



## Quality Test of Drinks from Carica Papaya Tip with Addition of Artocarpus Heterophyllus L.

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### Abstract

Drinks from papaya seeds and jackfruit have the potential to become functional drinks with health benefits. This study aims to test the quality of drinks from papaya seeds with the addition of jackfruit in various comparisons. The research method used was pre-test and post-test experimental design by analyzing data descriptively using table results. The quality parameters tested include antimicrobial tests on *Escherchia colli* bacteria, *Staphylococcus aureus* bacteria, *Candida albicans* fungus using the disc diffusion method (well diffusion), vitamin C content test using the volumetric method, color, aroma, taste, and consumer liking with organoleptic testing. The results showed that the addition of jackfruit significantly had antibacterial effectiveness and had vitamin C levels in composition 1 (5 gr papaya seeds) with a result of 0.2804%, and in composition 2 (4 gr papaya seeds: 1 gr jackfruit) with a result of 0.1400%. The color of the drink becomes brighter with the addition of jackfruit. The aroma and taste of the drink also became better with the addition of jackfruit. Based on the results of the consumer favorability test, drinks with a ratio of papaya seeds and jackfruit in composition 2 are most favored by panelists. Drinks from papaya seeds with the addition of jackfruit have good quality and are favored by consumers. This drink has the potential to become a functional drink with health benefits.

## Introduction

Indonesia is one of the countries rich in plants because it has fertile soil and a tropical climate so that plants are very easy to grow lushly. In Indonesia's tropical forests, there are 30,000 species of plants. Of these, there are 9,600 plant species that are useful as medicines, but 200 species have been utilized as raw materials in the herbal industry for health, one of which is herbal drinks (Wibowo & Mulyana, 2021).

Currently, herbal drinks are rampant drinks offered as supplement products that can improve body health. One of them is herbal drinks, which are drinks containing compounds that can have a positive effect on body health. One example of an herbal drink that can be found is papaya fruit seed drink. Plants contain compositions that provide benefits, be it in the organs of the leaves, fruit, sap, or seeds (Hasanah et al., 2020).

According to research (Wachyuni & Setiawan, 2017) papaya seeds contain compounds that have antibacterial activity that inhibits the growth of *gram-positive* and *gram-negative* bacteria. Papaya seeds also have antibacterial effects that can be useful, traditionally papaya seeds can be used as worm medicine, indigestion, diarrhea, raw materials for colds and as a source for obtaining oil with fatty acid content.

Papaya seeds contain steroid compounds. The seed content in papaya fruit is approximately 14.3% of the whole papaya fruit. The content is in the form of high unsaturated fatty acids,

namely oleic and palmitic acids. In addition to containing fatty acids, papaya seeds are known to contain other chemical compounds such as phenolics, alkaloids, terpenoids and saponins. And according to (Damayanti et al., 2021) Papaya seeds also contain flavonoid compounds. This compound has antibacterial power by denaturing bacterial cell proteins and damaging their cell membranes. Behind the many benefits of the content in papaya seeds, papaya production increases from year to year. Based on data from the Central Bureau of Statistics, in 2010 papaya production in Indonesia was recorded at 675,801 tons and increased in 2011 to 955,078 tons. This figure is likely to continue to grow from year to year because papaya cultivation is easy and very suitable for the climate in Indonesia. The increase in production is in line with the amount of papaya seeds produced (Lestari et al., 2018). Until now, the utilization of papaya seeds is only as ethanol extract, coffee, brewed tea, and without the addition of natural flavors as an attraction for consumption. Therefore, the author is interested in testing the quality of drinks from papaya seeds (*Carica papaya*) with the addition of jackfruit (*Artocarpus heterophyllus L.*).

Jackfruit is a type of tropical plant that grows in Indonesia. Jackfruit in particular provides a lot of nutrition for people in Indonesia as a source of vitamins. Both soft and ripe fruits are rich in vitamins. In ripe fruit, it has a unique aroma, the flesh of the front part of the fruit is harder than the back (inside). The aroma of both is very penetrating. The hard jackfruit is larger than the soft jackfruit although the inner flesh is sweeter and more flavorful. (Alfitasari, 2015). Although, the use of synthetic flavors can give flavor to food, strengthen the taste and aroma of food, affect the attractiveness for consumption, and can save costs. However, the use of synthetic flavors that are not in accordance with the specified dose can have a negative impact on health (Dewi, 2022). (Dewi, 2022). It would be better if it is replaced with natural flavors obtained from nature such as plants, namely jackfruit. And from that the addition of jackfruit in papaya seed powder drinks as a natural flavor and aroma giver in papaya seed drinks as an attraction for consumption and making papaya seed powder drinks with the addition of jackfruit as an herbal drink that has the ability to inhibit or kill microorganisms such as bacteria in the body.

In an effort to ensure that drinks from *papaya* seeds (*Carica papaya*) with the addition of jackfruit (*Artocarpus heterophyllus L.*) have the ability to inhibit or kill microorganisms such as bacteria, the authors conducted an antimicrobial test using 3 bacteria, namely: *Escherichia coli* bacteria that exceed the limit of flora in the human body will cause diarrhea, and *Escherichia coli* is a gram-negative bacterium that is pathogenic, *Staphylococcus aureus* bacteria is one type of harmful *gram-positive* bacteria. These bacteria cause infections characterized by tissue damage accompanied by purulent abscesses, some infectious diseases caused by *Staphylococcus aureus* are boils, acne, impetigo, and wound infections. *Staphylococcus aureus* is also caused by food poisoning (Kulla & Herrani, 2022). And finally using *Candida albicans* bacteria is the cause of infectious diseases. *Candida albicans* causes a condition called candidiasis, which is a disease of the mucous membranes of the mouth such as thrush (Andayani & Kurniawan, 2014). This test uses the diffusion method, namely the disc diffusion method (*well diffusion*) by looking at the results of research from papaya seed powder drinks with the addition of jackfruit with the specified composition, which is tested by the disc diffusion method and the diameter of the inhibition zone is seen (Sari & Febriawan, 2021).

