

## Development of Dried Nipa Palm Leaf for Infusion

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### **Abstract**

This work aimed to develop dried mixed nipa palm leaf with herbs for infusion. The result showed that the appropriate drying method for the nipa palm leaf was steaming at 100°C for 5 min before roasting in a pan at low heat for 15 min. Then 7 prototyped formulations were developed by mixing the nipa palm leaf with either jasmine or chrysanthemum at 10%, 20% and 30% including the 100% nipa palm leaf as control sample. The infusion was prepared by packing 2 grams of the mix in a tea bag and soaking in 150 ml hot water for 1 min. The results from 9-point Hedonic scale indicated that the overall acceptance scores of the natural flavor was at slightly like level (6.00±1.17). The selected formulas for jasmine and chrysanthemum flavor were at 20% herbs which were scored at moderately like level (6.55±1.06 and 6.76±1.12, respectively). The acute toxicity test revealed that the developed products were safe for consumer. The results from quality analysis showed that the general characteristics, color, odor, moisture content, microbiological quality and the infusion flavor of the samples passed the requirements of Thai Community Product Standard (TCPS 996/2556).

**Keywords:** Nipa palm leaf, dried mixed herbs for infusion, TCPS 996/2556

### **1. Introduction**

Phra Samut Chedi district, Samut Prakan province is one of the targets for the area-based development research of Dhonburi Rajabhat University. There are a lot of nipa palm clusters growing naturally in many areas in this district. The local people have made many uses of nipa palm, for example, mature leaves for basketry, thatching and wrapping Thai dessert called Kanom Jak and the young fruits for dessert and drink. In the past few years, there were many DRU researchers studied on the utilization on nipa palm aiming to encourage more employment of local resources and help to preserve the nipa palm forest in this area.

Nowadays, due to the health awareness, the trend of drinking tea and herbal tea is increasing. There are many tea products in the market such as green tea, mulberry leaf tea, chrysanthemum tea,

bael fruit tea and roselle tea, etc. Also, there are many researches on new kind of herbal tea made from various plants, for example, cat's whisker plant [1], Ya-nang leaf [2], banana blossom [3] and even pomelo peel [4]. Most of these researches claimed for the benefit on the antioxidant properties and other medicinal properties. However, based on the Guidelines for Considering Herbal Tea, Food and Drug Administration (2006) [5] and Notification of the Ministry of Public Health (No. 280) B.E. 2547 [6], the term "herbal tea" must be used with the products made from the plants that are listed in the appendix of the Guidelines or in the list announced by the Food and Drug Administration only. The products made of other kind of plants should use the word "dried (plant name) for infusion" instead. Therefore, the objective of this study was to develop a new product of dried mixed nipa palm leaf with herbs for

infusion. The results were propagated to the community enterprises in Phra Samut Chedi district for an identity community product in the future.

## 2. Research Methodology

### 2.1 The study of drying method

The mature nipa palm leaves were selected, washed and cut along the transverse line into 2-3 mm wide. Four treatments were studied which were (1) roasting in a pan at low heat, (2) steaming at 100°C for 5 min before roasting in a pan, (3) drying in a solar cabinet and (4) steaming at 100°C for 5 min before drying in a solar cabinet. Samples were taken in triplicate from each treatment for moisture content analysis at every 5 minutes for roasting treatment and every hour for drying treatment. Drying curves were established to determine the appropriate drying time.

The dried leaves were minced and packed 2 grams in a tea bag and then soaked in 150 ml hot water for 1 min for sensory test. The multiple ranking test was used to evaluate the overall acceptance using 100 panelists by accidental sampling. The rank sum of each treatment was calculated and the statistically significant difference was determined using Friedman's test.

### 2.2 The development of dried mixed nipa palm leaf with herbs for infusion

The appropriate drying method from the previous step was used to prepare nipa palm leaf. The dried nipa palm leaf was then coarsely minced and mixed with either dried minced jasmine or dried minced chrysanthemum at 10%, 20% and 30%. The natural flavor or 100% nipa palm leaf was accounted for the control sample. For infusion preparation, the 2-gram product in a tea bag was soaked in 150 ml hot water for 1 min. The samples were evaluated using 9-point Hedonic scale with 175 panelists by accidental sampling. The balanced incomplete block design (BIB) was performed. Each panelist tasted 4 samples

at a time while each formula was tested by 100 panelists. The data were analyzed in terms of mean and SD. The statistically significant difference was determined using Duncan's new multiple range test.

