



Organoleptic Characteristics of *Tongkat langit* Banana Smoothie with Variations in Gum Arabic Concentration

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ABSTRACT

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This study aimed to determine the optimal concentration of gum arabic to produce the best banana *tongkat langit* smoothie, based on its organoleptic properties. The research design employed was a 1-factor Completely Randomized Design with Arabic gum concentration treatment, consisting of four levels: without gum arabic, 0.05%, 0.10%, and 0.15%, repeated three times. The variables analyzed included organoleptic tests, such as color, aroma, taste, texture, aftertaste, and overall impression. Based on the results of the study, it can be concluded that the 0.15% arabic gum concentration yielded the highest scores in color (3.12), aroma (2.82), taste (3.18), texture (3.24), aftertaste (2.94), and overall (12) liking, while based on hedonic quality it produces a yellow color (3.12), soft taste (3.12), and creamy texture (3.18).

INTRODUCTION

Tongkat langit banana (*Musa troglodytarum* L.) is a type of banana only found in eastern Indonesia, namely in the Maluku and Papua islands. This banana has bunches that grow upwards, a green skin color, and when ripe, the skin color is brownish-red with a yellow to orange flesh color (Samson *et al.*, 2013). This banana contains 0.269% tannin, 78.41% water content, 12.28% total sugar, 2.84 mg vitamin C, 2.42% ash content (Tetelepta *et al.*, 2015), and very high levels of provitamin A and total carotenoids (Samson *et al.*, 2013; Letelay *et al.*, 2020; Hiariej *et al.*, 2021).

Tongkat langit banana fruit can be eaten fresh or processed by frying, grilling, boiling (Tetelepta *et al.*, 2015), or made into flour (Tetelepta & Picauly, 2017), puree (Tuhumury *et al.*, 2018), starch (Palijama *et al.*, 2020), instant porridge (Picauly & Tetelepta, 2015), crackers (Tetelepta & Picauly, 2017), flakes (Lawalata *et al.*, 2019), snack bars (Lawalata *et al.*, 2019), fruit juice (Lawalata & Tetelepta, 2019; Augustyn & Tetelepta, 2024), and smoothies (Picauly *et al.*, 2021). A smoothie is a fruit- or vegetable-based drink characterized by its soft texture. One

of the distinguishing features of smoothies and juices is that they are thicker in consistency than juice (Ainiyah *et al.*, 2017). Smoothies are a promising drink because, in the market, consumers are looking for high-quality products with simple compositions that are minimally processed, have high organoleptic and nutritional qualities, and are beneficial for health, especially in increasing endurance (Nunes *et al.*, 2016).

The characteristics of a good smoothie can be observed in its texture, which serves as a benchmark for sensory acceptance when consuming smoothies. Various studies have been conducted to enhance the texture of smoothies, primarily by adding fruit pectin (Chaudhary & Peter, 2015), CMC, dextrin, and gum Arabic (Handayani & Vini, 2016). Picauly *et al.* (2021) have researched the effect of adding CMC concentration to banana smoothies, but the use of gum arabic has not been studied.

Arabic gum in food products serves as an aroma binder in volatile products, as well as a stabilizer and emulsifier. Gum Arabic can increase stability with increasing viscosity. Adding gum Arabic can increase viscosity, making it stable, non-settling, and appealing to consumers (Patel & Goyal, 2016). Based on the research results by Christiana *et al.* (2017), adding gum Arabic with a concentration of 0.15% resulted in good taste, aroma, color brightness, pH, viscosity, and turbidity of fruit juice drinks. This study aims to determine the appropriate concentration of gum arabic to produce the best hedonic and organoleptic quality of the *tongkat langit* banana smoothie.

METHODS

Materials

The materials used in this study were *tongkat langit* bananas sourced from Siwang Village, Sirimau District, Maluku Province, water (Aqua, PT. Tirta Investama), Yakult (PT. Yakult Indonesia Persada), and Arabic gum.

Research Design

The research design used in this study was a 1-factor Completely Randomized Design consisting of four treatment levels: gum arabic concentrations of 0%, 0.05%, 0.10%, and 0.15%, with three replications.

Tongkat Langit Banana Smoothie Production

Ripe *tongkat langit* bananas are peeled and packaged in PE (polyethylene) plastic and then frozen below 0 °C for 12 hours to prevent browning. Furthermore, 600 g of frozen bananas were mixed with 10%, 0%, 0.05%, 0.10%, and 0.15% solutions using a blender for 5 minutes.

Organoleptic Evaluation

The organoleptic test parameters used included color, taste, aroma, texture, aftertaste, and overall impression in determining the level of preference among 20 semi-trained panelists.

Data Analysis

The research data were statistically tested using analysis of variance according to the design used. If there was a significant or highly significant effect on the observed parameters, the Tukey test was performed at the 95% level ($\alpha = 0.05$). The software used was Minitab version 20.

