

Conference Paper

Characteristics of Barlin Banana Velva (*Musa acuminata*) With the Addition of Katuk Leaf Extract (*Sauropus androgynus* (L.) merr) And CMC Concentration

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ABSTRACT

Barlin banana contain high nutrients but are not widely processed. Barlin banana velva with the addition of katuk leaf extract will produce a frozen dessert product that is high in nutrition. The addition of CMC (carboxy methyl cellulose) is expected to improve the physicochemical properties of the Velva. This research aimed to determine the effect of katuk leaf extract addition and CMC concentration on the physical, chemical, and organoleptic characteristics of barlin banana velva. This research used a Completely Randomized Design factorial pattern of two factors. Factor I was the addition of katuk leaf extract (2%, 4%, and 6%) and factor II was the concentration of CMC (0.5%, 0.6%, and 0.7 %). The data obtained was then analyzed using analysis of variance, if there were differences, it was continued with the Duncan test (DMRT). The results showed that the best treatment was on the addition of katuk leaf extract 6% and the concentration of CMC 0.5 % which produced barlin banana velva with water content of 70.76%, total solids 29.21%, antioxidant activity 29.15%, total phenols 1.007 mg TAE/g, vitamin C 35.49 mg/100gr, overrun 19.76%, melting time 19.33 minutes, and viscosity 2.16 Pa.s, hedonic organoleptic tests include taste 3.241 (liked a bit), aroma 3.068 (liked a little), texture 3.860 (like), and color 3.724 (like).

Keywords: Velva, barlin banana, katuk leaf, CMC

Introduction

Velva or often called frozen dessert made from fruit puree with a texture similar to ice cream. This product is made from a frozen mixture of fruit puree, sucrose, and stabilizers to obtain a smooth texture resembling ice cream (Kesuma, 2011). Velva has a low-fat content because it is made from fruit. According to Dewi et al. (2017), the fruit used to make velva is a fruit that has thick flesh and a distinctive aroma and taste, such as mango, banana, guava, jackfruit, and pineapple. One of the commodities that can be processed into Velva products is bananas.

Bananas are a fruit that can be consumed by all ages without side effects, are easy to obtain, and are relatively cheap compared to other fruits. East Java is the second largest contributor of bananas in Indonesia. One type of banana variety in East Java is the barlin banana. Barlin bananas are quite popular bananas and are popular as table fruit in the East Java region (Hapsari & Masrum, 2011). One alternative use of barlin banana fruit is to process it into a frozen product, namely velva.

Barlin bananas have high nutritional value but are currently sold at cheap prices and for consumption only. The shelf life of barlin bananas is quite low, namely less than 5 days (Khasanah & Marsusi, 2014). According to Hapsari and Masrum (2011), barlin bananas have a sweet taste and the highest potassium and water content compared to green Ambon, Raja Bandung, and Kepok bananas, namely 375 mg/100 g and 80.94%. The nutritional content of the velva produced really depends on the raw materials. The unique aroma and taste of fruit give Velva products an appeal that differentiates

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them from similar products (Damanik et al., 2018). So that the nutritional value of Velva products can be increased, another raw material, namely katuk leaves, is added.

Katuk with the scientific name *Sauropus androgynus* (L.) Merr has many uses such as treating boils, fever, and dirty blood. Another benefit of katuk which is widely known by the public is that it stimulates breast milk/lactagogum. Along with the development of science and technology, many studies have been carried out to prove the effectiveness of katuk leaves, especially as a breast milk enhancer. Theoretically, compounds that have a lactagogum effect include sterols. Sterols are compounds in the steroid group. These compounds can be obtained from local food, namely katuk leaves (*Sauropus androgynus* (L) Merr). According to Dedi et al. (2017) stated that the phytosterol content of katuk leaves, namely stigmasterol, sitosterol, and fukosterol obtained by extracting katuk flour with 70% ethanol is 2.43% (2.43 g/100 g) or 2433.4 mg/100 g dry.