### 2.3 The quality analysis of the developed products

The selected formulas from the previous step were studied for general characteristics, color, odor, moisture content, microbiological quality and the infusion flavor compared to the requirements of Thai Community Product Standard (TCPS 996/2556): dried mixed herbs for infusion [7].

## 3. Results and Discussion

According to the TCPS 996/2556, the moisture content of the dried mixed herbs for infusion product was specified at lower than 10%. The drying curves of the four treatments revealed that the appropriate time for roasting method was at 15 min for both conditions (steamed and no steamed) while the appropriate time for drying was at 3 hr for both conditions (Fig. 1-2).

The results from the multiple ranking test showed that the steaming before drying method yielded better outcome than no-steaming method (Table 1). This might be due to the green leaf smell and a faint astringent taste of the no-steamed sample. The steamed samples received better rank because they provided lighter smell and taste since the steaming or blanching could remove the raw taste and odor of the vegetables [8,9].

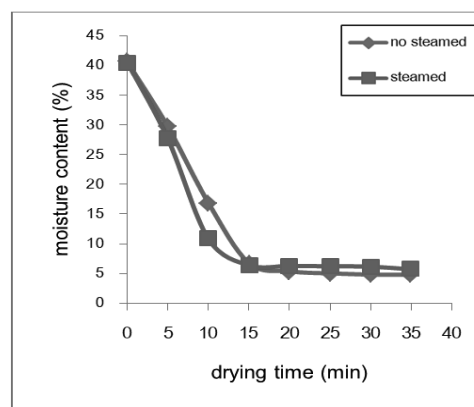
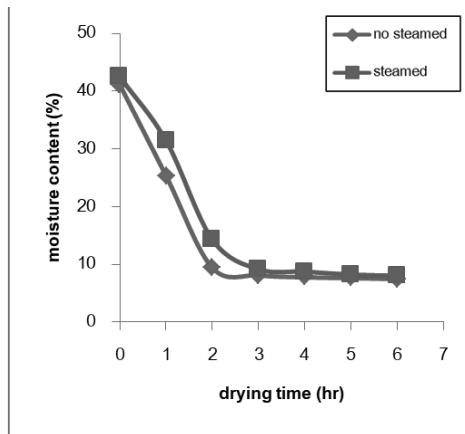
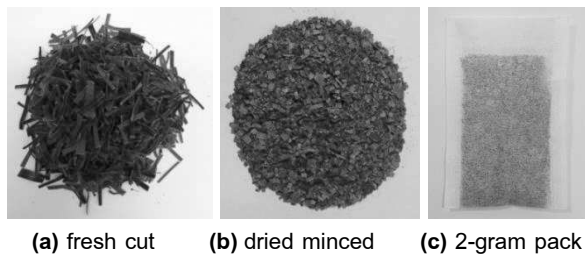


Fig. 1: Drying curve of nipa leaf roasted in a pan at low heat



**Fig. 2:** Drying curve of nipa leaf dried in a solar cabinet



**Fig. 3:** Nipa palm leaf preparation

The results also showed no difference between roasting and drying nipa palm leaf indicating that the drying method at the proper level had no effect on the overall acceptance. Phaipan (2007) [1] suggested that the roasting and drying at appropriate level yielded similar sensory results on herbal tea from cat’s whisker. Othong *et al.* also pointed the same conclusion for Ya-nang leaf tea [2].

Although the rank sum between steam-roasting and steam-drying were not significantly different, the steam-roasting method was selected for further study due to the time saving.

During the sensory test, the panelists were also asked for the preference herbs which they wanted to flavor the product. The suggested choices for selection were jasmine, pandan leaf, bael fruit, butterfly pea, roselle, chrysanthemum, lemon grass, monk fruit and open end answer. The highest score were jasmine and chrysanthemum at 20.77% and 21.26%, respectively.

**Table 1:** Results of the multiple ranking test of the dried nipa palm leaf

Drying method	Rank sum
No steamed, roasting	255 <sup>bc</sup>
Steamed, roasting	217 <sup>a</sup>
No steamed, drying in solar cabinet	291 <sup>c</sup>
Steamed, drying in solar cabinet	237 <sup>ab</sup>

The different letters show significantly different ( $p \leq 0.05$ )

At the product development stage, the nipa palm leaf were mixed with the 2 selected herbs at 10%, 20% and 30% giving 7 formulas including natural flavor. Since the number of 7 samples were too much for a panelist to test at one time, the balanced incomplete block design was performed and each panelist was determined to test only 4 samples at a time.

