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Production, Assessment & Packaging of De-Junked Chocolate Made with Doum Palm Fruit (Hyphaene Thebaica)

[1]Hadiza Lawan, [2]FatimaYusuf, [3]Grace Momoh

[1]Department of Home Economics Education, Federal College of Education (Technical) Bichi, Kano State - Nigeria
[2]Department of Home Economics Education, Federal College of Education (Technical) Bichi, Kano State - Nigeria
[3]Department of Marketing Education, Federal College of Education (Technical) Bichi, Kano State – Nigeria.

ABSTRACT

Doum palm is one of the underutilized dried fruit despite its abundant supply and all-year-round availability in Kano State Nigeria. Its harness encourages children to be its popular gnawers, causing it to be abandoned by adults except for traditional therapy. This study, which is basically a research, titled "Production and Assessment and packaging of De-Junked Chocolate made with Doum Palm Fruit (Hyphaene Thebaica)"aims firstly at producing de-junked chocolates and also to render the products nutrient dense and favorable to health as well as free from nutritional implications. The research also assesses the sensory and nutritional properties of the product using ten panelists and a 1 to 9 points hedonic scale to ascertain the product's taste, appearance, and texture. The product was evaluated both before and after storage for four weeks at room temperature. The result showed that all the products were accepted as the scores of all the products were above 5 mean points which is the benchmark of the decision made. The paper recommends, among other things, that the Standard Organization of Nigeria – SON and the NAFDAC should organize sensitization workshops to create awareness about the novel Doum palm fruit powder, its uses and benefits and that this researched product should be registered and commercialized throughout Nigeria and also exported to other African countries and beyond.

Keywords: ***Production, Doum Palm fruit, Chocolate, De-Junk, Assessment, Packaging***

Introduction

Chocolates alternatively called sweet or candy is a confectionery which encompasses sugar as a principal ingredient. It is a delicious and delightful luxury that provides momentary pleasure and delightful sweet taste and creamy texture often aesthetically pleasing. Streater (2022) stated that chocolate contains serotonin and phenylethylamine antidepressants which help to stimulate mood, even though sugar in sweet provides a lot of calories and energy that can be felt immediately. Singh, Minifie, Knechtel (2023) observed that many people are bombarded with unhealthy junk foods. Although confectionaries as chocolates may look innocent, however high consumption may lead to dietary habits that are difficult to terminate with detrimental effects on health such as raised blood pressure and sugar increased chronic inflammation, weight gain, diabetes and fatty liver disease, as a result of its unhealthy, artificial additives Fox (2019). Fatty liver disease is also a great factor in cardiovascular diseases. Similarly, Frank (2023) submitted that one negative effect of sugar is that it causes tooth decay.

Donsky, Boyer and Tsakos (2011) opined that to make distinctive trail of sweets for long-lasting energy and healthy snacking, natural ingredients should be mixed wisely. Thus de-junk and control the amount of sugar in foods, a careful selection of unsweetened fruits nuts, dried or roasted foods: nuts, dried fruits (raisins, cranberries, blueberries, bananas, etc.), peanut butter chips, sunflower seeds, roasted pumpkin seeds and dried, unsweetened coconut flakes should be made.

Doum palmfruit (Hyphaene thebaica) is a medium sized oval shaped snack fruit obtained from doum palm tree native to hot regions like Kano State, Nigeria. It is a very hard woody textured fruit with a mildly sweet taste consumed popularly among children by gnawing. Doum palm fruit comprises three parts: the outer layer with varying colours ranging from brown, red brown to maroon colour in lighter or darker hues; the middle light brown woody textured fiber and a large hairy seed at the center. Consumption of Doum palm involves prolonged play-like activities by beating up the fruit with stone to remove outer layer and gnawing the middle fiber. Its consumption is abandoned by adult except for traditional therapy of headache and dizziness.

According to Islam, Saeed, Afzaal, Hussain, Al Jbawi, Armghan, (2022) Doum palm fruit has antimicrobial ability, antioxidant, antitumor and anti-inflammatory ability. Doum palm fruit also contains dry matter (96.69 %), per 100g, total carbohydrates (84.87 %), total sugars (29.39 %) crude fiber (22.36%), Protein (3.44%), Fat (1.14 %), Potassium (171.60 mg), calcium (336.40 mg) Magnesium (131.35 mg), sodium (153.92 mg) and iron (168.87 mg) (Hisham and Mahmoud 2013).Consumption of doum palm fruit lowers blood pressure in hypertensive patients and changes blood lipids and lipoproteins that decrease the risk of cardiovascular system, Gendy, El-Mileegy, Ghyaty, Malek, El-Hamid (2015)

The Doum Palm Fruit is considered an under-utilized crop in the study area because of its limited usage. Bongjo, Ahemen, Gbertyo, Guyih& Muyong (2023) stated that there have been recent strides in the incorporation of other flours from legumes, tubers, vegetables or fruit-based in food processing industry and in terms of composite flour technology. Incorporating Doum Palm Fruit in foods will de-junk and facilitate its consumption for nutritional benefit, constitute inexpensive high-quality and functional ingredients as well as an avenue for fulfillment of the four main dimensions of food security (Peng Berry 2018).

