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# Effect of Java Turmeric Juice Addition on the Chemical and Sensory Characteristics of Pineapple Juice Drink

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**ABSTRACT**

Fruit juice drinks are widely consumed because of their nutritional value and practical use as refreshing beverages. Pineapple (*Ananas comosus* L.) is rich in vitamin C, while Java turmeric (*Curcuma xanthorrhiza* Roxb.) contains bioactive compounds such as curcumin that may support antioxidant activity. This study aimed to determine the effect of adding Java turmeric juice on the chemical and sensory characteristics of pineapple juice drink. The study was conducted at the Laboratory of STIP Mujahidin Tolitoli from September to November 2025 using a completely randomized design with six treatments and three replications, resulting in 18 experimental units. The treatments consisted of pineapple juice and Java turmeric juice ratios: P1 (100%:0%), P2 (98%:2%), P3 (96%:4%), P4 (94%:6%), P5 (92%:8%), and P6 (90%:10%). The observed parameters were pH, total soluble solids (Brix), vitamin C, and organoleptic characteristics, including color, aroma, and taste. Data were analyzed using analysis of variance followed by a 5% honestly significant difference test. The results showed that the addition of Java turmeric juice did not significantly affect pH, total soluble solids, or vitamin C, but significantly affect sensory characteristics. P1 produced the highest values for pH, total soluble solids, vitamin C, aroma, and taste, whereas P6 produced the strongest color score. Therefore, the additon of Java turmeric should be limited to maintain consumer acceptance of pineapple juice drinks.

## INTRODUCTION

Pineapple (*Ananas comosus* L.) is one of the fruit crops widely cultivated in Indonesia. Pineapple fruit has many uses and is consumed not only as fresh fruit but also as a raw material for processed products such as jam, syrup, preserved fruit, and fruit juice drinks. Pineapple processing is found in many regions of Indonesia and continues to be developed as part of fruit-based agroindustry [1]. The availability of pineapple throughout the year, its relatively affordable price, and its pleasant sweet-sour taste make this fruit suitable for the development of functional and refreshing beverages.

Pineapple also has important nutritional value. It contains carbohydrates, protein, vitamin A, vitamin C, potassium, organic acids, aroma compounds, and the proteolytic enzyme bromelain [2-5]. Vitamin C is one of the major quality attributes of pineapple-based drinks because it contributes to nutritional value and antioxidant activity. However, processing and formulation can influence chemical characteristics such as pH, total soluble solids, and vitamin C. Therefore, the development of pineapple juice drinks requires attention to both nutritional quality and consumer acceptance.

Java turmeric (*Curcuma xanthorrhiza* Roxb.) is a medicinal rhizome from the Zingiberaceae family. It contains bioactive compounds such as curcumin and xanthorrhizol and has been reported to have antioxidant, anti-inflammatory, antimicrobial, and other health-related properties [6,7]. The use of Java turmeric in food products can also contribute to food diversification and extend the usefulness of this rhizome, which is commonly processed into simplicia, flour, starch, instant drinks, candies, noodles, crackers, cakes, and other products [8]. Nevertheless, Java turmeric has a distinctive yellow color, sharp aroma, and bitter taste, which may affect consumer acceptance when incorporated into fruit drinks.

Previous studies have reported that adding Java turmeric juice and sugarcane juice can influence the quality of fresh Java turmeric drinks [9]. Other research has also shown that the addition of pineapple juice may significantly affect the chemical and sensory

characteristics of cascara tea drinks [10]. However, studies evaluating the combination of pineapple juice and Java turmeric juice, particularly its effects on chemical quality and sensory acceptance, remain limited. In addition, the proportion of Java turmeric that can maintain acceptable aroma and taste in pineapple juice drinks has not been studied comprehensively. Therefore, this study aimed to analyze the effect of Java turmeric juice addition on the chemical characteristics, including pH, vitamin C, and total soluble solids, as well as the sensory characteristics, including color, aroma, and taste, of pineapple juice drinks.

