

Characteristics of Vegetable Canistel Mousse Dessert (*Pouteria campechiana*) Using Polysaccharide Stabilizer

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Abstract

Canistel contains specific nutritional so that it has potential as a functional food. One way to use fruits is to process them into innovative foods, such as a dessert mousse. The aims was to study the differences in the quality of mousse using animal and vegetable recipe formulas treated with a stabilizer substitute for gelatin. The study used a factorial randomized block design with two treatment factors, namely the recipe formula: animal and vegetable ingredients and the treatment of stabilizers: CMC, arabic gum and jelly powder. The quality observed included fiber and fat content also organoleptic quality of taste, aroma, texture and color. The results showed that the recipe formula of vegetable ingredients produced a dessert mousse that is better in term of fiber (1,76%) and fat content (8,53%) as a functional food, while the stabilizer CMC produces crude fiber content of 1.56% and fat of 11.26% and a soft textured organoleptic quality; better used as a substitute for gelatin than other stabilizers. The organoleptic testing resulted that interaction of the animal ingredient recipe with CMC stabilizer having a preferred taste and aroma with an attractive yellow-orange color.

Keywords

Canistel, dessert, ingredients, mousse, stabilizers

1. Introduction

Canistel or by another name Campolay (*Pouteria campechiana*) is one of Indonesia's exotic fruits whose existence is starting to become rare due to the absence of cultivation efforts and the on going conversion of land functions. Tropical fruits in Indonesia have a very high level of diversity both in terms of taste, shape, color and aroma, some of which are very unique and exotic that only exist on Indonesian so that they become a wealth of biodiversity of Indonesian fruit plants.

Canistel fruit has a fairly complete nutritional content such as fiber, starch, minerals, calcium, phosphorus, carotene, thiamin, riboflavin, niacin, vitamin A and vitamin C (de Lanerolle *et al.*, 2008 and Warta, 2015 in Sutrisno *et al.*, 2018). Canistel fruit also contains polyphenol antioxidant compounds, namely gallic acid, gallocatechins, catechins, epicatechins (Elsayed *et al.*, 2016). Along with the times, processed foods have also developed a lot. Processed food is not only a main course but also a dessert. One of the dessert products that are often served is mousse. Mousse has a sweet taste that comes from the fruit flavor used.

Mousse usually using topping cream, which is processed into whipped cream then added fresh dairy milk and with a bit of gelatin as a binder (Panji *et al.*, 2019). Gelatin can function as a gelling agent, emulsion stabilizer, thickener, clarifier, water binder, coating and emulsifier (Harun *et al.*, 2015). The use of gelatin as a binder or stabilizer in mousse processing is a concern in this study. Most of the gelatin on the market comes from the skin and bones of pork or cow (Faridah and Susanti, 2018). The high demand for gelatin as a mixture of food products that still rely on imported products and the uncertainty about the halalness of imported gelatin products, which are generally made from pork skin, are very worrying for consumers, especially Muslim consumers. Opportunities to use other materials that have similar characteristics to gelatin to replace the function of gelatin are quite open and need to be encouraged to reduce dependence on imported gelatin. Examples of other materials that have characteristics similar to gelatin are carrageenan, gum arabic, CMC (Carboxymethyl Cellulose) and jelly.

As time progressed, a person's lifestyle can change, as well as their diet. The International Vegetarian Union (IVU) defines a vegetarian as someone who lives on a variety of plant-based products, with or without consuming milk and eggs and their processed products, but overall avoids the use of any kind of meat (Liu, 2017). Vegetable foodstuffs are food ingredients that come from plants (can be in the form of roots, stems,

branches, leaves, flowers, fruit or some parts of plants or even the whole) or food ingredients that are processed from plant-based ingredients. Most are a source of carbohydrates, vitamin C, fat, and protein (Permatasari, 2018). In the recipe formula for mousse processing, apart from using the fruit itself, other ingredients are added, such as dairy milk and eggs. Currently, the trend of lifestyle that applies a vegetarian lifestyle is increasing. Research by Astuti *et al* (2019) said that the vegetarian group had better nutritional status (body mass index) and health status than the non-vegetarian group

This research was conducted by processing canistle fruit into innovative processed foods that provide health benefits, as one way to socialize the advantages of the nutritional content of canistle fruit. Thus, it is hoped that many people will be interested in consuming and cultivating this plant. With the problems described above, a study was carried out using various suitable stabilizers in processing canistle mousse desserts based on vegetable ingredients that have good quality and can be accepted by consumers.

