Development and Assessment of Palmyra palm Toffee

BY

Masud Ahmed

ID – 182-34-787

Department of Nutrition & Food Engineering

Supervised By

Juwel Rana

Lecturer

Department of Nutrition and Food Engineering

Daffodil International University

CO-Supervised By

Dr. Sheikh Mahatab Uddin

Associate Professor

Department of Nutrition and Food Engineering

Daffodil International University

DAFFODIL INTERNATIONAL UNIVERSITY

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LETTER OF TRANSMITAL

Date: 5th March 2022

Ms. Fouzia Akter

Head & Assistant Professor

Department of Nutrition & Food Engineering

Daffodil International University

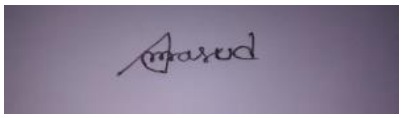
Subject: **Submission of Project report**

Dear Mam,

With very gladness and honor, I would like to inform you that I have completed my project report on" **Development and Assessment of Palmyra palm Toffee**". I have done my best to complete the Project Report for consistency with the optimal standard under your valuable support.

I have achieved the purposes of the project report and hope that my effort will serve the commitment. The practical knowledge and experience that was absorbed during the report preparation will be greatly helpful in my future professional life. I am requesting you to excuse me for any oversight that may occur in the report despite my best effort.

Sincerely Yours



Masud Ahmed

ID-182-34-787

Department of Nutrition & Food Engineering

Daffodil international University

LETTER OF AUTHORIZATION

Date: 5th March 2022

The Head of the Department,

Department of Nutrition & Food Engineering

Daffodil International University

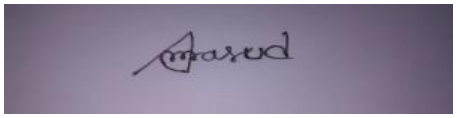
Subject: **Submission of Project Report**

Dear Mam,

This is my truthful declaration that the "Project Report" I have prepared is not a copy of any other project report previously prepared by any other students.

I also express my honest confirmation in support of the fact that the said thesis report has neither been used before to fulfill my other course related nor it will be submitted to any other person or authority in future.

Sincerely Yours



Masud Ahmed

ID: 182-34-787

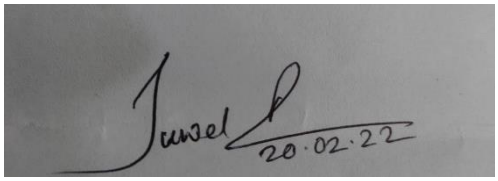
Department of Nutrition & Food Engineering

Daffodil International University

CERTIFICATE OF APPROVAL

I am pleased to certify that the project report on **"Development and Assessment of Palmyra palm Toffee"** conducted by **Masud Ahmed**, bearing **ID No: 182-34-787** of the department of Nutrition and Food Engineering has been approved for presentation and defense/viva voice.

Masud Ahmed bears a strong moral character and a very pleasant personality. It has indeed a great pleasure working with him. I wish him all success in life.



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Supervisor	**Head**
Juwel Rana	**Ms. Fouzia Akter**
Lecturer	Head & Assistant Professor
Department of NFE	Department of NFE
Faculty of Allied Health Science	Faculty of Allied Health Science

ACKNOWLEGEMENT

At first I express my gratitude to Allah SW, Who created me and gave me strength for working honesty and hardly, give me the ability to complete my project and preparation this report. And I would like to acknowledgement the inspiration and collaboration for giving me by a number of people. I am grateful to my lovely parents, who supported me to achieve my objectives & goals.

My Deep gladness and cordial thanks from my heart to my honorable supervisor **Juwel Rana**, Lecturer, Department of Nutrition and Food Engineering, Daffodil International University, for his active supervision during my project work.

Deep gratitude and sincere thanks to the honorable CO-Supervisor **Dr. Sheikh Mahatab Uddin**, Associate Professor, Department of Nutrition & Food Engineering, for his kind cooperation and to accept this Degree.

I am very grateful to **Ms. Fouzia Akter**, Head of the Department of Nutrition and Food Engineering, Daffodil International University.

I would also like to express my heartfelt obligations to all NFE Faculty members' and officials for their immeasurable motivation and encouragement throughout my student life.

