

PHYSICOCHEMICAL AND SENSORY CHARACTERISTICS OF NONI–LEMONGRASS POWDERED DRINK AT DIFFERENT JUICE RATIOS

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ABSTRACT

Commercial noni powder generally has a bitter taste and an unpleasant aroma; therefore, lemongrass was added to improve its sensory characteristics. The purpose of this research was to obtain the best formulation for the physicochemical and sensory characteristics of noni juice and lemongrass juice powder drinks in accordance with SNI 01-4320-1996. The treatments consisted of MS1 (noni juice 85% and lemongrass juice 15%), MS2 (noni juice 75% and lemongrass juice 25%), MS3 (noni juice 65% and lemongrass juice 35%), and MS4 (noni juice 55% and lemongrass juice 45%). Data were statistically analyzed using analysis of variance (ANOVA), followed by Duncan's Multiple Range Test (DMRT) at the 5% significance level. The result showed the juice ratio had a significant effect on yield, moisture content, ash content, total dissolved solids, dissolution time, antioxidant activity, and organoleptic. The optimum treatment in this research was MS3 (noni juice 65% and lemongrass juice 35%), which meets the quality requirements for powdered drinks as specified in SNI 01-4320-1996. The powdered drinks with the MS3 treatment had a yield of 43,26%, moisture content of 1,91%, ash content of 1,54%, total dissolved solids of 15,20°Brix, dissolution time of 25,92 seconds, and antioxidant activity of 67,48%. The product had slightly cloudy, a slightly noni aroma, a slightly lemongrass aroma, a slightly noni taste, a slightly lemongrass aroma, and a slightly lemongrass taste. The MS3 treatment has met the quality requirements for powdered drinks in accordance with SNI 01-4320-1996.

Keywords: lemongrass, noni, powdered drinks

INTRODUCTION

Indonesia is rich in biological resources and possesses a wide diversity of agricultural commodities with potential for development into functional foods. One promising biopharmaceutical commodity is noni (*Morinda citrifolia*). According to data from the Central Statistics Agency (Badan Pusat Statistik, BPS), national noni production reached 4,169 tons in 2023 (Badan Pusat Statistik, 2024). In Riau Province, production was recorded at 35.6 tons, with Kampar Regency as the main producing area contributing 26.5 tons, followed by Rokan Hulu Regency and Pekanbaru City (Badan Pusat Statistik, 2024). This production potential indicates that noni has considerable prospects for development into various value-added food products.

Noni fruit contains various nutrients and bioactive compounds that are beneficial to human health. In 100 g of fresh fruit, noni contains 89.1 g water, 3 g fiber, 2.90 g protein, 2.20 g carbohydrates, 1.20 g ash, and 0.60 g fat (Jones, 2000). Traditionally, noni has been used to help treat several health conditions, including kidney stones, cough, hypertension, fever, and common cold. Despite these benefits, the utilization of noni in food products remains limited due to its unfavorable sensory characteristics, particularly its bitter taste and strong distinctive aroma.

One strategy to improve consumer acceptance of noni is through product innovation, such as processing it into powdered beverages. Powdered beverages offer several advantages, including convenience, longer shelf life, and easier distribution and storage compared to liquid products. However, currently available noni powder products still present several drawbacks, such as bitterness, less desirable aroma, and relatively long preparation time due to incomplete solubility during reconstitution.

The incorporation of ingredients with more acceptable flavor and aroma may improve the sensory quality of noni-based products. Lemongrass (*Cymbopogon citratus*) is an aromatic plant widely used in food products due to its bioactive compounds, including saponins, flavonoids, polyphenols, alkaloids, and essential oils, which contribute to its characteristic aroma and flavor (Harianingsih et al., 2017). In addition to enhancing flavor, the inclusion of lemongrass may also increase the functional value of the product.

Several studies have reported the application of herbal ingredients in instant beverage formulations. Dusun et al. (2020) reported that an instant beverage formulation consisting of ginger, nutmeg, and lemongrass at a ratio of 300:50:150 produced the best characteristics, with a total phenolic content of 20.05 mg GAE/g and high panelist preference. Similarly, Sitompul et al. (2014) found that a noni juice–pineapple juice ratio of 75:25 resulted in the best instant beverage characteristics, with a yield of 50.47%, moisture content of 3.24%, total soluble solids of 91.99 °Brix, vitamin C content of 146.71 mg, solubility of 85.50%, and favorable sensory acceptance.

