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UTILIZATION OF PAPAYA TREE ON DRIED CANDIED MAKING

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ABSTRACT

The research was intended to determine making method of dried candied from papaya stem. The experiment was conducted at Post-Harvest Laboratory of Indonesian Tropical Fruit Research Institute, Solok, West Sumatra in April 2010. The experiment was designed in Randomized complete design with 16 treatments and 2 replications. The treatments were: P0K0 (papaya stem was boiled in water); P0K1 (papaya stem was boiled in water and than soaked in 0.5% shell lime solution); P0K2 (stem was boiled in water and than soaked in 1% shell lime solution); P0K3 (papaya stem was boiled in water and than soaked in 1.5% shell lime solution); P1K0 (papaya stem was boiled in water that was added sikaduduk (*Melastoma malabathricum* L.) leaves); P1K1 (papaya stem was boiled in water that was added sikaduduk (*Melastoma malabathricum* L.) leaves and than soaked in 0.5% shell lime solution); P1K2 (papaya stem was boiled in water that was added sikaduduk (*Melastoma malabathricum* L.) leaves and than soaked in 1% shell lime solution); P1K3 (papaya stem was boiled in water that was added sikaduduk (*Melastoma malabathricum* L.) leaves and than soaked in 1.5% shell lime solution); P2K0 (papaya stem was boiled in water that was added cassava (*Manihot utilissima* Pohl.) leaves); P2K1 (papaya stem was boiled in water that was added cassava (*Manihot utilissima* Pohl.) leaves and than soaked in 0.5% shell lime solution); P2K2 (papaya stem was boiled in water that was added cassava (*Manihot utilissima* Pohl.) leaves and than soaked in 1% shell lime solution); P2K3 (papaya stem was boiled in water that was added cassava (*Manihot utilissima* Pohl.) leaves and soaked in 1.5% shell lime solution); P3K0 (papaya stem was boiled in water that was added guava (*Psidium guajava*) leaves); P3K1 (papaya stem was boiled in water that was added guava (*Psidium guajava*) leaves and soaked in 0.5% shell lime solution); P3K2 (papaya stem was boiled in water that was added guava (*Psidium guajava*) leaves and soaked in 1% shell lime solution); P3K3 (papaya stem was boiled in water that was added guava (*Psidium guajava*) leaves and than soaked in 1.5% shell lime solution). Preference test was conducted with 10 professional panelists on aroma, color, taste, and crispiness. Another observation was water content (oven method) and ash content (furnace method). Observation data were analyzed with 5% HSD test. Stem has a potential aspect to be developed as food resources. The dried candied making is very simple, which stems were boiled and soaked in sugar solution.

Keywords: *carica papaya* L., papaya stem, dried candied.

INTRODUCTION

In Indonesia, papaya is an economically important fruit in the local markets. Papaya is a very wholesome fruit. It provides a cheap source of vitamins and minerals in the daily diet of the people. According to the Indonesian Directorate General of Horticulture (2007), planting area of papaya in Indonesia is 7984 Ha. Papaya is a versatile crop because nearly all parts of this plant can be utilized. The fruit can be consumed fresh, the leaves and flowers can be used as vegetable. Every tree can produce 30 fruit, even up to 150 units. After the first harvest, papaya tree will continue to produce fruit until 4 years and at this time the fruit production will decline so the garden must be dismantled (Menegristek, 2008).

Unproductive garden will cause problem on tree waste. So far the tree waste just stacked and left to decompose without further treatment. If the numbers of tree are increasingly abundant due to the breadth of papaya planting area, then new problems will arise. This happen because there is no technology to process the stem, whereas the stem has a great potential as an alternative food resources.

At the local wisdom on Mandailing tribe in West Pasaman, West Sumatra - Indonesia, papaya stem was used for *urap* as one of traditional vegetable. Meanwhile in the East Java, that stem has been used as a raw material to makes *dodol*. Dodol is one of popular snacks in Indonesia. According to Yon (1994), papaya stem contains a lot of water, hollow, soft textured and cork. Generally, stem grows upright and unbranched, except if there is any injuries on the top. Generally, people rarely use papaya tree as a raw material for snack because the form of rod outer has similar with woody plants. Before the stem processing to be candied, we did some testing methods on papaya stem (Table-1).

