INTRODUCTION

Papaya (Carica papaya L.) is very common in tropical and subtropical countries such as in Indonesia and Latin American. In Indonesia, especially in Java, besides its being prepared for dessert (unprocessed), it is also prepared as processed products such as papaya juice and papaya candy. Papaya contains mainly ascorbic acid (Vitamin C) and vitamin A.

Manokwari is well known as a “fruit city” in Papua, where the production of papaya is very abundant. Unfortunately, papaya is a very perishable fruit. Therefore, there is a need for treatment or preserving so that it can stay longer and make food diversification. In Manokwari, unfortunately, there is no a common processed product of papaya. Hence, it is needed to introduce the manner in making papaya candy. This product has two advantages: namely, it can preserve the papaya and can enhance the preference of the consumers.

In making papaya candy, there are two main treatments usually done. First, the papaya candy is soaked in lime solution, and second it is soaked in sugar solution. The purpose of the former is to make papaya texture harder which in turn may enhance the consumer preference as well as for lengthen it shelf life. The latter, is to preserve the papaya so that the papaya is still edible in a longer period and retain its desired flavor.

Soaking papaya in lime solution has negative effect on vitamin contents, particularly vitamin C. It causes decrease in vitamin C content. Vitamin C is not stable in alkaline solution like lime solution. The papaya fruit is a main source of vitamin C (78 mg per 100 g fresh fruit). So, if such treatment is not considered, the role of the papaya as main source of vitamin C is over looked. Soaking in sugar solution also should be considered because vitamin C readily soluble in water.

Based on the statement above, there is a need to introduce the manner of making papaya candy to community living around the campus of UNIPA Manokwari. And to know the precise concentration of lime solution and length of time of soaking papaya in sugar solution in relation to produce high quality of papaya candy that can meet the preference of the consumers.

MATERIALS AND METHODS

Experimental Design

The experimental design used was Factorial in Completely Randomized Design (CDR) with two factors, namely, C (concentration of lime solution),
using four levels of concentration, and D (the length of soaking in saturated sugar solution), using four levels of the time lengths.

The treatments applied, were as follows: the soaking of the papaya for 2 hours in four levels of concentration of lime solution namely; 0% w/w (C1), 5% w/w (C2), 10% w/w (C3), and 15% w/w (C4).

The time length of papaya soaking in the saturated sugar solution, namely: 1 day (D1), 2 days (D2), 3 days (D3), and 4 days (D4).

The procedure of making papaya candy

Papaya was peeled and washed. Cut into pieces of 2.5 cm in length, 1.25 cm in width and 0.5 cm in thick. Then soaked in four concentration levels of lime solutions for 2 hour (0% w/w, 5% w/w, 10% w/w, and 15% w/w). Washed and drained, then soaked in saturated sugar solution with four different times (1 day, 2 days, 3 days and 4 days).

The Objective Tests

1. Determination of vitamin C
   Vitamin C will be determined by using tetrimetric method (AOAC, 1994). Ten grams of papaya and ten grams of axolic acid will be ground. Water up to 250 ml is added to the mixture and filtered. Ten milliliter of the mixture is titrated by standard dye solution until pink solution (AOAC, 1994)

2. Determination of water content.
   Water content will be detected by using directly heating method (AOAC, 1994)

3. Measurement of pH
   The pH will be measured by using pH-meter. Ten grams of the papaya candy is ground and pure water up to 50 ml is added. It is boiled and cooled. After cooling, the pH was measured (AOAC, 1994).

4. Measurement of hardness
   The hardness will be detected by putting weight on the papaya as much as 50 grams for 10 seconds. The unit used is mm/second

5. Detection of sugar content
   The sugar content will be determined by using refractometer. First, sugar is ground as much as 10 grams and weighed. Second, 10 ml aqua is added to sugar and mixed. Finally, the mixture is filtered and the sugar content of the filtrate is measured by using refractometer.

The Organoleptic Test

The preference of the consumers on the papaya candy will be tested using the preference test method (Kramer, 1955). The scores given are as follows: (1) not preferred, (2) less preferred (3) preferred, and (4) very preferred. Thirty people will be employed for this purpose.

RESULTS AND DISCUSSIONS

Objective Test

Vitamin C

The correlation between the time length of papaya soaking in sugar solution and the levels of ascorbic acid concentrations at different concentrations of lime solution is as follows: vitamin C content decreased when the concentration of lime solution being used for soaking increased. In addition, the vitamin C content dropped significantly when the papaya was soaked in concentration higher than 5%. According to Sediotama (1976), vitamin C is not stable in alkaline solution, so the damage will increased when the concentration of alkaline solution increases.

