Physical characteristics of ice cream with the addition of tangerines (*Citrus reticulata*)

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Abstract. The addition of fruit can improve the taste of the ice cream. One type of fruit that can be used as an additional ingredient is mandarin orange or tangerines *(Citrus reticulate)*. This study aimed to determine the effect of the addition of tangerines to pH, melting power and *overrun*. This research was conducted at the Dairy Processing Biotechnology Laboratory, Faculty of Animal Husbandry, Hasanuddin University, Makassar. The ingredients used are full cream milk, water, sugar, yolk, tangerines, *whippy cream*, vegetable fat, and cornstarch. This research was conducted completely randomly (CRD) with 4 treatments and 3 replications. The results clearly showed that the addition of different tangerine levels did not affect the pH value of the ice cream. Additionally, the higher level of tangerine addition resulted in a decrease in *overrun* value and slowed the melting power of the ice cream. Hence, in making ice cream it should be consisted of tangerines at a level of 15% by considering *overrun* and melting power of the ice cream.

1. Introduction

Nowadays, dairy products are progressively easy to find in the market. Dairy products are generally accepted after a series of developments in processing research. Certainty, that go through various research processes such as fermented products [1–5], powder products [6] health drink products [7–11]. Ice cream is one of the dairy products which is also very popular nowadays. Various researches on the development of ice cream continue to be carried out [12,13]. As currently known, ice cream is commonly used as a dessert or snack with various flavor innovations. However, ice cream with the addition of fruit adds to the taste and level of preference. The addition of fruit can improve the taste of the ice cream. In some analyses, one type of fruit that can be used as an additional ingredient is tangerines *(Citrus reticulate)*. Tangerines are a type of tropical fruit that is quite high in vitamin C and antioxidants. It has a sweet taste with orange flesh. The high citric acid content can improve flavor, mask odors, and provide a refreshing effect and this type of fruit is relatively inexpensive and easy to obtain. Tangerines have been used in the processing of dairy products, one of which is in making cheese but is rarely used in making ice cream. Characteristics of tangerines with sweet and sour taste and the color of the orange flesh on tangerines will affect the final quality of ice cream. The addition of tangerines to ice cream will give a new flavor and increase the nutritional content of the product. In addition, the fiber in tangerines makes it possible to add to the total value of the ice cream solids. Total solids will give a soft texture

and slow the melting power of ice cream. This study aims to determine the effect of the addition of tangerines to pH, total acid, melting power, *overrun.*

2. Materials and method

The ingredients used were full cream milk, water, sugar, egg yolk, tangerine, *whippy cream*, vegetable fat, and cornstarch. The equipment used in this research are analytical scales, stainless steel bowls, pans, *freezer, mixer*, measuring cup, thermometer, ice cream cups, plastic wrap, label paper.

This research was conducted completely randomized (CRD) with 4 treatments and 3 replications. The treatments consisted of 10%, 15%, 20% and 25% addition of tangerines.

2.1. Research and procedure

Washed citrus fruit. Oranges are then divided into two parts and then squeezed oranges Orange juice will be added later in the making of ice cream. Making ice cream is made with a percentage of *full cream milk* 10% (w/v), 12% vegetable fat (w/v), 8% *whippy cream* (w/v), 0.5% cornstarch (w/v), 7% sugar (w/v), egg yolk 1.5% (w/v), tangerines respectively 10% (v/v), 15% (v/v), 20% (v/v) and 25% (v/v).

The dough mixture was pasteurized at 75°C for 25 seconds and cooled at room temperature. Subsequently cooled at 4°C for 24 hours then homogenization with a mixer for ± 15 minutes medium speed. Finally, the packaging in a cup and storage in the *freezer* at a temperature of ± -180°C.

2.2. Measured parameters

The parameters measured in this study were pH, overrun, and melting power with the addition of each level of tangerine *(Citrus reticulata)*.

2.3. Data analysis

Data were analyzed variously and processed with SPSS 22. Treatment that showed influence, was tested further by the Duncan method.

3. Result and discussion

3.1. PH value of tangerine ice cream

Potential hydrogen (pH) or acidity is used to express the acidity or base level of the solution. The pH value is determined by the concentration of H2O and -OH ions in it, which is formed by the dissociation of acids and bases. The pH value of ice cream with the addition of tangerines is presented in figure 1.

The pH value of ice cream decreased with the addition of tangerines. Essentially, the average pH value of ice cream with the addition of tangerines ranged from 5.26 to 5.4. There is a decrease in the pH value of ice cream with the addition of tangerines because tangerines contain acidic organic vitamin C compounds. This acidic nature affects the acidity level or pH value in the final product of ice cream processing.

Variance analysis showed that the different levels of tangerine addition to the processing of ice cream did not significantly affect the pH value. This happens because the level of acidity in citrus fruits varies. Tangerines are a type of orange that is commonly consumed by the public because they are not too sour but not too sweet, so they are usually used in syrup processing or added to candy preparations. This is in accordance with the opinion [14] which states that there are various types of oranges so that the acidity level of oranges is also different, such as tangerines, different from others.