1.1 Objectives

This research aims to study to determine the difference in the quality of mousse using animal and vegetable recipe formulas treated with gelatin substitute stabilizers, namely CMC, Arabic Gum and Jelly powder. In order to achieve the aim of study, following objectives were defined:

- a) Looking for the best interaction between the recipe formula and the stabilizer on the crude fiber and fat content as well as the organoleptic quality of the mousse
- b) Study the best recipe formula for mousse quality as a functional food
- c) Study the best stabilizer for its quality as functional food and organoleptic quality

2. Literature Review

Canistel grows in places that have tropical temperatures. Canistel tree grows up to 10 meters, the fruit is bright yellow or orange yellow (Figure 1). The flesh of this fruit has a sweet taste, the texture is similar to a cooked sweet potato (Figure 2). This fruit is initially hard and gummy but when it is ripe the flesh will become soft.



Source: portalmadura.com
Figure 1. Canistel fruit



Source : Hesthiati *et al*, 2019a.
Figure 2 : Yellow-Orange Flesh of Canistel Fruit

Currently, canistle plants are rarely found due to logging in the practice of land conversion which is still ongoing and the lack of technology for the use of canistle fruit which is usually only consumed as fresh fruit. Whereas canistle fruit has complete nutritional content such as fiber, starch, minerals, calcium, phosphorus, carotene, thiamin, riboflavin, niacin, and vitamin C (Warta, 2015 in Sutrisno *et al.* , 2018). According to Senthuraman *et al.* (2020) canistle fruit also has a high starch content of 40.19%, this high starch content can be used as a source of carbohydrates such as cassava (38%), sweet potato (20%) and canna (22.6%) (Sutrisno *et al.*, 2018). Based on its complete vitamin and mineral content, alkesa fruit is a functional food, so it has considerable prospects and opportunities as raw materials for alternative food industries and functional foods.

Mousse is a typical French dessert. Although there are many variations, mousse is usually divided into two categories, fruit and chocolate (Bo Fiberg (2003) in Paramita (2017). Nowadays mousse is also one of the dishes commonly available in pastry shops. The ingredients are also varied. Mousse is one way to enjoy fruit in a different way. The mousse has a soft and smooth taste resembling ice cream. Research by Panji *et al.* (2019), processing mousse using jackfruit, while Paramita (2017) processed mousse using avocado as basic ingredients and Dani (2017) processed mousse using cilembu sweet potato.

The use of food additives is one of the needs in the food processing industry. Stabilizers are part of food additives that are often used in the processing of food products such as ice cream, packaged drinks, chili sauce, and many more. The presence of a stabilizer is needed so that the physical form of the product is more viscous and the level of homogeneity is more stable (Ferdiansyah et al., 2016).

The stabilizer that is often used in food is gelatin. Gelatin is a product obtained from the partial hydrolysis of collagen derived from skin, connective tissue and animal bones. Data from Gelatin Manufacturers of Europe in 2005, the world's largest production of gelatin comes from raw materials for pork skin, namely 44.5% (136,000 tons), the second from cowhide 27.6% (84,000 tons), the third from bone 26.6% (81,000 tons) and from other 1.3% (4,000 tons). Therefore, the use of gelatin as an additional food ingredient in the processing of food products is very worrying for Muslims

Research on mousse processing has not been found much. Panji et al. (2019) studied about the processing of mousse from fruit and seeds of jackfruit as a substitute for sugar and vegetable fat. The results of this test obtained a comparison of recipe formulations using 50% white chocolate, 50% jackfruit seeds, and 100% jackfruit flesh is the best formulation because the product can be accepted by the community. Canistel processing into mousse brownies has also been carried out in the research of Hesthiati *et al.* (2019b) using animal ingredients, namely eggs, sugar, whipped cream powder and a stabilizer, namely gelatin, and using brownies as a base. Based on the results of the organoleptic test, the color of the canistel mousse was obtained, namely yellow orange to orange which came from the canistel color, while the taste organoleptic test showed that the canistel mousse taste was very dominant from the canistel taste.

3. Method

The research was conducted from November 2020 to February 2021 at the Agricultural Laboratory, Center of Universitas Nasional Laboratory, Jl. Bambu, Kuning, Jatipadang, Pasar Minggu, South Jakarta. The study used a factorial randomized block design in separate plots with two treatment factors. The first treatment was a mousse recipe formula consisting of animal and vegetable ingredients and the second treatment was a stabilizer substitute for gelatin, namely CMC, arabic gum and jelly powder. The animal formula uses egg yolks, granulated sugar, cornstarch and dairy milk, while the vegetable formula uses bananas, sugar, cornstarch and soy milk.