## Methods

The research was conducted at the Microbiology Laboratory of Islamic University, Organic Chemistry Laboratory of Industrial Chemistry Polytechnic of North Sumatra. This research was carried out in May 27 - June 27, 2024. The tools used in the manufacture of papaya seed

powder and jackfruit powder are blenders, scales, knives, basins, pans, sieves, spoons, spatulas, pans, tampahs and ovens, autoclaves, laminar air flow (LAF), incubators, petri dishes, test tubes, dropper pipettes, ose needles, paper discs, tweezers, vectors, and permanent markers. The materials used in this study are papaya seeds, jackfruit, distilled water, Mueller-Hinton agar media (MHA), bacterial cultures of *Escherichia coli*, *Staphylococcus aureus*, *Candida albicans*, and papaya seed powder drinks with the addition of jackfruit. The papaya seeds and jackfruit were washed and sorted. Then dried papaya seeds using sunlight for 3 days until completely dry. While jackfruit is dried using an oven (in an oven at 60°C for 4 hours), then grinding using a blender and finally sieving.

### **Antimicrobial Test**

This test uses the diffusion method, namely the disc diffusion method (*well diffusion*), and uses a positive control (+), namely Entrostop herbal drinks. By looking at the results of research from papaya seed powder drinks with the addition of jackfruit with composition 1 (5 grams of papaya seeds) and composition 2 (4 grams of papaya seeds: 1 gram of jackfruit). Which is tested by the disc diffusion method and the diameter of the inhibition zone is seen in the bacteria *Escherichia coli*, *Staphylococcus aureus*, *Candida albicans*. The calculation of the inhibition zone value is calculated from, the diameter of the clear zone (mm) - the diameter of the disc (mm), and is repeated 4 times. Antimicrobial testing is carried out in stages starting from, the first stage of making a bacterial suspension, suspending the bacterial culture in physiological NaCl solution until it reaches a turbidity equivalent to the McFarland standard 0.5, the second stage of making agar media, pour the sterilized liquid MHA agar into a sterile petri dish until it reaches a thickness of about 4 mm, the stage of bacterial inoculation, use sterile tweezers to take the bacterial suspension and inoculate it to the entire surface of the MHA agar until it is evenly distributed, the fourth stage of placing paper discs, place sterile paper discs on the surface of the agar that has been inoculated with the same distance between the discs, the fifth stage of adding powdered beverage solution: Pipet 20  $\mu$ L of powdered beverage solution that has been dissolved in physiological distilled water solution onto the paper disc, the sixth stage of incubation, close the petri dish and incubate at 37°C for 24 hours, and the last stage of observing the results, after the incubation period is complete, observe the zone of growth inhibition (ZHT) around the paper disc. ZHT is the area around the paper disk where bacteria do not grow due to the antimicrobial effect of the powdered beverage (Klau et al., 2021).

### **Vitamin C Test**

This test uses a volumetric titration method that can be used to test vitamin C levels in powdered drinks with composition 1 (5 gr papaya seeds) and composition 2 (4 gr papaya seeds: 1 gr jackfruit), in a gradual way the first is weighed using an analytical balance, the weight of composition 1 = 0.5024 gr and the weight of composition 2 = 0.5029 gr, the second stage is added to the sample with 100 ml of distilled water and then homogenized, the third stage is filtered the sample, then 25 ml is taken into Erlenmeyer, the fourth stage is added as much as 1.2 ml with 10% H<sub>2</sub>SO<sub>4</sub> solution, then a few drops of amylum are added to the sample solution and the last stage The sample solution is then titrated with iodine solution until blue.. The end point of the titration is marked by a change from colorless to blue (Nilna, 2021).

### **Organoleptic (sensory) test**

This test uses the human senses of 15 people, to see the quality of papaya seed powder drinks with the addition of jackfruit composition 1 (5 gr papaya seeds) and composition 2 (4 gr papaya seeds: 1 gr jackfruit). Starting from the taste, aroma, texture and appearance.

The data analysis process that will be carried out is descriptive. Where all data that has been collected will be described with support using tables of results from antimicrobial testing where the diameter of the inhibition zone is seen in the bacteria *Escherichia coli*, *Staphylococcus aureus*, *Candida albicans*., Vitamin C test with the best concentration, and organoleptic testing using 15 panelists to see the taste, aroma, and texture.

## Results and Discussion

### Antimicrobial Test

Antimicrobial tests in this study used the disc diffusion method. Which begins with making a suspension by taking a sterile oce needle on *Escherichia coli* bacteria, *Staphylococcus aureus* bacteria, and *Candida albicans* fungus. Furthermore, the bacteria taken are put into a test tube containing 0.9% NaCL and then homogenized on fortex until the suspension is cloudy the same as the McFarland 0.5 standard. Then inoculated microbial suspensions on MHA media on petri dishes using cotton buds until evenly distributed. Furthermore, the preparation of herbal drinks from papaya seeds with the addition of jackfruit diluted with sterile distilled water. In composition 2, the weight of the sample weighed 0.4 g papaya seeds: 0.1 g jackfruit, and in composition 1 the weight of the sample weighed 0.5 g of papaya seeds, and each was put into a test tube and then diluted each using 5 ml of sterile distilled water. Each concentration that has been diluted is homogenized and insert paper discs at each concentration of 4 pcs (4 repetitions) for each concentration, then homogenized again. Then the positive control (K+) herbal entrostop was put into a test tube as much as 5 ml not forgetting the paper discs as many as 4 pcs (4 repetitions) then homogenized. And paper discs as many as 4 pcs (4 repetitions) that have been soaked and homogenized for 15 minutes are then placed on the surface of the MHA media Petri dish which has been inoculated with a suspension of *Escherichia coli* bacteria, *Staphylococcus aureus* bacteria, and *Candida albicans* fungus, then incubated for 24 hours at 37°. The formation of an inhibition zone around the disc with composition 1, composition 2 and K + indicates antimicrobial effectiveness. The zone of inhibition obtained can be seen from Table 1, Table 2, and Table 3.

