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Melting time and physical characteristic of ice cream in addition if banana flour as stabilizer

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Abstract
Banana contains high of carbohydrate and pectin, so it can be used as stabilizer in various food products. One of a product that need stabilizer is ice cream. This mini experiment was aimed to determine the effect of banana flour addition to the melting time of banana ice cream. Melting time is crucial in evaluating the quality of ice cream. The method used in this research is descriptive methods. The variable analysed in this research is the concentration of banana flour addition (0%, 5%, 15%, and 25. The result of this research showed that 5% is the finest concentration of banana flour addition in banana ice cream making.

Keywords: banana, banana flour, ice cream, melting time

1. Introduction
Banana plant fruit initially found in Southeast Asia. These fruit plants then spread to the African region (Madagascar), South America and Central America. Bananas (*Musa paradisiaca* L.) abundantly grows in Indonesia. Based on data from the Central Bureau of Statistics, the national production of bananas per year to reach 7.29 million tons. Although the number of banana production in Indonesia very much, but the results of post-harvest loss is still quite high. This is due to the limited use of bananas for further processing. banana flour can be used as composite flour in the manufacture of various food, for example several varieties of snacks and bakery [1]. Diversification of banana still tend to be a bit limited especially in the scale of industrial products.

Bananas are aa good source of nutritions, vitamins, and minerals. It contain mostly carbohydrates therein namely contained starch content reaches approximately 70% [2]. In fresh banana fruit the starch has a amylose:amylopectin ratio of 20.5%:75.5%. Banana starch gelatinisation temperature higher than on other minor tubers alternative flour [3], it is suspected because of the strong bond in the starch granules. Banana starch granule is considered as large size with an average size between 20-50 μm [4]. The size of a large banana starch has the potential to be used as a stabilizer in the manufacture of various products.

One kind of product that used stabilizer regularly is ice cream. Ice cream was a frozen food which applied milk as a key ingredients. Ice cream is usually added with other ingredient such as stabilizer and sweetener. Bananas which both in the form powder or in the fresh condition form be used as an ice cream product. The nature of the banana starch after being dried is changed. It lead to changes in properties of the resulting ice cream. This study aims to determine the effect of different concentration in the addition of banana flour both as a filler material and also stabilizer in banana ice cream making.

2. Methods
Tools and materials
Materials used in this study is optimum-ripened Cavendish bananas, milk, sugar and Candi Banana flour. The tools used in this study is the freezer, blender, ice cream maker, measuring cups, ice cream cup, soft-ware colori meter, refrakto meter, pH meter, stopwatch, analytical balance, and the viscometer.

Ice cream making process
First performed is 100 grams of bananas diced and frozen for 120 minutes. Afterthat, the banana crushed with a blender and added 20 grams of sucrose, 100 ml of liquid milk and banana flour with varying concentrations of 0%, 5%, 15% and 24%. Each treatment was repeated 3 times.

Melting time [5]
The melting power measurement based on the time required to melt the ice cream fully at room temperature. Measurement is done by taking a scoop of ice cream -20ºC temperature and placed in a container or dish. The ice cream was left to thaw at room temperature and a perfect melting time is measured using a stopwatch.

Color analysis [6]
Ice cream was analyzed using a colorimeter software 3 times observations on 3 different places. Color measurement is done using the color reader by placing the sample in a white container with a diameter of 5 cm ± 2 cm thickness. With adequate lighting, color reader then brought closer to the sample to read the degree of color brightness (L), redness (a) and yellowness (b). The results of the analysis of data recorded

Overrun [7]
Development of ice cream volume overrun and expressed as a value calculated based on the difference in volume

Beginning with volume dough ice cream end is formed. Overrun value is calculated based on the formula:

$$Overrun = \frac{V2 - V1}{V1} x100\%$$

PH measurements

PH measurement is done by dipping a pH meter probe into stirred ice cream.

Total Solid Measurements

The sample dripped on the refractometer prism, and then observed the screen reader of refractometer.

4. Results and discussion

Melting time

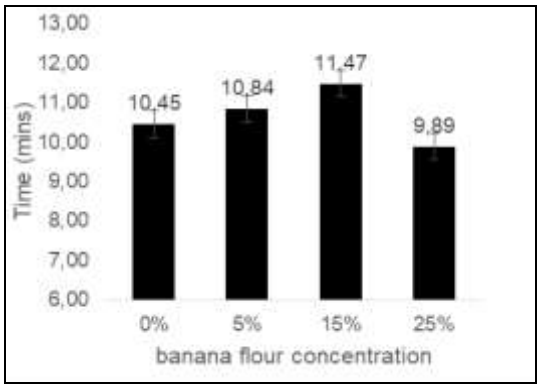

Fig 1: The effect of banana flour concentration to melting time of banana ice cream

The result of the melting of banana melting time can be seen in Figure 1. Base on the test results it could be seen that the longest melting time can be achieved with the addition of banana flour at the value of 15% (w/w). Lowest melting time achieved by the addition of banana flour as much as 25% (w/w). Melting time of ice cream is closely related to the thickness of the ice cream. This ice cream viscosity also determines the texture of ice cream. Until the addition of banana flour 15%, the higher addition of banana flour resulted in the increase melting time. But the addition of 25% banana flour melting time decreases due to the addition of banana flour is too much that the mixture is too hard. According to Flores [8], between 10-15 minutes of ice cream melting time is concodered as good qualuty. This shows that the addition of up to 15% of banana flour still meet the good criteria of melting time ice cream.