The processing of canistel mousse is divided into two stages, namely the processing of mousse with an animal formula and mousse processing with a vegetable formula. Canistel mousse processing using the formula Hesthiati *et al.* (2019) modified. The stages of mousse processing are as shown in Figure 3. Observations on quality characteristics include fiber content, fat content and organoleptic quality of taste, aroma, texture and color. The effect of treatment was analyzed using Analysis of Variance (ANOVA) with a significance level of 0.05. Any differences between treatments will then be tested using Duncan's Multiple Distance Test (DMRT) at a level of 0.05 using the SPSS application.

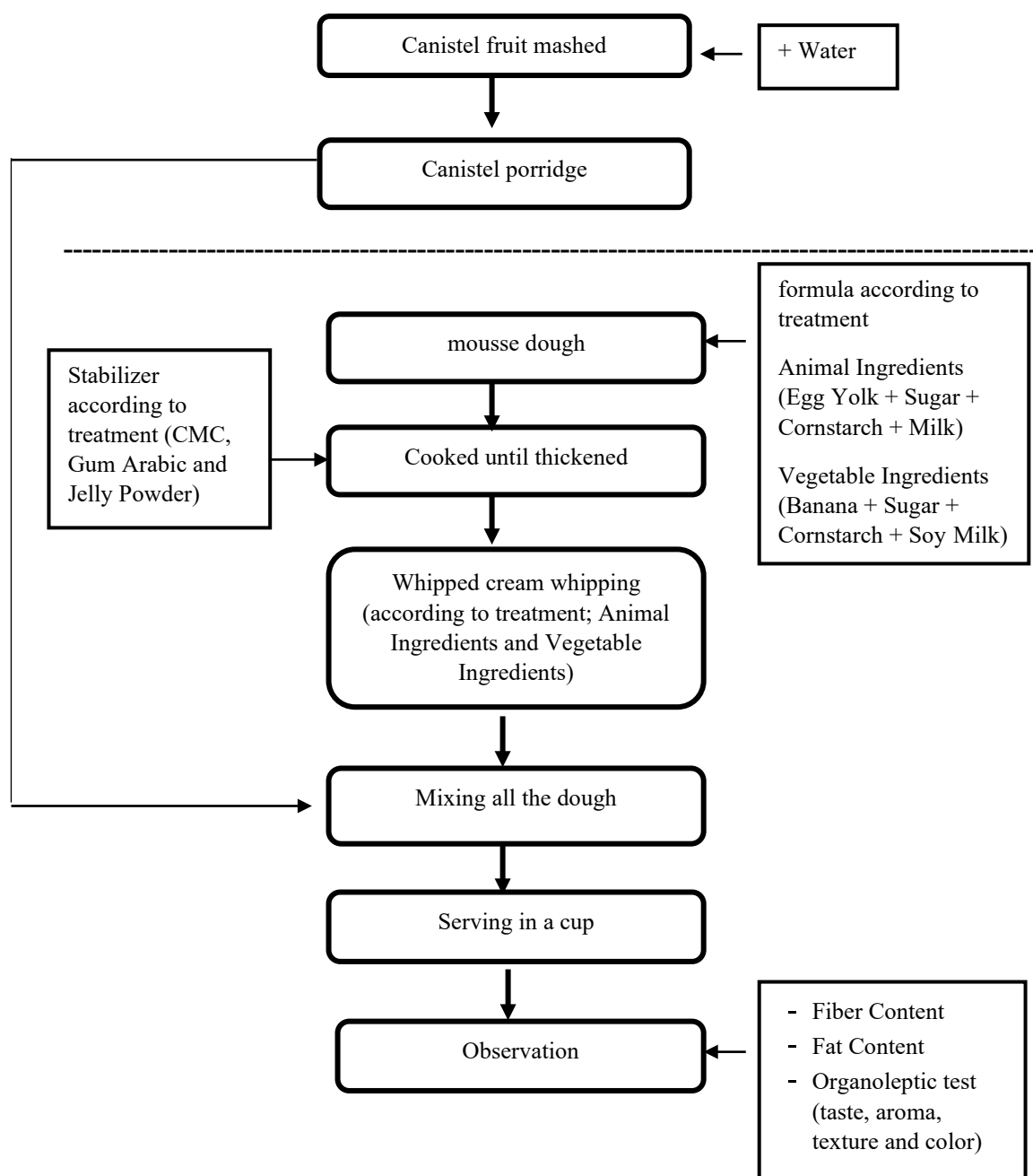


Figure 3. Canistel Mousse Dessert Processing Flow Chart

4. Results and Discussion

4.1 Canistel Fruit Content

Based on the literature, canistel fruit has the potential as a functional food, therefore a test of the nutritional content in canistel fruit is carried out as a reference before being processed into mousse. From Table 1, based from testing is known that canistel fruit contains quite complete nutrients, namely carbohydrates, protein, fiber, beta carotene, potassium, calcium, magnesium and vitamins C and A

