

Development of Coconut Delight Candy Using Desiccated Coconut Kernel

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ABSTRACT

Coconut delight candy bar was prepared with 20% (w/w) of defatted desiccated coconut kernel with other ingredients and its acceptability was evaluated. The study was conducted on 80 participants of different age level in Dhaka city area. The odor and organoleptic test of coconut delight candy bar was the major characteristics in the sensory evaluation. Four weeks feeding trial of coconut delight candy bar on 40 volunteers were conducted, compared at pre and after intervention period. Significant correlation $C_r = 0.99$ and $(r = 0.996)$ for BWt and BMI were observed during pre and after intervention respectively. The coconut delight candy bar was found in good condition at ambient temperature up to 12 months in food grade heat-sealed flexible metallised pouch in the store. Coconut delight candy contained 9.1% fat. Vitamin E was used as anti-rancidity agent.

Key words: Desiccated defatted dried coconut kernel, coconut powder, icing sugar, milk powder, vitamin E, and BMI.

Introduction:

In Western countries, different types of delicious confectionery food items have already been formulated and commercially manufactured for consumers. These are popular brands "Snickers" (Nestle, Singapore) "Five Star" (Cadbury, India) "Picnic Delight" (Mimi Chocolate, Bangladesh) etc. but till to-date no coconut tailored vitamin E or vitamin C rich candy bar are available in the market. Therefore, it was thought necessary to introduce such item as a snack food with longer shelf life. According to annual report of Cadbury Company¹, high demand of Five Star candy bar is due to intake of carbohydrate and other associated nutrients. Mimi chocolate² report showed that their previous item, named "Picnic Delight" have had good response in the market due to taste and its rich source of nutrients. Antioxidants provide a valuable degree of protection during food processing and preservation. Such natural antioxidants are often depleted, during processing or by chemical degradation. The FAO / WHO joint expert committee on food additive has given a list of 29-antioxidant compounds³. Antioxidants (vitamin E, vitamin C, beta-Carotene) are used in various confectionery products, for protecting of the fat phase in toffees, in order to avoid rancidity and fading^{4,6}. The used antioxidants in coconut delight candy are vitamin-E along with vitamin C and beta-carotene, and beta-carotene. Coconut delight candy bar is prepared using hydrogenated palm kernel oil, liquid glucose, cocoa powder, defatted desiccated dried coconut kernel, condensed milk, icing sugar, carrot vitamins and minerals. Coconut delight candy bar is usually supplied in the heat

sealable aseptic packet at low cost. It was prepared to promote nutrition and provide additional energy among the consumers and for better economic return for a commercial producer.

MATERIALS AND METHODS:

Preparation of ingredients: Harvested matured nuts were purchased from local market and the nuts were cracked and the kernel was thoroughly washed. After that the kernel was shredded with a shredding knife leaving the testa. After shredding, the coconut meat was pressed in oil expeller for removing oil, dried at 105°C for 6 hours and roasted at a slightly higher temperature for about 10 minutes to develop crispness. The processed kernel contained 3 % fat and 4% moisture.

Germinated wheat and green gram powder (mung bean) were dried at 105°C and roasted like coconut meat. Dehydrated yellow carrot powder was prepared using pulverizer and rotary drier. Supplementary ingredients for preparation of coconut delight candy were icing sugar, liquid glucose, cocoa powder, lecithin, egg albumin, skimmed milk powder, condensed milk, vegetable fat, vitamins, minerals and carnitine. Carnitine was used to improve absorption of fat component. The formulation of coconut delight candy bar is shown in Table-1. All the ingredients are locally available.

Table 1: Formulation of coconut delight candy bar:

Name of the ingredients	Quantity (Kg)	Percentage (%)	Supplementary Ingredients/100 Kg	Quantity
Germinated wheat flour	10	10	Beta carotene	600 mcg
			Vitamin C	30 mg
Defatted desiccated coconut kernel	20	20	Vitamin E	1 0000 IU
Germinated green gram	5	5	Pantothenic acid	5000 mg
Yellow carrot powder	4	4	Niacin	1200mg
Cocoa powder	5	5	Riboflavin	1000 mg
Hydrogenated palm kernel oil	7	7	Pyridoxine	1300 mg
Skimmed milk powder	5	5	Vitamin B12	3800 mcg
Condensed milk	25	25	Iron	7000 mcg
Icing sugar	13	13	Zinc	6mg
Liquid glucose	3	3	Selenium	3800mcg
Egg albumin Lecithin	0.7	0.7	Calcium	400gm
Calcum Carnitine	0.3	0.3	Carnitine	8.4 gm

Different stages for preparation of coconut delight candy bar

Melanzeuring: Required quantity of icing sugar, germinated wheat flour and green gram powder, hydrogenated palm kernel oil, cocoa powder and yellow carrot powder were put together in a melanzeur machine (Carley Montainery, Italy, Spa) in order to produce a homogeneous mixture within one hour. During loading, the melanzeur was heated to 60°C.