The longer the soaking of papaya in sugar solution, the lower was the vitamin C content. Vitamin C is easily soluble in water, so the longer was the soaking of papaya the more vitamin C dissolves in water (Sediotama, 1976). Moreover, sugar will promote oxidation of vitamin C (Hurt, 1979).

pH

The higher the lime solution concentration used, the higher was the pH of papaya candy. The reason for this is that more calcium was absorbed when the papaya was soaked in the higher concentration of lime solution which in turn make the papaya more alkaline.

In addition the longer the soaking of papaya in sugar solution, the lower was the pH of the papaya. This is due to a fermentation process taking place during the soaking in sugar solution in which sugar was changed to acid (Braverman’s, 1976).

Water Content

When the papaya was soaked in the higher concentration of lime solution, water content was higher than when soaked in the lower concentration.
This may be attributed to the formation of pectic calcium. The higher the concentration of lime solution used, the more pectic calcium was formed which inhibited the water diffusion from the papaya to the solution; thus the water content of the papaya was kept high. Inversely, the longer the soaking of papaya in sugar solution, the lower was the water content. The reason is that more water was leaked from the flesh of the papaya to the solution when the soaking was longer.

**Hardness**

The higher the concentration of lime solution used for soaking of the papaya, the harder was the papaya candy. The reason is that the formation of pectic calcium increased when the papaya was soaked in the higher concentration of lime solution. Pectic calcium is responsible for the elasticity of the fruit, so the pectic calcium was formed, the more elastic or harder the fruit became (Mayer, 1973). Furthermore, pectic calcium will stabilize the membranes of the fruit (Adams and Blundstone, 1971). On the other hand, the longer the soaking of papaya in sugar solution, the softer the papaya became, because the decompositing of the papaya.

**Sugar Content**

The higher the concentration of lime solution used, the less was the sugar content of papaya candy. Similar to water content and hardness, pectic calcium also affects concentration of sugar content of papaya candy. An increased in the formation of pectic calcium causes the cell membrane structures to become more stable, thus the penetration of sugar into the flesh will be inhibited, so the sugar content of the papaya candy was low.

The higher the lime solution used, the less was the penetration of the sugar in papaya. The use of 15% lime solution would not change sugar content at different length of soaking. The decreasing of sugar content after two days soaking in sugar solution was caused by the equilibrium process between the concentration of sugar in the fruit and the solution. According to Mayer (1973), if the the concentration inside the fruit cell is lower than that of the outside, the solute will penetrate into the cell until the perfect equilibrium takes place or *vise versa*.

**Organoleptic Test**

**Hardness**

The papaya soaked in the lime solution with 5% concentration was the most preferred by the consumers. Probably the papaya candy soaked in concentration 0% w/w was too soft, whereas those soaking in 10% and 15% of lime solution were too hard.

The papaya soaked for two days in sugar solution was the most preferred by consumers. Whereas those in other treatments were not preferred. Probably one day soaking of papaya candy was too hard, will three days soaking or more decreased the hardness of the papaya candy and as a result it became too soft which may have been caused by micro organism that can spoil the fruit cells.

**The Taste**

The taste of papaya candy was particularly influenced by pH and sugar content. The concentration level of lime solution did not affect of the consumers preference of the taste of papaya candy (not significantly different). On the other hand, the time length of soaking papaya in sugar solution was significantly different. The most preferred taste by consumer was the papaya candy soaked in sugar solution for 2 days. The reason is that the three days soaking caused papaya candy to become too sour because of fermentation, while on the one-day soaking, sugar had not completely penetrated the papaya yet.

**CONCLUSIONS**

From the experiment that has been done, it can be concluded as follows:

The soaking of the papaya in sugar and lime solution affected the quality of the papaya candy. The higher the lime solution used and the longer the soaking in sugar solution, the higher the damage of vitamin C. The preference of the consumers on the taste and hardness of the papaya candy increased up to 5% concentration, the preference decreased. Two days soaking of the papaya in sugar solution was the most preferred by consumers.
The best condition in making papaya candy, which contained high vitamin C and favored by consumers, was the papaya soaked in sugar solution for two day using 5% w/w of lime solution. By implementation such conditions, the characteristics of papaya candy was as follows: Vitamin C content was 40 mg/100 grams of the flesh; pH was 5.92; water content was 73.26%; hardness was 3.14/10 seconds; and sugar content was 18.37%.

The product was still edible up to two weeks. For longer shelf life, it must be frozen.

LITERATURE CITED


Hurt, D. 1979. Food Technology. Publication of Food Technologist Campaign. USA.
