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MAKING HIGH ANTIOXIDANT MIX FRUIT POWDER WITH COMPOSITION VARIATIONS FRUIT AND DRYING TEMPERATURE

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ABSTRACT: Making a drink mixing fruit from the fruit of the banana ambon, California papaya, pumpkin, and Solanum betaceum can be a way to enhance the antioxidant content of their products and will raise the value of fondness of the community towards it. This study aims to determine the right formula for the variation of the composition of fruit and temperature levels drying against anti oxidant and know the community in power fruit drink mix—methods used to make a drink mix fruit that is a method in which a Foam Mat Drying. Based on an analysis of vitamin C the best conditions exist to vary the composition of fruit 50% of Solanum betaceum. While for antioxidant content IC50, the best conditions exist to vary the fruit composition by 50% of banana ambon at 50ºC. The temperature drying affects the womb IC50 antioxidant vitamin C and fruit, resulting mix of the liqueurs. Based on the is the hedonic organoleptic can be received by the fruit drink mix for its shade from variations composition of 50% of pumpkin (50ºC), the scent of 50% of pumpkin (70ºC), and the sense of 25% respectively fruit (50ºC). So it can be concluded that variations of fruit are produced with the composition of 50% of pumpkin.

Keywords: *Mix Fruit, Banana, Papaya, Pumpkin, Solanum betaceum*

1. Introduction

Post-harvest handling by fruit farmers who are not done well can cause physiological changes, chemical and microbiological changes of fruit can be damaged where the shelf life of the fruit depends on the water content and the maturity level of the fruit; the higher the water content in the fruit, the faster the fruit is damaged and vice versa. From several types of fruit, some fruits are not favoured by the community because of several factors, namely the less attractive shape, taste and aroma. Therefore, one of the treatments is processing fruit into processed food in instant powder drinks to extend shelf life and be a popular fruit with the community.

Instant powder drinks are food preparations in powder, easily soluble in water, practical in serving, and have a long shelf life due to their low water content. They make instant powder based on attractive colours due to lycopene, instant powder scent reinforcement from soursop addition because it contains volatile compounds that cause a sharper aroma and taste. According to Iswari (2015), with the research on the Utilization of Tomatoes and Soursop as Basic Materials for Making Health Supplement Products using the Foam-Mat Drying method, there are differences in the formulation of comparative tomatoes and soursop. The best combination of the two fruits is a mixture of 60% tomato + Soursop 40. By using two mixtures, the higher the percentage of lycopene and vitamin C content in instant powder, the higher the water content because it strongly affects product solubility and shelf life. In addition, because powder drinks in Indonesia are mostly found only from one or two fruits and vegetables, the composition of adding food additives is not recommended, so that they can be developed into mixed fruit powder drinks.

2. Literature review

Banana Ambon is one type of banana with a sweet and fragrant aroma and much nutritional content, including vitamin C of 3 mg / 100g, vitamin B1 of 44 mg / 100g and vitamin B2 of 0.08 mg / 100g [1].

Dutch eggplant contains anthocyanin, which is included in the class of flavonoids, which is one type of antioxidant; the high fibre in the fruit helps prevent cancer and constipation. Dutch eggplants contain lots of vitamins, especially vitamin A for 5600SI / 100g, vitamin B for 0.3 - 0.14 mg / 100g and vitamin E for 2 g / 100g [2].

The pumpkin plant (Cucurbita moschata) or commonly known as pumpkin, contains many vitamins, including vitamin C of 52 g / 100g, vitamin A of 180.00 SI / 100g, and vitamin B1 of 0.08 mg / 100 g [3]. Beta-carotene is beneficial for growth, maintenance of body tissues and vision, reproduction, fetal development, and reducing the risk of cancer and the liver.

California Papaya (Carica Papaya L) is a tropical fruit with sweet fruit and reddish yellow flesh. Papaya has a vitamin C content of 61.8 mg / 100g, 32.8 mg / 100g and beta-carotene vitamin A, which are helpful as antioxidants [4].

The use or mixing of the four types of fruit to become mixed fruit powder drinks can be an effort to increase the antioxidant content, considering that each fruit has a high amount of antioxidants and vitamins, which can increase people's preferences and become a powder drink without ingredients unauthorized additions and a long shelf life for these fruits. The method used for making mixed fruit drinks is the Mat Drying Foam method. Ambon banana, papaya, pumpkin and Dutch eggplant are mixed into one by adding a foam agent solution to accelerate the drying time until the foam is formed and then dried using a cabinet dryer.

