

A Study on the Processing of Coconut Products

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Abstract

In Myanmar, a wide variety of coconuts are abundantly available from coastal areas (Ayeyarwady, Rakhine and Tanintharyi Region). In this research work, the flesh of coconut was used to produce the value-added products of coconut such as coconut chips and coconut cream. Premature coconuts were collected from Thanlyin Township and mature coconuts were purchased from Thiri Mingalar Market, Bayint Naung Road, Kamayut Township, Yangon Region. To obtain the suitable process conditions, the effect of roasting temperature and time using oven without fan and with fan on the quality of coconut chips and the effect of homogenizing rate and time on the quality of coconut cream were studied. In addition, the effects of weight of food additives such as sugar, stabilizer/emulsifier, salt, antioxidant and chemical preservative on the quality of coconut products were also studied. The most suitable thickness of coconut chips was found to be 1 mm thick and the most favourable colour of that was obtained using oven with fan. The most suitable homogenizing rate and time for coconut cream was 15000 rpm and 7 minutes. The characteristics of coconut chips such as pH, acidity, moisture content, crude fiber content, ash content, fat content, protein content, carbohydrate content, color and organoleptic properties were determined and compared with the product of Thailand. The results so obtained would in some way be helpful or supplement the local cottage industries.

Keywords: coconut chips, coconut cream, roasting temperature and time, homogenizing rate and time, food additives

Introduction

Coconut is a mature fruit of the *Cocos nucifera* L. palm. It is one of very versatile food item for millions of inhabitants of South and South-East Asia and Pacific islands. Coconuts are known for their versatility ranging from food to cosmetics (www.nutrition-and-you.com/coconut.html).

The Myanmar Fruits, Flower and Vegetable Producer and Exporter Association (MFVP) is planning to set up a new coconut plantation zone in Mudon Township, Mon State, according to a report in the Myawady Daily's Saturday edition (www.moi.gov.mm/moi:eng/).

The aim of this research work is to compare the colour of processed coconut chips, roasting in oven without fan and with fan were used and to generate the employment from rural and urban community for their career opportunities.

Materials and Methods

Premature and mature coconuts were purchased from Thanlyin Township and Thiri Mingalar Market, Kamayut Township, Yangon Region. Sugar, salt, stabilizer, vitamin E and potassium sorbate were purchased from Thein Gyi Zay (C) Yone and Super Shell Store, 27th Street, Pabedan Township, Yangon.

Preparation of Coconut Chips

Firstly suitable premature (young) coconut was chosen and husking and shelling were done. After that the coconut was peeled to obtain white meat. And then it was sliced with a sharp knife to get about 1 mm thickness of coconut chips. These slices were blanching at 70 – 80°C for 3 minutes. This was made to eliminate bacteria and to maintain the natural colour of coconut. After blanching, the slices were soaked in 50°Brix sugar solution, containing

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0.1%w/w salt, at 40 – 45°C for 30 minutes to obtain a good taste. Subsequently, the solution was drained and the slices were dried by solar cabinet dryer at 45 – 50°C for 9 hours as shown Figure (1) to dehydrate the coconut chips.

Solar cabinet dryer is suitable to dry and to control the colour of coconut chips. The dried chips thus obtained were roasted in oven without fan or with fan as shown in Figures (2) and (3) at 100 – 105°C for 60 minutes and 90 minutes respectively. Finally, crispy coconut chips were cooled and packed in air tight plastic containers.

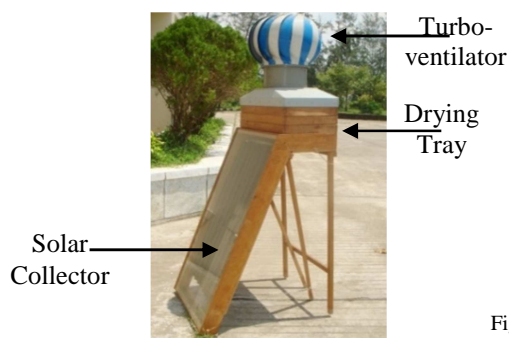


Fig. (1) Solar Dryer



Fig. (2) Oven without Fan



Fig. (3) Oven with Fan

Preparation of Coconut Cream

About 100 g of coconut cream obtained from the upper portion of coconut milk was sterilized and followed by adding about 1.0 g of stabilizer / emulsifier (EXCELAIS 602) and mixed thoroughly by magnetic stirrer at about 70 – 75°C for 10 minutes. When all the stabilizer / emulsifier will completely dissolved, 0.05 g of salt, 0.5 g of vitamin E as an antioxidant and 0.01 g of potassium sorbate as a preservative were added to the coconut cream under the same condition and mixed well. The mixture was followed by homogenizing with a homogenizer under the condition of 15000 rpm for 7 minutes. After homogenization, the coconut cream was pasteurized at 80 – 85°C for a few minutes. Before filling the coconut cream, the empty bottle and lid were cleaned and sterilized in boiling water, followed by drying and cooling. After sterilization of the bottle, the coconut cream was carefully filled into the bottle to give a headspace 5/6 inch. The prepared coconut cream was stored in a cool and dry condition.