Table 1. Results of Measurement of Zone of Inhibition of Drinks from Papaya Seeds with the Addition of Jackfruit Fruit with Composition 1 (5 gr papaya seeds) and Composition 2 (4 gr papaya seeds: 1 gr jackfruit fruit), and K+ Entrostop Herbal. Tested on *Escherichia coli* bacteria.

Composition	U1	U2	U3	U4	Average	Description
1	6,2	5,35	5	5,85	5,6	Medium
2	5,7	5,85	4,5	5,85	5,47	Medium
K +	2,55	1,55	3,7	2,85	2,66	Weak

In the antimicrobial test in this study shows Table 1 The results of measuring the inhibition zone of papaya seed herbal drinks with the addition of jackfruit with composition 1 (5 gr papaya seeds) and composition 2 (4 gr papaya seeds: 1 gr jackfruit) and K + Entrostop Herbal. Which was tested on *Escherichia coli* bacteria, showing the average inhibition zone of each concentration is different. In composition 2, which was carried out 4 times, the repetition resulted in an average inhibition zone of 5.47 having a moderate description, which means that composition 2 or papaya seed herbal drink with the addition of jackfruit fruit shows that it has antimicrobial inhibition on *Escherichia coli* bacteria. And in the composition of 1 papaya seed done 4 times repetition has an average inhibition zone of 5.6 which has a moderate description and shows the composition of 1 papaya seed drink has antimicrobial inhibition on *Escherichia coli* bacteria. And the inhibition zone in *Escherichia coli* bacteria given K + (Entrostop herbal

drink) which is done 4 times repetition has an average inhibition zone of 2.66 which means weak, this can be caused by the use of herbal entrostop drinks that are less according to recommendations, which causes the inhibition zone in *Escherichia coli* bacteria to be weak.

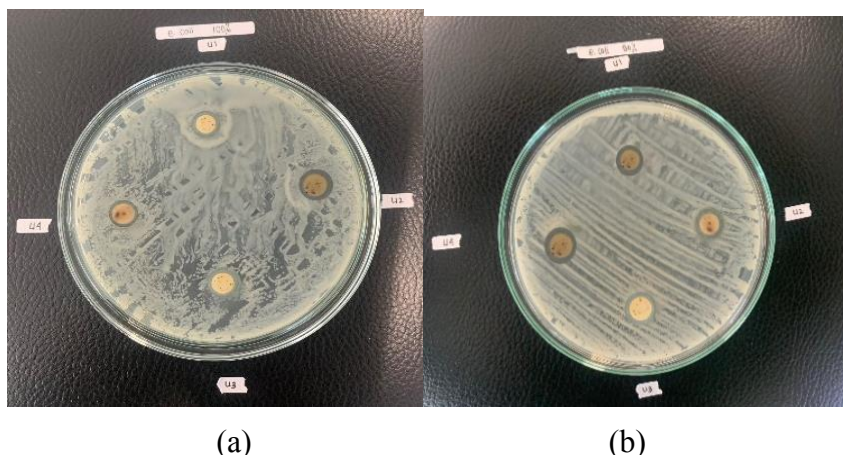


Figure 1. (a) composition 1, (b) composition 2

From research that has been done before, it is known that papaya seeds have antioxidant compounds, one of which is triterperoid where the compound is antibacterial, one of which is *Escherichia coli* bacteria, papaya seeds extracted using n-hexane solvent. In this study, the solvent used was 75% ethanol solvent which tends to extract phenolic compounds. As shown in the results, the papaya seed extract obtained has a relatively high antioxidant activity (Christalina et al., 2013).

Table 2. Measurement Results of Zone of Inhibition of Drinks from Papaya Seeds with the Addition of Jackfruit with Composition 1 (5 gr papaya seeds) and Composition 2 (4 gr papaya seeds) 1 g jackfruit), and K+ Entrostop Herbal. Tested on *Staphylococcus aureus* bacteria.

Composition	U1	U2	U3	U4	Average	Description
1	0,00	0,00	0,00	0,00	0,00	None
2	6,2	6,1	5,65	4,7	5,66	Medium
K +	4,6	4,15	6,65	3,5	4,72	Weak

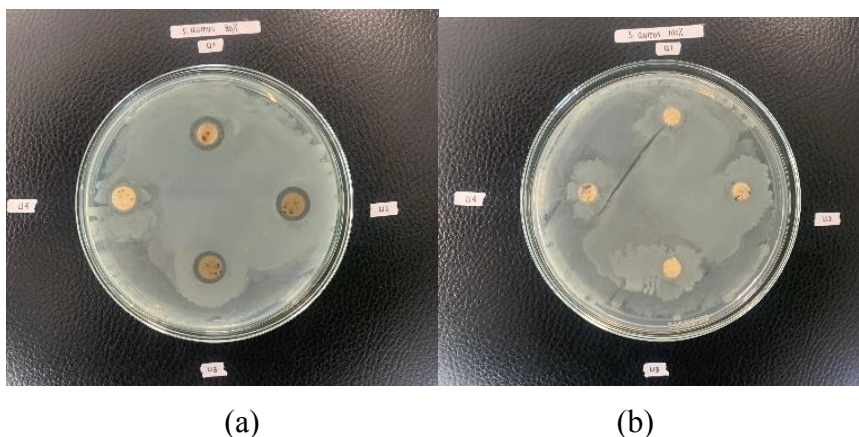


Figure 2. (a) composition 1, (b) composition 2

The results of the measurement of the inhibition zone of papaya seed herbal drink with the addition of jackfruit with composition 1 (5 gr papaya seeds) and composition 2 (4 gr papaya