Table-1. Papaya stem ingredients.

Ingredients	Total
Carbohidrat (pati) with antrone method	5.24 %
Fiber content with gravimetri method	2.74%
Protein with kjeldhal method	0.32%
Water content with oven method	82.3%
Ash content with furnance method	1.03%

Stem has excellent prospect to be develop as food resources. According to Nofiarli, *et al*., (2010) candied is one of food process that more preferred by the public. It was a sweet taste that mixed with characteristic flavor of fruit, it is very suitable to be enjoyed on many occasions.

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Usually, candied is made from fruit. According to Nada, *et al*., (2007), producing of dried candied is one form of business that is applied in addition to preservation and increase the diversification of presentation forms and added value of papaya fruit in economic terms.

Substantively, the technology of dried candied making from stem is very simple and it is easy to applied by all people. However, this technology is still new and until now there is no a patent or scientific publications.

The main advantages of stem as a raw material of dried candied are: (1) It is easily available and cheap, (2) it can solve environment waste problems when plantation rejuvenation, (3) it is rich in nutrients (carbohydrates, fiber and protein) (4) It can increase farmer's income (economic analysis).

MATERIAL AND METHODS

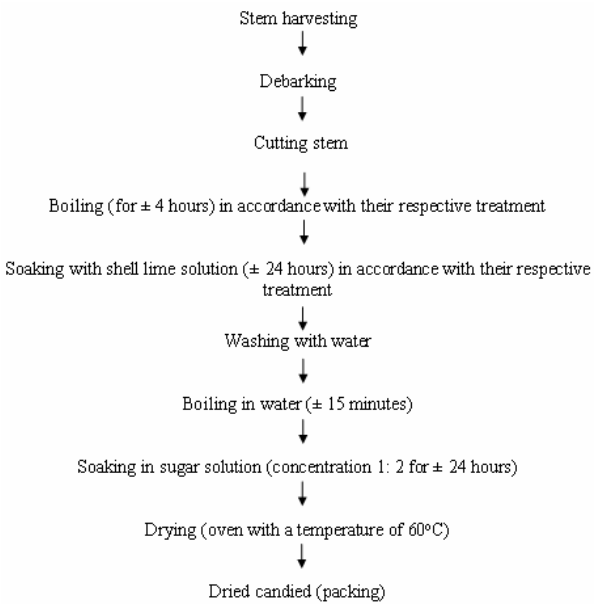
The experiment was conducted at Post-Harvest Laboratory of Indonesian Tropical Fruit Research Institute, Solok-West Sumatra (Indonesia) in April 2010. The experiment was designed in Randomized complete design with 16 treatments and 2 replications.

The treatments were:

a) P0K0 (papaya stem was boiled in water)
b) P0K1 (papaya stem was boiled in water and than soaked in 0.5% shell lime solution)
c) P0K2 (papaya stem was boiled in water and than soaked in 1% shell lime solution)
d) P0K3 (papaya stem was boiled in water and than soaked in 1.5% shell lime solution)
e) P1K0 (papaya stem was boiled in water that was added sikaduduk (*Melastoma malabathricum* L.) leaves)
f) P1K1 (papaya stem was boiled in water that was added sikaduduk (*Melastoma malabathricum* L.) leaves and than soaked in 0.5% shell lime solution)
g) P1K2 (papaya stem was boiled in water that was added sikaduduk (*Melastoma malabathricum* L.) leaves and than soaked in 1% shell lime solution)
h) P1K3 (papaya stem was boiled in water that was added sikaduduk (*Melastoma malabathricum* L.) leaves and than soaked in 1.5% shell lime solution)
i) P2K0 (papaya stem was boiled in water that was added cassava (*Manihot utilissima* Pohl.) leaves)
j) P2K1 (papaya stem was boiled in water that was added cassava (*Manihot utilissima* Pohl.) leaves and than soaked in 0.5% shell lime solution)
k) P2K2 (papaya stem was boiled in water that was added cassava (*Manihot utilissima* Pohl.) leaves and than soaked in 1% shell lime solution)
l) P2K3 (papaya stem was boiled in water that was added cassava (*Manihot utilissima* Pohl.) leaves and than soaked in 1.5% shell lime solution)
m) P3K0 (papaya stem was boiled in water that was added guava (*Psidium guajava*) leaves)
n) P3K1 (papaya stem was boiled in water that was added guava (*Psidium guajava*) leaves and than soaked in 0.5% shell lime solution)
o) P3K2 (papaya stem was boiled in water added guava (*Psidium guajava*) leaves and than soaked in 1% shell lime solution)
p) P3K3 (papaya stem was boiled in water that was added guava (*Psidium guajava*) leaves and than soaked in 1.5% shell lime solution).