3. Experimental

1. Fixed variable
- Fruit mixture weight: 1000 gr
- Sieve size: 60 mesh
- Tween 80: 0.5% (b / b) concentration
- Dextrin concentration: 10% (b / b)
- Sucrose concentration: 20% (b / b)
- Time: 6 hours

2. Variables change
- Drying temperatures: 50, 55, 60, 65 and 70^{o}C
- Fruit mixing composition:

1. Ambon Banana 50%, 10% Yellow Pumpkin, California Papaya 25% and Dutch Eggplant 15%
2. Ambon Banana 25%, 15% Yellow Pumpkin, 50% California Papaya and 10% Dutch Eggplant
3. Ambon Banana15%, 50% Yellow Pumpkin, 10% California Papaya and 25% Dutch Eggplant
4. Ambon Banana 10%, 25% Yellow Pumpkin, 15% California Papaya and 50% Dutch Eggplant
5. Ambon Banana 25%, 25% Pumpkin, California Papaya 25% and Dutch Eggplant 25%.

3.1 Research Procedure

1. Making mixed fruit powder
- Preparing California Papaya fruit, Ambon Banana, Yellow Pumpkin, Dutch Eggplant
- Peeling skin and removing fruit seeds
- Wash the fruit clean
- Weigh each ingredient by weight according to the predetermined composition
- Steaming yellow pumpkin for 3 minutes
- Cut each dice-shaped fruit
- Insert all ingredients and smooth in a blender for 1 minute until the mixed fruit pulp is obtained
- Mix mix fruit porridge with 20% sucrose and 10% dextrin and tween 80 0.5% until homogeneous
- Pour the mixture onto a baking sheet with a thickness of 3 mm
- Putting a baking sheet in the Cabinet Dryer tool with the temperature according to the treatment, then obtain a dry extract of mixed fruit powder
- Sifting powder obtained with a 60 mesh sieve

2. Test the antioxidant activity of the DPPH method
- Extract the sample by dissolving 1 gram of the sample in 10 ml of methanol, then silence overnight
- Filter the sample solution and dry the filtrate using a rotary evaporator; the results of the rotary evaporator are sample extracts
- Take an extract of 0.25 ml sample and insert it into the test tube
- Adding 2 ml of DPPH solution of 0.1 mm and methanol until the volume in the test tube reaches 8 ml
- Measuring the absorbance of the sample in the 30 minutes with a spectrophotometer at a wavelength of 517 nm
- The control solution or blank is made by adding methanol to 2 mL of DPPH solution until the volume in the test tube reaches 8 ml

3. Analyze the moisture content of the drying method/oven
- Dry the empty cup in the oven at 105^{o}C for 15 minutes, then weigh it
- Weigh the sample ± 2-3 gr and put it in a dried cup, and find the weight into the oven at 105^{o}C for 3 hours
- Transfer the sample containing the sample to the desiccator and cool it for 15 minutes and weigh the final weight
- Do this continuously until it gets a constant weight. Weight is considered constant if the difference does not exceed 0.2 mg
- Calculate dry weight / dry base and wet/wet base weight

4. Analysis of Vitamin C with the Iodimetry Method

- Smooth the sample and take 0.5 grams, and then dissolve it with 100 ml distilled water
- The sample solution was taken as many as 45 drops and then diluted with 22.5 ml of distilled water
- Add 1% H2SO4 as much as 5 ml and six drops of starch indicator.
- Titrate with iodine solution.
- Note: iodine solutions should not be exposed to light because that is when the burette is filled with iodine solution covered in newsprint.

5. Analysis of microbes through the M.P.N. method (Most Probable Number)

- Prepare 9 test tubes; 3 tubes for Series A, three tubes for Series B and three tubes for Series C
- Insert 1 ml of sample water from dilution, 10-5, 10-6, 10-7 nutritional broth for series A, B, and C tubes
- Insert the Durham tube on all test tubes with the mouth of the tube below
- Fill out all test tubes with 9 ml K.F.L.
- Cover the tube with cotton/tissue
- Incubation for 24-48 hours at 37ºC
- Observe changes in the Durham tube and calculate the number of positive tubes for the positive tube series for tube series.