Table 1. Nutritional Content of Canistel Fruit

No.	Parameter	Unit	Amount
1.	Water content	%	53.00
2.	Ash content	%	0.83
3.	Protein	%	1.92

4.	Fat	%	0.44
5.	Crude Fiber	%	3.36
6.	Carbohydrate	%	43.80
7.	Beta carotene	mg/kg	47,50
8.	Vitamin C	mg/kg	408.00
9.	Vitamin E	mg/100 g	<0.01
10.	Vitamin A	Ppm	3.83
11.	Fructose	g/100 g	9.49
12.	Glucose	g/100 g	9.54
13.	Phosphorus (P)	mg/100 g	33.76
14.	Calcium (Ca)	ppm	275.29
15.	Potassium (K)	ppm	10505,13
16.	Magnesium (Mg)	ppm	305.81
17.	Iron (Fe)	ppm	13.48
18.	Zinc (Zn)	ppm	5.81

It even contains high levels of carbohydrates and vitamin C. In addition to being used as a source of energy, carbohydrates can give food a sweet taste and also help excrete feces (Nurul *et al.*, 2019). Vitamin C functions as an antioxidant and counteracts free radicals that can damage cells (Mulyani, 2018). From the analysis of its nutritional content, it can be concluded that canistel serves as a functional food because of its high vitamin C content as an antioxidant and several minerals, especially potassium, magnesium and calcium which are quite high. Minerals also act as cofactors for enzymes, muscle function, and nerves. Potassium is one type of mineral that is needed by the body. This substance is needed as a building block for cardiac muscle activity, osmosis regulation, muscle and nerve function, enzyme cofactor, and energy metabolism (Goentoro, P.L., 2020)

4.2. Crude Fiber

Food with high crude fiber content usually contains low calories, low sugar and fat content which can help reduce the occurrence of diabetes obesity. Canistel mousse analyzed for crude fiber content. The results of the effect of the mousse recipe formula and stabilizer on crude fiber obtained as presented in Table 2.

Table 2. Effect of Mousse Recipe Formula and Stabilizers on Crude Fiber of Canistel Mousse Dessert

Treatment	Average
Mousse Recipe Formula:	
Animal Ingredients	0.68b
Vegetable Ingredients	1.76a
Stabilizer:	
CMC	1.56a
Arabic Gum	1.10a
Jelly Powder	0.99a

Note: The average number followed by the same letter in the same column shows that it is not significantly different according to DMRT 5%.

Different treatments of mousse recipe formulas produced significantly different crude fiber. Vegetable materials produce higher crude fiber content, this is due to the use of bananas in the manufacturing process. Setianingsih *et al.* (2017) said Cavendish bananas have higher protein and crude fiber content and lower fat and ash than Ambon bananas and because of the high carbohydrate content in bananas, it can increase crude fiber. (Sukasih *et al.* 2018).

The stabilizer treatment showed no significantly different to crude fiber content, but the use of CMC stabilizer tends to produce the highest crude fiber content compared to arabic gum and jelly powder, which is 1.56%. This is because of the nature of CMC which can trap fiber. This is in accordance with the research of Waliyurahman *et al.* (2019) in his research said that CMC has cellulose compounds so that the addition of CMC will increase the value of crude fiber. Further interactions between the treatment of the mousse recipe formula and the stabilizer on crude fiber from canistel mousse can be seen in Table 3.

Table 3. Interaction of Mousse Recipe Formula and Stabilizer on Crude Fiber of Canistel Mousse Dessert

Mousse Recipe Formula	Stabilizer		
	CMC	Arabic Gum	Jelly Powder
Animal Ingredients	0.78Ba	0.69Ba	0.57Ba
Vegetable Ingredients	2.35Aa	1.51Aa	1.42Aa

Note: The average number followed by the same uppercase letter in the same column and the average number followed by the same lowercase letter in the same row shows not significantly different according to DMRT 5%

- capital letters compare the treatments of mousse recipe formula
- lowercase letters compare the treatment of the stabilizer.