Color determination

Table 1: Effect of banana flour addition to ice cream color quality

Banana flour concentration in banana ice cream	Color analysis		
	L	a	b
0%	59,97±5,05	8,77±1,92	16,33±1,89
5%	54,57±2,83	10,50±2,03	17,10±3,02
15%	62,07±2,39	7,47±2,75	14,17±7,27
25%	67,67±10,30	7,73±1,62	15,77±3,36

Color is one of the most crucial quality attributes in the food processing industry, color can affect the level of consumer acceptance. In the manufacture of banana ice cream color is dull brown. It is might due to the activity of phenolic compound inbanana. The color of this ice cream should be camouflaged with colors matching the color of cocoa, for example dyes and Flavor of chocolate which also had brownish characteristic. The higher the addition of banana flour causes the color brightness slightly increased. This is because the treatment with sodium metabisulfite in making banana flour

Over run determation

The higher the over-run value means the better quality of ice cream. Industrial ice cream over the run value is around 70-80%. But for house hold production the value usually run over 30-50% (Arbuckle 1986). Small value of ice cream over-run in the household industry is due to the absence of air injection at the time of freezing. The effect of banana flour addition to the ice cream over run value can be seen in fig2. The highest overrun value achieved by 5% banana flour addition. Above 5%, addition, the value is decreasing. The smallest number of overrun value achieved by 25% banana flour addition. The values of ice cream over run affected by the ice cream making process and composition[9]. This composition might focused in milk fat content and also the amount of stabilizer and dissolved solids inside the dough.

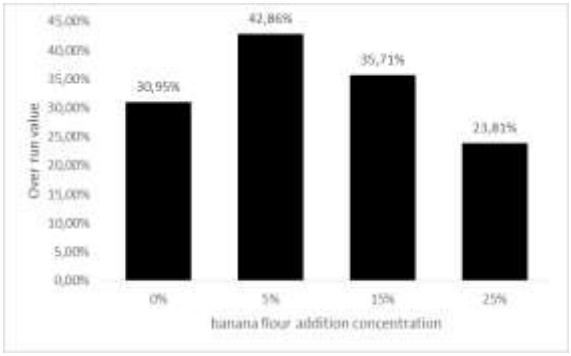

Fig 2: The effect of banana flour concentration to melting time of banana ice cream

Brix and pH value determination

This study showed that the addition of banana flour concentration resulted in 24,67-25 Brix (Fig3). There was no differences between total solid content of ice cream in different banana flour concentration. This study showed that the pH value of this banana ice cream (5.2-5.3) (fig4). It was indicated that the use of fully ripened banana still have potential to make acid taste of ice cream. The acid taste should be neutralized using addition of another flavor and sweeteners. The composition should be readjusted.

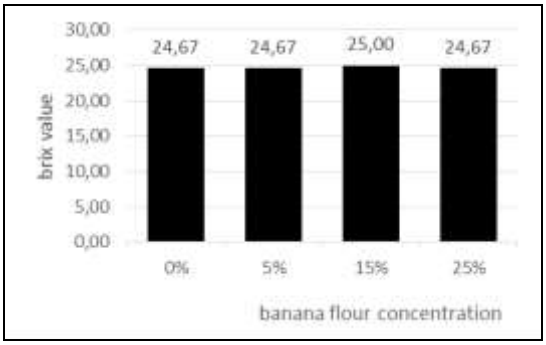

Fig 3: The effect of banana flour concentration to total solid (brix)

value of banana ice cream

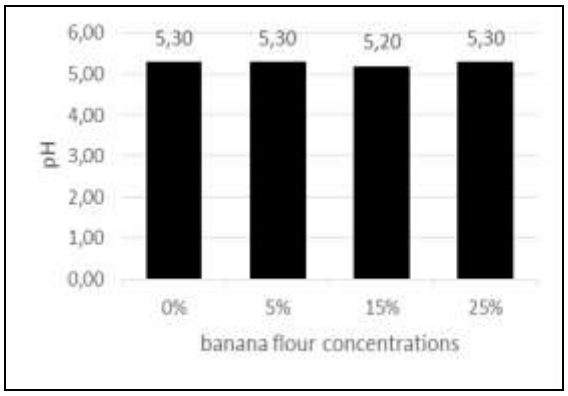

Fig 5: The effect of banana flour concentration to pH value of banana ice cream

5. Conclusion

Based on the research, it can be concluded that the addition of 5% is the best concentration of banana ice cream making. Where in this concentration has the characteristics of over-runs and time melting enter both categories, in addition, an acquired taste is not too sour. Furthermore, the addition proportion of banana flour can be continued for the manufacture of ice cream banana.

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