6. Hedonic Organoleptic Test

- Prepare panellists as many as 30 panellists
- Serve mix fruit drinks from mixed fruit powder drinks
- Give an assessment of the mixed fruit powder beverage products with a numerical scale 1-3 where 1 = Dislike, 2 = typical neutral, and 3 = Dislike, the parameters tested are aroma, texture, colour and taste like the parameters tested are aroma, texture, colour and taste
- Record the results of measurement results of mixed fruit powder beverage products [5].

7. Test for Solubility (Solubility)

- Filter paper in the oven at 105ºC for 10 minutes.
- Cool in a desiccator, weigh until the weight is constant (a) and weigh the sample (initial weight)
- Enter the sample weighed in the specified water ml at 25ºC.
- Strain with filter paper that has known weight.
- The filter paper is reheated at 105ºC for 3 hours.
- Cooled in a desiccator and balanced until a constant weight is obtained (b).

8. Metal Contamination Test

- Prepare a sample solution in the form of a mixed fruit drink
- Add with a solution of hydrochloric acid (if there is a white precipitate, it is possible to contain metals Pb2 +, Hg22-, and Ag +
- Adding enough hot water, if dissolved, the sample contains metal Pb2 +
- Add a little K.I. solution. If there is a green precipitate, it contains Hg22 metal - and if an excess K.I. solution is added, there is no change, and then it contains Ag + [6].

4. Result

To determine the level of vitamin C in mixed fruit powder drinks, the iodometry titration method was analyzed to determine the effect of the composition of the ingredients on the drying temperature of mixed fruit drinks.

Table 1 Vitamin C Analysis Mix Fruit Drinks (mg / 100g)

Temp.	Vitamin C (mg/100g)				
(ºC)	I	II	III	IV	V
50	102,0	153,6	170,0	270,2	102,0
55	69,3	169,7	201,4	292,3	154,9
60	154,9	152,9	187,2	254,9	155,3
65	121,5	137,4	202,3	272,1	136,3
70	100,3	202,5	205,2	240,4	208,1

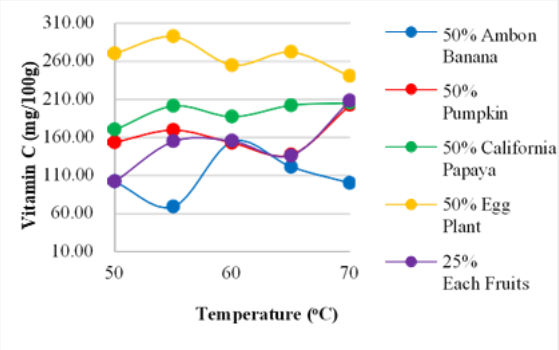

Figure 1 Effect of Fruit Composition and Temperature of Drying on the Content of Vitamin C Mix Fruit Drinks

Based on the analysis of each temperature, it can be concluded that the composition variation that has the highest vitamin C level is the composition of 50% Dutch eggplant at temperatures of 50, 55, 60, 65, and 70ºC because of the ability of Dutch eggplant fruit to maintain

vitamin levels C until it reaches a high temperature and the amount of vitamin C is 42 mg / 100 grams in the Dutch eggplant fruit. Based on the analysis results at each temperature, it can be concluded that the higher the drying temperature, the lower the level of vitamin C because from the drying temperature of 50ºC to 70ºC, the level of vitamin C can reach the optimal temperature at 60ºC. In this study, following Susanti et al. [7], the heating process can affect the stability of vitamin C so that vitamin C levels decrease. Because of damage to components in food, including vitamin C, can be caused by high temperatures. The process of damage to these vitamins can also be accelerated by heat, light, alkalis, enzymes, and oxidizers and vitamin C is easily damaged during storage. This condition also follows Budiyati [8], stating that by processing fruit with low temperatures of less than 60ºC, vitamin C does not experience much damage. In the analysis of the variant one path using α = 0.05, there was a significant influence between variations in fruit composition and drying temperature on vitamin C levels); the variation in vitamin C content was due to differences in the percentage of fruit composition. As can be seen from the results of vitamin C content obtained in the percentage of 50% Dutch eggplant is higher than the difference in the percentage variation of other compositions. Based on Iswari [9], about the use of tomatoes and soursop as essential ingredients in making health supplement products, states that adding different percentages of tomatoes given, it can affect the amount of vitamin C in the product because it can be seen that the vitamin C content of tomatoes is higher than soursop so that the higher the percentage of tomatoes given, the higher the vitamin content of the product

4.1 *Determination of IC50 Antioxidant Analysis*

To determine the antioxidant activity of IC50 in mix fruit drinks, a DPPH method was analyzed to determine the effect of the composition of the ingredients on the drying temperature of the mixed fruit drink.