RESULTS AND DISCUSSION

Acceptance of a product can be determined organoleptically, namely by tasting, although the assessment is subjective. The organoleptic smoothie test employed hedonic and sensory quality tests, including color, aroma, texture, taste, aftertaste, and overall consumer evaluation, which were conducted by 20 semi-trained panelists.

Color

Color is crucial in determining the quality or degree of acceptance of a food ingredient. Food color can characterize the quality characteristics of food, indicate the maturity stage and problems that occur during processing and storage, and will also affect consumers' choice (Zhaotian *et al.*, 2021). The treatment of gum arabic concentration did not have a significant effect on the hedonic or hedonic quality of the color of the *tongkat langit* banana smoothie ($P > 0.05$). The results of the panelists' preference (hedonic) assessment of the smoothie color ranged from 2.88 to 3.12, descriptively on the like scale. Meanwhile, based on the hedonic quality assessment, the smoothie color ranged from 2.94 to 3.12, indicating a predominantly yellow hue (Table 1).

The higher concentration of gum arabic added resulted in a yellow smoothie with the panelists' preference level for all treatments, namely, liking. The yellow color in the smoothie comes from the raw material used, namely, the *tongkat langit* banana. *Tongkat langit* banana contains β -carotene, indicated by a yellow color (Hiariej *et al.*, 2021). Adding stabilizers to food products does not affect the resulting product because the color of the gum arabic stabilizer is white; when it is dissolved, it turns yellow (Widiantoko & Yuniarta, 2014). The addition of a stabilizer can protect the product from damage by forming a film layer and binding the components in the product (Marchelina *et al.*, 2020).

Aroma

Aroma is one of the parameters used in testing sensory properties (organoleptic) through the sense of smell. Aroma is acceptable if the resulting material has a specific aroma (Aryani *et al.*, 2022). Furthermore, the aroma is a subjective sensation smelling (smell) produces.

Table 1. The effect of gum arabic concentration on the color of the *tongkat langit* banana smoothie

Arabic Gum Concentration (%)	Hedonic	Hedonic Quality
0	2.88±0.69	3.12±0.69
0.05	3.06±0.60	3.06±0.56
0.10	3.06±0.66	3.08±0.66
0.15	3.12±0.69	3.12±0.69

Note: values followed by a similar letter within the column were not significantly different at α 0.05 level by the Tukey test

The treatment with gum arabic concentration did not have a significant effect on the hedonic aroma of the *tongkat langit* banana smoothie ($P > 0.05$). The results of the panelists' preference (hedonic) assessment of the aroma of the smoothie ranged from 2.76 to 2.82, which descriptively was on a liking scale (Table 2). This shows that the addition of gum arabic does not have a significant effect on the aroma of the smoothie. The aroma of the smoothie is influenced by the aroma of the raw materials and other additives added. Gum arabic is odourless, and its addition to the food product does not affect the product's odour (Featherstone, 2015).

Table 2. The effect of gum arabic concentration on the aroma of the *tongkat langit* banana smoothie

Arabic Gum Concentration (%)	Hedonic
0	2.71±0.85
0.05	2.76±0.56
0.10	2.76±0.56
0.15	2.86±0.73

Note: values followed by a similar letter within the column were not significantly different at α 0.05 level by the Tukey test

Taste

The taste of food is one factor determining consumer acceptance of a product. Generally, there are four basic tastes: sweet, bitter, sour, and salty. Sensitivity to taste is found in the taste buds on the tongue (Azlan *et al.*, 2019). The treatment with gum arabic concentration did not have a significant effect on the hedonic or hedonic quality of the taste of the *tongkat langit* banana smoothie ($P > 0.05$). The panelists' (hedonic) preference for flavor smoothies ranged from 3 to 3.18, descriptively on the like scale. Meanwhile, based on the hedonic quality assessment, the smoothie taste ranged from 2.71 to 3.12 and descriptively showed a soft preference (Table 3).

The higher the concentration of gum arabic, the smoother the taste will be, with the panelists' preference for all treatments, namely, likes. Food flavors come from the raw material itself, and if it has undergone processing, the flavor will be influenced by the ingredients added during that process. Gum arabic functions as a hydrocolloid that can form a thick, homogeneous solution. Therefore, the higher the concentration of gum arabic added to a smoothie, the more viscous it will be, resulting in a softer, less watery texture and a smoother mouthfeel when consumed (Azlan *et al.*, 2019).