seeds: 1 gr jackfruit), and K + Entrostop Herbal. which was tested on *Staphylococcus aureus* bacteria. Tested on *Staphylococcus aureus* bacteria, showing the average inhibition zone for each concentration is different. In composition 2, which was carried out 4 times, the repetition resulted in an average inhibition zone of 5.66 having a medium description, which means that composition 2 or papaya seed herbal drink with the addition of jackfruit fruit shows that it has antimicrobial inhibition on *Staphylococcus aureus* bacteria. And in the composition of 1 papaya seeds, 4 repetitions were carried out, which had an average inhibition zone of 0.00 which had a description of none and showed that the composition of 1 papaya seed drink did not have inhibition or was unable to act as an antimicrobial on *Staphylococcus aureus* bacteria. This could be due to composition 1 not using jackfruit in the sample only using papaya seeds and previous research shows that jackfruit contains various types of carotenoids, flavonoids, sterols and tannins whose concentrations differ depending on the variety. There are not many known compounds that have antimicrobial activity, but generally tannins and flavonoids have potential as antimicrobials. The content of cycloartenone is known to have low activity against *E. coli*, *Staphylococcus aureus*, and other microorganisms. (Yuniarni et al., 2014).. And this could be due to the average composition 2 is able to inhibit microbes due to the content of jackfruit. And the inhibition zone in *Staphylococcus aureus* bacteria given K + (Entrostop herbal drink) which was done 4 times repetition had an average inhibition zone of 4.72 which means weak, this could be due to the use of herbal entrostop drinks that are less according to recommendations, which causes the inhibition zone in *Staphylococcus aureus* bacteria to be weak.

And according to (Torar et al., 2017) Antibacterial power shows that each concentration of papaya seed ethanol extract can inhibit the growth of *Pseudomonas aeruginosa* and *Staphylococcus aureus* test bacteria, where the results of measuring the diameter of the inhibition zone show numbers 5.00 mm, 6.00 mm and 7.00 mm which are classified in the medium category according to Davis and Stout (1971). In the process of testing antibacterial activity, it was found that the best visible antibacterial effect was at the highest concentration, where at this concentration the inhibition zone area of papaya seed ethanol extract against *Pseudomonas aeruginosa* and *Staphylococcus aureus* bacteria was 7.00 mm. (Davis & Stout, 1971).

Table 3. Measurement Results of Zone of Inhibition of Papaya Seed Herbal Drink with the Addition of Jackfruit Fruit with Composition 1 (5 g papaya seeds) and Composition 2 (4 g papaya seeds: 1 g jackfruit fruit), and K+ Entrostop Herbal. Tested on *Candida albicans* Fungus.

Composition	U1	U2	U3	U4	Average	Description
1	4,05	6,8	7,1	4,2	5,53	Medium
2	3	3,2	5,25	2,15	3,4	Weak
K +	3,45	0,8	1,95	2,45	2,16	Weak

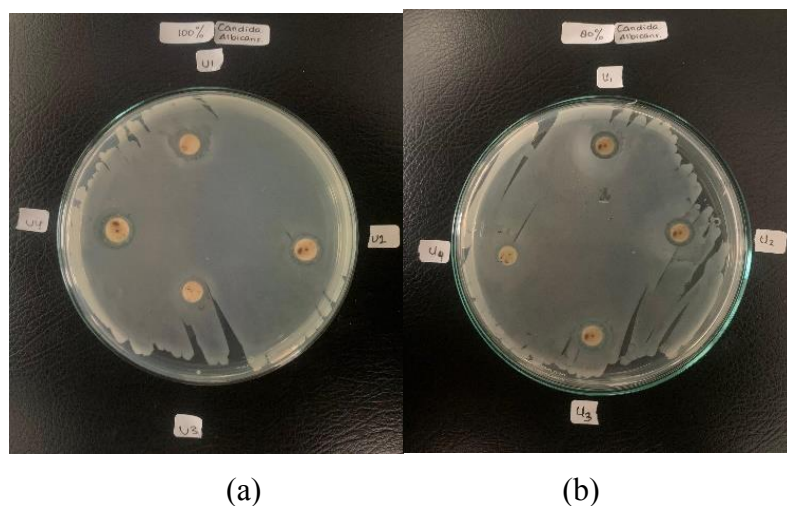


Figure 3. (a) composition 1, (b) composition 2

In the antimicrobial test in this study, the table shows the results of measuring the inhibition zone of papaya seed herbal drink with the addition of jackfruit with composition 1 (5 gr papaya seeds) and composition 2 (4 gr papaya seeds: 1 gr jackfruit), and K + Entrostop Herbal. Which was tested on *Candida albicans* fungus. In composition 2, which was carried out 4 times, the repetition resulted in an average inhibition zone of 3.4, which has a weak description, which means that composition 2 or Papaya Seed herbal drink with the addition of Jackfruit Fruit shows that it has antimicrobial inhibition but is weak in *Candida albicans* fungi. And according to (Komalasari & Fauz, 2023) In the reported primary study identified the significance of the inhibition of papaya leaf extract in overcoming various types of candida fungi of all species which is about  $26 \pm 0.11$  and activity index: 1.23 with minimum inhibitory concentration values ranging between 3.175 mg/mL and 12.5 mg/mL. And in the composition of 1 papaya seed done 4 times repetition has an average inhibition zone of 5.53 which has a moderate description and shows the composition of 1 papaya seed drink has *antimicrobial* inhibition on *Candida albicans* fungi. And the inhibition zone in the *Candida albicans* fungus given K + (Entrostop herbal drink) which was carried out 4 times repetition had an average inhibition zone of 2.16 which means weak, this could be due to the use of herbal entrostop drinks that were less according to recommendations, which caused the inhibition zone in the *Candida albicans* fungus to be weak.