Based on the analysis of each temperature, it can be concluded that the variation in composition with the highest IC50 antioxidant content/value was the composition of 50% Ambon banana at temperatures of 50, 55, 60, and 70ºC.

Table 2 Antioxidant Analysis of IC50 Fruit Mix Drinks (mg / mL)

Temp. (ºC)	Antioxidant IC50 (mg/mL)				
	I	II	III	IV	V
50	66,9	47,0	39,6	23,3	45,1
55	41,3	40,6	35,2	24,5	34,3
60	46,4	44,3	39,4	23,8	29,3
65	30,7	55,7	34,0	35,1	37,4
70	46,3	40,1	38,9	20,5	28,5

Relation of drying temperature to the antioxidant activity of IC50. In this study, refer to Amir et al. [10] stated that the lower the IC50 value of antioxidants, the higher the antioxidant activity, and the IC50 value increases with increasing temperature and duration of the oven. This means that antioxidant activity can decrease due to temperature treatment and oven drying time.

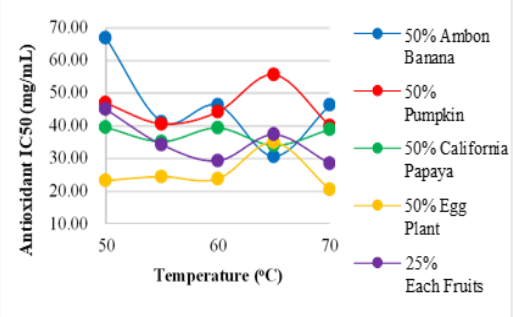

Figure 2 Effect of Fruit Composition and Drying Temperature on Antioxidant Mix Fruit Drinks

In the analysis of the variant one path using α = 0.05, there was a significant effect between variations in fruit composition and drying temperature on antioxidant levels of IC50

4.2 *Determination of Moisture Analysis*

Determining water content illustrates the amount of free water in materials, including water physically bound to the material [5]. To determine the water content in mixed fruit drinks, an oven method was analyzed to determine the effect of the composition of the ingredients and the drying temperature on the water content.

The effect of fruit composition on moisture content can be deduced from Figure 3. It is known that the lower the percentage of Ambon bananas according to the variation of the composition of each fruit, the lower the product's water content. This is due to using a low drying temperature of 50ºC, where the water has not entirely evaporated

within 6 hours, so the water content is higher than other temperatures, affecting the water content of the mixed fruit drinks produced.

Table 3 Analysis of Mix Fruit Drinking Water Content (%)

Temp. (ºC)	Water Content (%)				
	I	II	III	IV	V
50	9,00	7,50	8,50	8,50	5,50
55	6,00	7,50	7,50	7,00	6,50
60	3,50	6,00	5,50	6,00	5,50
65	3,50	5,50	5,50	1,50	6,00
70	2,00	1,00	2,00	1,50	1,00

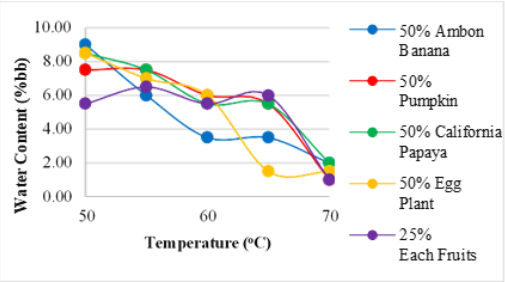

Figure 3 Effect of Fruit Composition and Drying Temperature on Water Content of Mix Fruit Drinks

The relationship of drying temperature to moisture content can be concluded from Figure 3. An increase in drying temperature affects the decrease in water content of mixed fruit drinks. This is because the higher the drying temperature, the lower the water content of a material to prevent a decrease in the nutritional value of the material. According to Histifarina et al. [11], the material's ability to release water from the surface will be more significant along with the temperature of the drying air used and the longer the drying process, so the lower the water content produced [12].

