

# Development and Evaluation of Nutri Choco Bites Enriched with Jackfruit Seed Flour

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## ABSTRACT

Jackfruit seeds (*Artocarpus heterophyllus* Lam) are underutilized, despite having significant health and nutritional benefits. The seeds account for 10% to 15% of the fruit weight. The seeds are high in dietary fiber and B-complex vitamins, which are known to help lower the risk of heart disease, prevent constipation, and promote weight loss. Jackfruit seeds also contain resistant starch, which helps to regulate blood sugar and maintain gut health. This study is an attempt to develop Nutri Choco Bites using jackfruit seed flour in 3 variations: 20%, 30% and 40 % respectively. In this investigation, the developed and standardized Nutri Choco Bites were subjected to sensory evaluation, proximate analysis and shelf-life study. The ingredient composition of the developed product, Control and the Variations was as follows :- Control (Coconut: 40%, Milk: 20%, Dates: 10% and Milk chocolate: 30%), Variation 1 – (Jackfruit seeds: 20% Coconut: 20%, Milk: 20%, Dates: 10%, Milk chocolate: 30%), Variation 2 (Jackfruit seeds: 30%, Coconut: 10%, Milk: 20%, Dates: 10%, Milk chocolate: 30%) and Variation 3 – (Jackfruit seeds: 40%, Milk: 20%, Dates: 10%, Milk chocolate: 30%). The developed products were evaluated by 40 semi-trained panel members using 9-point Hedonic scale of consumer acceptability for sensory attributes like appearance, colour, flavour, taste, texture and overall acceptability. The results of the sensory evaluation, showed that variation 2 (V2), jackfruit seed flour based choco bites with coconut (10%), jackfruit seeds powder (30%) was highly acceptable. The developed Nutri choco Bites (V2) contains 5.60 g protein, 15.54 g fat, 2.65 g total fiber, 55.16 g carbohydrate and 382.9 kcal of energy per 100g, with a shelf -life of 4 days at room temperature and shelf life of 12 days at refrigeration temperature. This value-added Nutri Choco Bites thus developed can be consumed by all age groups.

**KEY WORDS:** Jackfruit seed flour, dietary fiber, resistance starch, nutrient enrichment, sensory evaluation.

## 1. INTRODUCTION

Jackfruit is a compound fruit of the Jack Fruit tree (*Artocarpus heterophyllus* Lam.) and belongs to the family Moraceae. Jack fruit has been cultivated from a very long time and grows well in tropical lowland regions. It is found in Southeast Asian regions like India, Sri Lanka, Thailand, China and other regions

like Africa, Brazil, Australia Florida etc. In India it is popular in states like Karnataka, Kerala, Tamil Nadu, Goa Andhra Pradesh and Maharashtra. The ripe fruit contains yellow sweet bulbs with embedded seeds (1). Seeds constitute 10 to 15% of the total fruit weight and are underutilized and underappreciated. The seeds have high carbohydrate and protein

contents. Fresh seeds are of perishable nature and have a very low shelf life. A small quantity of the seeds are consumed fresh by steaming or by using them in the traditional dishes. However dried and powdered seeds can be used to make various products. In many parts of South India, the seeds are collected from the ripe fruit, sun-dried and properly stored for use during the rainy season. Every year, vast amounts of seeds are wasted as a result of problems encountered during processing and storage. Due to their perishable nature, the seeds are typically discarded as waste, but when properly processed and stored in a cool environment, they have a shelf-life of about one month. Roasted seeds can be ground into powders, used to add value and extend the shelf life of a variety of products. (2) (3).

Jackfruit seeds have antimicrobial activity, which aids in the prevention of foodborne diseases. The seeds are high in Protein, Fiber and Starch. Nutrients such as Nitrogen, Phosphorus, Potassium, Magnesium, Sulphur and other minerals are also abundant in Jackfruit seeds. Because the seeds are high in dietary fiber and B-complex vitamins, they help reduce the risk of heart disease, prevent constipation, and promote weight loss (4). High levels of calcium which is important for maintaining bone health and lowering blood pressure is present in the seeds. Carbohydrates present in the seeds provides energy, aid in the formation of macromolecules and free up protein and fat for other uses. High protein levels in the seeds help as one of the building blocks in the formation of tissues and organs. Fiber in the seeds aids digestion, makes one feel full and helps maintain healthy blood cholesterol levels. The B complex vitamins present in the seeds helps in cell health, red blood cell growth, proper nerve function and aids in overall wellbeing of the individual. (5).

Jackfruit seed powder is used as an alternative flour in baking units and in the making of

confectionary products by combining it with wheat flour and other low-cost flours. (6) (7) (8) (9) (10) (11).

Many children's celebrations around the world include chocolates, confectionery, ice creams, chocolate-based beverages and bakery products. Many cereal breakfasts contain chocolate, thereby making it difficult to determine how much chocolate children are consuming and what percentage of daily energy intake can be attributed to the chocolate consumption.

In general, children prefer foods with a lot of sugar and dislike bitter flavors. Children quickly pick up on products associated with high levels of energy. The high sweetness and energy profile of chocolate explain why it is so popular among children. Chocolate and children are inextricably linked and will most likely always be. Chocolate brings a lot of joy to children, but as with all high-energy foods, moderation is the key to long-term enjoyment. (12) .