## MATERIALS AND METHODS

### *Research Site and Time*

This research was conducted at the Laboratory of Sekolah Tinggi Ilmu Pertanian Mujahidin Tolitoli, Tuweley Village, Baolan District, Tolitoli Regency, Indonesia. The study was carried out from September to November 2025.

### *Materials and Equipment*

The materials used in this study were Bogor pineapple fruit, Java turmeric rhizome, water, distilled water, iodine solution, potassium iodide, and starch indicator. The equipment included knives, cutting boards, tongs, rubber gloves, stainless containers, pans, filter cloth, a blender, sieves, spoons, wooden spatulas, a 600 mL measuring cup, a digital balance, 100 mL bottle packaging, 100 mL volumetric flasks, droppers, 250 mL Erlenmeyer flasks, glass stirring rods, stands and clamps, burettes, and a gas stove.

### *Experimental Design*

The study used an experimental method arranged in a completely randomized design (CRD) with six treatment levels and three replications, resulting in 18 experimental units. The treatments were based on the ratio of pineapple juice to Java turmeric juice: P1 = 100% pineapple juice without Java turmeric juice, P2 = 98% pineapple juice + 2% Java turmeric juice, P3 = 96% pineapple juice + 4% Java turmeric juice, P4 = 94% pineapple juice + 6% Java turmeric juice, P5 = 92% pineapple juice + 8% Java turmeric juice, and P6 = 90% pineapple juice + 10% Java turmeric juice. The mathematical model for the CRD was $Yij = \mu + Ai + \varepsilon ij$, where Yij is the observation value, $\mu$ is the overall mean, Ai is the treatment effect, and $\varepsilon ij$ is the experimental error.

**Table 1.** Treatment composition of pineapple juice and Java turmeric juice

| Treatment | Pineapple juice (%) | Java turmeric juice (%) |
|---|---|---|
| P1 | 100 | 0 |
| P2 | 98 | 2 |
| P3 | 96 | 4 |
| P4 | 94 | 6 |
| P5 | 92 | 8 |
| P6 | 90 | 10 |

### *Preparation of Pineapple Juice*

Mature Bogor pineapple fruit with a yellow-orange color was selected as the raw material. The fruit was washed thoroughly to remove dirt and foreign materials, peeled, and cut into small pieces to facilitate blending. The pineapple pieces were blended into pulp, pressed using filter cloth, and then filtered to obtain clear pineapple juice.

### *Preparation of Java Turmeric Juice*

Java turmeric rhizomes were washed with clean water to remove adhering soil and impurities and then peeled. The rhizomes were cut into small pieces to facilitate blending. A ratio of 300 g Java turmeric to 300 mL water was used. The blended material was pressed using filter cloth, and the extract was filtered to obtain Java turmeric juice.

### *Drink Formulation and Processing*

Pineapple juice and Java turmeric juice were mixed according to the treatment ratios. Each mixture was placed in a pan and heated until boiling. The resulting pineapple-Java turmeric juice drink could be consumed warm or chilled after processing.

### *Observed Parameters and Data Analysis*

The observed chemical parameters were pH, total soluble solids, and vitamin C. pH was measured using a calibrated pH meter. Total soluble solids were measured using a refractometer and expressed as Brix. Vitamin C content was determined by iodine titration using starch indicator. Approximately 25 mL of sample was diluted to 100 mL in a volumetric flask. A 10 mL aliquot was placed in an Erlenmeyer flask, mixed with 2 mL starch indicator, and titrated with iodine solution until a violet-blue endpoint was reached. Organoleptic testing was carried out using 30 panelists who evaluated color, aroma, and taste. Color scores ranged from clear yellow to dark orange, aroma scores ranged from pineapple aroma to strong Java turmeric aroma, and taste scores ranged from sweet to very bitter. Data were analyzed using ANOVA. When significant or highly significant effects were detected, the analysis was continued using the honestly significant difference (HSD) test at the 5% level.

## RESULTS

### *pH*

The analysis of variance showed that adding Java turmeric juice had no significant effect on the pH of pineapple juice drink. The mean pH values ranged from 4.48 to 4.61. The highest pH was observed in P1 (100% pineapple juice), with a value of 4.61, while the lowest pH was observed in P5, with a value of 4.48. Although the differences were not statistically significant, the pH tended to decrease as the proportion of Java turmeric juice increased. This trend may be related to the contribution of organic compounds in Java turmeric and the natural organic acids contained in pineapple juice, such as citric, malic, and oxalic acids [11].