The water content, according to the traditional powder quality food requirements, is a maximum of 5% b / b (S.N.I. 01-4320-1996). In the sample temperature of 65ºC, the 50% Dutch eggplant composition was 1.50% and 70ºC variation. The composition of 50% Ambon banana was 2.00%, 50% pumpkin was 1.00%, 50% California papaya was 2.00%, 50% Dutch eggplant was 1.50 %, and 25% of each fruit of 1.00% met the requirements of S.N.I. 01-4320-1996 because it has a moisture content of <5% b / b. Whereas the other samples do not meet the water content according to S.N.I. 01-4320-1996, which is <5% b / b

4.3 *Determination of Microbial Analysis*

Microbial contamination in mixed fruit drinks with the M.P.N. method contained Bacillus Subtillus bacteria commonly found in anaerobic air, water and soil. In the sample mix of fruit drinks, there was no finding of the Escherichia Coli bacteria. According to S.N.I. 01-4320-1996, regarding the quality requirements of traditional beverage powder, the maximum limit of metal contamination is 3x103 colonies/gr.

The results of microbial analysis on the manufacture of mixed fruit drinks showed the highest yield at a temperature of 65oC in the variation of the composition of 50% Ambon banana obtained by the calculation of colonies of 61x106. This is due to several factors, including the water content in the powder drink, which is too high, so microbes are increasingly developing in the sample. Because the humidity factor is relatively high and the microbial nutritional needs in the sample are fulfilled.

On the results of microbial analysis on the manufacture of mixed fruit drinks, the lowest yield at a temperature of 70oC in the variation of the composition of 50% Dutch eggplant obtained colony calculation results of 3x104. This is due to the low water content contained in the sample, so microbial growth gets smaller.

4.4 *Determination of Metal Contamination Analysis*

Metal contamination contained in mixed fruit drinks shows negative results for Pb metal. This shows that powdered drink products are safe for consumption. Metal contamination carried out on mix fruit drinks was carried out employing group I anion analysis by adding 37% HCl to get the result that there was no white sediment in the sample, so the sample did not contain Pb metal. According to the quality requirements (S.N.I. 01-4320-1996) in powder drinks, the maximum limit of Pb metal contamination is 0.2 mg/kg. So the powder drink produced has met the quality requirements of S.N.I. 01-4320-1996.

4.5 *Determination of Solubility Analysis*

Solubility is the ability of dry products from flour, powder or seeds to dissolve in water [9]. To determine the solubility of mixed fruit drinks, an oven method was analyzed to determine the effect of the composition of the ingredients on the drying temperature of the mixed fruit drink. According to

Susanti et al. [7], because the measurement of solubility is a parameter to determine the quality of a product.

Table 4. Results of Analysis of Soluble Mix Fruit Power (%)

Temp. (ºC)	Soluble Mix (%)				
	1	2	3	4	5
50	85,0	65,0	70,0	75,0	60,0
55	60,0	75,0	70,0	60,0	100,0
60	75,0	65,0	65,0	70,0	65,0
65	75,0	50,0	50,0	70,0	75,0
70	50,0	65,0	80,0	50,0	60,0

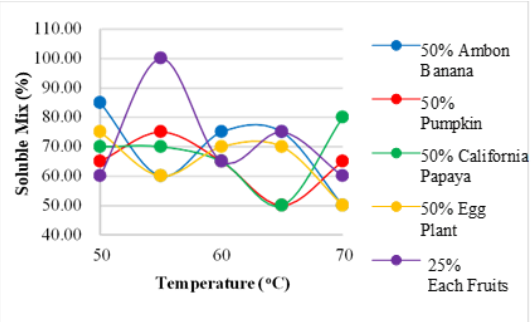

Figure 4 Fruit Composition Effect and Drying Temperature on Power After Soluble Mix Fruit Drinks

Based on the results of solubility analysis on Mix Fruit powder drinks based on the relationship and influence of fruit composition on solubility, a temperature of 50ºC obtained higher solubility in the composition variation of 50% ambon banana at 85%, at 55ºC higher solubility in composition variations 25% of each fruit is 100%, at 60ºC the higher solubility of the composition of 50% ambon banana is 75%, at a temperature of 65ºC the higher solubility of the composition of 50% Ambon banana and 25% each is obtained. Fruit by 75% and at 70oC obtained higher solubility variation of 50% California papaya composition by 80%. Thus, variations in fruit composition affect the solubility of mixed fruit drinks because variations in composition at temperatures of 50, 55, 60, 65 and 70ºC obtain low solubility.