And according to previous research, (Andayani & Kurniawan, 2014) The reason *Candida albicans* is difficult to inhibit is because *Candida albicans* can form biofilms, which are cell layers embedded in the extracellular matrix. This biofilm protects the fungus from antimicrobial attacks and the immune system. *Candida albicans* can form biofilms, which are layers of cells embedded in an extracellular matrix. This biofilm protects the fungus from antimicrobial and immune system attack. *Candida albicans* can form biofilms, which are layers of cells embedded in an extracellular matrix. This biofilm protects the fungus from antimicrobial and immune system attack. Phenotypic Changes, *Candida albicans* can switch between yeast and hyphal forms, which have different levels of susceptibility to antimicrobials.

### Vitamin C Test

The Vitamin C test used in this study uses the Volumetric method, this test uses a volumetric titration method that can be used to test vitamin C levels in powdered drinks with composition 1 (5 gr papaya seeds) and composition 2 (4 gr papaya seeds : 1 gr jackfruit), in a gradual way the first is weighed using an analytical balance, composition 1 = 0.5024 gr and composition 2

= 0.5029 gr, the second stage is added to the sample with 100 ml of distilled water and then homogenized, the third stage is filtered the sample, then 25 ml is taken into Erlenmeyer, the fourth stage is added as much as 1.2 ml with 10% H<sub>2</sub>SO<sub>4</sub> solution, then a few drops of amylum are added to the sample solution and the last stage of the sample solution is then titrated with iodine solution until blue.

$$\text{Vitamin C Content} \left( \frac{\text{mg}}{100\text{gram}} \right) = \frac{\text{Concentration } I_2 \times \text{Titration volume} \times 8,806 \times F_p \times 100}{\text{Sample Weight}(\text{gr})}$$

Sample weight:

Composition 1 = 0.5024 g                      Titration volume = 0.4 ml

Composition 2 = 0.5029 g                      Titration volume = 0.5 ml

$$\text{Vitamin C content (Composition 1)} = \frac{0,1 \text{ N} \times 0,3 \times 8,806 \times \left( \frac{100}{25} \right) \times 100}{502,4(\text{mgr})}$$

Vitamin C content of composition 1 = 0.2804%

$$\text{Vitamin C Content (composition 2)} = \frac{0,1 \text{ N} \times 0,3 \times 8,806 \times \left( \frac{100}{25} \right) \times 100}{502,9(\text{mgr})}$$

Vitamin C content (composition 2) = 0.1400%

Furthermore, the test results of vitamin C levels tested using composition 1 and composition 2 samples obtained vitamin C levels can be seen in Table 4.

Table 4. Test Results of Vitamin C Content in Papaya Seed Herbal Drink with the Addition of Jackfruit with Composition 1 (5 gr papaya seeds) and Composition 2 (4 g papaya seeds: 1 g jackfruit).

Compositi oni	Vitamin C content
1	0,2804%
2	0,1400%

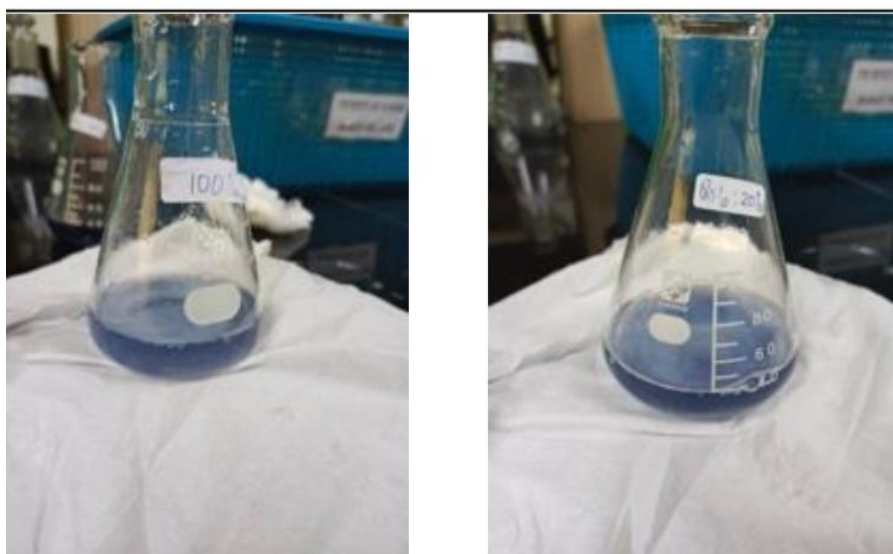


Figure 4. Vitamin C content



The test results of vitamin C content in papaya seed herbal drinks with the addition of jackfruit with composition 1 (5 gr papaya seeds) and composition 2 (4 gr papaya seeds: 1 gr jackfruit), which were obtained in this study using the volumetric method and calculated with the provisions and showed the final result which was blue:

And according to (Khairi et al., 2019) during a training study on making coffee with other raw materials, one of which is papaya seeds, can be an alternative to coffee beans while utilizing industrial waste that has been wasted. Papaya seeds have a vitamin C content of 140 mg/100 g. Papaya seeds also contain alkaloids, steroids, tannins, essential oils, small amounts of carbohydrates, water, protein, and fat. Papaya seeds also contain high amounts of unsaturated fatty acids in the form of oleic and palmitic acids, chemical compounds of the phenol group, terpenoids, as well as saponins which are cytotoxic, anti-androgen and estrogenic effects.