Results and Discussion

Processing and Characterization of Coconut Chips

In the production of coconut chips, effect of coconut kernel thickness, effect of additives and characteristics of coconut chips were examined and compared with literature value. Table (1) indicates that 1 mm thickness of coconut chips was obtained in crispy texture and 2 mm thickness of coconut chips was obtained in flaky texture.

In roasting of coconut chips, oven without fan and with fan were used to compare the quality of products. In Table (2), products were obtained by using oven without fan and the most favorable sugar concentration for the processing of coconut chips was 50°Brix because this sugar amount gave good taste of coconut chips but pale yellow colour coconut chips was obtained. Effect of salt concentration on characteristics of coconut chips processed by oven without fan is shown in Table (3). In this table, 0.1% of salt concentration was found to be the most favorable in according to organoleptic properties under constant sugar concentration.

In Table (4), coconut chips were obtained by using oven with fan and the most favorable sugar concentration for the processing of coconut chips was also 50°Brix. In this condition, good taste and milky colour (attractive colour) were obtained.

The physical and chemical characteristics of coconut chips are shown in Table (5). From the results of this table, the characteristics of coconut chips, as shown in Figures (4) and (5), were acceptable values for the consumers under safety condition.

Table(1) Effect of Thickness on Characteristics of Processed Coconut Chips

Dryer = Solar Cabinet Dryer & Oven without Fan

Sample A = (1 mm Thickness)

Sample B = (2 mm Thickness)

PS = Potassium Sorbate

Sample	Sugar (°Brix)	Salt (%w/w)	PS (%w/w)	Shelf-life (month)	Organoleptic Properties
A*	40	0.1	0.01	3	Crispy Texture
B	40	0.1	0.01	3	Flaky Texture

* The Most Favorable Thickness of Processed Coconut Chips

Table (2) Effect of Sugar Content on Characteristics of Processed

Coconut Chips Made by Oven without Fan

Dryer = Solar Cabinet Dryer & Oven without Fan

Coconut Thickness = 1 mm

PS = Potassium Sorbate

Sr No.	Sugar (°Brix)	Salt (%w/w)	PS (%w/w)	Shelf-life (month)	Organoleptic Properties
1	40	0.1	0.01	3	Light Taste and Pale Yellow Colour
2	50*	0.1	0.01	3	Good Taste but Pale Yellow Colour
3	60	0.1	0.01	3	Sugary Taste and Pale Yellow Colour

* The Most Favorable Sugar Content for the Processing of Coconut Chips

Table (3) Effect of Salt Content on Characteristics of Processed Coconut Chips Made by Oven without Fan

Dryer = Solar Cabinet Dryer & Oven without Fan

Coconut Thickness = 1 mm

Sr No.	Sugar (°Brix)	Salt (%w/w)	PS (%w/w)	Shelf-life (month)	Organoleptic Properties
1	50	-	0.01	3	Light Taste and Pale Yellow Colour
2	50	0.1*	0.01	3	Good Taste but Pale Yellow Colour
3	50	0.2	0.01	3	Salty Taste and Pale Yellow Colour

* The Most Favorable Salt Content for the Processing of Coconut Chips

Table (4) Effect of Sugar Content on Characteristics of Processed Coconut Chips Made by Oven with Fan

Dryer = Solar Cabinet Dryer & Oven with Fan

Coconut Thickness = 1 mm

Sr No.	Sugar (°Brix)	Salt (%w/w)	PS (%w/w)	Shelf-life (month)	Organoleptic Properties
1	40	0.1	0.01	3	Light Taste and Milky Colour
2	50*	0.1	0.01	3	Good Taste and Milky Colour
3	60	0.1	0.01	3	Sugary Taste and Milky Colour

* The Most Favorable Sugar Content for the Processing of Coconut Chips



Fig. (4) Coconut Chips Processed from Oven without Fan



Fig. (5) Coconut Chips Processed from Oven with Fan

Table (5) Comparison of Characteristics of Processed Coconut Chips with Fresh Coconut and Product of Thailand