However, studies investigating powdered beverage formulations based on a combination of noni juice and lemongrass juice remain limited, particularly those evaluating the effect of different ratios of these ingredients on the physicochemical and sensory properties of the product. The proportion of ingredients is a critical factor influencing the physicochemical stability and overall consumer acceptance of the final product.

Therefore, this study aimed to evaluate the effect of different ratios of noni juice and lemongrass juice on the physicochemical and sensory characteristics of powdered beverages and to determine the best formulation that meets the quality standards for powdered beverages according to SNI 01-4320-1996. The findings of this study are expected to support the development of functional powdered beverages based on local resources and contribute to the diversification of value-added food products.

METHODS

Materials and Equipment

The materials used in this study included noni fruit (*Morinda citrifolia*), lemongrass (*Cymbopogon citratus*), granulated sugar (Gulaku), and water. Reagents used for chemical analysis were distilled water, DPPH (1,1-diphenyl-2-picrylhydrazyl), and methanol. The equipment used for product preparation included a blender, gas stove, wok, steamer, sieve, spoon, wooden stirrer, bowl, cutting board, 80-mesh sieve, and knife. Analytical instruments consisted of an oven, muffle furnace, desiccator, analytical balance, refractometer, dropper pipette, porcelain crucible, spatula, UV–Vis spectrophotometer, thermometer, stopwatch, crucible tongs, cuvette, micropipette, aluminum foil, measuring cylinder, volumetric flask, test tubes, cups, stationery, labeling paper, tissue paper, trays, sensory evaluation booths, and a digital camera.

Experimental Design

The experiment was conducted using a completely randomized design (CRD) with four treatments and four replications, resulting in a total of 16 experimental units. The treatments consisted of different ratios of noni juice and lemongrass juice based on the formulation reported by Sitompul et al. (2014), namely:

MS1: 85% noni juice and 15% lemongrass juice

MS2: 75% noni juice and 25% lemongrass juice

MS3: 65% noni juice and 35% lemongrass juice

MS4: 55% noni juice and 45% lemongrass juice

Research Implementation

Preparation of noni juice

The preparation of noni juice followed the method described by Nurhidayah et al. (2021). Ripe noni fruits were sorted and washed thoroughly under running water. The fruits were then peeled and the pulp was weighed according to the treatment formulation. The pulp was blended with water at a ratio of 1:1 (w/v) to obtain noni juice. The blended mixture was filtered to separate the juice from the pulp. The obtained juice was transferred into a container and allowed to stand for 30 min to allow starch sedimentation, after which the supernatant juice was separated from the sediment.

Preparation of lemongrass juice

The preparation of lemongrass juice was carried out according to Utomo & Ariska (2020). Lemongrass stalks were sorted and washed to remove adhering impurities. The stalks were weighed according to the treatment requirements, cut into approximately 22 cm lengths, and further chopped into pieces of approximately 1 × 1 cm to facilitate blending. The chopped lemongrass was blended with water at a ratio of 1:1 (w/v) for approximately 3 min at high speed. The blended mixture was heated at 70 °C for 3 min and then filtered to obtain lemongrass juice. The juice was subsequently placed in a container and allowed to stand for 30 min to separate the starch from the liquid fraction.

Preparation of powdered beverage

The powdered beverage was prepared according to the method described by Irawan et al. (2017) with a modification in which red ginger was replaced with lemongrass juice. Noni juice and lemongrass juice were mixed in a container according to the treatment ratios, and granulated sugar (80 g per 100 g of raw material) was added. The mixture was heated on a stove at approximately 77 °C while being continuously stirred for 4 min. Once the solution reached boiling, the heat was reduced and stirring was continued until the mixture thickened due to moisture reduction. The heat source was then turned off, and the mixture was continuously stirred for approximately 15 min until granules formed and gradually dried. The resulting granules were sieved using an 80-mesh sieve to obtain a uniform powdered product.

Observation parameters and data analysis

The parameters evaluated in this study included powdered beverage yield, moisture content, ash content, total soluble solids, dissolution time, antioxidant activity, and sensory evaluation using intensity rating and hedonic tests.