Before sensory testing, the samples with 20% mixed herbs were sent for the acute toxicity test at the Medicinal Plant Research Institute, Department of Medical Sciences, to ensure that the products were safe for consumption.

The results from 9-point Hedonic scale indicated that the overall acceptance scores of the natural flavor was the lowest at slightly like level ( $6.00 \pm 1.17$ ).

**Table 2:** The level of acceptability of dried mixed nipa palm leaf with herbs for infusion products.

Formula	Acceptance score		
	Color	Flavor	Overall liking
Natural flavor	6.28±1.39	5.82±1.20	6.00±1.17
10% jasmine	6.71±1.23 <sup>ns</sup>	6.44±1.27 <sup>a</sup>	6.59±1.20 <sup>ns</sup>
20% jasmine	6.59±1.19 <sup>ns</sup>	6.42±1.01 <sup>a</sup>	6.55±1.06 <sup>ns</sup>
30% jasmine	6.64±1.27 <sup>ns</sup>	6.13±1.09 <sup>b</sup>	6.41±1.19 <sup>ns</sup>
10% chrysanthemum	6.70±1.36 <sup>b</sup>	6.57±1.16 <sup>b</sup>	6.70±1.11 <sup>b</sup>
20% chrysanthemum	6.56±1.42 <sup>b</sup>	6.60±1.21 <sup>ab</sup>	6.76±1.12 <sup>ab</sup>
30% chrysanthemum	7.08±1.15 <sup>a</sup>	6.87±1.12 <sup>a</sup>	7.01±1.09 <sup>a</sup>

For means within the same column of the same flavor, the different letters show significantly different ( $p \leq 0.05$ )

**Table 3:** Qualities of the products (dried mixed nipa palm leaf with herbs for infusion) compared to the standard TCPS 996/2556

standard/formula	Moisture content (%)	total plate count (CFU/ g)	yeast and mold (CFU/ g)
dried mixed herbs for infusion (TCPS 996/2556)	< 10%	< 1x 10 <sup>4</sup>	< 100
natural flavor	7.43±0.24	4.7 x 10 <sup>3</sup>	22.67
20% jasmine	8.41±0.03	5.3 x 10 <sup>3</sup>	63.67
20% chrysanthemum	8.79±0.32	8.4 x 10 <sup>3</sup>	88.33

All formulas of jasmine flavor received better scored than the natural flavor (6.59±1.20, 6.55±1.06 and 6.41±1.19, respectively). All formulas of chrysanthemum flavor were also received better scored than the natural flavor and a little bit better than the jasmine flavor (6.70±1.11, 6.76±1.12 and 7.01±1.09, respectively). It can be seen that the average scores for chrysanthemum flavor were higher than those of jasmine flavor for all attributes. Because chrysanthemum provided color while jasmine had no effect on the infusion color. Moreover, chrysanthemum at the same amount as jasmine, provided stronger flavor.

Latterly, the 20% chrysanthemum formula was selected as the appropriate formula since there was no statistically significant difference between 20% and 30% chrysanthemum. Although there was no statistically significant difference among jasmine formulas, the 20% jasmine was selected for the reason of the same amount of herbs which would be easily for the production as community products.

Some qualities of the developed product were analyzed and compared to requirements of the standard, TCPS 996/2556: dried mixed herbs for infusion. The results showed that the general

characteristics, color, odor, moisture content, microbiological quality and the infusion flavor of the samples passed the requirements of the standard.

#### 4. Conclusions

The appropriate drying method for the nipa palm leaf was steaming at 100°C for 5 min before roasting in a pan at low heat for 15 min. The results of the development yielded 3 products of dried nipa palm leaf for infusion which are natural flavor (100% dried minced nipa palm leaf), jasmine flavor (80% nipa palm leaf mixed with 20% jasmine) and chrysanthemum flavor (80% nipa palm leaf mixed with 20% chrysanthemum). All products were safe for consumption and their general characteristics, color, odor, moisture content, microbiological quality and the infusion flavor passed the requirements of (TCPS 996/2556).

#### 5. Acknowledgement

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