The consumption of katuk leaves can be in the form of a decoction, processed as a vegetable, or in the form of an extract that has been made into a standardized herbal medicine preparation (Margono, 2013). According to research by Dedi et al. (2017), katuk leaves have higher chlorophyll levels compared to suji leaves. Green coloring from suji leaves and katuk leaves is often used as a green coloring agent in food, the chlorophyll content can be used as a source of green coloring material. The problem faced in making fruit velva is that the texture is rough and melts quickly, therefore a dough stabilizer is needed with a type and concentration that suits the character of the fruit. The main function of stabilizers is to bind water in the dough so that the formation of large ice crystals can be avoided, and also to maintain the body and texture of the product during storage (Sakawulan et al., 2014). One of the stabilizers commonly used to make velva is CMC.

CMC is a semi-synthetic gum produced from the reaction between alkaline cellulose and sodium monochlor acetate. This thickening agent, which is widely used in the food industry, is in the form of a white powder and is widely used in coating formulations to protect food ingredients from mass transfer (Djarmiko, 1991). CMC is used to give the product consistency and texture, where CMC acts as a water binder, thickener, and stabilizer. CMC can increase the viscosity of the solution because it can bind water through hydrogen bonds (Glicksman, 1969).

Therefore, researchers will conduct research aimed at finding out the effect of adding katuk leaves and CMC to the physical, chemical, and organoleptic characteristics of barlin banana velva and to obtain the best treatment.

Material and Methods

The ingredients used in making velva are ripe Barlin bananas obtained from Betro Market, katuk leaves from Surabaya, sugar and citric acid obtained from Betro Market, CMC food grade. The materials used for analysis include distilled water, starch, boric acid, tannic acid, Kjedahl tablets, Na₂CO₃, ethanol, methanol, H₂SO₄. The tools used include basins, knives, scales, ice cream makers, blenders, freezers, thermometers, stirrers, analytical scales, measuring cups, glassware, ovens and other analytical tools. Ingredient preparation includes making katuk leaf extract, namely washing katuk leaves, blanching for 5 minutes, and blending with the addition of water 1:1 then filtering. The manufacture of banana puree includes washing, sorting, blanching at 90°C for 5 minutes, mashing with the addition of water 1:1 then filtering. The manufacture of velva includes mixing 200 mL of banana puree with Na CMC (0.5%, 0.6%, 0.7%) (w/v), 0.1% citric acid (w/v), and puree. katuk leaves 1:1 as much as (2%, 4%, and 6%) (v/v) with a blender for 10 minutes. then aged in a 5°C refrigerator for 12 hours, frozen in an ice cream maker for 30 minutes packaged in plastic cups, then placed in the freezer at a temperature of – 20°C for 24 hours. The product is then analyzed including water content, overrun, total solids, antioxidant activity, vitamin C content, melting time, Total Phenol, and Organoleptic tests (taste, aroma, color, and texture).

The research design used was a completely randomized design (CRD) with a factorial pattern consisting of 2 factors, namely the addition of katuk leaf extract (2%, 4%, and 6%) and the concentration

of Na - CMC (0.5%, 0.6%, and 0.7%) where each treatment was repeated 3 times. The data obtained were analyzed using a test of variance (ANOVA) with a 5% confidence interval to determine whether there was an effect on each treatment. If there is a real effect between treatments, the DMRT test will be continued with a level of 5%.

Results and Discussion

Raw material analysis

The results of the analysis of raw materials from katuk leaf extract and barlin banana puree on several components, namely antioxidant activity, vitamin C content, total solids, water content, total phenols, protein content, and fat content can be seen in Table 1. Differences in the results of the analysis can also be caused by the test methods used in the preparation of chemical samples and different analytical instruments, which can also cause different analysis results. The difference in analysis results with the literature can be influenced by the age of the fruit, climatic conditions, place of growth, methods of maintaining and harvesting the fruit, and post-harvest storage of the fruit.

Table 1. The results of the analysis of Katuk leaf extract and barlin banan puree

Parameter	Katuk leaf extract		Barlin Banana Puree	
	Analysis	Literature	Analysis	Literature
Antioxidant activity (%)	84.73	85,63	45.06	47.76
Vitamin C (mg/100g)	311.2	314,3	23.46	25.54
Total Solids (%)	5.99	4,52	28.58	19.06
Water content (%)	94.01	95,48	71.42	80.94
Total Phenols (mg TAE/g)	2.46	1,49	0.12	0.14
Protein content (%)	8.12	8,32	-	-
Fat content (%)	8.76	9,06	-	-

Physicochemical analysis

Based on the result of statistical analysis, there was a significant interaction ($p \leq 0.05$) between the volume of katuk leaf extract and CMC concentration for the parameters of water content, overrun, viscosity, melting time, total solid, vitamin C, antioxidant activity, and total phenols. Table 2, showed the average value of water content, overrun, viscosity, melting time, total solid, vitamin C, antioxidant activity, and total phenols of Barlin banana velva affected by the volume of katuk leaf extract and CMC concentration.