Powdered beverage yield was calculated as the ratio of the final product weight to the initial raw material weight and expressed as a percentage. Moisture content was determined using the oven-drying method at 105 °C until a constant weight was obtained, while ash content was measured by incineration in a muffle furnace at approximately 550 °C, following the standard procedures of the Association of Official Analytical Chemists (Association of Official Analytical Chemist (AOAC), 2005). Total soluble solids were determined using a refractometer and expressed in °Brix (Muchtadi & Sugiyono, 1989). Dissolution time was determined by measuring the time required for the powdered beverage to dissolve completely in a specified volume of water at room temperature (Yati et al., 2022). Antioxidant activity was determined using the DPPH (2,2-diphenyl-1-picrylhydrazyl) radical scavenging method (Gumansalangi et al., 2019).

Sensory evaluation was conducted using intensity rating and hedonic tests according to Meilgaard et al. (2016). The intensity rating test was used to evaluate the intensity of specific sensory attributes, while the hedonic test was conducted to assess overall consumer preference.

A total of 30 untrained panelists participated in the intensity rating test, whereas 80 untrained panelists were involved in the hedonic test. In the intensity rating test, panelists evaluated the intensity of several attributes, including color, noni aroma, lemongrass aroma, noni taste, and lemongrass taste, using a five-point numerical scale, where higher scores indicated stronger perceived intensity.

The hedonic test evaluated panelists' preference for color, aroma, taste, and overall acceptability of the powdered beverage using a five-point hedonic scale, where 1 = dislike extremely and 5 = like extremely.

Samples were prepared by dissolving a measured amount of powdered beverage in hot water at a specified volume and served to panelists in plastic cups labeled with random three-digit codes to minimize evaluation bias. Samples were presented in randomized order, and panelists were provided with mineral water to cleanse their palate before evaluating the next sample.

All data obtained were analyzed statistically using analysis of variance (ANOVA). When the calculated F value was greater than or equal to the critical F value at the 95% confidence level, the analysis was followed by Duncan's Multiple Range Test (DMRT) at a 5% significance level to determine significant differences among treatments.

RESULTS AND DISCUSSION

The results of the analysis of variance for powdered beverage yield, moisture content, ash content, total soluble solids, dissolution time, and antioxidant activity of the powdered beverage formulated from noni juice and lemongrass juice are presented in Table 1.

Table 1. Chemical analysis of powdered drinks

Chemical Analysis	Treatment			
	MS1	MS2	MS3	MS4
Powdered beverage yield (%)	42.32 ^a	42.93 ^b	43.26 ^c	43.50 ^c
Moisture content (%)	1.39 ^a	1.74 ^b	1.91 ^b	2.24 ^c
Ash content (%)	1.00 ^a	1.42 ^b	1.54 ^b	1.89 ^c
Total soluble solids (°brix)	16.57 ^c	16.10 ^c	15.20 ^b	14.37 ^a
Dissolution time (second)	23.79 ^a	24.96 ^b	25.93 ^c	26.43 ^c
Antioxidant activity (%)	74.08 ^a	67.53 ^b	67.48 ^b	66.23 ^b

Note: Numbers followed by different lowercase letters indicate significant differences according to the DMRT test at the 5% level.

Powdered Beverage Yield

Yield represents the percentage of the final product weight relative to the total weight of the initial raw materials used. The yield of the powdered beverage ranged from 42.32% to 43.50%. The yield value increased with increasing proportions of lemongrass juice and decreasing proportions of noni juice in the formulation. This phenomenon is associated with the moisture content of the raw materials, as ingredients with higher moisture content tend to produce lower yields after thermal processing.

Noni fruit contains approximately 92.68% moisture, while lemongrass contains 89.93% moisture. According to Dahlan et al. (2024), raw materials with high moisture content tend to lose a substantial amount of water during the heating process due to evaporation, resulting in weight loss and consequently lower product yield. Increased water evaporation reduces the total solids in the food matrix, which ultimately decreases the resulting yield (Sulisyawati, 2019).