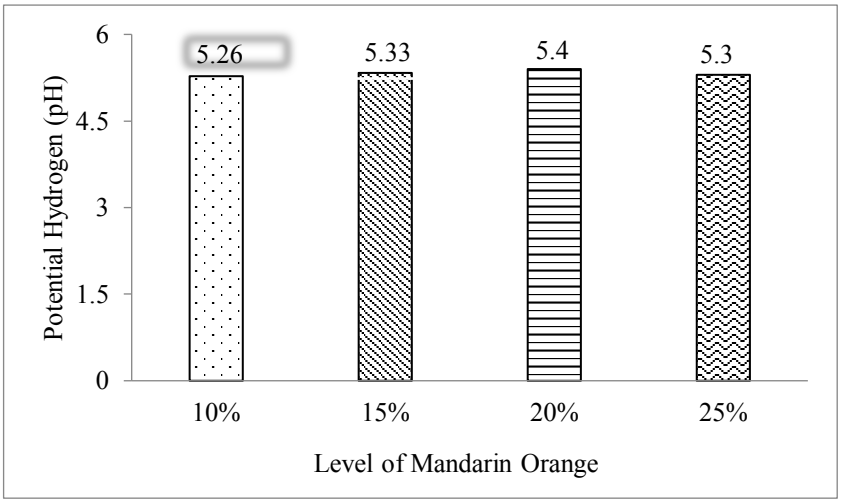
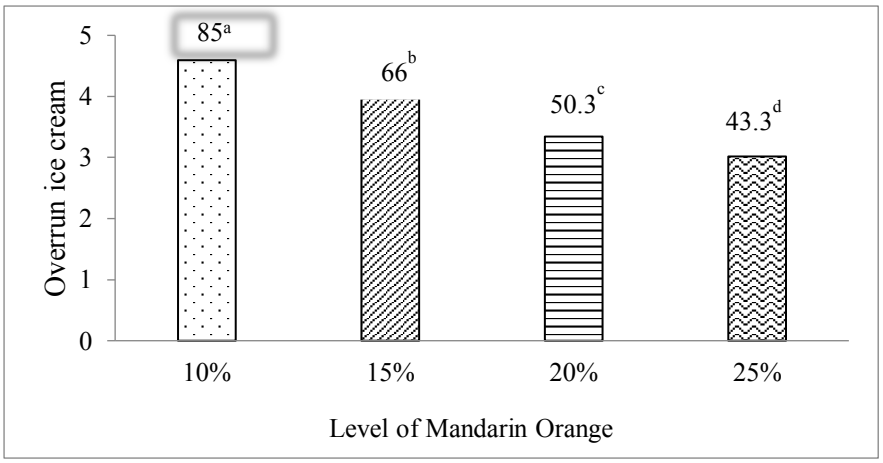


Figure 1. Potential Hydrogen (pH) ice cream with the addition of tangerines at different levels

3.2. Overrun tangerine ice cream

Overrun is a volume development, namely the increase in volume between before and after the freezing process. *Overrun* is one of the factors that can affect the structure of the ice cream. Ice cream overrun with the addition of tangerines is presented in figure 2.



Note: Different superscripts show very significant differences ($p < 0.01$).

