil (*kemangi*). The greenish color is more pronounced in the F3 formula due to the higher presence of holy basil (*kemangi*) simplicia. This observation aligns with previous research findings (Agustiari et al., 2020). Despite minor differences in color, panelists assigned scores that were largely similar, with the greenish color of F3 being particularly attractive in color assessment.

Taste

Taste stands as a crucial quality determinant in products, significantly influencing consumer acceptance. Organoleptic taste testing employs the tongue as a sensory tool. From the research results, the F3 formula exhibited the highest taste value. Upon statistical analysis, the obtained p-value was 0.035, indicating differences in taste parameters among the three formulas. According to Putri (2019), holy basil (*kemangi*) imparts a robust, sometimes peppery, and refreshing taste. This taste variation in holy basil (*kemangi*) leaves arises from various chemical compounds present, notably methyl chavicol (orestragol), linalool, citral, methyl cinnamate, and eugenol. Consequently, panelists often favor flavors with a higher

proportion of holy basil (*kemangi*) simplicia due to these flavor-enhancing compounds.

3.2 Chemical Test

Chemical analysis of Serangi herbal drink was performed to examine the parameters; pH, Vitamin C and total phenol, which results are shown in Table 3.2

Table 3.2 The Results of Chemical Analysis on *Serangi* Herbal Drink

Formula	Mean \pm SD		
	pH	Vitamin C (%)	Total Phenol (mg GAE/100g/ml)
F1	5.3 \pm 0.550a	1.120 \pm 0.36a	85.25 \pm 10.10b
F2	5.5 \pm 0.552a	1.180 \pm 0.38a	60.15 \pm 12.50c
F3	5.8 \pm 0.551a	1.224 \pm 0.35a	122.10 \pm 10.25a

pH Testing

pH testing was conducted to ensure the safety of Serangi herbal drinks from potential stomach irritation. Using a pH meter, acidity or alkalinity levels in the herbal drink were measured to ensure they fall within the safe range for human consumption (R. Sari & Suhartati, 2016). Results from the pH testing indicate that all herbal drink preparations have met the required standards between 3-8. Specifically, beverage preparations for F1 exhibit an average pH of 5.3, F2 at 5.5, and F3 at 5.8. However, the pH value from the test results did not show any difference. Additionally, there were no significant differences among replications, also with a p-value > 0.05. Low or acidic pH values can contribute to extending the shelf life of preparations by inhibiting the growth of microorganisms (Siagian et al., 2020).

Vitamin C Test

The vitamin C activity test determined the levels of vitamin C (ascorbic acid) in *Serangi* herbal drink samples using iodometric titration. Functional drinks serve tertiary functions, such as supplementing vitamins, enhancing stamina, and bolstering the immune system (Farid Hossain, 2015). With the increasing popularity of functional drinks made from natural ingredients like spices, known as herbal ingredients, it becomes essential to ascertain the remaining levels of vitamin C in these beverages.

The assessment of vitamin C levels in lemongrass and holy basil (*kemangi*) tea samples revealed that the highest concentrations were found in F3, reaching 1.224%. Statistical analysis indicated no significant differences among the three formulas, with a p-value > 0.05. Additionally, there were no significant differences among replications, also with a p-value > 0.05. Lemongrass and holy basil (*kemangi*) tea exhibit higher vitamin C levels compared to other herbal teas due to their rich antioxidant content. Antioxidants play a crucial role in safeguarding cells from damage caused by free radicals, unstable molecules that can harm body cells. Therefore, antioxidants are vital for maintaining overall health and bolstering immunity (Khadim and Al-Fartusia, 2021).

Total Phenol Test

Phenolic compounds encompass simple components such as phenolic acids and more intricate polyphenolic components like tannins. Flavonoids, a subgroup commonly found in various plants, typically exist in glycoside form. Analysis of the total phenol content of the *Serangi* herbal drink as presented in Table 3.2 reveals that the highest level is in the F3 formulation, reaching 122.10 mg as galat/100 mL. Comparatively, the total phenol content of *Serangi* herbal drink surpasses the standard polyphenol content of green tea bags specified in the SNI (Indonesian National Standard) when in a dry state of at least 11% (Fadhlorrohan et al., 2023).

Statistical analysis indicates significant differences among the three formulations, with a p-value ≤ 0.05 , suggesting diversity in total phenol content among the formulas or heterogeneity. Furthermore, there are significant differences among replications, with a p-value ≤ 0.05 . In this research, formula F2 (Lemongrass 75: Holy basil 25) exhibited the lowest total phenolic content compared to formula F3 (Lemongrass 25: Holy basil 75), at 122.10 mg as galat/100 mL. The influence of total phenol levels in drinks can be attributed to the active substances present in each ingredient. A higher proportion of holy basil (*kemangi*) simplicia tends to result in higher total phenol levels, while a smaller proportion of holy basil (*kemangi*) simplicia (as in F2) may lead to decreased levels, possibly because the total phenol content in holy basil (*kemangi*) flowers is lower than in lemongrass (Yanti et al., 2022). Test results suggest that increasing the proportion of holy basil (*kemangi*) in the herbal drink correlates with greater antioxidant activity. Research on the relationship between Total Phenol and Antioxidant Activity (Cahyadi & Widiantera, 2018) indicates that higher phenolic compound concentrations correspond to increased antioxidant activity. Phenol content in plants can be influenced by geographical and environmental growth conditions (Singh et al., 2020).

4. Conclusion

The research findings reveal that in the organoleptic assessment of aroma, color, and taste of the *Serangi* drink, panelists show a preference for F3 across multiple categories. F3 shows the highest rating for color, with a score of 4.12. Similarly, in the aroma and taste categories, F3 is favored with scores of 4.02 and 4.05, respectively. Additionally, the pH levels of all *Serangi* drinks are within the required range of 3-8. Formula F3 exhibits the highest vitamin C content of 1.224% and the highest total phenol content of 122.10 mg GAE/100g/ml. *Serangi* drink is enriched with vitamin C and secondary metabolites which can boost the immunity.

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