The interaction between animal-based mousse recipe formulas produces crude fiber that is significantly different from vegetable ingredients. The content of crude fiber in food is very important for the human digestive tract, besides that it can prevent degradative diseases such as diabetes mellitus, colon cancer, obesity and many more (Proverawati *et al.*, 2019).

4.3 Fat

Canistel mousse were analyzed for their fat content. The results of the effect of the mousse recipe formula and stabilizer on fat content obtained fat data are presented in Table 4.

Table 4. Effect of Mousse Recipe Formula and Stabilizers on Fat Content of Canistel Mousse Dessert

Treatment	Average
Mousse Recipe Formula:	
Animal Ingredients	17.15b
Vegetable Ingredients	8.53a
Stabilizer:	
CMC	11.26a
Arabic Gum	13.92b
Jelly Powder	13.34ab

Note: The average number followed by the same letter in the same column shows that it is not significantly different according to DMRT 5%.

The treatment of the mousse recipe formula was significantly different to the fat content of the canistel mousse produced. The use of animal materials has a higher fat content than vegetable ingredients, namely 17.15%. This is in accordance with the research of Sari *et al.* (2017) that the use of soy milk in the processing of pumpkin ice cream resulted in lower fat content than the use of dairy milk. The low fat content of the mousse is also influenced by the fat content of the canistel fruit itself which is only about 0.44%.

The treatment of the stabilizer also affects the fat content produced. The use of arabic gum stabilizer has the highest fat content of 13.34%. This is explained in foods containing sugar, arabic gum can have the advantage of encouraging the formation of fat emulsions so that the use of arabic gum can be said to have an effect on increasing the fat content of a product (Tantono *et al.*, 2017). The stabilizer CMC produces the lowest fat content of 11.26% and is not significantly different from jelly powder. This is in accordance with the research of Novidahlia *et al.* (2018) that CMC can cause a decrease in fat due to a dilution effect, namely the addition of certain substances into a material which results in a decrease in the original composition of the material. Further interactions between the treatment of the mousse recipe formula and the stabilizer on the fat content of the canistel mousse can be seen in Table 5.

Table 5. Interaction of Mousse Recipe Formula and Stabilizer on Fat Content of Canistel Mousse Dessert

Mousse Recipe Formula	Stabilizer		
	CMC	Arabic Gum	Jelly Powder
Animal Ingredients	13.70Ba	19.20Bb	18.55Bb
Vegetable Ingredients	8.83Aa	8.65Aa	8.12Aa

Note: The average number followed by the same uppercase letter in the same column and the average number followed by the same lowercase letter in the same row shows not significantly different according to DMRT 5%

- capital letters compare the treatment of mousse recipe formula
- lowercase letters compare the treatment of stabilizer.

The interaction between animal ingredients with CMC stabilizer was significantly different from that animal ingredients with arabic gum or jelly powder. SNI quality requirements for mousse have not been registered, but all treatment interactions produce fat content in accordance with SNI quality requirements for ice cream, a fruit product similar to mousse, which is more than 5%. The best treatment interaction resulted from the treatment of vegetable ingredients recipe formula with jelly powder stabilizer which produced the lowest fat content of 8.12%.

Fat is one component of multifunctional food ingredients that are very important for human life. The functions of fat in humans include being a source of energy, an insulator in maintaining a balance in human temperature, protecting organs and vitamins A, D, E and K (Rasyid, 2019). However, high fat content will have a negative impact on health, as explained by Yamin *et al.* (2018) that high fat levels in foodstuffs can cause colon cancer, further research on animal fat can increase serum fat levels, resulting in high serum cholesterol, narrowed blood vessels and high blood pressure.

4.4 Organoleptic Character

Organoleptic testing was carried out on 23 panelists consisting of men and women, of which 13 panelists were trained panelists from the Postharvest Center, Cimanggu, Bogor and the 10 other panelists were moderately trained panelists who were randomly selected from the community representing the Jakarta, Bogor and Bekasi areas. The results of organoleptic testing of canistel mousse dessert can be seen in Table 6.

Table 6. Organoleptic Canistel Mousse Dessert

Treatment	Flavor	Aroma	Texture	Color
Mousse Recipe Formula:				
Animal Ingredients	3.13a	3.23a	4.10a	3.55a
Vegetable Ingredients	2.48b	2.98a	4.04a	1.83b
Stabilizer:				
CMC	2.65a	3.04a	4.30a	2.71a
Arabic Gum	2.76a	3.17a	4.10ab	2.80a
Jelly Powder	3.00a	3.02a	3.80b	2.54a

Note: The average number followed by the same letter in the same column shows that it is not significantly different according to DMRT 5%.