Table 2. The average value of water content, overrun, viscosity, melting time, total solid, vitamin C, antioxidant activity, and total phenols of Barlin banana velva

Treatment		Water Content (%)	Overrun (%)	Viscosity (Pa.S)	Melting Time (minute)	Total Solid (%)	Vit. C Content (%)	Antioxidant Activity (%)	Total Phenols (mg TAE/g)
Vol. of katuk leaf extract (%)	CMC concentration (%)								
2	0.5	73.35 ±0.11 ⁱ	26.39 ±0.21 ⁱ	1.60 ±0.08 ^a	13.33 ±0.58 ^a	26.65 ±0.11 ⁱ	19.92 ±0.28 ^a	17.79 ±0.49 ^a	0.22 ±0.01 ^a
	0.6	72.88 ±0.07 ^h	24.78 ±0.22 ^g	1.80 ±0.05 ^b	13.67 ±0.58 ^b	27.12 ±0.07 ^h	20.39 ±0.67 ^a	17.89 ±0.49 ^b	0.41 ±0.02 ^b
	0.7	72.71 ±0.06 ^g	23.86 ±0.31 ^f	1.90 ±0.04 ^c	16.3 3±0.58 ^d	27.29 ±0.06 ^g	22.88 ±0.88 ^b	21.01 ±0.67 ^c	0.48 ±0.02 ^c
	0.5	72.55 ±0.09 ^f	25.33 ±0.31 ^h	1.99 ±0.15 ^d	14.67 ±0.58 ^c	27.45 ±0.09 ^f	26.69 ±0.51 ^c	20.58 ±0.85 ^c	0.69 ±0.03 ^d
4	0.6	72.35 ±0.13 ^e	22.56 ±0.23 ^e	2.13 ±0.03 ^e	17.33 ±0.58 ^e	27.65 ±0.13 ^e	31.39 ±0.51 ^d	22.40 ±0.81 ^d	0.73 ±0.02 ^e

To be continued...

6	0.7	72.08	19.85	2.14	18.33	27.92	35.05	26.69	0.94
		±0.01 ^d	±0.23 ^d	±0.03 ^e	±0.58 ^f	±0.01 ^d	±0.25 ^e	±0.64 ^e	±0.02 ^f
	0.5	70.79	19.08	2.16	19.33	29.21	35.49	29.15	1.01
		±0.06 ^c	±0.29 ^c	±0.11 ^e	±0.58 ^g	±0.06 ^c	±0.51 ^e	±0.19 ^f	±0.02 ^f
	0.6	70.66	18.71	2.28	20.33	29.33	43.71	29.90	1.12
		±0.04 ^b	±0.30 ^b	±0.12 ^f	±0.58 ^h	±0.04 ^b	±0.51 ^f	±0.19 ^g	±0.01 ^g
	0.7	70.37	16.84	2.70	21.33	29.63	46.35	30.87	1.26
		±0.13 ^a	±0.19 ^a	±0.02 ^g	±0.58 ⁱ	±0.13 ^a	±0.25 ^g	±0.32 ^h	±0.03 ^h

Description: The average value accompanied by different letters expresses a significant difference ($p \leq 0.05$).

Table 2 shows that the higher the volume of katuk leaf extract and the CMC concentration, the lower the water content of barlin banana velva. This is because increasing the volume of katuk leaf extract causes the protein content in the velva to become higher so that the protein can bind water molecules through hydrogen bonds causing the water content in the velva to decrease. According to Puteri et al. (2015), there is a decrease in water content due to the protein interaction mechanism so water cannot be bound perfectly because the hydrogen bonds that should bind water have been used for protein interactions. Apart from that, CMC, which is a stabilizer, can increase total solids so that the water content decreases. According to Cahyadi et al. (2017), stabilizers will increase the solids in the product so that the water content will decrease. The water contained in the sorbet is bound by the CMC stabilizer so that it becomes bound water and is difficult to free.