Refining: Refining of prehomogenized mixture was done in a five roller refiner to obtain the desired particle size (Five-roller refiner, Carley Montainery, Italy, Spa).

Conching: The process of conching was accomplished for flavor and texture development by removing the excess moisture and by the chemical changes that took place in the product mix. In these, the refined paste was first turned over vigorously by means of powerful mixer blades. The paste assumed the condition of small lumps in a double-jacketed vat.

Preparation of cream: Cream was prepared in a vertical mixer machine at 1400 rpm for 2 hours agitation using egg albumin, water, icing sugar, milk powder and vitamins in the first stage. Secondly, sugar syrup at 70°C with a desirable pH range (5.5 to 6.2) was mixed in the cream portion in order to make form enough for handling prior to covering. Sugar syrup was prepared using sucrose and liquid glucose at the proportion of 75:25 and boiled to become 60 % solid phase.

Preparation of coconut candy: The roasted coconut kernel was loaded into the hot sugar syrup and then transferred into the cream portion and mixed rapidly. The mix was poured in an oil coated stainless steel flat tray to make a thick sheet. The candied materials were kept in an air-conditioned room for 12 hours to harden.

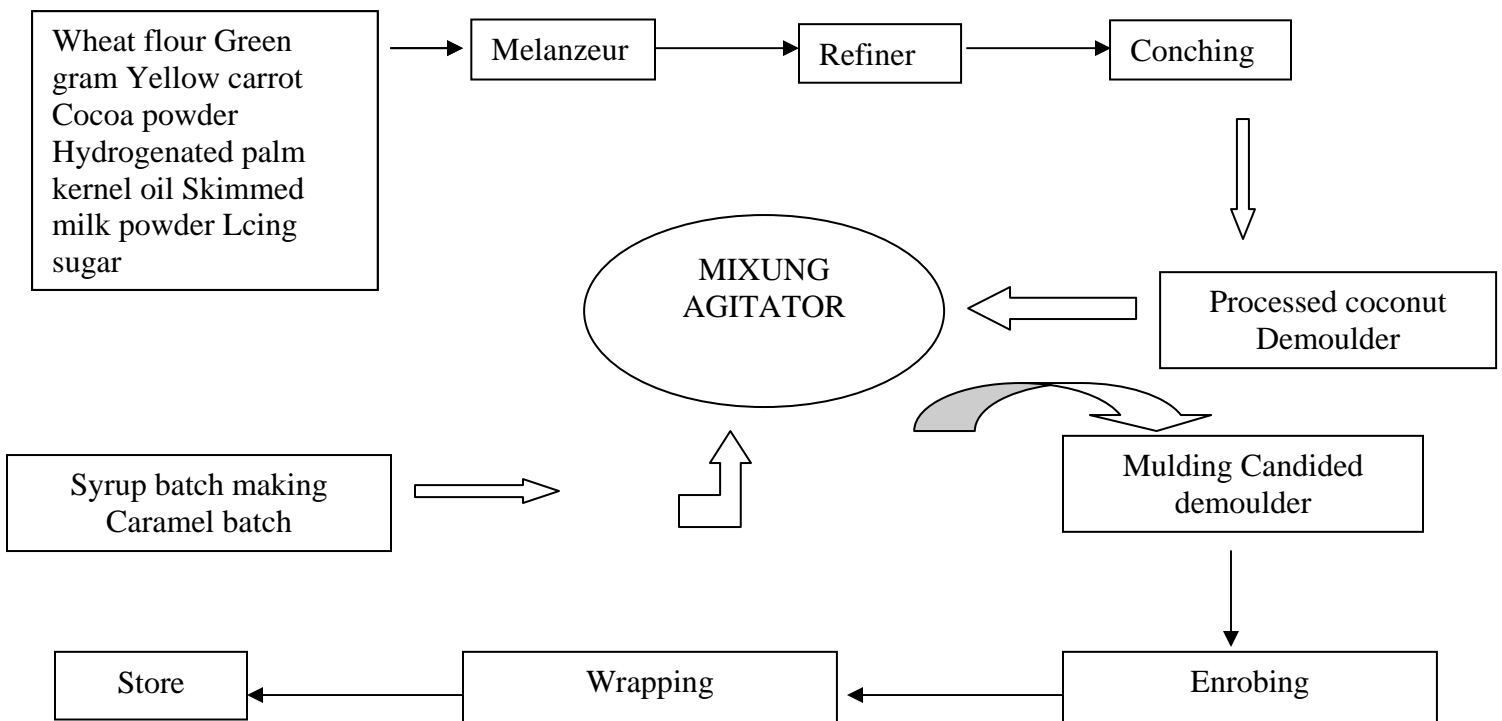


Figure 1. Flow chart diagram of coconut delight candy bar

Preparation of caramel and finished products: Blending of glucose, icing sugar, condensed milk, hydrogenated palm kernel oil and salts produced the caramel. The hatch was turned out and poured on the cold candied materials and stored at 25°C. The candied sheet was cut into small pieces and enrobed with chocolate already available in the factory by using enrobing machine (SIRE-300, Martine Loveras, Spain) and then packed by heatsealable photocell wrapping machine (Taiwan, roc).