4.4.1 Taste Organoleptic

The treatment of the mousse recipe formula was significantly different to the panelists' preference for the canistel mousse dessert taste. Panelists preferred mousse made with animal ingredients compared to mousse made with vegetable ingredients. In contrast, the treatment of different stabilizers resulted in taste preferences that were not significantly different. This is also in accordance with the research of Dimiyati *et al.* (2020) that the added arabic gum does not affect the jackfruit leather fruit because arabic gum is a component that has no taste. CMC also does not change the taste, because the stabilizer has no taste (Abdullah and Mutia, 2020). Likewise with jelly powder which also has no taste and has no effect on the processing of jelly candy (Kurniawan and Deglas, 2019).

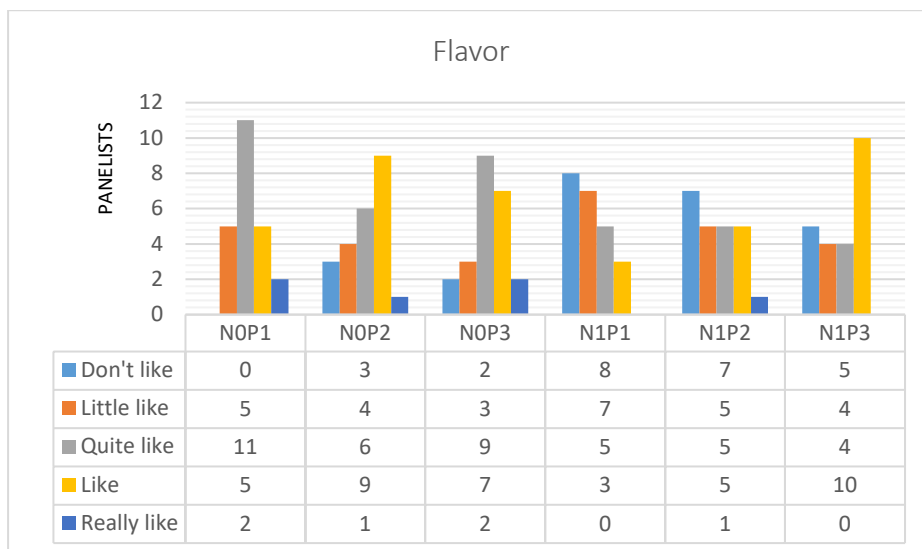


Figure 4. Graph of Organoleptic Taste Test of Canistel Mousse Dessert

Information :

N0: Animal Ingredients

P1: CMC

N1: Vegetable Ingredients

P2: Arabic Gum

P3: Jelly Powder

Based on the graph, it can be seen that 78.26% of the panelists stated that they quite like to really like the taste of mousse with an animal-based recipe formula with CMC stabilizer and jelly powder, the remaining 21.74% said they quite like it. The mousse recipe formula with vegetable ingredients with jelly powder stabilizer 60.87% of panelists stated that they liked it very much and only 39.13% said they liked it a bit like the taste of the canistel mousse produced. Treatment of animal ingredient recipe formulas with CMC stabilizer and jelly powder had the highest taste score (Table 6)

4.4.2 Aroma organoleptic

The Interaction treatment between the mousse recipe formula with the stabilizer resulted in a canistel mousse aroma that was not significantly different (Table 6). This is presumably because canistel fruit has a distinctive fragrant aroma. The graph below presents the panelists' level of preference for the aroma of canistel mousse dessert