DEDICATION

THE PROJECT WORK IS

DEDICATED TO

MY BELOVED PARENTS

&

MY TEACHERS

ABSTRACT

Palmyra Palm *(Borassus flabellifer)* is commonly known as tala or tala palm, sugar palm or toddy palm. Palmyra palm is commonly available in South Asia (e.g. Bangladesh, Sri Lanka and India), Southeast Asia (e.g. Myanmar, Cambodia, Malaysia, Indonesia, Vietnam and Thailand) and Africa. Palm fruit pulp has short-shelf life due to its high water content. However, the aim of this study to develop toffee from fresh Palmyra palm pulp and evaluates its nutritional value and sensory quality. A different recipe was used to prepare this value added products (toffee) from fresh pulp with varying quantities of skim milk powder, Maida, glucose, sugar, til. The toffee was produced by cooking & stirring at medium heat. The result obtained from the proximate assessment indicates a medium composition of water, high composition of sugar, fat, protein and ash. The sense quality of developed toffee was also promising. 78% participant's extremely like the toffee. Result from proximate composition & sensory analysis stated that Palmyra palm toffee has potential for alternative use of Palmyra palm fruit pulp. So, it can be said that the toffee would be best way to reduce waste and commercial use of Palmyra palm fruit pulp.

Key-Words: Palmyra palm, toffee, proximate value, sensory quality, alternative use, waste reduce.

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Introduction

The Palmyra palm *(Borassus flabellifer)* has long been one of the most important trees with various utility is believed to be a native of tropical Africa, although it grows widely in different parts of Asia especially Bangladesh, India, Sri Lanka and Myanmar. Also cultivated in Nepal, Laos, Vietnam, Malaysia and Indonesia this coconut like tree.

Most palms trees can grow up to 98 ft. in height and have hearty trunks with separate leaf scars. Depending on the species the fruit has three sides that separate into three large seeds with oval or rounded shape and are 15-25 cm wide. Fruit color changes black to brown, yellow or orange. The pulp is aromatic sweet to taste. Palmyra (Borassus) palm is of substantial value to indigenous inhabitants where it is located and it is referred to as tree of life having numerous uses comprising timber, fiber, medicine and food and beverage (Peter, 2008). The three most important economic species are B. aethiopum Mart, B. flabellifer and B. sundaicus Becc. (Davis & Johnson, 1987)

With slightly bitter the yellowish sweet Palmyra palm pulp rich in vitamin A (carotenoids) and C as well as some macronutrients are relevant in products like cakes, jelly, ice cream, jams, cordials, beverages and toffee ; (Rao, Das, & Das, 2008). Also extracted juice from tree trunk and various by-products like molasses and palm sugar produced. In the tropical season of Bangladesh the immature juicy Palmyra palm fruit seed are very popular in local market. A Palmyra palm fruit contains about 40 % of undiluted pulp which is dark yellow in color with its characteristic flavor and bitterness and the pulp is extracted manually with water (JANSZ & Baeckström, 2002)

However, have very little commercial use of these fruit in Bangladesh. Due to improper storage, over 60% of the annual fruit yield is being lost (Chaurasiya, Chakraborty, & Saha, 2011) . There is no standard variety of Palmyra palm in Bangladesh and has no attempt to grow. Therefore, an effort has been made to prepare Palmyra palm fruit pulp toffee from the fresh pulp for the purpose of nutritional characteristics and sensory analysis.

Objective of the study

The objective of this study was to develop palm toffee based Palmyra palm fruit pulp incorporating with others value added ingredients.

- To develop Palmyra palm fruit pulp toffee.
- To analyze the proximate composition of palm toffee.
- To determine the sensory quality of the toffee.
- To create scope to develop a new product from Palmyra palm fruit pulp

Chapter 2

Review of Literature

The study delved into the alternative use of Palmyra palm by developing an uncommon value added products from Palmyra palm pulp that is toffee. Palmyra palm is an underutilized indigenous fruit, which have looked relatively little attention for research in Bangladesh.

The ripe Palmyra palm fruit pulp is sugary with soft characteristics and orange-yellow color. Dense and edible and also rich in vitamin C and A. Palmyra palm pulp also slightly bitter in taste for its flabella ferries. That is steroidal saponins.

Unfortunately, due to its highly water content over 60% of the annual fruits generation is being lost due to spoil in storage. Prepared toffee can be a better way to reduce losses by increasing commercialization use of this fruit. Toffee is produced by caramelizing sugar mix with milk, flour and others ingredients. Develop toffee from Palmyra palm pulp is an uncommon product. However, there is no standard variety of Palmyra palm fruit in Bangladesh. Although has a variability among the local types fruits.