### Organoleptic Test

In this Organoleptic Test, there are 15 people used as samples, testing is done using human senses. to see the quality of papaya seed herbal drinks with the addition of jackfruit with composition 1 (5 gr papaya seeds) and composition 2 (4 gr papaya seeds: 1 gr jackfruit). Starting from the aroma, texture, color and taste. Organoleptic assessment using hedonic scale 1-9.

Table of organoleptic test results of papaya seed drink composition 1, showing and organoleptic test by 15 panelists starting from the aroma. And the value most favored by 5 panelists is a score (very like), where the panelists assess the aroma of papaya seeds like chocolate powder which makes the panelists very interested in composition 1 drinks.

Table 5. Organoleptic Test Results Composition 1

Composition	Score	Number of Panelists			
		Indicator			
		Aroma	Texture	Color	Taste
1	1	0	0	0	0
	2	0	0	0	2
	3	3	0	0	2
	4	1	1	0	1
	5	1	1	3	0
	6	1	3	2	3
	7	2	4	3	3
	8	5	3	3	2
	9	2	3	4	2

In the texture of composition 1, and the value that is most liked by 4 panelists is a score of 7 (slightly very like), where the panelists assess the slightly less soft texture of the composition 1 beverage powder which makes interested panelists slightly very like the composition 1 drink. In the color of composition 1, and the value that is most liked by 4 panelists is a score of 9 (very much like), where the panelists assess the cloudy brown color of the composition 1 drink which makes interested panelists very much like the composition 1 drink. In the taste of composition 1, and the value most liked by 6 panelists, namely scores 6 (like) and 7 (a little very like), where panelists are interested in assessing the tartness produced from the natural taste of papaya seed powder and making panelists interested in composition 1 drinks.

The most desirable results seen from the table of organoleptic test results of papaya seed drinks with the addition of jackfruit with composition 2 and papaya seed drinks composition 1 seen

from the aroma, texture, color and taste are papaya seed drinks with the addition of jackfruit with composition 2, where papaya seeds provide many benefits and jackfruit as an attractant for panelists to consume herbal drinks with the most desirable composition 2.

**Organoleptic Test Results Composition 1**

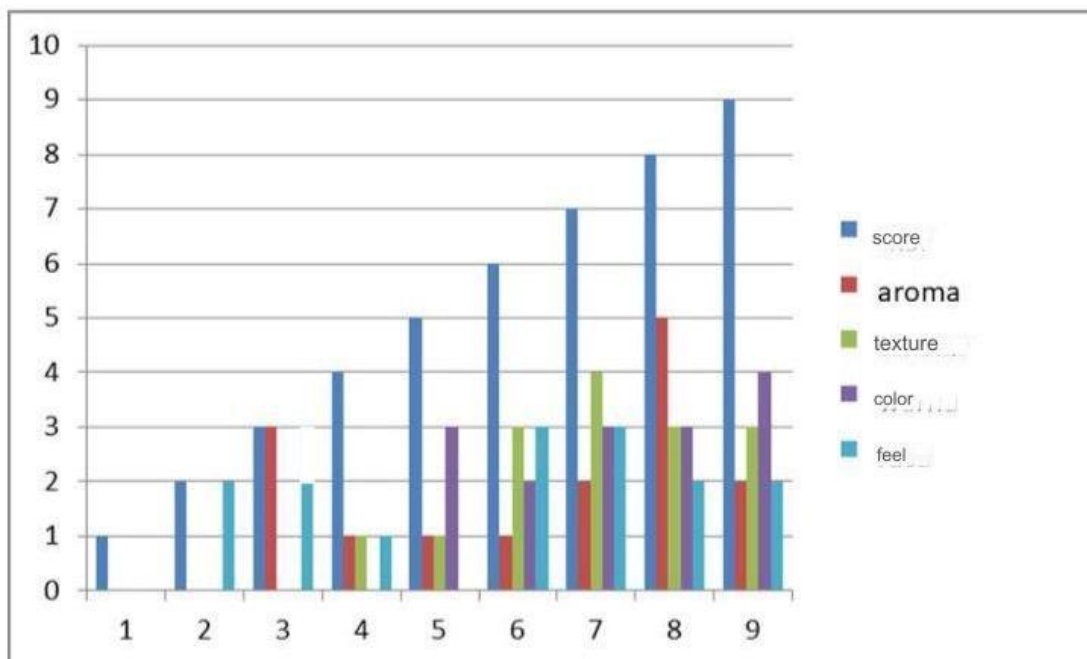


Figure 5. Graph of Organoleptic Test Results Composition 1

Table 6. Organoleptic Test Results Composition 2

Composition	Score	Number of Panelists			
		Indicator			
		Aroma	Texture	Color	Taste
2	1	0	0	0	0
	2	0	0	0	0
	3	0	0	0	0
	4	1	1	0	0
	5	1	0	0	1
	6	0	2	2	2
	7	6	5	3	3
	8	5	4	6	5
	9	2	3	4	4

The table of organoleptic test results of papaya seed drinks with the addition of jackfruit with composition 2, shows and organoleptic tests by 15 panelists starting from the aroma. And the value that is most liked by 6 panelists is a score of 7 (a little very like), where the panelists assess the aroma of jackfruit which makes the panelists a little very interested in the composition 2 drink. On the texture of composition 2, and the value that is most liked by 5 panelists is a score of 7 (a little very like), where the panelists assess the soft texture of the composition 2 beverage powder which makes the panelists a little very interested in herbal drinks composition 2. In the color of composition 2, and the value that is most liked by 6 panelists is a score of 8 (very like), where the panelists assess the dark brown color of the

composition 2 drink which makes the panelists very interested in the composition 2 drink. In the taste of composition 2, and the value that is most liked by 5 panelists is a score of 8 (very like), where the panelists are interested in assessing the sweetness produced from natural flavors, namely jackfruit and making the panelists like the composition 2 drink which makes the panelists very interested in the composition 2 drink.