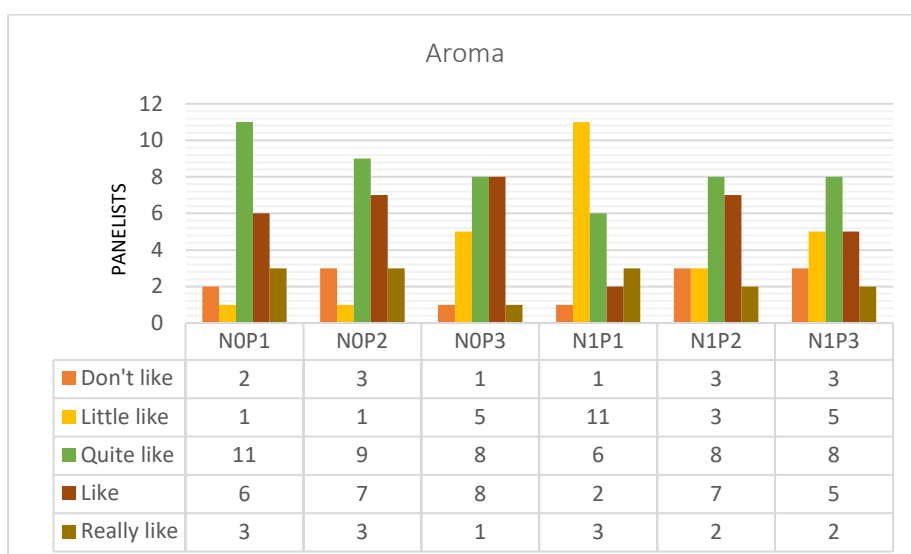


Figure 5. Graph of Organoleptic Aroma Test of Canistel Mousse Dessert

Information :

N0: Animal Ingredients	P1: CMC
N1: Vegetable Ingredients	P2: Arabic Gum
	P3: Jelly Powder

Based on the graph, it can be seen that 86.99% of the panelists stated that they quite like to really like the aroma of the mousse recipe formula based animal ingredients with CMC stabilizer and only 13.01% stated that they liked it slightly to not like it. A total of 47.83% of panelists stated that they quite like to really like and somewhat like the aroma of the mousse recipe formula based vegetable ingredients with CMC stabilizer and 4.34% said they did not like it.

4.4.3. Texture Organoleptic

The treatment of the mousse recipe formula was not significantly different to the texture of the canistel mousse dessert produced. Both the treatment of animal or vegetable ingredients produce a soft canistel mousse dessert texture. In according with the research of Novidahlia *et al.* (2018) which states that the pectin content in bananas can make smoothies softer due to the binding of monomers into the main chain, which is called the smooth region. The treatment of the three stabilizers (CMC, Arabic gum and Jelly powder) produced a soft texture but the use of CMC stabilizer had the highest hedonic quality score of 4.3 (Table 6). The graph below presents the panelists' level of preference for the texture of canistel mousse dessert

Based on the graph, it can be seen that 69.57% of the panelists stated that the animal-based recipe mousse formula with CMC stabilizer had a soft texture and 30.43% said it was very soft. A total of 56.52% of panelists stated that the mousse recipe formula with vegetable ingredients with CMC stabilizer had a soft texture, 39.13% said it was very soft and only 4.35% said it was rough

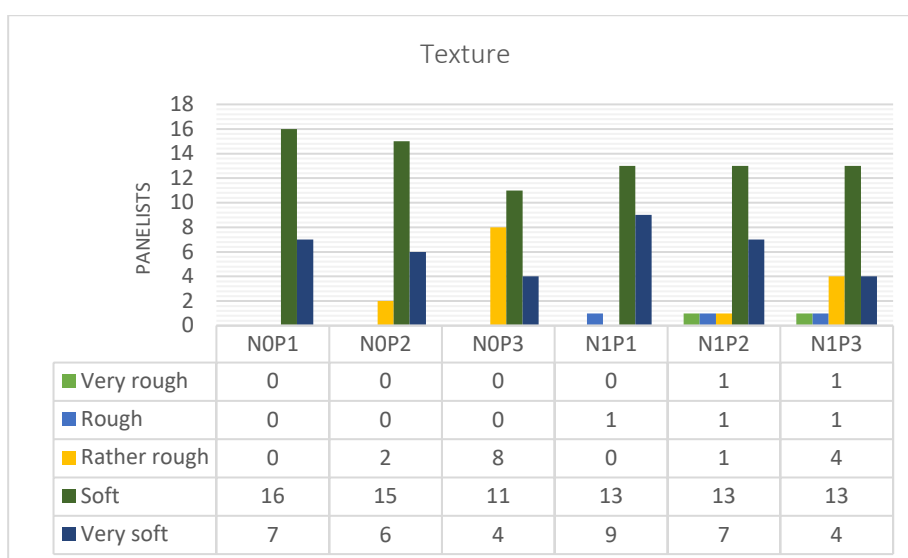


Figure 6. Graph of Organoleptic Texture Test of Canistel Mousse Dessert

Information :

N0: Animal Ingredients	P1: CMC
N1: Vegetable Ingredients	P2: Arabic Gum
	P3: Jelly Powder

4.4.4. Color Organoleptic

Panelists' assessments on the treatment of the mousse formula recipe to the color of the canistel mousse dessert were significantly different. The color of canistel mousse dessert made using animal ingredients had the highest average score of 3.55 or a yellow-orange color (Table 6). The color of this mousse dessert can be said to be close to the color of flesh of ripe canistle fruit before processing. The graph below presents the panelists' level of preference for the color of canistel mousse dessert