### *Total Soluble Solids*

The addition of Java turmeric juice did not significantly affect total soluble solids. The mean values ranged from 14.87 to 19.53 Brix. The highest total soluble solids value was recorded in P1 (19.53 Brix), whereas the lowest value was found in P6 (14.87 Brix). The results indicated that increasing the proportion of Java turmeric juice tended to reduce total soluble solids in the drink. This decrease was particularly evident in the formulation containing 90% pineapple juice and 10% Java turmeric juice. Pineapple juice generally contains higher sugar levels than Java turmeric juice, which may explain the declining Brix values as the amount of Java turmeric juice increased [12,13].

### *Vitamin C*

The vitamin C content of the pineapple juice drink was not significantly affected by the addition of Java turmeric juice. The mean vitamin C values ranged from 28.93 to 43.68 mg/100 g. The highest value was obtained in P1, while the lowest value was obtained in P6. This pattern suggests that replacing part of the pineapple juice with Java turmeric juice reduced the vitamin C contribution from pineapple. The result differs from studies using other rhizome or plant juice additions, where formulation significantly affected vitamin C content, indicating that the effect depends strongly on the type and composition of the added material. According to [14], statistical tests showed that the formulation of pineapple juice and turmeric juice significantly affected the vitamin C content of the turmeric juice drink. However, this study, which used Javanese turmeric juice, showed no significant effect. This indicates that the addition of certain fruit juices has an effect on pineapple juice.