The decrease in powdered beverage yield observed in this study is consistent with the findings of Furayda & Khairi (2023) in the production of instant powdered beverages from pineapple core and maltodextrin. In their study, maltodextrin had significantly lower moisture content compared to pineapple

core, with moisture contents of approximately 6% and 80%, respectively. The formulation containing 97 g pineapple core and 3 g maltodextrin produced a yield of 0.137%, whereas the formulation containing 97 g pineapple core without maltodextrin produced a yield of 0.100%. These results indicate that moisture content is a key factor influencing product yield, as it determines the amount of solid material remaining after the drying process.

Moisture Content

Moisture content represents the amount of water contained in a product. The moisture content of the powdered beverage ranged from 1.39% to 2.24%. The moisture content increased as the proportion of lemongrass juice increased and the proportion of noni juice decreased in the formulation. This condition is influenced by both the moisture content and fiber content of the raw materials used.

Noni fruit contains approximately 92.68% moisture, whereas lemongrass contains 89.93% moisture. Therefore, the use of lower concentrations of noni juice tended to reduce the overall moisture content of the powdered beverage. The reduction in moisture content is related to the interaction between free water and bound water present in the raw materials. During the heating process, a significant portion of the water present in noni juice evaporates (Nurhidayah et al., 2021). The free water present in the juice evaporates during the drying process; consequently, the greater the amount of free water lost, the lower the resulting moisture content (Pangeran & Aimanah, 2016).

In addition, the fiber content of noni fruit is lower than that of lemongrass. Noni contains approximately 3 g of dietary fiber (Jones, 2000), while lemongrass contains 65.68 g of fiber (Villalobos et al., 2024). Dietary fiber has the ability to bind water through hydroxyl groups, thereby increasing the amount of water retained within the structural matrix of the material. As a result, water strongly bound within dietary fiber becomes more difficult to remove during the drying process (Fadilah et al., 2020).

The moisture content of the powdered beverage obtained in this study meets the requirements specified in the Indonesian National Standard for powdered beverages (SNI 01-4320-1996).

Ash Content

Ash content represents the inorganic residue or mineral content remaining after the combustion of organic matter. The ash content of the powdered beverage ranged from 1.00% to 1.89%. The ash content increased with increasing proportions of lemongrass juice in the formulation.

The ash content of powdered beverages is closely related to the mineral composition of the raw materials used. Lemongrass contains a higher ash content (0.43%) compared to noni (0.23%), indicating that increasing the proportion of lemongrass juice contributes to a higher mineral content in the final product.

The increase in ash content observed in this study is consistent with the findings of Arisanti & Mutsyahidan (2018) in the production of herbal tea from lemongrass and cinnamon, where higher proportions of lemongrass resulted in higher ash content in the beverage product. Similarly, Saputri et al. (2025) reported that the ash content of lemongrass (7%) was higher than that of cinnamon (2.5%). These findings indicate that increasing the proportion of lemongrass juice while decreasing the proportion of noni juice results in higher ash content in the powdered beverage.

Total Soluble Solids

Total soluble solids (TSS) are an important parameter indicating the amount of dissolved components in beverage products and are commonly used to evaluate product concentration and quality. The TSS of the powdered beverage ranged from 14.37 to 16.57 °Brix. Higher proportions of noni juice combined with lower proportions of lemongrass juice resulted in higher TSS values in the powdered beverage. This

phenomenon is associated with the presence of simple sugars, organic acids, and water-soluble polysaccharides.

Noni fruit contains various water-soluble polysaccharides that contribute to the soluble solid content. According to Zhang et al. (2025), noni contains water-soluble polysaccharides composed of galacturonate (29.1%), galactose (30.9%), and arabinose (30.1%). These soluble carbohydrate components increase the concentration of dissolved solids in the beverage formulation.

Conversely, the total soluble solids of the powdered beverage decreased as the proportion of noni juice decreased and the amount of lemongrass juice increased. This effect may be attributed to the presence of essential oils and volatile compounds in lemongrass, which are easily evaporated and exhibit limited solubility in water. Essential oils in lemongrass stems contain compounds such as geranial (14.9%), neral (12.9%), and geraniol (6%) (Olayemi, 2017). According to Liah (2022), the essential oil components of lemongrass, particularly geraniol, exhibit hydrophobic properties and relatively low solubility in water, thereby contributing less to the soluble solid fraction of the beverage.