Proximate analysis of the processed coconut delight candy bar: The calorific value of the product was determined using Gallenkamp Adiabatic Bomb Calorimeter⁷. Moisture, fat, protein and ash were estimated using standard methods of Hawk's Practical Physiological Chemistry⁷. Carbohydrate was calculated by difference. Micronutrients were estimated by atomic absorption spectrophotometer⁷⁻⁹. Microbiological count was done using Burgeys method¹⁰. Vitamin E (Alpha tocopherol) was estimated by HPLC⁷.

Table-2: The nutritive value of the processed coconut delight candy bar

Nutrients	Percentage %	Nutrients	Percentage %
Moisture	5	Vitamin –B ₁	1.4 mg
Ash	2.9	Vitamin –B ₂	1.2 mg
Protein	15.7	Vitamin –B ₆	1.3 mg
Fat	9.1	Vitamins –C	55 mg
Carbohydrate	67.3	Zinc	7.0 mg
Beta-Carotenc	6 mg	Selenium	12.0 mg
Vitamin –E	11.4 IU	Iron	7.0 mg

Energy per 100 gm Coconut Delight = 412 Kcal.

Table-3: Microbial count of coconut delight candy bar

From of sample	Sample (gm)	Moisture Content (%)	Test	Limit/100g	Total Count
Before heat	20	10	Total count	100	81
Treatment			Total colifrom count	0	0
After heat	20	5	Total count	>60	57
Treatment			Total colifrom count	0	0

Sensory evaluation of coconut delight candy bar: Sensory evaluation consisted of judging the quality of food by a panel of eighty participants. It was designed to reflect common preference, to maintain the quality of food for a given standard. Processed coconut delight candy bar was jistributed among the participants. They were at different age levels. The judging factors were odor, organoleptic test and comparing comments with Picnic delight (Bangladesh). These results were evaluated with degree of judgement using suitable defined scores for statistical analysis.

Feeding trial/Acceptability study: Coconut delight candy bar was given to forty volunteers for 4 weeks. A baseline data was first obtained. Volunteers were given 80 gm (2 pcs.) coconut candy bar as additional snack to taste the product. Body weights of the volunteers were measured by using 150-kg type scale at pre and after intervention period. The height was measured with a locally made height scale. Volunteers were in the age group between 30-50 years. The study target groups were selected from Dhaka city areas.

Statistical analysis: Body weight and height were used for comparison of variables between volunteers and BMI with mean and standard deviation. The association between variables was done by pearson`s correlation coefficient ``r``. The significant variables were identified where the independent variables were body weight and BMI. At the base level and after intervention, all these analyses were done using SPSS/PC++ programs”.

RESULTS:

The moisture content was 5% and protein-was 15.7%; fat content was 9.1 % and carbohydrate was 67.3% (Table-2). Table -3 shows the microbial count where total count was 57 per 100gm at 5% moisture level.

Forty volunteers at different age groups were enlisted as volunteers. Their biophysical report were collected for measuring BWt. and BMI (pre ad after intervention n). More than 50% of the volunteers were up to30 years old and 50% were >30 years old. Table-4 shows the body weight distribution in this study. The mean weight variables of the volunteers was 42.9 ± 6.53 kg to 44.31 ± 6.41 kg at pre and after Intervention period respectively. The body weight level increased from 42.93 ± 4.27 kg to 44.31 kg ± 6.41 kg I, e, 0.032% during intervention and the difference was significant $P=0.001$. The correlation of the body weight was $r = 0.99$ which means that there was a strong negative association between pre and after intervention period.