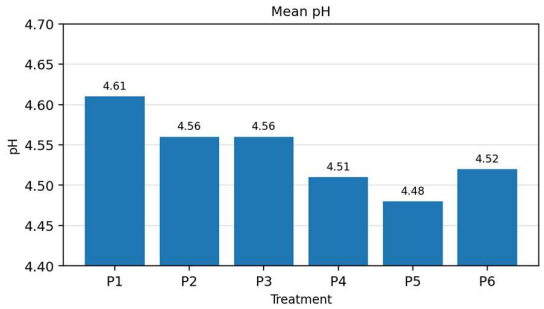



**Figure 1.** Mean pH of pineapple juice drink with Java turmeric juice addition.

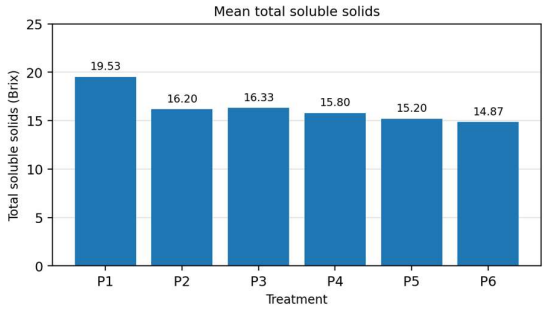



**Figure 2.** Mean total soluble solids of pineapple juice drink with Java turmeric juice addition.

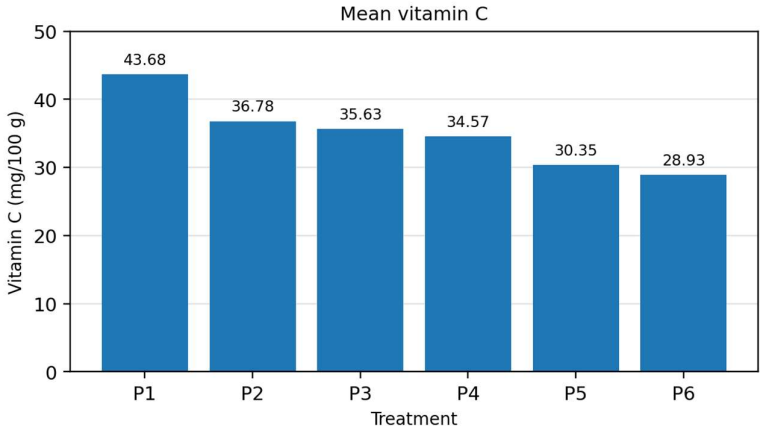



**Figure 3.** Mean vitamin C content of pineapple juice drink with Java turmeric juice addition.

**Table 2.** Mean chemical and sensory characteristics of pineapple juice drink with Java turmeric juice

| Treatment | pH | Brix | Vitamin C (mg/100 g) | Color | Aroma | Taste |
|---|---|---|---|---|---|---|
| P1 | 4.61 | 19.53 | 43.68 | 1.96a | 3.80c | 3.77b |
| P2 | 4.56 | 16.20 | 36.78 | 3.20b | 2.43a | 3.40b |
| P3 | 4.56 | 16.33 | 35.63 | 3.57b | 2.90b | 3.20ab |
| P4 | 4.51 | 15.80 | 34.57 | 3.93b | 2.43a | 2.77a |
| P5 | 4.48 | 15.20 | 30.35 | 4.03b | 2.23a | 3.10ab |
| P6 | 4.52 | 14.87 | 28.93 | 4.37b | 1.97a | 2.57a |

Note: Different letters in the same sensory column indicate significant differences based on the 5% honestly significant difference test. Chemical parameters were not significantly affected by treatment.

### *Organoleptic Color*

The analysis of variance showed that the additon of Java turmeric juice had a highly significant effect on the color of the pineapple juice drink. The mean color score ranged from 1.96 to 4.37. The lowest score was recorded in P1, which contained only pineapple juice, while the highest score was recorded in P6, which contained 10% Java turmeric juice. This result indicates that increasing Java turmeric concentration produced a more intense yellow-orange color. The color change is likely associated with curcuminoid pigments naturally present in Java turmeric [15].

### *Organoleptic Aroma*

Java turmeric juice addition had a highly significant effect on aroma. The mean aroma score ranged from 1.97 to 3.80. P1 produced the highest aroma score, whereas P6 produced the lowest score. These results show that panelists preferred the aroma of the drink without Java turmeric addition. The distinctive aroma of Java turmeric is relatively sharp and can dominate the fresh aroma of pineapple when its proportion is increased [16].

### *Organoleptic Taste*

Taste was also highly significantly affected by the addition of Java turmeric juice. The mean taste score ranged from 2.57 to 3.77. The highest score was observed in P1, while the lowest score was observed in P6. This indicates that increasing Java turmeric juice reduced taste acceptance, mainly because Java turmeric has a characteristic bitter flavor that may not be acceptable to some consumers [17].