Table 3. The effect of gum arabic concentration on the taste of the *tongkat langit* banana smoothie

Arabic Gum Concentration (%)	Hedonic	Hedonic Quality
0	3.00±0.79	2.71±0.77
0.05	3.06±0.75	2.94±0.56
0.10	3.06±0.89	3.06±0.66
0.15	3.18±0.81	3.12±0.86

Note: values followed by a similar letter within the column were not significantly different at α 0.05 level by the Tukey test

Texture

Texture assessment is a complex process that involves multiple sensory modalities, with vision and touch being the most prominent (Ndengue, 2022). The treatment of gum arabic concentration had a significant effect on the hedonic and hedonic quality of the texture of the *tongkat langit* banana smoothie ($P < 0.01$). The results of the panelists' preference (hedonic) assessment of the smoothie texture ranged from 1.94 to 3.24. Meanwhile, based on the hedonic quality assessment, the smoothie texture ranged from 1.76 to 3.18, descriptively showing a slightly creamy to creamy texture (Table 4).

The results of the study showed that smoothies with added gum arabic had a creamier texture than those without it. The higher the concentration of gum arabic added, the creamier the smoothie texture the panelists preferred. According to Azlan *et al.* (2019), gum arabic can increase the viscosity of food. Gum arabic functions as a hydrocolloid that can increase the viscosity of liquid systems. Therefore, adding gum arabic to the *tongkat langit* banana smoothie results in a thicker and more homogeneous mixture, yielding a denser, smoother, and creamier texture than the one without the gum.

Table 4. The effect of gum arabic concentration on the texture of the *tongkat langit* banana smoothie

Arabic Gum Concentration (%)	Hedonic	Hedonic Quality
0	1.94±0.56 ^b	1.76±0.44 ^b
0.05	3.18±0.73 ^a	2.88±0.69 ^a
0.10	2.88±0.69 ^a	2.71±0.68 ^a
0.15	3.24±0.75 ^a	3.18±0.81 ^a

Note: values followed by a similar letter within the column were not significantly different at α 0.05 level by the Tukey test

Aftertaste

The aftertaste is the impression that is felt or that arises after enjoying a food. The aftertaste is important in sensory testing because it affects consumer acceptance of a food product. The treatment of gum arabic concentration did not have a significant effect on the hedonic aftertaste of the *tongkat langit* banana smoothie ($P > 0.05$). The panelists' preference (hedonic) assessment of aftertaste smoothies ranged from 2.53 to 2.94, descriptively on a liking scale (Table 5).

The panelists' assessment of the aftertaste of the smoothie, which had the lowest value, was for the smoothie without adding gum arabic, at 2.53. In contrast, the highest value was found in the smoothie with the addition of 0.15% arabica gum, which was 2.94. *Tongkat langit* bananas naturally have a distinctive aftertaste due to their relatively high content of volatile compounds, organic acids, and phenolic compounds. This aftertaste can sometimes leave a slightly astringent sensation or lingering aftertaste in the mouth after consumption (Tuhumury *et al.*, 2018). The research result of Tetelepta *et al.* (2015) showed that the *tongkat langit* banana contains 0.269% tannin, which causes an astringent taste.

The addition of gum arabic to the *tongkat langit* banana smoothie formulation plays a key role in modifying the aftertaste perception. Gum arabic, as a hydrocolloid with emulsification and viscosity-forming properties, can bind some of the aftertaste-causing compounds and slow their release during consumption (Glicksman, 2019). As a result, the distinctive aftertaste of *tongkat langit* bananas is smoother and less overpowering, providing a more balanced taste sensation.

Table 5. The effect of gum arabic concentration on the aftertaste of the *tongkat langit* banana smoothie

Arabic Gum Concentration (%)	Hedonic
0	2.53±0.72
0.05	2.59±0.62
0.10	2.59±0.62
0.15	2.94±0.83

Note: values followed by a similar letter within the column were not significantly different at α 0.05 level by the Tukey test

Overall

A product's general preference can be seen from the overall assessment or acceptance given by the panelists. The combination of sensory properties, including color, aroma, taste, aftertaste, and overall appearance, is a key factor in consumer acceptance of a product.

Table 6. The effect of gum arabic concentration on the overall of the *tongkat langit* banana smoothie

Arabic Gum Concentration (%)	Hedonic
0	2.88±0.78
0.05	2.88±0.78
0.10	2.71±0.77
0.15	3.12±0.86

Note: values followed by a similar letter within the column were not significantly different at α 0.05 level by the Tukey test

The treatment with gum arabic concentration did not have a significant effect on the overall taste of the *tongkat langit* banana smoothie ($P > 0.05$). The results of the panelists' preference (hedonic) assessment of overall smoothies ranged from 2.71 to 3.12, descriptively on a liking

scale (Table 6). The higher the concentration of gum arabic added, the smoother the smoothie will be, which the panelists like.

CONCLUSION

Smoothies with a concentration of 0.15% arabic gum were the best treatment that produced hedonic characteristics of color (3.12), aroma (2.82), taste (3.18), texture (3.24), aftertaste (2.94) dan overall (3.12) that were preferred by the panelists, while based on hedonic quality it produces a yellow color (2.94-3.12), soft taste (2.71-3.12), creamy texture (2.53-3.18). Further research is needed to assess the physical stability and nutritional value during storage.

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