The overrun in barlin banana velva is influenced by the fiber content of katuk leaf extract, the decrease in overrun is caused by the chemical composition of raw materials including fiber content. Apart from that, CMC also has an effect, where adding CMC can cause the thickness of the dough to increase, making it difficult for the dough to rise. According to Oktajaya et al. (2018) stated that as the hydrocolloid concentration is added, the mixture becomes thicker, and the surface tension of the gel increases. However, up to a certain point surface tension that is too high will prevent air from entering the dough so that the overrun becomes low.

The higher the volume of katuk leaf extract and the CMC concentration, the higher the viscosity of barlin banana velva. This is because the addition of katuk leaf extract increases the total solids in the velva so that it can increase the viscosity. The higher CMC concentration causes the viscosity to also increase. This is because the stabilizer has one function, namely increasing viscosity. According to Basito et al. (2018), the presence of CMC in solution tends to form cross-links in polymer molecules which causes solvent molecules to be trapped in them, forming a molecular structure that is rigid and resistant to pressure. The higher the CMC content, the greater the formation of cross-links and the immobilization of solvent molecules is also higher, causing a tendency for viscosity to increase.

The higher the volume of katuk leaf extract and the CMC concentration, the greater the melting time of Barlin banana velva or the longer it takes to melt. This is because the decrease in the freezing point of velva is influenced by the content of the materials used, one of which is fiber. The fiber content in katuk leaves is 1.5 g/100 g, allowing for greater water absorption. The more water molecules trapped in the matrix cause the voids between the matrix to become denser and more difficult for air to penetrate, resulting in the dough becoming thick and the melting time slowing down (Basito et al., 2018). And then CMC can optimize the water binding strength so that the resulting viscosity increases and the melting time becomes slower. According to Yudhistira et al. (2018) states that the stabilizer's ability to bind water causes water molecules to be trapped in the gel structure produced by the stabilizer so that the viscosity of the dough increases and the melting power of the ice cream increases.

In total solid, The higher the volume of katuk leaf extract and the CMC concentration, the greater the total solids of Barlin banana velva. This is because the higher the volume of katuk leaf extract, the higher the total solids in the velva in the form of a solid fraction originating from katuk leaves in water as a solution fraction. Adding CMC concentration to the velva to add weight or increase total solids.

According to Kesuma (2011), in making pineapple velva, the higher the stabilizer added, the higher the total solids produced.

In vitamin C content, the higher the volume of katuk leaf extract and the CMC concentration, the higher the vitamin C of barlin banana velva. The addition of katuk leaf extract causes an increase in the vitamin C levels of Velva products because the analysis results show a value of 311.2 mg/100 gr. Apart from that, according to Puteri et al. (2015), increasing the addition of CMC causes stable ingredients and water-soluble vitamin C to be bound by CMC, so that the damage to vitamin C will be smaller. Risnawati (2015) stated that the addition of hydrocolloids can maintain the vitamin C and antioxidant content in ingredients because hydrocolloids form a matrix that functions to protect sensitive components such as vitamin C and antioxidants.

In antioxidant activity, the addition of katuk leaf extract causes an increase in the antioxidant activity levels of Velva products because katuk leaves have an antioxidant activity of 84.73%. Suwanti (2016) stated that katuk leaves contain tannins, saponins, flavonoids, vitamin C, β -carotene which have antioxidant properties. The higher the concentration of CMC added to velva, the higher the antioxidant activity produced. According to Herawati (2018), hydrocolloids have characteristics that can absorb and bind water well, so that in making food products they can be used as additional ingredients for stabilizers, texture formers and water absorbers.

In total phenol, the higher the volume of katuk leaf extract and the CMC concentration, the more total phenols of barlin banana velva increase. The addition of katuk leaf extract caused an increase in the total phenols of the Velva product because katuk leaves had a total phenol of 2.46 mg TAE/gr. According to Andarwulan et al. (2010) the flavonoids in fresh katuk leaves are 143 mg/100 g of fresh leaves. Flavonoids are a class of phenolic compounds (Zuraida et al., 2017). Apart from that, the increase in total phenol content in the velva treatment is because CMC is a hydrocolloid that has hydroxyl groups that can function as a protector for phenolic compounds by forming a double helix structure. The more double helix formed from hydrocolloids, the stronger the ability to protect phenolic compounds so that fewer phenolic compounds are damaged.