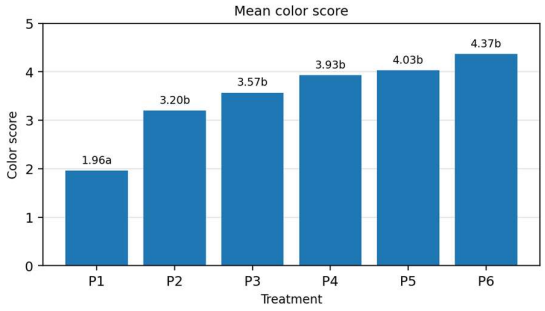



**Figure 4.** Mean organoleptic color score. Different letters indicate significant differences at the 5% HSD level.

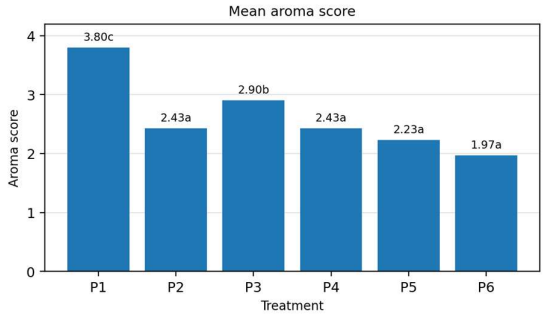



**Figure 5.** Mean organoleptic aroma score. Different letters indicate significant differences at the 5% HSD level.

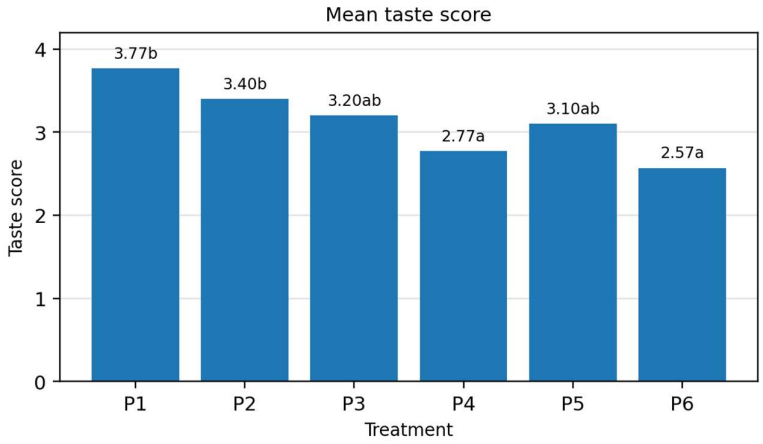



**Figure 6.** Mean organoleptic taste score. Different letters indicate significant differences at the 5% HSD level.

## DISCUSSION

The chemical results showed that the addition of Java turmeric juice did not significantly affect pH, total soluble solids, or vitamin C content. However, all chemical parameters showed a consistent tendency to decline as the proportion of Java turmeric juice increased. This pattern suggests that replacing part of the pineapple juice with Java turmeric juice diluted or reduced the contribution of pineapple-derived sugars and vitamin C. Pineapple is known as a fruit with substantial sugar and vitamin C contents, whereas Java turmeric is mainly valued for its bioactive compounds and color pigments rather than for sweetness or vitamin C content.

The decline in total soluble solids is important from a product development perspective because Brix is closely related to sweetness and consumer perception of fruit juice quality. A lower Brix value may reduce the sweetness and fullness of the drink. In this study, the highest Brix value was obtained in the control formulation (P1), which may explain why P1 also received the highest taste score. Although Java turmeric may improve functional value through curcumin and related compounds, high proportions can reduce the sensory balance of the beverage.

The most prominent treatment effect was observed in sensory characteristics. Color increased significantly with higher Java turmeric concentration, and P6 produced the strongest color score. This is expected because Java turmeric contains yellow-orange curcuminoid pigments that intensify beverage color. A stronger color may be desirable for product appearance, particularly when a herbal drink identity is intended. However, color improvement was not accompanied by improvement in aroma and taste.

Aroma and taste acceptance decreased with higher Java turmeric addition. Java turmeric has a sharp aroma and bitter taste, and these attributes can dominate the natural pineapple flavor. The results support previous findings that low Java turmeric addition can help maintain acceptable sensory quality, whereas excessive addition may reduce consumer acceptance [10]. The findings also indicate that the formulation of pineapple-Java turmeric beverages should consider a balance between functional ingredients and sensory quality. In practical terms, Java turmeric addition should be limited or combined with other formulation strategies such as sweetener adjustment, aroma balancing, or flavor masking to improve consumer acceptance.

Overall, the study demonstrates that Java turmeric juice can be used to modify the color of pineapple juice drinks, but its use at high levels may reduce aroma and taste acceptance. Further research should evaluate antioxidant activity, curcumin content, shelf life, pasteurization conditions, and consumer acceptance using a hedonic scale to identify a formulation that provides both functional benefits and acceptable sensory quality.

## CONCLUSION

The addition of Java turmeric juice to pineapple juice drink did not significantly affect chemical characteristics, including pH, total soluble solids, and vitamin C content. However, it had a highly significant effect on sensory characteristics, including color, aroma, and taste. The best overall treatment for chemical quality, aroma, and taste was P1, consisting of 100% pineapple juice without Java turmeric addition, with pH of 4.61, total soluble solids of 19.53 Brix, vitamin C of 43.68 mg/100 g, aroma score of 3.80, and taste score of 3.77. The highest color score was obtained in P6, containing 10% Java turmeric juice. Practically, the results indicate that Java turmeric addition should be limited to maintain consumer acceptance while still contributing to beverage color and potential functional properties.

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