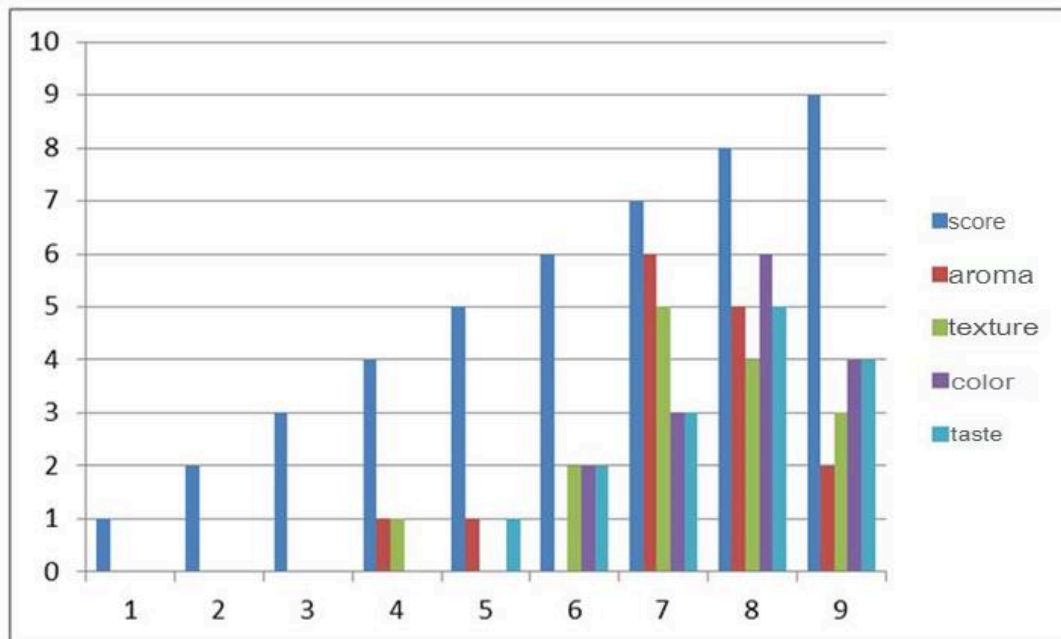


Figure 6. Graph of Organoleptic Test Results of Composition 2

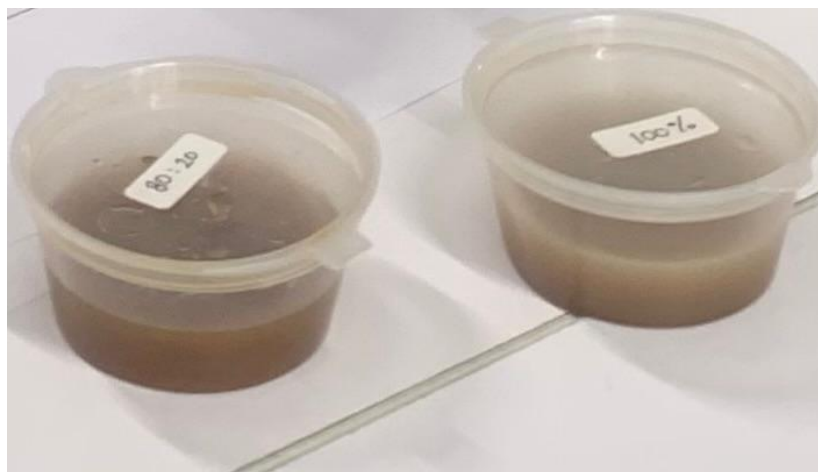


Figure 7. Herbal drink composition 1 and composition 2

This work, therefore, reveals the antimicrobial efficacy of functional drinks produced from papaya seeds and jackfruit – results that inform potential uses of these natural ingredients in the producing functional beverages. The study reveals moderate inhibition of *Escherichia coli* and *Staphylococcus aureus* by both compositions, with composition 2 (4 g papaya seeds: 1 g jackfruit) for which the parameter was identified as particularly effective. This puts light to the fact that there exists synergistic effects of the various bioactive compounds that exist in both papaya seeds and jackfruit.

The local parts of papaya have been identified as containing bioactive compounds including phenolics, flavonoids and triterpenoids which have been demonstrated to possess antimicrobial activity. It was found that phenolic compounds – mainly – have the potential of destabilizing the bacterial cell membrane and are also effective against both the gram-positive and gram-negative bacteria. These outcomes corroborate with the above results of this study and confirms that these compounds present in the papaya seeds were responsible for the recorded antimicrobial activity. However, the combination with the new fruit ‘jackfruit’ which includes such substances as tannins and flavonoids, explains an even stronger impact of such mixtures. Perhaps that is why other research has indicated that the synergistic use of other bioactives from different plants can have a stronger antimicrobial effect because of their different working mechanisms.

The absence of antimicrobial activity against *Staphylococcus aureus* in composition 1 imposes the most interest. *Staphylococcus aureus* is known to be highly resistant and capable to form resistance to several antimicrobial agents thus one cannot be surprised that composition 1 with no addition of jackfruit did not work. This observation gives credence to the argument that the uses of papaya seeds’ antimicrobial efficacy may not effectively handle newer strains of bacteria; the presence of the other bioactive components that come in jackfruits is definitely needed.