Health concerns coupled with the need to utilize abundant natural indigenous crops like doum palm plus the need to diversify Nigerian economy are some of the factors that prompted this research investigation for snacks fortification, supplementation, complementation and modification since conventional ones in the study area lack the nutrients found Doum Palm fruits.

Packaging has been defined as the general group of activities in product planning which involves designing and producing the container or wrapper for a product – William . Stanton (2018). Packaging attracts the attention of consumers, helps to connect with their own personality and establishes an emotional relation in very small fraction of time. The basic purpose of undertaking product or consumer packaging is to safeguard the goods from reactions caused by natural elements, to draw the attention of the market and to have ease of handling. Thus the finished product of this research, as intended by the researchers, will be properly packaged for better handling of consumers.

Objectives of the Study

The main objective of this study is the Production, Assessment and Packaging of De-Junked Chocolate made with Doum Palm Fruit. The specific objectives however are to:

1. Produce chocolate with doum palm fruit
2. De-Junk the chocolate with unrefined materials
3. Assess the sensory properties of the de-junked Doum palm chocolate
4. Assess the nutritional contents of the de-junked Doum palm chocolate
5. Package the finished product as the semi-final step preceding labeling and registering of the product.

Materials and method

This research adopted the product development research. Product development research is the process of crafting, developing and bringing a product from concept or idea by tracking the progress of a product and appealing to the target (Koshy 2022).The population of the research is 23 staff of Home Economics Department, (Homec 2023), School of Secondary Education (Vocational), Federal College of Education (Technical) Bichi. Ten [10] staff equivalent to 43% were randomly sampled and used for the study.

Equipment used

I. Vegetable Grater

II. Heavy duty blender

III. Muslin fabric

IV. Measuring Cup

V. Spatula

VI. Cutting board

VII. Pallet knife

VIII. Acrylic mold

IX. Pot

X. Stove

XI. Mixing bowls etc.

Production of Doum palm fruit powder

Step 1: Scrape outer layer of doum palm fruit using vegetable grater

Step 2: Scrape middle layer of doum palm fruit using vegetable grater

Step 4:Grind doum palm fiber into very fine powder

Step 4:Sieve doum palm powder through a muslin fabric

WHOLE DOUM PALM FRUIT

SCRAPED DOUM PALM FRUIT

DOUM PALM FIBER

DOUM PALM SEED

Production of De-Junked chocolate made with Doum palm fruit powder

Materials used for De-junking

Coconut oil replaced refined vegetable oil
Fresh milk replaced evaporated can milk
Honey and sugar cane juice replaced refined white sugar

Ingredients used	**Quantity**
Coconut Oil	2 table spoon
Fresh milk	1 cup
Honey	¼ cup
Sugar cane juice	¼ cup
Doum palm fruit powder	1 cup
Grounded cloves and ginger	A Pinch each

Procedures for Production of De-Junked Chocolate Made with Doum Palm Fruit

i. Heat oil in a low temperature for 3 minutes

ii. Add fresh liquid milk

iii. Add sweeteners and allow to dissolve

iv. Continue heating and stirring constantly till partially thick

v. Add spices and stir

vi. Add doum powder and stir till it becomes thick

vii. Use oil to mold it to the desired shape and size

DE-JUNKED DOUM FRUIT [DDF] CHOCOLATE

PACKAGED DDF CHOCOLATE

Nutritional Contents Doum Plam Fruit De-Junked Chocolate

SAMPLE ID	ASH (%)	MOISTURE (%)	FAT (%)	PROTEIN (%)	FIBRE (%)	CARBOHY DRATE (%)
MILK CANDY	2.74 2.82 2.69	4.26 4.32 5.16	8.68 7.89 8.82	13.00 12.89 12.82	14.23 14.32 14.34	57.09 57.76 56.24