Stem was peeled then it was cut equilateral triangle-shaped pieces with side length of 2 cm and 0.5 cm thickness. Then it was boiled in water that accordance with their respective treatment. The candied was dried for 24 hours with the temperature 60°C until water content was obtained below 10%. It was to prevent the fermentation process and the microbe's growth that cause material damage due to high water levels. Candied was wrapped in airtight plastic packaged in a box.

Flowchart to makes candied of papaya stem:



Preference test was conducted with ten professional panelists on aroma, color, taste, and crispiness. Preference test by ten professional panelists was made based on specific scores, namely:

(i) Very dislike
(ii) Dislike
(iii) Ordinary
(iv) Like
(v) Very like

The other observations were water content (*oven method*) and ash content (*furnance method*). Observation data were analyzed with HSD test at 5% level.

Materials and tools were papaya stem, sikaduduk (*Melastoma malabathricum* L.) leaves, cassava (*Manihot*

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utilissima Pohl.) leaves, guava (*Psidium guajava*) leaves, shell lime powder (shell lime was milled until flour form), sugar, machetes, knives, pans, ovens, and stationery.

RESULTS AND DISCUSSIONS

Data of dried candied preference test are presented in Table-2. Base on the statistical analysis showed that the treatment was not significant affect on aroma and taste, but it was significant on color and crispiness. Boiling with sikaduduk leaves, cassava and guava was not give a different flavor in each dried candied treatment. Aroma of dried candied was very typical and preferred by the panelists with score 3.4.

Table-2. The treatment on preference test (aroma, color, taste, and crispiness).

Treatment	Aroma	Color	Taste	Crispiness
P0K0	3.4 a	4 a	4 a	3.8 a
P0K1	2.8 a	3 ab	3.4 a	3 ab
P0K2	2.4 a	2.8 ab	3 a	2.8 ab
P0K3	2.8 a	3 ab	3.2 a	3 ab
P1K0	2.8 a	3.6 ab	3.4 a	2.4 ab
P1K1	2.2 a	3.2 ab	3.4 a	2.2 b
PIK2	2.8 a	2.8 ab	3.2 a	2.8 ab
P1K3	2.6 a	2.2 b	3.2 a	2.4 ab
P2K0	2.6 a	2.6 ab	3.6 a	2.4 ab
P2K1	2.8 a	2.4 ab	2.6 a	2.4 ab
P2K2	2.2 a	2.4 ab	3 a	2 b
P2K3	2.8 a	3 ab	3.6 a	3.2 ab
P3K0	2.8 a	3.8 ab	3.4 a	3.2 ab
P3K1	2.6 a	2.8 ab	3.4 a	3.4 ab
P3K2	2.6 a	2.2 b	2.8 a	2.4 ab
P3K3	2.4 a	2.2 b	3 a	2 b

* Means in the same column followed by the same letter are not significant different at 5% HSD test