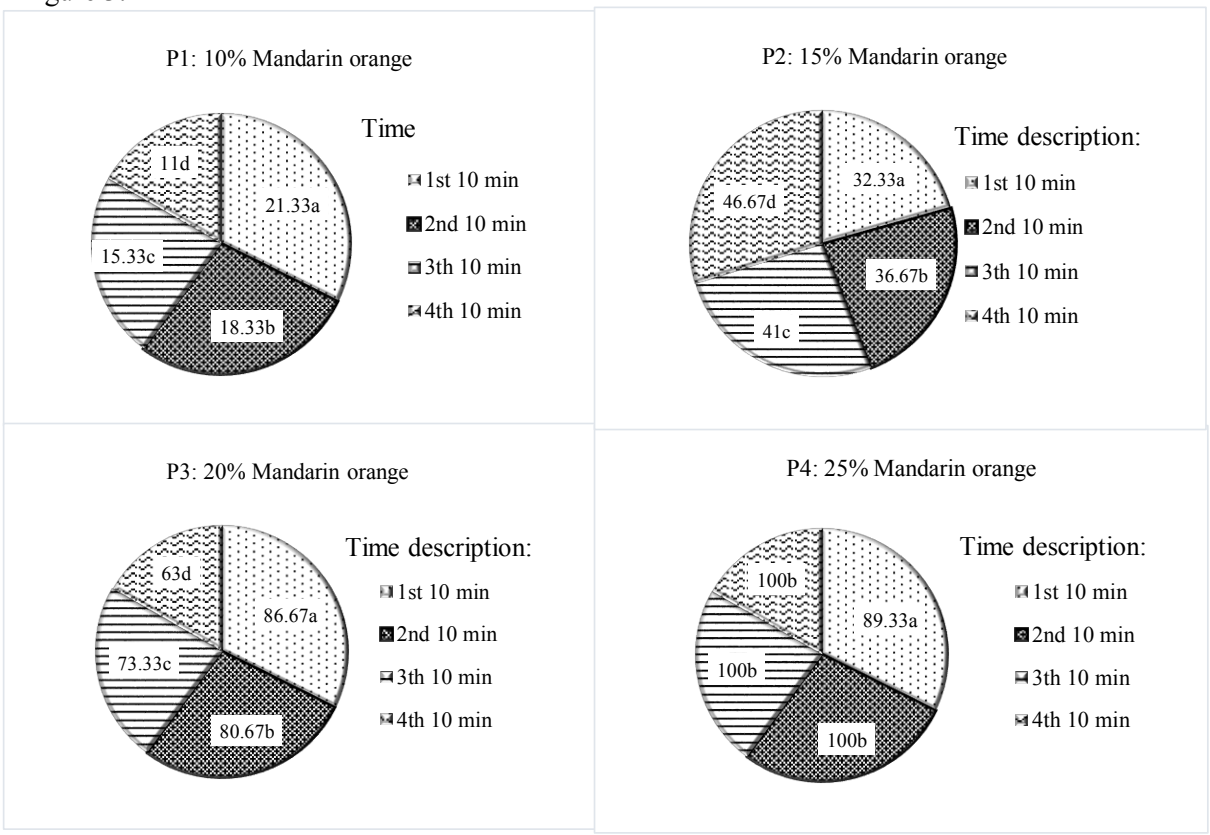
Figure 2. Ice cream overrun with addition of tangerines.

Ice cream *overrun* has decreased in line with the increase in the level of tangerines added to the ice cream processing. The average overrun of ice cream with the addition of tangerines ranged from 43.3–85%. The decrease in ice cream *overrun* was due to tangerines which are high in fiber. This is in accordance with the opinion [15] which states that tangerines are a type of citrus which is rich in vitamin C and fiber which is good for digestion. The existence of this high fiber content can affect the thickness of the ice cream dough in embedding air so that during further processing the ice cream dough is difficult to expand and affects *overrun*.

Analysis of variance showed that the level of tangerine addition had a very significant effect on ice cream overrun. The results of Duncan's continued test ($P<0.01$) showed that the ice cream *overrun* between each treatment of adding tangerines to the ice cream processing experienced a difference,

namely that overrun decreased with increasing use of tangerine levels. The decrease in overrun in ice cream was due to the fiber content in tangerines. Fiber can affect the thickness of the ice cream dough which makes it difficult for air to enter. This is in accordance with the opinion Tala Z Z (2009), which states that food fiber has a high water absorption, because the size of the polymer is large, the structure is complex and contains a lot of hydroxyl groups so it can absorb large amounts of water [16]. The higher levels of fiber produced, the more water is absorbed causing the ice cream mixture to become thick so that the ability to form air cavities that can trap air is low. Muse M R and Hartel W (2004), also states that a thick dough will cause a low *overrun*, because the dough has difficulty expanding and the air has difficulty penetrating the surface of the dough [17]. Ice cream with higher thickness will have greater resistance to melting.

Melting power is the time it takes for ice cream to melt completely at room temperature after going through the freezing process. The melting power of ice cream with the addition of tangerines is presented in figure 3.



Note: Different superscripts show very significant differences (P<0.01)

Figure 3. The melting power of ice cream with the addition of tangerines

Figure 3 clearly shows that the higher the level of adding tangerines to the ice cream processing, the longer the ice cream melting power time. The fastest melting power is at the treatment of 10% in the first 10 minutes. This is because the milk fat content is less causing a lower density of ice cream so that ice cream melts faster. The higher the level of tangerine added, the longer it takes for the ice cream to melt.

Variance analysis illustrated that the addition of tangerines had a very significant effect (P<0.01) on the melting power of ice cream. The results of Duncan's further test on the melting power of ice cream showed that there were differences in each treatment for the addition of tangerine levels in the ice cream processing. This is due to the high fiber content in oranges. The high fiber content causes the total solids to increase so that the ice cream melts longer.

Referring to SNI No. 01-3713-1995, that a good range of melting in ice cream is 15–25 minutes. Ice cream with the addition of tangerines in each treatment was classified as good. The quality of the ice cream is also determined by its melting power. Ice cream that melts easily or is too hard is not liked by consumers. Consumer acceptance of ice cream by assessing the ice cream is soft and not easy to melt at room temperature (±27°C). High fiber content in ice cream with the addition of pineapple can increase total ice cream solids. It melts quickly, due to the low solids used.

4. Conclusion

Increasing the tangerine level does not change the pH value, decreases the overrun value and slows the melting power of ice cream. In consequence, the use of tangerines in ice cream processing should use a level of 15%.

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