Dissolution Time

Dissolution time is an important quality parameter for powdered beverages because it reflects the ability of the product to disperse and dissolve in water prior to consumption. In this study, the dissolution time ranged from 23.79 to 26.43 seconds. Dissolution time was closely related to both the total soluble solids and moisture content of the product.

Higher total soluble solids indicate a greater amount of components that are readily soluble in water, which can accelerate the dissolution of powdered beverages. This effect is associated with the presence of polar compounds such as sugars and organic acids derived from noni fruit, which readily dissolve in water. According to Motshakeri & Ghazali (2015), noni fruit contains approximately 90% water and 10% dry matter, in which the dry matter consists of soluble solids (8–10 °Brix), including about 5% reducing sugars (glucose and fructose) and 1.3% sucrose.

Powdered beverages with higher moisture content tend to require longer dissolution times. High moisture levels promote stronger adhesion between powder particles, which reduces pore formation and decreases the surface area available for water absorption (Kania et al., 2015). As a result, water penetration into the powder matrix becomes slower, leading to longer dissolution times. This observation is consistent with the findings of Saswati et al. (2024), who reported that increased moisture content in powdered beverages resulted in slower dissolution rates.

Antioxidant Activity

Antioxidant activity represents the ability of antiradical compounds to scavenge free radicals. In this study, the antioxidant activity of the powdered beverage ranged from 66.23% to 74.08%. Higher proportions of noni juice combined with lower amounts of lemongrass juice resulted in stronger antioxidant activity in the powdered beverage.

Noni fruit contains various bioactive compounds with antioxidant potential, including alkaloids, triterpenoids, steroids, saponins, phenolic compounds, hydroquinones, and flavonoids (Kurniati, 2019). Among these compounds, flavonoids are particularly important contributors to antioxidant activity. Kurniawan (2018) reported that noni fruit contains approximately 0.0017 mg/g of flavonoids.

Flavonoids belong to the phenolic compound group and play a significant role as antioxidants by stabilizing free radicals through electron-donating mechanisms, thereby interrupting free radical chain reactions (Anwar & Triyasmono, 2016). Therefore, the higher proportion of noni juice in the beverage formulation contributes to increased antioxidant capacity due to the presence of these bioactive phenolic compounds.

Sensory Evaluation

Sensory analysis in this study consisted of intensity rating tests and hedonic tests. The intensity rating test evaluated several sensory attributes, including color, noni aroma, lemongrass aroma, noni taste, and lemongrass taste. Meanwhile, the hedonic test assessed panelists' preferences toward color, aroma, taste, texture, and overall acceptability. The analysis of variance results for the sensory evaluation of the powdered beverage formulated from noni juice and lemongrass juice using both intensity rating and hedonic tests are presented in Table 2.

Table 2. Recapitulation of observations of noni-lemongrass powdered drinks at various juice ratios

Parameter	SNI 01-4320-1996	Treatment			
		MS1 (85:15)	MS2 (75:25)	MS3 (65:35)	MS4 (55:45)
Physical analysis					
- Powdered beverage yield	-	42.32 ^a	42.93 ^b	43.26 ^c	43.50 ^c
- Dissolution time	-	23.79 ^a	24.96 ^b	25.93 ^c	26.43 ^c
Chemical analysis					
- Moisture content	Max 3%	1.39^a	1.74^b	1.91^b	2.24^c
- Ash content	Max 1.5%	1.00^a	1.42^b	1.54^b	1.89 ^c
- Total soluble solids	-	16.57 ^c	16.10 ^c	15.20 ^b	14.37 ^a
- Antioxidant activity	-	74.08 ^a	67.53 ^b	67.48 ^b	66.23 ^b
Intensity rating test					
- Color	-	2.70 ^a	3.03 ^b	3.10 ^b	3.77 ^c
- Noni aroma	-	2.33 ^a	3.17 ^b	3.40 ^b	3.43 ^b
- Lemongrass aroma	-	3.67 ^b	3.43 ^b	3.37 ^b	2.30 ^a
- Noni flavor	-	2.40 ^a	3.10 ^b	3.40 ^{bc}	3.53 ^c
- Lemongrass flavor	-	3.53 ^c	3.07 ^b	3.03 ^b	2.33 ^a
Hedonic test					
- Color	-	2.54 ^a	3.19 ^b	3.42 ^c	3.70^d
- Aroma	-	2.34 ^a	3.09 ^b	3.32 ^c	3.56^d
- Taste	-	2.56 ^a	3.32 ^b	3.62^c	3.75^c
- Overall acceptance	-	2.56 ^a	3.27 ^b	3.50^c	3.67^c

