

# Preparation and Characterization of Citrus Peel Candy

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## Abstract

The main objective of this research is to study the preparation of citrus peel candy produced by saturation in sucrose syrup. Citric peel is a waste from citrus processing industries and it can be used as a raw material in this research. Its advantage is not only reducing waste but also adding value to citrus fruits. In this research, citrus peels were pretreated by using different methods namely, blanching, parboiling and soaking in aqueous solution of lime solution. The physico-chemical properties of preserved citrus peel such as acidity, pH, moisture content and ash content were determined by AOAC methods. The organoleptic properties of preserved citrus peel were determined and compared with literature values.

Keywords : Citrus fruits, drying, physico-chemical properties, organoleptic properties

## Introduction

Candy is a sweet food and can be produced from fruits and vegetables. Candy is filled with sugar syrup by draining of excessive syrup and then being dried, its shelf life is stable. Candy can be made from fruits such as apple , mango, guava and some citrus peel. Lime belongs to citrus family of fruit.

Lime (*citrus aurantifolia*) is a small, round, green color hybrid citrus fruit .Lime is rich in vitamin C. Compared lime to lemon, lime includes more sugar and acid contents than lemon. Lime is also used in cooking with other products. It is good for health to make candy from lime peel (<https://en.m.wikipedia.org/wiki/Lime>).

Dehydration is quite a distinct process and is carried out in the dehydrator where temperature, humidity and rate of air flow are controlled . Preparation for dehydration involves a variety of treatments. Preservation by drying depends upon reducing the moisture content to the point at which the concentration of the dissolved solid in the product is so high, 70 percent or above that osmotic pressure will prevent the growth of microorganism (Cruess,W.V, 1958).

Drying is a mass transfer process and removes water and other solvent. Drying food is the oldest and easiest method for preserving food. After the drying process, the final step before marketing is packaging (<https://en.m.wikipedia.org/wiki/Drying>).

The aim of this research is to produce lime, products with natural flavor, aroma and longer shelf- life. It is hoped that the result would in some way be helpful for food producers to produce higher quality products. One of the main objectives of food processing is the preservation of perishable foods. Candying of fruits gives the decreasing ability of water activity by osmotic dehydration prolonging fruits shelf-life.

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## Materials and Methods

### Materials

In this research work, fresh lime were collected from Yadanabon Market, Chan Aye Thar San Township, Mandalay Region. Food additives such as sugar, salt, calcium hydroxide, calcium chloride were purchased from local market.

### Methods

At first, citrus peel were washed and cut by a steel knife to obtain pieces of peel approximately 0.5cm in length. 20 g of sliced citrus peel were dipped in prepared 100ml of 1%  $\text{Ca}(\text{OH})_2$  lime solution for 45 min. And then, lime solution was filtered and citrus slices were washed with water to remove excess lime. Then, the citrus slices were blanched with hot water at  $100^\circ\text{C}$  for 10 min until the peel turned into translucent. And then 1L of water, 100g of sugar and 0.5g of salt were placed in a steel pot and cooked at  $70^\circ\text{C}$  on a hot plate. After that the peel were added into the pot and continuously stirred until it became citrus peel in sugar syrup. The resultant citrus peel in sugar syrup were dried in oven at  $70^\circ\text{C}$  for 6 hr. Then, the peel were sprinkled with 50 g of crystal sugar. Finally, the prepared candies were packed a plastic box.

### Physico-chemical Properties of Fresh Lime

The physico-chemical properties of preserve citrus peel such as moisture content ,ash content, acidity and pH were determine by AOAC official methods.

### Organoleptic Properties

Citrus peel candies were evaluated organoleptic for color, flavor, texture and suitable taste and color evaluation by sensing of our students.



Figure (1) Citrus fruit (Lime)



Figure (2) Citrus peel

## Results and Discussion

In this research, citrus peel candy was prepared by the conventional method. The ingredients were citrus peel, sugar, salt, lime and distilled water. The data in Table (1) represents the physico-chemical properties of fresh lime peel, namely, the moisture content, pH, acidity and ash content .

The properties of prepared citrus peel candy, such as moisture content, ash content, pH and acidity were determined. The results obtained are shown in Table (2) to (7).

The effect of blanching time on the properties of citrus peel candy can be clearly seen in Table 2. In the preparation of citrus peel candy, there was variation of blanching time ranging from 4 min, 6 min, 8min, 10min, 15min. It was observed that the bitterness taste of citrus peel was almost disappeared at 10min blanching time.

On the preparation of citrus peel candy, the effect of sugar content was studied. The amount of sugar such as 25g , 50g, 75g, 100g and 125g were used in preparation of candies. It was found that the citrus peel candy processed with 100g of sugar for 20 g of citrus peel gave a good flavor and sweetness. The results were recorded in Table (3).

The effect of dipping time on the taste and texture of citrus peel candy can be seen in Table (4) . In the preparation of citrus peel candy, the dipping time in 1% (CaOH)<sub>2</sub> solution was varied from 25min, 30min, 35min, 40min and 45 min. It was found that the hardness texture of citrus peel was almost disappeared at 45 minutes dipping time.

The effect of drying temperature on the physico-chemical properties of citrus peel candy was studied by varying the temperature ranging from 60°C to 100°C. It was observed that the citrus peel candy was in the best condition at drying temperature 70°C and the candy color was kept in the natural green colour of citrus peel. When the drying temperature was above 70°C the candy color was brownish. The results were observed in Table (5).