Base on statistical analysis showed that the treatment was significant effect on the dried candied color and crispiness. On the dried candied color, the lowest value found on P1K3, P3K2 and P3K3 with a score 2.2 (dislike) while P0K0 (control) most preferred by panelists with a favorite score 4 (like). On the dried candied crispiness, the lowest value found on P2K2 and P3K3 with a score 2 (dislike) and the highest value on P0K0 with a score 3.8 (Ordinary). The function of the addition of shell lime powder is to strengthen the cells network and adding crispiness. However, stems that have been soaked in shell lime solution given a darker color. This causes to makes candied color become darker and less preferred by panelists. According to Demarty, *et al*., (1984) shell lime function is to strengthen the cell wall. Antunes *et al*., (2005) said that shell lime as the intracellular and extracellular cell by reducing discoloration and decay. Shell lime made candied became harder and less crispy, so that P0K0 (control) was preferred by panelists. Crispiness is one of the requirements of dried candied quality. The chemical composition, especially water content will determine the nature of crispiness, so the product which has lower water content will be crispier (Sipahutar, 2008).

Statistical analysis was not significant effect on the dried candied taste. The dried candied had a distinctive taste. The highest result obtained on P0K0 (control) with a score 4 (like) and the lowest value obtained on P2K1 with a score 2.6 (dislike). According to Nofiarli, *et al*., (2010) high concentration of shell lime will strengthen the cell wall and generate a sense astringent taste in tongue.

From all tests (aroma, color, taste, and crispness), panelists prefer dried candied on P0K0. This treatment is only a control, where papaya stems were quite simply boiled in water and then soaked in sugar solution without any treatment given. So from this activity, it can be concluded that is to produce the dried candied is very simple, does not require complex technology.

From the observation and statistical testing was known that the treatment was significant effect on the water content and ash content (Table-3).

Table-3. Treatment effect on water content and ash content.

Treatment	Water content (%)	Ash content (%)
P0K0	8.170 abcd	2.411 ab
P0K1	5.243 bcd	3.098 ab
P0K2	7.513 abcd	1.103 b
P0K3	6.380 abcd	2.550 ab
P1K0	6.837 abcd	1.715 ab
P1K1	5.657 abcd	3.111 ab
PIK2	7.783 abcd	1.700 ab
P1K3	9.040 abc	4.430 ab
P2K0	9.857 ab	2.257 ab
P2K1	8.043 abcd	2.913 ab
P2K2	3.347 d	6.567 a
P2K3	3.703 cd	2.120 ab
P3K0	7.067 abcd	3.547 ab
P3K1	7.470 abcd	1.420 ab
P3K2	7.970 abcd	3.040 ab
P3K3	10.96 a	2.323 ab

* Means in the same column followed by the same letter are not significantly different at 5% HSD test

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The highest water content was found on P3K3 (10.96%) and the lowest water content on P2K2 (3.347%). In accordance with SNI 01-4443-1998, maximum water content (w/w) on the quality of nutmegs dried candied was 44% with the water content measuring method of SNI 01-2891-1992. So it can be said that all treatment are accordance to the Indonesian National Standard (SNI).

The water content is crucial for dry candied quality. The candied cannot be kept in long term because high water content. Fungi and bacteria will grow very rapidly in materials that have high water content thus speeding up the fermentation and decay process. According to Widaningrum *et al*., (2008) low water level does not allow microbes to grow and develop, and the damage that occurs in young bean chips can be delayed.

Statistical analysis showed that the treatment was significant affected to the ash content. The highest value obtained on P2K2 (6.567%) and the lowest value on P0K2 (1.103%). The ash content values showed that the amount of mineral content in food. According to Olaoye and Onilude (2008), Widaningrum *et al*., (2008) said that ash content indicates the amount of minerals contained in food.

Papaya stem dried candied has a delicious taste and aroma, unique color and has a high nutrient content. The further test, the dried candied was containing 77.59% carbohydrate/starch (antrone method), 3.92% fiber content (gravimetric method), 0.37% protein content (kjeldhal method). With packaging and a good promotion, dried candied from papaya stem would sell in the market so it can increase people's income and to encourage the creation of new industries and jobs for the people.

Figure-1. Papaya stem.

Figure-2. Dried candied.

CONCLUSIONS

a. Stem has a potential to be developed as a food resources.
b. Treatment had significant affect on color, crispiness, water content, and ash content but had not significant affect on aroma and taste.
c. Dried candied making is very simple; stems were boiled and soaked in sugar solution.

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