Sensory evaluation

Based on Friedman's test, it was shown that the addition of katuk leaf extract and CMC concentration were significantly different ($p \leq 0.05$) on the taste, color, aroma and texture of the Barlin banana velva produced. The average value of preference for taste, color, aroma and texture of Barlin banana velva with different addition of katuk leaf extract and CMC concentration can be seen in Table 3.

Table 3. Average value of preference for taste, color, aroma and texture in Barlin banana velva

Treatment		Taste	Color	Aroma	Texture
Katuk leaf extract (%)	CMC concentration (%)				
2	0.5	3.52	2.93	3.45	3.59
	0.6	3.31	2.90	3.48	3.41
	0.7	3.69	3.00	3.55	3.21
4	0.5	3.62	2.79	3.28	3.34
	0.6	3.48	2.97	3.48	3.62
	0.7	3.59	2.83	3.52	3.62
6	0.5	3.24	3.72	3.07	3.86
	0.6	3.00	3.41	3.03	3.55
	0.7	3.10	3.48	2.90	3.48

Description: The greater the value, the more preferred

Based on Table 3, the panelist's preference for the highest taste was obtained in the treatment of the addition of katuk leaf extract 2% and a CMC concentration 0.7%. The taste of the product is mainly influenced by katuk leaf extract which has an astringent taste derived from flavonoid compounds (Dewi et al., 2017). Panelists preferred velva with a little addition of katuk leaf extract. The response of the panelists to the color preferences obtained the highest color preference in the treatment of the addition of katuk leaf extract 6% and CMC concentration of 0.5%. The product color is mainly influenced by katuk leaf extract as a natural green dye, the higher the addition of katuk leaf extract, the more preferred by the panelists. The panelists preference for aroma showed a significant effect, where the highest taste was obtained in the treatment with the addition of 2% katuk leaf extract and 0.7% CMC concentration. The aroma of the product is mainly influenced by katuk leaf extract which has a pleasant aroma. In other words, the panelists preferred velva with a little added katuk leaf extract. The panelists preference for the highest textured was obtained in the treatment of the addition of katuk leaf extract at 6% and a CMC concentration of 0.5%. The addition of katuk leaf extract caused an increase in total solids in the velva. In accordance with Arbuckle (2000), total solids will replace the amount of water in the dough and improve the body and texture. The higher the CMC concentration, the viscosity of the product will increase. In accordance with Yudhistira et al. (2018) statement, that with increasing viscosity, more water is trapped so that the formation of ice crystals can be prevented and produces a soft texture.

Effectivity test

Effectiveness tests are carried out to determine the best treatment. Based on the results of effectiveness tests on all research parameters including physicochemical tests and sensory evaluation, treatment with the addition of 6% katuk leaf extract and 0.5% CMC concentration was the best treatment with antioxidant activity results of 29.15%. overrun of 19.77%, water content 70.79%, total solids 29.21%, melting time 19.3 minutes, vitamin C content 35.49 mg/100g, viscosity 2.16 Pa.s, total phenols 1,01 mg TAE/gr, and organoleptic tests included aroma 3.07 (liked a little), taste 3.24 (liked a bit), color 3.72 (like), texture 3.86 (like). Next, the best treatment for the product will be tested for protein content and fat content.

Conclusion

The additions of katuk leaf extract and CMC concentration have a significant effect on the characteristics of the resulting Barlin banana velva. The best treatment was obtained in addition to 6% katuk leaf extract and 0.5% CMC concentration with the results of antioxidant activity 29.15%. overrun 19.77%, water content 70.79%, total solids 29.21%, melting time 19.3 minutes, vitamin C content 35.49 mg/100g, viscosity 2.16 Pa.s, total phenols 1,01 mg TAE/gr and organoleptic tests included aroma 3.07 (liked a little), taste 3.24 (liked a bit), color 3.72 (like), texture 3.86 (like).

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