Table-4: Weight distribution of the tion volunteers group in the feeding trial during base line and after intervention period

Age (Years)	No. of Volunteers	Mean \pm SD (Pre intervention)	Mean \pm SD (After intervention)	2-tail, P values
5-20	19	28.63 \pm 12.52	30.0 \pm 12.53	0.0001
21.30	13	54.15 \pm 3.93	55.56 \pm 3.64	0.0001
31 +	8	57.63 \pm 4.27	59.88 \pm 1.81	0.0001
Total	40	42.93 \pm 6.53	44.31 \pm 6.41	0.0001

Table-5: Distribution of the volenteers by BMI

Age (Years)	No. of Volunteers	Mean \pm SD (Pre intervention)	Mean \pm SD (After intervention)	2-tail, P values
5-20	19	18.44 \pm 6.4	20.03 \pm 5.50	0.0001
21.30	13	21.84 \pm 2.7	22.40 \pm 2.8	0.0001
31 +	8	21.15 \pm 1.05	21.44 \pm 1.05	0.0001
Total	40	20.48 \pm 6.0	21.39 \pm 1.19	0.0001

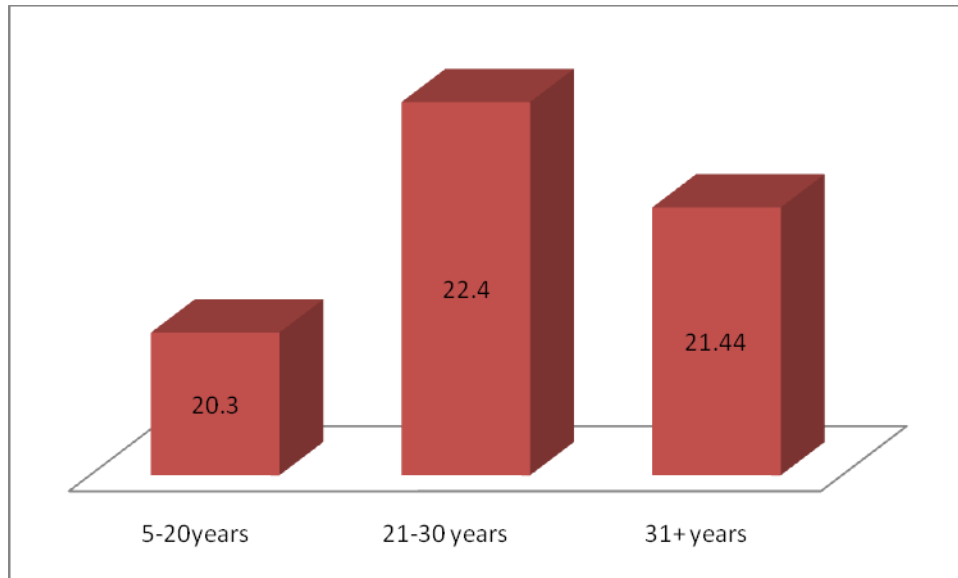


Figure 2: The distribution of volunteers by body mass index (BMI)

Table 6 shows the comparison of coconut delight with commercially available Picnic delight candy bar in the market among different age groups. The participants up to 30 years (n = 30) were evaluated and categorized as liked coconut delight candy bar (65%, $P > 0.02$); 30-40 years (n = 30) liked coconut delight candy bar (52%, $P > 0.02$) and 40+ years (n = 20) liked Coconut delight candy bar (50%, $P > 0.02$) and remaining 50% liked Minis Picnic delight candy bar ($P > 0.02$). Therefore, most of the participants evaluated coconut delight candy bar as a better product.

Table-6: Comparative Acceptability of processed coconut delight and commercially available picnic delight candy barnd in the local market of Bangladesh

Age group (years)	No. of Volunteers (N = 80)	Acceptability of coconut delight brand (%)	Acceptability of picnic delight (Minichocolate) 9(%)
<30	30	65	35
30-40	30	52	48
40+	20	50	50

Table 7 shows the organoleptic test of coconut delight. The participants up to 30 years (n = 30) were evaluated as extremely liked category (59%), 30-40 years (n = 30) as extremely liked (55%) and 40 + yrs. (N = 20) extremely liked group (60).

Table-7: Evaluation of organoleptic test of coconut delight

Age (year)	Volunteers (N = 80)	Acceptability %				
		Dislike	Do not like very much	Nor like nor dislike	Like	Extremely like
Up to 30-	30	0	12	7	12	59
30-40	30	0	9	8	28	55
40 +	20	0	10	9	21	60

DISCUSSION

The study provided an opportunity to use newly developed coconut delight candy bar to evaluate its nutritional quality by feeding trial. An increase in BWt. and BMI was seen in the study. The results were encouraging regarding the intervention of food supplementation and health care variables. It is known from earlier studies that on average the volunteers received more calories and vitamins³ compared to other commercially available candy bar. However, in our study the volunteer's received 412 kcal/100 gm candy bar as additional supplements. Thus, it would appear that the nutritional effects on the volunteers were expected to be due to coconut delight candy bar supplementation as the cheapest candy (maximum retail) price of Five Star candy = Tk.12.00, Picnic delight of Mimi chocolate = TK.8.00 and coconut delight candy = Tk.6.00). in future, it is proposed to extend the study to cholesterol levels, free radical injuries and other valuable nutritional indicators.

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