Characteristics	Fresh Coconut	Coconut Chips A	Coconut Chips B	Product of Thailand *
pH	7.42	6.97	7.12	6.49
Acidity (% v/w)	0.4	1.0	0.8	1.4
Moisture (% w/w)	58.2	1.4	2.0	4.8
Crude Fiber (% w/w)	66.5	33	50	44
Ash (% w/w)	1.0	2.1	0.9	1.4
Fat (% w/w)	-	7.23	9.39	-
Carbohydrate (% w/w)	-	86.57	84.11	-
Protein (% w/w)	1.3	2.7	3.6	3.5
Colour	-	0.1 B, 50.2 Y, 4.0 R	6 W, 0.3 Y	0.4 W, 50.3 Y, 3 R
Organoleptic Properties	-	Pale Yellow Colour & Good Taste	Milky Colour & Good Taste	Pale Yellow Colour & Good Taste

* Manufactured and distributed by Mungmee Inter Co., Ltd., Thailand

Processing and Characterization of Coconut Cream

In the processing of coconut cream, effect of homogenizing condition and effect of additives such as stabilizer / emulsifier, on the characteristics of coconut cream were examined and compared with literature value. In Tables (6) and (7), the optimum homogenizing rate and time of coconut cream was 15000 rpm and 7 minutes respectively.

The effect of stabilizer concentration on the characteristics of coconut cream was studied by varying the amount of stabilizer concentration as shown in Table (8). From these results, 1.0 % of stabilizer concentration was suitable for the processing of coconut cream because of the formation of pleasant flavour and good taste.

The physical and chemical characteristics of coconut cream are described in Table (9). From the results of this table, the characteristics of coconut cream were acceptable range of literature value.

Table (6) Effect of Homogenization Rate on Characteristics of Coconut Cream

Upper Portion of Coconut Milk = 100 g

PS = Potassium Sorbate = 0.01 (% w/w)

SE = Stabilizer / Emulsifier = 1.0 (% w/w)

Vita E = Vitamin E = Antioxidant = 0.5 (% w/w)

Sr No.	Homogenization		Remark
	Rate (rpm)	Time (min)	
1	13000	7	Non-homogenized
2	15000*	7	Homogenized / Stable Emulsion
3	17000	7	Emulsion Breakdown
4	19000	7	Emulsion Breakdown

Table (7) Effect of Homogenization Time on Characteristics of Coconut Cream

Upper Portion of Coconut Milk = 100 g

PS = Potassium Sorbate = 0.01 (% w/w)

SE = Stabilizer / Emulsifier = 1.0 (% w/w)

Vita E = Vitamin E = Antioxidant = 0.5 (% w/w)

Salt = 0.05 (% w/w)

Sr No.	Homogenization		Remark
	Rate (rpm)	Time (min)	
1	15000	5	Non-homogenized
2	15000	7*	Homogenized / Stable Emulsion
3	15000	9	Homogenized / Stable Emulsion
4	15000	11	Emulsion Breakdown

* The Most Favorable Homogenization Time of Coconut Cream

Table (8) Effect of Stabilizer / Emulsifier Content on Characteristics of Coconut Cream

Upper Portion of Coconut Milk = 100 g

PS = Potassium Sorbate = 0.01 (% w/w)

Vita E = Vitamin E = Antioxidant = 0.5 (% w/w)

Salt = 0.05 (% w/w)

Sr No.	SE (%w/w)	Organoleptic Properties	Remark
1	-	Good Taste & Favorable Odour	Non-homogenized
2	0.5	Good Taste & Favorable Odour	Non-homogenized
3	1.0*	Good Taste & Favorable Odour	Homogenized & Uniform Milky
4	1.5	Good Taste & Favorable Odour	Viscous & Uniform Milky

* The Most Favorable Stabilizer / Emulsifier Content of Coconut Cream

Table (9) Comparison of Characteristics of Processed Coconut Cream with Literature Value

Characteristics	Processed Coconut Cream	Literature Value
pH*	6.28	5.95-6.30
Acidity (% v/w) *	0.92	-
Moisture (% w/w) *	74.62	74.6
Total Solids (% w/w) *	25.38	25.4-37.3
Fat (% w/w) **	18.54	20 minimum
Carbohydrate (% w/w) **	2.21	1.82-2.62
Protein (% w/w) **	2.75	-
Ash (% w/w) *	1.18	0.63-0.96
Non Fat Solids (% w/w) *	5.19	5.4
Crude Fiber (% w/w) *	3.87	-
Colour***	W-6, B-0.5, Y-0.2	-

Conclusion

In the preparation of coconut chips, blanching of coconut slices in hot water as a pretreatment before drying can reduce the amount of microorganisms present on the surface and protect from oxidative breakdown during drying. Roasting by using the oven with fan preserves the natural colour in dried coconut chips and the crispness of coconut chips were obtained. The selection of stabilizer is important in producing coconut cream that is able to maintain good stability and quality after being treated under processing conditions. The benefits are development of new technology for producing value-added product and also development of small scale industries in Myanmar.

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