Based on the results of the solubility analysis on Mix Fruit powder drinks based on the relationship and influence of drying temperature on solubility, solubility was obtained at variations in the composition of 50% pumpkin by 65% and 50% California papaya by 70% at 50ºC. Solubility increases at 55oC, then decreases at 60ºC and 65ºC and increases again at 70ºC. So, the higher the drying temperature, the lower the solubility of the sample.

In the analysis of variant one lane using α = 0.05, there was no significant effect between variations in fruit composition and drying temperature on solubility. According to Iswari K (2015), the higher the value of solubility obtained, the better the product quality produced because the serving process will be more straightforward. And the speed of dissolution is a powder quality requirement because it should be in the form of a powder having the character of being easily dissolved in cold water or hot water, easy to serve, and easily dispersed

4.6 *Hedonic Organoleptic Test*

Organoleptic tests carried out hedonic organoleptic tests were conducted to determine the product acceptance power to the community, represented by 30 panelists. 3 parameters are taken, in color, namely 1 (Not Interesting), 2 (Less Interesting), and 3 (Interesting). The aroma is 1 (Odorless), 2 (Odorless), and 3 (Odorless Mix Fruit). At taste that is 1 (Dislike), 2 (Dislike), and 3 (Likes).

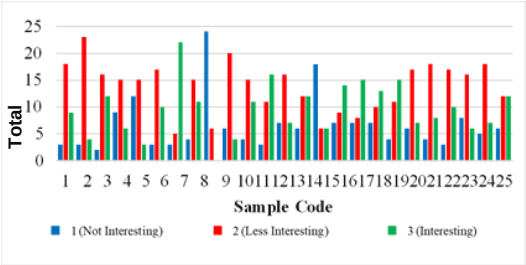

Figure 5 Organoleptic Test Based on Color Parameters in 25 Samples

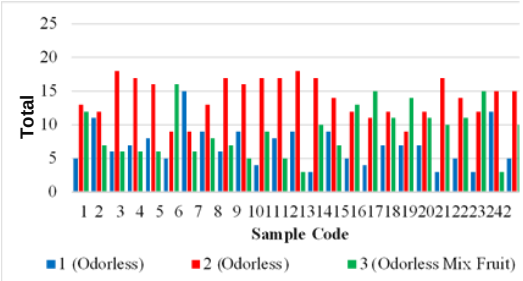

Figure 6 Organoleptic Test Based on Aroma Parameters in 25 Samples

The colour that people like with a favourite score of 3 (interesting) is a mixed fruit drink with a variation of the composition of 50% pumpkin. Aroma that people like with a favourite score of 3 (mixed fruit smell) is a mixed fruit drink with a composition of 50% yellow pumpkin. The taste that people like with a favourite score of 3 (likes)

is a mixed fruit drink with a composition variation of 25% for each fruit

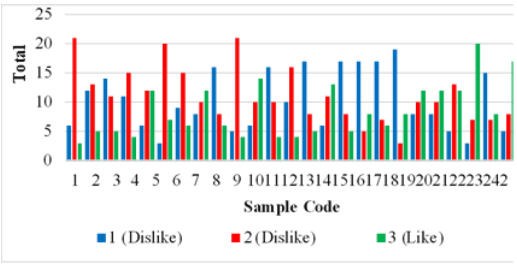

Figure 7 Organoleptic Test Based on Taste Parameters in 25 Samples

5. Conclusion

Variations in fruit composition affect the content of vitamin C and antioxidant levels of IC50 in the mix of fruit drinks produced. The relationship of variation in fruit composition to the average vitamin C content was higher in the variation of the 50% Dutch eggplant composition. The relationship of variation in fruit composition to the antioxidant content of IC50 was, on average higher in the variation of the composition of 50% fruit of Ambon banana at temperatures of 50, 55, 60, and 70ºC and the composition of 50% papaya california fruit at 65ºC.

Drying temperature affects the vitamin C and antioxidant IC50 content in the mixed fruit drinks produced. The relationship is, on average, the higher the temperature from 50ºC to 70ºC, the lower the vitamin C and antioxidant IC50 content.

In the hedonic organoleptic test, the community can accept mixed fruit drinks, and what people like is the colour from sample 7 (50ºC) with variations in the composition of 50% pumpkin, the aroma from sample 6 (70ºC) with variations in the composition of 50% pumpkin, and flavour from sample 23 (50ºC) with a composition variation of 25% for each fruit.

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