Ali et al. (2010) has determined the morphological and nutritional characteristics of ripe Palmyra fruit. Significant differences found in physical and chemical properties in various Palmyra palms those were collected from different locations of Cameron. The physical and chemical characteristics were examined for each of the 30 fruits collected in the two agro climatic areas. Weight of fruits, Weight of kernels, weight of pulp, thickness of pulp,% of pulp were measured to determine the morphological value of Palmyra palm fruits. The determination showed difference of the physical morphological properties between the fruits of the same zone, the weight of whole fruit. The chemical analyses were set out on the pulp of 30 fruits from each agro climatic zones. Water contents of Palmyra palm fruit, total sugar content, protein contents, total carotenoids, vitamin Total ash are examined to measure the nutritional value and difference between different agro climate Palmyra palm fruits.

Agro climatic region, level of ripens and different criteria affected the national and physical characteristic of Palmyra palm fruit. The research of chemical and physical difference is help to identify Palmyra palm processing and storage. Palmyra palm is a highly perishable food, due to its water content. And also other parameters influence its self-life. Palmyra palm fruit pulp product change its chemical characteristic quality during storage period.

According to A.K Chaurasiya (2014), gradually increase and decrease with retain taste the amount of each chemical value of Palmyra palm toffee during ambient and refrigerated condition. A standardized used for preparing palm toffee that suggested by Diwate et al which is a papaya toffee preparation. Mixing the ingredients and cooking with continuous stirring for 40 min at law medium temperature was the steps of palm toffee production.

Water drop test had been used to determine the end point. This determined showed the increase in TSS content. By hydrolytic enzymes sugar converted into polysaccharides and then converted into simple sugar The total sugar also reducing sugar amount of the prepared palm toffee products also followed the familiar trend as the case of TSS amount. The possible cause behind the improved in total sugar content during storage might be due to the hydrolysis of complex carbohydrates. Due to the partial hydrolysis of complex carbohydrates, the total sugar amount of prepared toffee also followed the same increase of TSS during storage period. ß-carotene content of processed products had the similar decreasing trend at the end of ambient storage. The possibly reason was moisture loss or due to concentration effect of toffee during storage period.

The ascorbic acid content of prepared toffee had similar decreasing trend up to 4 months at room storage, after that the value was negligible. This was also possible reason was of moisture loss or due to concentration effect of products during storage. In ambient temperature the protein content also had a decreasing trend at the end time of storage. This research examined up to 8 months in ambient temperature and refrigerated condition. the result was sensory evaluation and microbial status showed the prepared product remained acceptable quality. The comparison obtained resulted from between ambient temperature and refrigerated condition product, where the inversion was more in ambient temperature than refrigerated product. With acceptable changes of Palmyra palm toffee this new product from palm pulp is good way to lose the annual Palmyra palm fruits and have a chance to produce it for commercialization. Developing Palmyra palm toffee with the view to increasing nutritious value and flavor can be added others ingredients. That makes the toffee more delicious and nutritious. Therefor a worked tried to develop Palmyra palm pulp toffee with value added ingredients and also used til to increase the taste. For adding til in Palmyra palm toffee make the toffee different with new flavor and taste.

Chapter 3

Materials & Method

3.1 Collection of Materials

The materials required for the preparation of palm toffee like Palmyra fruit, skim milk powder, sugar were collected from local market.

3.2 Pulp extraction

After washing well ripened palm peeled and extracted pulp manually by rubbing. Added additional water to extract pulp in the ratio of 1:1 with seeds.

Heat at 70 °C for 7 min was given for maximum pulp extraction as per the method suggested by Roy & Singh (1979) in bale fruit. To remove fiber the extract pulp was sieved and measured of the pulp.

3.3 Preparation of toffee

Table 1: Ingredients & Amounts

Ingredients	Amounts
Pulp	250 gm.
Sugar	250 gm.
Skim Milk Powder	100 gm.
Glucose	25 gm.
Maida	50 gm.
Till	5 gm.