SAMPLE ID	VIT. A (µmol/L)	VIT. C (mg/100g)	VIT. E (mg/100g)	VIT. B_1 (mg/100g)	VIT. B_2 (mg/100g)	VIT. B_3 (mg/100g)	VIT. B_6 (mg/100g)
Milk Candy	29.14 29.21 29.23	21.44 21.51 21.67	8.01 8.04 8.10	2.01 1.99 2.00	2.82 2.84 2.85	4.44 4.43 4.42	0.53 0.53 0.54

SAMPLE I.D	K (Eq)	Fe (µmol)	Mg(mEg)	Ca2(mdl)
Milk candy	6.57	31.51	3.93	8.92

Nutritional Properties of De-Junked Doum Fruit Chocolate and Proposed Name of the Product

Nutritional contents of de-junked Doum fruit chocolate indicated that itis nutrients dense because of the enhancement of fibre content (14.23(%)) protein (13.00(%)), vitamin A(29.14µmol/),(21.44mg)vitamin C, and vitamin E (8.10mg) and vitamin B2 (4.44mg) while mineral contents of potassium(6.57 Eq), ion(31.51 µmol)magnesium(3.93 mEg) and calcium(8.92 mdl) some of which were above the daily requirements. The result also indicated the presence of fat ranging from (8.82) ash (2.69mg), and traces of vitamin B_1, B_2 and B_6. The moisture content isof4.26 the chocolate tremendously indicated the shelf life of the product where the product maintains its nutritious value up to four consecutive weeks of storage in a room temperature.

Assessment of De-Junked Doum Palm Fruit Chocolate

The sample was presented to 10 panelists (Home Economics Staff) who were trained for organoleptic assessment using 1-9 points hedonic scale in terms of taste, texture, appearance respectively (Chang (2016). The overall acceptability are as follows:

Table 1: Sensory assessment of De-Junked Doum Palm Fruit Chocolate

Parameters	E	VG	MG	FG	NG NB	FB	MB	VB	EB	Total	Mean	Remarks
Taste: Flavor, sweetness palatability	4	3	2	1	0	0	0	0	0	10	8.0	Accepted
Texture: Soft, hard	4	2	2	2	0	0	0	0	0	10	7.8	Accepted
Appearance, Smooth, rough color	3	3	2	2	0	0	0	0	0	10	7.7	Accepted

N=10:

Keys: Excellent [E] - 9 points, Very good [VG]- 8 points, moderately good [MG] - 7 points, slightly good [SG] - 6 points, neither good nor bad [NGNB] - 5 points, fairly bad [FB] - 4 points, moderately bad [MB] - 3 points, very bad [VB] - 2 points, extremely bad [EB] - 1 point.

The result of the properties showed that the product was accepted by the panelists as the scores of all the parameters of taste, texture and appearance of the products tested were above than 5 points. This showed that the panelists accepted all the products with sensory qualities as expected of chocolate features. Thus the researchers are proposing to name this product – **Doum Fruit Choco Bars.** The actual label and package of the product is proposed to be unveiled at the 22nd National Conference and Exhibition of the Nigeria Association of Vocational and Technical Educators – NAVTED by September 2024.

Conclusion

Production of de-junked chocolate made with Doum palm powder has potentially resulted into nutrient dense chocolate. The action served dual functions; firstly, by substitution of refined materials to replacement of natural substances and secondly by enriching the product through incorporation of Doum palm fruit powder. These combinations improved the products' nutritive value by significant increase of dietary fiber, protein, ash, fat, and vitamin A, E, and C, also rich in Fe, K, Mg and Ca while lower the carbohydrate content of conventional chocolate respectively. A decreased moisture content of the de-junked chocolate is also significant to the shelf life of the researched product. Generally, the research product was accepted by the panelists as the sensory properties of the product showed high mean scores upon all the parameters tested. In view of these, Doum palm chocolate would greatly enhance efficient utilization of Doum palm fruit in Nigeria as well as its acceptance for consumption of adult and other group of people under avoidance of sugar consumption worldwide.

Recommendations

The researchers hereby put the following recommendations forward:

1. Registration and commercialization of the Doum palm chocolate should be made across all the states in Nigeria, including the Federal Capital Territory and also for export to other African countries and beyond;
2. There is a need of public sensitization on the incorporation of Doum palm fruit in food preparation, it should be organized and publicized through mass media
3. Nigerian government and other stake holders should offer financial support on the production and utilization of Doum palm fruit chocolate and other products.
4. The SON/NAFDAC should organize sensitization workshops to create awareness to showcase this novel research and inaugurate the use of the Doum Palm fruit powder and its by productsin Nigeria.
5. Food processing industries in Nigeria should be mandated to begin come up with innovative product brands for adults and children using the Doum palm fruit powder.

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