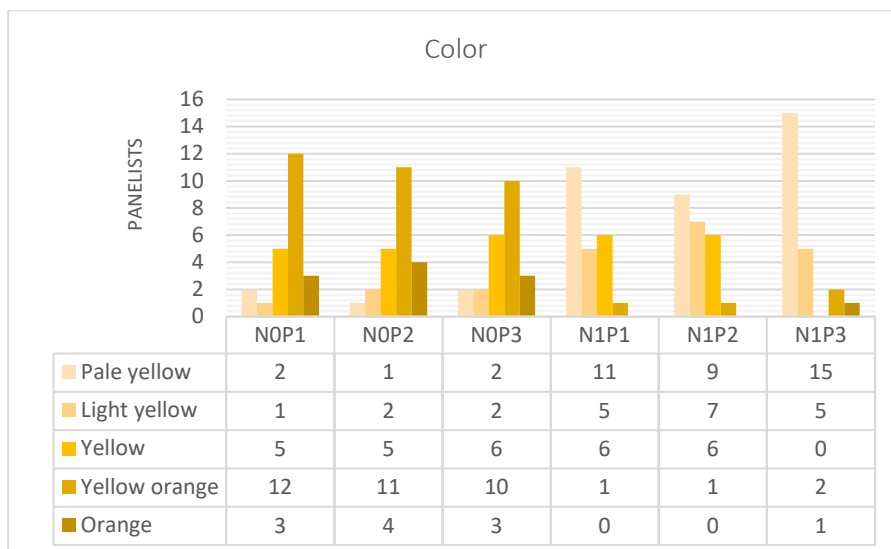


Figure 7. Graph of Organoleptic Color Test of Canistel Mousse Dessert

N0: Animal Ingredients	P1: CMC
N1: Vegetable Ingredients	P2: Arabic Gum
	P3: Jelly Powder

Based on the graph, it can be seen that 65.22% of the panelists stated that the color produced by the animal-based mousse recipe formula with CMC stabilizer and arabic gum stabilizer was yellow-orange to orange, 21.74% said the color of the canistel mousse dessert was yellow and only 13.04% said the color was light yellow to pale yellow. A total of 69.57% each of the panelists stated that the color produced in the mousse recipe formula of vegetable ingredients with CMC stabilizer and arabic gum stabilizer was pale yellow to light yellow and 30.43% stated yellow to orange yellow. Further from the discussion above, the ranking is carried out. Based on the rankings, it was found that the treatment of animal ingredients recipe formulas with the use of CMC stabilizers was the best treatment for all organoleptic quality. Figure 8 below is the photos of the canistel mouse dessert from 6 treatment combinations

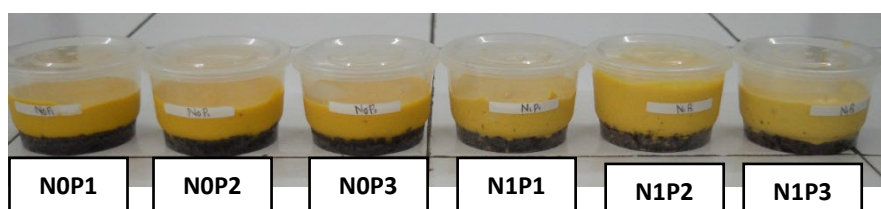


Figure 8. Canistel Mousse Dessert

Information

N0: Animal Ingredients	P1: CMC
N1: Vegetable Ingredients	P2: Gum Arabic
	P3: Jelly Powder

5. Conclusion

Based on the research that has been done, the following conclusions can be drawn:

The best interaction treatment based on its nutritional content was obtained from the treatment of vegetable-based recipe formulas combined with CMC stabilizer containing 2.35% crude fiber and 8.83% fat.

Based on the organoleptic test, the interaction selected by the panelists was the treatment of animal ingredients formula combined with CMC stabilizer where the mousse produced had a taste and aroma in the category of like, soft texture and attractive mousse color, namely yellow-orange. Treatment of the recipe formula from vegetable ingredients resulted in a better quality dessert mousse than animal ingredients in the fat content of 8.53% and crude fiber content of 1.76%. Treatment of animal ingredients recipe formulas is better than

vegetable ingredients for organoleptic quality with quite favorable taste and aroma, soft texture and yellow color.

The treatment of CMC stabilizer was better than arabic gum and jelly powder at the fat content of 11.26% and crude fiber content of 1.56% also organoleptic quality that produced a soft texture canistle mousse dessert

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