The effect of the drying time on the physico-chemical properties of citrus peel candy was studied by varying the time ranging from 3hr to 7hr. It was found that, at 6hr of drying time was the best condition and candy color was kept in green. When the drying time was above 7 hr, the candy color was found in light brown. The result were observed in Table (6).

The physico-chemical characteristics of citrus peel candy such as pH, acidity, moisture content and ash content were determined in at Ministry Of Agriculture, Livestock and Irrigation Small Scale Industrial Department. The results were shown in Table (7)

Table (1) Physico-chemical Properties of Citrus Peel from Fresh Lime

Sr.No.	Properties	Experimental Value	Literature Value*
1	pH	2.46	2.50
2	Acidity (%w/v)	2.98	3.40
3	MoistureContent (%w/w)	8.09	86.62
4	Ash Content (%w/w)	0.62	0.69

\* SihamMahamedElobeid, 1995

Table (2) Effect of Blanching Time on Organoleptic Properties of Citrus Peel Candy

Dipping Time in 0.1% Lime Solution = 45 min  
 Blanching temperature = 100°C  
 Amount of sugar = 100g  
 Drying temperature = 70°C for 6 hr

Sample No.	Citric peels (g)	Blanching Time (min)	Organoleptic Properties		
			Taste	Texture	Color
1	25	4	Bitter	Hard	Green
2	25	6	Slightly bitter	Slightly hard	Green
3	25	8	Sweet	Slightly soft	Green
4	25	10*	Sweet	Good	Green
5	25	15	Sweet	Soft	Green

\*The most suitable Blanching Time

Table (3) Effect of Weight of Sugar on Organoleptic Properties of Citrus Peel Candy

Dipping Time in 0.1% Lime Solution = 45 min  
 Blanching time and temperature = 100°C for 10 min  
 Drying temperature = 70°C for 6 hr

Sample No.	Citric peels (g)	Weight of sugar	Organoleptic Properties			Shelf-life (week)
			Taste	Texture	Colour	
1	25	25	Bitter	Hard	Green	2
2	25	50	Slightly bitter	Slightly hard	Green	4
3	25	75	Slightly sweet	Slightly hard	Green	8
4	25	100*	Sweet	Good	Green	12
5	25	125	Very Sweet	Soft and sticky	Green	18

\*The most suitable Sugar

Table (4) Effect of Dipping Time in Lime Solution on Organoleptic Properties of Citrus Peel Candy

Dipping Time in 0.1% Lime Solution = 45 min  
 Blanching time and temperature = 100°C for 10 min  
 Amount of sugar = 100g  
 Drying temperature = 70°C for 6 hr

Sample No.	Citric peels (g)	Dipping Time (min)	Organoleptic Properties		
			Taste	Texture	Colour
1	25	30	Bitter	Hardness	Green
2	25	35	Slightly bitter	Slightly hard	Green
3	25	40	Sweet	Soft	Green
4	25	45*	Sweet	Good	Green
5	25	50	Sweet	Very soft	Green

\*The most suitable dipping time

Table (5) Effect of Drying Temperature in on Organoleptic Properties of Citrus Peel Candy

Dipping Time in 0.1% Lime Solution = 45 min  
 Blanching time and temperature = 100°C for 10 min  
 Amount of sugar = 100g  
 Drying time = 6 hr

Sample No.	Citric peels	Temperature (°C)	Organoleptic Properties		
			Taste	Texture	Color
1	25	60	Sweet	Slightly Soft	Green
2	25	70*	Sweet	Good	Green
3	25	80	Sweet	Slightly viscous	Green
4	25	90	Sweet	Viscous	Brown
5	25	100	Sweet	Very viscous	Brownish

\*The most suitable drying temperature

Table (6) Effect of Drying Time on Organoleptic Properties of Citrus Peel Candy  
 Dipping Time in 0.1% Lime Solution = 45 min  
 Blanching time and temperature = 100°C for 10 min  
 Amount of sugar = 100g

Sample No.	Citric peels	Drying Condition		Organoleptic Properties		
		Temperature (°C)	Time (hr)	Taste	Texture	Color
1	25	70	3	Sweet	Soft	Green
2	25	70	4	Sweet	Soft	Green
3	25	70	5	Sweet	Soft	Green
4	25	70	6*	Sweet	Good	Green
5	25	70	7	Sweet	Dry and Hard	Brown

\*The most suitable drying time

Table(7) Physico-Chemical Properties of Citrus Peel Candy From Lime

No	Properties	Experimental Value	Literature Value
1	pH	2.54	2.60
2	Acidity(% w/v)	0.99	1.92
3	Moisture Content (% w/v)	10.35	11.33
4	Ash Content (% w/v)	0.75	5.34

\*SihamMahamedElobeid, 1995

These data were measured at Ministry Of Agriculture , Livestock and Irrigation  
 Small Scale Industrial Department



Figure (3) Citrus peel candy

### Conclusion

In this research, citric peel candy was prepared by using 25 g of citrus peel, 1 L of water, 100 g of sugar and 0.5 g of salt . The citrus peel was boiled in water for 10 min and drained the water. And 100 g of sugar and 1L of water are boiled until the sugar is dissolved. After that, the peel were cooked in sugar solution for 45 min .

The organoleptic properties, that is, texture, colour and taste were studied for various conditions in citrus peel candy preparation. The physico- chemical properties of prepared citrus peel candy such as pH, acidity, moisture content and ash content were also determined. According to these results of organoleptic and physico-chemical tests, the prepared citric peel candies are suitable for having as a dessert.

In conclusion, it is hoped that the prepared citric peel candy products could be used in domestic market production because of their good appearance and excellent quality.

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