Note: Values followed by different lowercase letters in the same row indicate significant differences according to Duncan's Multiple Range Test (DMRT) at the 5% significance level. SD = standard deviation; n = 4. Intensity rating scale: Color: 1 = very turbid; 2 = turbid; 3 = slightly turbid; 4 = clear; 5 = very clear. Noni aroma: 1 = very strong noni aroma; 2 = strong noni aroma; 3 = slightly noni aroma; 4 = no noni aroma; 5 = very no noni aroma. Lemongrass aroma: 1 = very strong lemongrass aroma; 2 = strong lemongrass aroma; 3 = slightly lemongrass aroma; 4 = no lemongrass aroma; 5 = very no lemongrass aroma. Noni taste: 1 = very strong noni taste; 2 = strong noni taste; 3 = slightly noni taste; 4 = no noni taste; 5 = very no noni taste. Lemongrass taste: 1 = very strong lemongrass taste; 2 = strong lemongrass taste; 3 = slightly lemongrass taste; 4 = no lemongrass taste; 5 = very no lemongrass taste. Hedonic scale: 1 = strongly disliked; 2 = disliked; 3 = slightly liked; 4 = liked; 5 = strongly liked. Values presented in bold indicate the best-performing treatment that complies with the Indonesian National Standard for powdered beverages (SNI 01-4320-1996).

Color

Color is an important aspect of sensory evaluation and serves as a primary indicator of product appearance quality. The intensity rating for color ranged from 2.70 to 3.77, corresponding to slightly turbid to clear. Higher proportions of noni juice combined with lower proportions of lemongrass juice resulted in a more turbid appearance in the powdered beverage solution.

This turbidity is attributed to the natural characteristics of noni juice. According to Sitompul et al. (2014), noni juice typically exhibits a cloudy appearance due to the presence of dispersed particles such as

pectin, fine fibers, phenolic compounds, and natural pigments including carotenoids, xanthophylls, and anthocyanins. In contrast, the increase in color clarity observed in the beverage formulation is associated with the addition of lemongrass juice, which contains bright yellow pigments that contribute to a lighter and clearer color appearance (Masurkar et al., 2024).

The hedonic evaluation of color ranged from 2.54 to 3.70, corresponding to slightly liked to liked. Higher proportions of lemongrass juice increased panelists' preference for the color of the powdered beverage. This preference is likely associated with the clearer visual appearance of the beverage solution. The contribution of lemongrass to improved color acceptability is consistent with the findings of Putri & Pujilestari (2024), who reported that increasing the proportion of lemongrass in herbal infusion beverages enhanced panelist acceptance due to the formation of a light orange color. The color characteristics of the resulting beverage products are presented in Figure 1.



Figure 1. Powdered drink color

Aroma

Aroma is perceived through the olfactory sense and represents an important sensory attribute influencing consumer acceptance. The intensity rating for noni aroma ranged from 2.33 to 3.43, corresponding to noni-like to slightly noni-like. Higher proportions of noni juice resulted in a stronger noni aroma in the powdered beverage.

The increase in aroma intensity is attributed to the presence of volatile compounds in noni juice that contribute to its characteristic odor. These compounds include caproic acid, caprylic acid, and butyric acid, which are known to play a role in the formation of the typical aroma of noni (Bangun & Sarwono, 2002).

The intensity rating for lemongrass aroma ranged from 2.30 to 3.67, corresponding to lemongrass-like to slightly non-lemongrass-like. The intensity of lemongrass aroma increased with the increasing proportion of lemongrass juice used in the beverage formulation. This effect is associated with the increased concentration of citronellal, a key compound responsible for the characteristic aroma of lemongrass.

According to Mardin et al. (2020), citronellal contains an aldehyde functional group and double bonds that can undergo aromatization reactions during oxidation, thereby producing the distinctive lemongrass aroma. The citronellal content in lemongrass juice has been reported to reach 85.05% (Ibrahim et al., 2021).