Apparatus

1. Measuring Balance
2. Spatula
3. Saucepan
4. Stirring rod
5. Gas Stove

Procedure

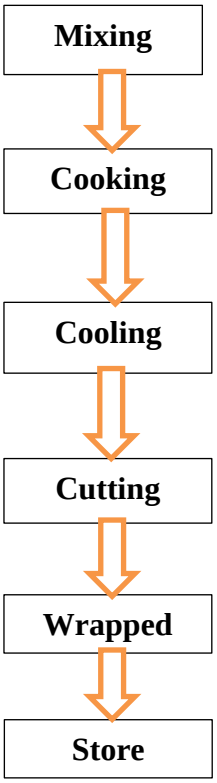

Figure 1: Flow chart of toffee production

Mixed all ingredients with pulp and cocked with stirring for 37 min at low medium heat. Drop test in water used to determine the end point. Then removed the saucepan from heat and spread the mixer on aluminum tray that was smeared with butter or oil. Put it overnight on air and cut into 2*1.00 cm size and wrapped with paper and stored in room temperature.

Chapter 4

Proximate Analysis

4.1 Determination of Moisture:

Moisture content of prepared product by using digital moisture machine.it took few minutes to give the result.

Procedure:

- Take 10 gm. sample on sample holder
- Close the cover and start the machine to read the moisture content and wait
- After some time when machine give a signal, read the moisture content
- Note down the content
- Again measure the moisture content for two times and average the three times result

4.2 Determination of Ash:

The inorganic residue reaming after the heat of organic matter in a food sample determines as ash.

Apparatus:

- Muffle furnace.
- Balance meter.
- Crucible
- Crucible lid
- Spatula
- Desiccator
- Hand gloves.

Sample: Palm Toffee (2gm)

Procedure:

- Take heat the crucible to remove moisture and take weight (W1)
- Take sample and cover by lid (W2)
- Put the crucible in a muffle furnace for 6 hours at 600°C
- Put out crucible and cool it in desiccator
- Again weight crucible (W3)

Calculation:

Ash % $=\frac{W2-W3}{SW\times100}$

4.3 Determination of TSS (Degree Brix):

Total soluble solids content of palm toffee was determined with the help of digital Hand Refractometer.

- Dilute sample with distil water.
- Take 1/2 drop on sample holder.
- Covered the sample holder.
- Keep eye on refractometer to read the TSS value.

4.4 Determination of PH:

Digital PH meter used to measure the PH of prepared products.

- Dilute sample with distil water.
- Submerged the probe in the sample solution
- Read the result

4.5 Determination of Fat:

Apparatus:

1. Digital Weight Machine
2. Crucible and lid
3. Soxhlet Apparatus.

Chemical: N-Hexane

Procedure:

- Take weight the empty thimble and round bottom flask (W1)
- Take 5 gm. sample and place it in thimble and 90 ml hexane in flask.
- Set the soxhlet apparatus and also add condenser water line, then start heat to boil hexane.
- This process may take 6 hours to extract fat, and then stop the process.
- The flask with fat keeps in oven to remove hexane and then put out and keep in desiccator.
- Then take the weight of flask with extracted fat.

Calculation

$$\text{FAT\%} = \frac{W2 - W1}{Ws} \times 100$$

4.6 Determination of Protein:

Protein content was estimated as per the method of kjeldhal method. It has three steps to determine nitrogen.

These are following-

1. Digestion
2. Distillation
3. Titration

Digestion:

Weight 0.4 gm. sample of palm toffee and poured into a kjeldhal flask, 10ml of H2SO4 was mixed with it. Also 2 gm. digestion mixer (CUSO4) added into it. placed the flask in digestion chamber to heat it at 70 degree centigrade until it become colorless. Then put out and keep it desiccator to cool it. Then take volume metric flask to make 100 ml with distilled water.

Distillation:

10ml of solution was taken to the distillation flask.150 ml DW was taken into the flask. Then 10ml of 40% NaOH was added to the distillation flask. Solution had no color. At the same time a blank process was ran where added only reagent. 50ml of distilled water and 10ml of 0.1 M HCL was taken in a trapping conical flask.2 drops of methyl orange was taken into the trapping flask. The solution was become pink.

Then the condenser was run for 30 minutes. After distillation process trapping flask collected for titration with NaOH**.**

Titration

The burette was filled with 0.1N of NaOH solution. Then the trapping conical flask was shaken gently under the burette and added NAOH by drop wise. Added NaOH until changed the color. Changed color pink to yellow was the determiner the last point.