On the other hand, min-SCs revealed only a weak inhibition effect on *Candida albicans*, that provokes crucial concerns regarding the efficacy of these formulations to control fungal pathogens. The initial target yeast species of interest, *Candida albicans* is a particularly challenging organism to control, primarily because it has the ability to form a biofilm and due to phenotypic switching of the cell. The moderate inhibition by composition 1 indicates that higher concentration of papaya seed could possess certain antifungal property but not very effective. This observation is in agreement with previous studies that have pointed out to the failure of natural extracts in controlling *Candida albicans* and called for the search for new approaches or synergistic mixtures of bioactives.

The antimicrobial results are also supported by vitamin C content analysis where the nutritional value of these beverages is also determined. Apart from being a potent antioxidant, vitamin C is one of the valuable antioxidants that help improve immune system effectiveness in combating infections. In the present experiment, composition 1 was found to contain vitamin C content of 0.2804% while composition 2 had only 0.1400% could be attributed to the fact that composition 1 contained a larger proportion of papaya seeds which are high in vitamin C content. However, as evidenced by the organoleptic test results, as the composition 1 has less sensory appeal, one has to think if it could be accepted well in market despite of having higher nutritional value. Such trade-off between the nutritional value and other factors such as taste and appearance is a question which often arises in the course of establishing and creating functional foods and drinks.

The organoleptic tests which consisted among others of the aroma, texture, color and taste preference, further showed that the panelists had a better preference for composition 2. The inclusion of jackfruit did have positive effects on the control as it not only reduced the palatability of the beverage but also its sensor appeal. This discovery is important because consumer acceptance forms one of the most vital success components of functional beverages in the market. Some of the latest research indicates that consumers are in quest of healthful foods and non-food products that also give them hedonic pleasure. The ability of composition 2 to meet these dual criteria therefore indicates that it stands a better likelihood to appeal to customers than does composition 1.

Nevertheless, several crucial factors that are relevant to the current study are pointed out: First, the antimicrobial effect of the beverages was not very high and the beverages did not exhibit undue efficiencies against more pathogenic forms of bacteria and fungi. This creates concern on the suitability of these formulations in combatting other microbial illnesses and infections. Further studies should investigate the possibility of adjusting the concentration and doses as well as analyse the effectiveness of components in combination. Also, research on the shelf-life of these beverages in various storage conditions is important so as to understand the antimicrobial efficacy or alteration of sensory properties of such beverages. Second, the vitamin C analysis and the organoleptic tests that compared the potato chips with the biscuit demonstrated that a trade-off between nutrition content and taste and/or texture is also possible in potato chips which implies that more work needs to be done to accommodate both at the optimal level. This could mean, for instance, looking for new formulations that include other natural flavor boosters or changing the ratio of papaya seeds to jackfruit in order to optimise the health impacts and acceptance among consumers. Finally, a low level of inhibition was noticed towards *Candida albicans* which indicates that these beverages might be rather useful in combating bacteria rather than fungi. Since there is a lot of interest in natural antifungal products, future research could focus on incorporating other antifungal bioactives to the formulation or could look at the possibility of blending these beverages with other natural extracts that have been labeled as having impressive antifungal activity.

## Conclusion

This research provides solid scientific data in support of the consumption of papaya seed and jackfruit-based beverages as functional drinks with good antimicrobial potential and market acceptance. It is also clearly evident that the use of these combinations of natural elements can prevent the growth of *Escherichia coli* and *Staphylococcus aureus*, so these beverages have a potential of becoming natural antimicrobial food products. The moderate antimicrobial activity established is attributed to the bioactive compounds an enzyme present naturally in papaya seeds and jackfruit and the synergistic bacteriostatic effects that they jointly impose on bacteria which in turn, add to the functional value of the beverages under study.

However, the study also reveals some of the frailties of the current formulation especially in view of their poorly or rather negligible antifungal efficiency against *Candida albicans*. This indicates that even though the beverages have potential toward specific bacterial pathogens, their usage as total spectrum antibacterial agents might still ought to be advanced, it is could be by augmenting the beverages with further antifungal bioactive compounds or by altering the constituent concentrations.

Nutritionally, the test beverage with significantly higher vitamin C in the papaya seed-dominant composition elevates the potential health benefit of the beverage. However, the issue of balance between nutritional improvement of the functional beverages and the sensory qualities, as demonstrated from the organoleptic tests, makes it quite challenging to formulate innovative functional beverages that are not only effective in their mode of functioning but also have high acceptability. Jackfruit complements the sensory off-notes brings about by the inclusion of papaya seeds while at the same time improving the overall liking levels which indicates that this formulation could act as a base upon which new products could be developed.

However it is also important to consider the following potential weaknesses of the study. The thus achieved moderately satisfactory antimicrobial activity yields a number of concerns regarding decreased effectiveness when it comes to more opportunistic pathogenic flora and stability of the developed formulation. More experimental research needs to focus on increasing the concentrations of bioactive, the synergistic interaction of the beverages with

other natural extracts, and the stability and shelf life of these products. Furthermore, the actual examination of the molecular mechanisms associated with the detected antimicrobial action might be also helpful for the further improvement.

Research was conducted in this study to enable the creation of functional papaya seed and jackfruit beverages to be sold in the market. Nonetheless, the current formulations suggest some opportunities for the development of new products, for their antimicrobial and sensory properties. As it has been underlined, they also indicate that further research and development are needed. That is why, resolving the outlined limitations and furthering the development of these products, such beverages can become much more significant in the field of functional foods and beverages, providing the consumer with tasty and healthy product of high efficacy.

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