The hedonic evaluation of aroma ranged from 2.34 to 3.56, corresponding to disliked to liked. Lower proportions of noni juice resulted in higher panelist acceptance of the beverage aroma. The contribution of lemongrass to improved aroma preference is consistent with the findings of Putri & Pujilestari (2024), who reported that increasing the proportion of lemongrass in herbal infusion beverages enhanced panelist acceptance due to the fresh and pleasant aroma produced by lemongrass.

Taste

Taste is one of the sensory perceptions detected by the gustatory system and represents an important parameter in determining panelist acceptance of a product. The intensity rating for noni taste ranged from 2.40 to 3.53, corresponding to noni-like to slightly noni-like.

The addition of higher proportions of noni juice resulted in a stronger characteristic noni taste. This phenomenon is associated with the presence of caprylic acid, which contributes to the slightly pungent and distinctive flavor of noni (Bangun & Sarwono, 2002).

The intensity rating for lemongrass taste ranged from 2.33 to 3.53, corresponding to lemongrass-like to slightly lemongrass-like. The increase in lemongrass taste intensity was closely related to the concentration of lemongrass juice used in the formulation. Similar findings were reported by Reku et al., (2023), who observed that the intensity of lemongrass flavor in beef jerky increased with increasing lemongrass concentration.

The stronger lemongrass taste is attributed to the increased content of essential oil compounds in lemongrass, particularly citronellal, geraniol, and citronellol, which play an important role in forming the characteristic flavor of lemongrass (Ibrahim et al., 2021).

The hedonic evaluation of taste ranged from 2.56 to 3.75, corresponding to slightly liked to liked. Higher proportions of lemongrass juice resulted in greater panelist preference for the taste of the powdered beverage. This preference is associated with the development of a distinctive citrus-like lemongrass flavor, while higher proportions of noni juice tended to produce a slightly unpleasant aftertaste that was less preferred by panelists.

The positive contribution of lemongrass to taste acceptability is consistent with the findings of Putri & Pujilestari (2024), who reported that increasing the proportion of lemongrass in herbal infusion beverages improved panelist acceptance due to the formation of a characteristic citrus-like flavor.

Overall acceptance

Overall acceptance in sensory evaluation represents the combined perception of several attributes, including color, aroma, and taste, in the powdered beverage formulated from noni juice and lemongrass juice. The overall hedonic score ranged from 2.56 to 3.67, corresponding to slightly liked to liked.

Overall acceptance increased with increasing proportions of lemongrass juice in the beverage formulation. This result may be attributed to the fresh aroma and citrus-like flavor of lemongrass, which can effectively mask the undesirable odor and slightly pungent taste of noni.

According to (Ibrahim et al., 2021), lemongrass contains essential oil compounds such as citronellal, citronellol, and geraniol, which contribute to its distinctive aroma and flavor characteristics. These compounds play an important role in enhancing the sensory quality of beverages, thereby improving overall consumer acceptance of the powdered beverage product.

CONCLUSION

The ratio of noni juice to lemongrass juice significantly affected the yield, moisture content, ash content, total soluble solids, dissolution time, antioxidant activity, and sensory attributes, including color, aroma, and taste of the powdered beverage. Based on the evaluated parameters, treatment MS3 (65% noni juice and 35% lemongrass juice) was identified as the selected formulation. This formulation produced a yield of 43.26%, moisture content of 1.91%, ash content of 1.54%, total soluble solids of 15.20 °Brix, dissolution time of 25.93 s, and antioxidant activity of 67.48%.

Sensory evaluation using the intensity rating test indicated that the selected formulation exhibited a slightly turbid color, slightly noni-like aroma, slightly lemongrass-like aroma, slightly noni-like taste, and slightly lemongrass-like taste. Meanwhile, the hedonic evaluation showed mean scores of 3.42 for color (slightly liked), 3.32 for aroma (slightly liked), 3.62 for taste (liked), and 3.50 for overall acceptance

(slightly liked). The MS3 formulation was selected because it met the quality requirements for powdered beverages according to the Indonesian National Standard (SNI 01-4320-1996) and demonstrated the most favorable overall performance among the evaluated treatments.

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