Calculation

$$\text{Protein \%} = \frac{(C-B)\times 14\times d\times 6.25\times 100}{a\times 100}$$

Where,

a= Weight of sample

b= (Final volume - Initial Volume) of NaOH for sample

c= (Final Volume - Initial Volume) of NaOH for blank

d= Normality of NaOH used for titration

The conversion factor of nitrogen to protein (6.25)

The atomic weight of nitrogen (14.007)

4.7 Determination of Carbohydrate:

Carbohydrate (%) was measured by a subtracted method.

Proximate Total Carbohydrate (%)

= (100-Protein+Fat+Ash+Moisture)

4.8 Sensory Evaluation:

The sensory analysis was conducted among 12 people through a 9-point hedonic scale planned by Perham and Girardot in 1952.

Chapter 5

Result & Discussion

5.1 Composition of Toffee

TSS values of prepared products were 69.3% at room temperature. A research by A. K. Chaurasiya found that the TSS of toffee was increased in ambient temperature which indicates that the sugar in prepared food deposits into polysaccharides. By various hydrolytic enzymes converted into soluble sugar (Chaurasiya, Chakraborty, & Saha, 2011).On the other hand, The Protein content of palm toffee 2.55% .That was decreased in ambient temperature shown by A. K. Chaurasiya. The proximate composition of toffee had shown that among all nutrients Carbohydrate content was greater than others, Moisture content was 11.10%, Ash was .8%, fat was .26%, protein content was 2.55%.

The pH value of palm toffee was 6.00.

Table 2: Composition of Toffee

Content	**Sample 1 (%)**	**Sample 2 (%)**	**Average Value**
Moisture	11.26	10.93	11.10
Carbohydrate	83.66	84.00	83.83
Fat	.23	.29	.26
Protein	2.6	2.5	2.55
Ash	.8	.8	.8

5.2 Physical Properties of toffee

Also analyzed the physical and chemical characteristic properties of prepared product. The degree brix of the toffee were 69.3 where the pH of the smoothie was 6.00.

Table 3: Physical & Chemical Properties of toffee

Parameters	**Value**
Degree Brix	69.3
PH	6.00

5.3 Sensory Perception

The toffee products were assessed for color, flavor, odor and texture/ mouth feel and overall acceptability. Sensory perception conducted among 12 students of daffodils international university. Figure 3 has shown the result of sensory perception.

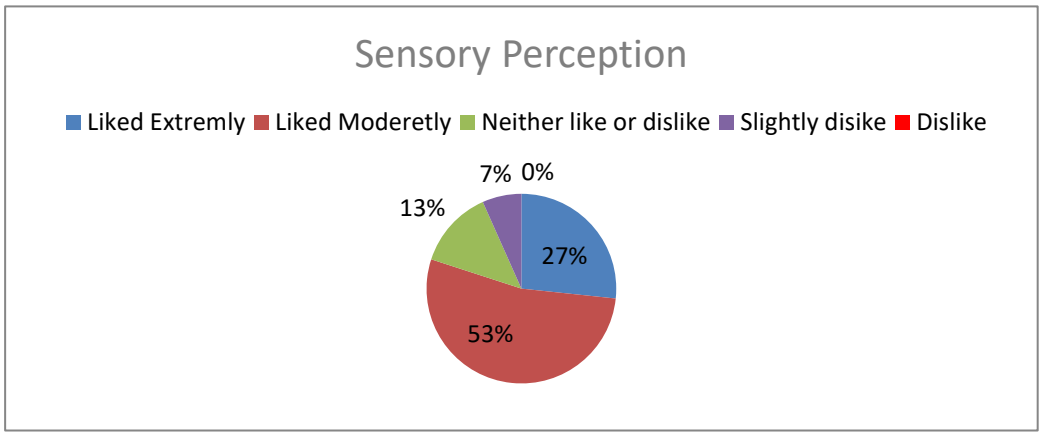

Figure 3: Sensory Perception

Chapter 6
Conclusion

The Palmyra palm fruit can be resources of important water content and a better sources of sugar, also Vitamin C, A, fibers and minerals. Unfortunately there is some possibility to loss its value like difficulty extraction of pulp, shorter shelf life etc.

The ripe Palmyra palm fruit can be used to prepare toffee. Proximate composition of palm toffee has shown that it is high source of carbohydrate, water & protein. This is not only nutritionally rich and commercially viable but also extremely palatable.

According to the result of A. K. Chaurasiya the palm toffee can be stored up to 9 months.

According to the sensory results obtained, it is concluded that prepared product was better preferred to all. The results prove that Palmyra palm fruit pulp toffee has potential for value added products which in turn help to reduce post-harvest losses.

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