Confectionery items are primarily made with sugar or other sweeteners. Confectionery products include chocolate and non-chocolate candy, gum, dessert and frozen desserts, cookies, cakes, and pastries, and other sweet goods such as jams, jellies, and preserves. (13).

Dates are excellent natural sweetener for replacing added sugar (sucrose) in a variety of foods, such as confectionary, juices, syrups and spreads. Dates form an important part of many people's daily diets. Dates contain 70% carbohydrates, the majority of which are fructose and glucose. Dates contain minerals such as calcium, iron, magnesium, selenium, copper, phosphorous, potassium, potassium, zinc, sulphur, cobalt, fluorine and manganese. Dates are nutritive and provide a wide range of health benefits. (14).

Development of Nutri choco bites taken up in this investigation is suitable for people of all ages. It is high in protein and energy, as well as micronutrients that aid in child growth and

development. The goal of this research study is to create healthy chocolate bites and to encourage people to consume and popularize the use of jackfruit seeds.

## 2. MATERIALS AND METHODS

The major raw materials used in the preparation of Nutri choco bites, include jackfruit seed flour coconut powder, milk, dates (chopped) and milk chocolate (coating). Good quality raw ingredients were procured from good local supermarkets.

### 2.1 Preparation of Flour

#### a) Jackfruit seed flour

After collecting jackfruit seeds, the defective and germinated ones were separated. The good quality seeds were washed thoroughly in clean drinking water, boiled, sliced, roasted and then powdered in a grinder and stored in air-tight container for further use.

#### b) Preparation of coconut powder

Deshelled coconuts were broken into small pieces, and powdered. The powder was then dried by evenly spreading it out in a tray.

### 2.2 Development of Nutri chocobites

The product was developed using an experimental method. Several trials with various variations were carried out at the laboratory. Three variations of Nutri Choco Bites, were planned and prepared, each with a different proportion of jackfruit seed flour. The nutri choco bites with coconut powder and jackfruit seed flour were developed in three variations at different incorporations of 20%, 30%, and 40 percent respectively.

Jackfruit seed flour, coconut powder, milk and chopped dates were mixed thoroughly, shaped into small balls and refrigerated for 20 minutes. The small ball shaped mixture, were dipped into the melted chocolate and refrigerated until it set completely.

The standardized Nutri chocobites contains, Jackfruit seed flour: 30%; Coconut: 10%; Milk: 20%; Dates: 10%; Milk chocolate: 30%.

### 2.3 Sensory evaluation

The sensory evaluation of the products was carried out by a panel of 40 semi-trained panel members using 9 Point Hedonic rating scale. Various characteristics like appearance, colour, texture, flavor, taste, flavour and overall acceptability were scored from a rating 9 to 1. The mean score and standard deviation was calculated. The best variation was chosen for further nutrient proximate analysis and shelf-life analysis.

### 2.4 Nutrient analysis

Nutritional composition of standardized and best rated standardized jackfruit seeds choco bites (Variation II) was determined by proximate analysis (Energy, Carbohydrate, Fibre, Fat, Protein, calcium and potassium). This was conducted at Robust Materials Technology Pvt Ltd, Nagarbhavi, Bangalore 560072.

### 2.5 Shelf life study

Shelf life study of the standardized and best rated, jackfruit seeds based, Nutri Choco Bites (Variation 2) was carried out at room and refrigeration temperature, in the Food and Nutrition laboratory of our college.

## 3. RESULTS AND DISCUSSION

**Table 1: Quantity of Ingredients used in the development of Choco Bite (Basic) and different variations of Nutri Choco Bites (Experimental)**

CHOCOBITES				
Ingredients	Chocobites (Basic)	Variations of Nutrichocobites (Experimental)		
	Basic (%)	Variation 1	Variation 2	Variation 3
Jackfruit seeds	-	20g	30g	40g
Coconut	40	20g	10g	-
Milk	20	20g	20g	20g
Dates	10	10g	10g	10g
Chocolate	30	30g	30g	30g

**Table 2: Sensory evaluation\* of Choco Bites and Nutri Choco Bites**

Sensory characteristics	Basic (Choco Bites)	Variation 1 Nutri Choco Bites	Variation 2 Nutri Choco Bites	Variation 3 Nutri Choco Bites
Appearance	8.875±0.109	8.675±0.219	8.775±0.694	8.175±0.6943
Colour	8.825±0.2443	8.675±0.2693	8.725±0.349	8.1125±1.168
Texture	8.725±0.349	8.575±0.244	8.55±0.2475	7.225±1.774
Flavor	8.725±0.249	8.38±0.3109	8.425±0.4443	7.4±0.94
Taste	8.575±0.4443	8.425±0.394	8.5125±0.268	7.425±1.094
Overall acceptability	8.7±0.36	8.4125±0.361	8.5±0.35	7.425±0.894
Total	52.425±1.756	51.15±1.7095	51.48±1.844	45.76±6.565

\*Sensory evaluation using 9-point Hedonic rating scale. N=40

Table 2, shows the mean sensory evaluation scores and standard deviation of Nutri Choco Bites prepared in various variations. Sensory evaluation results show that, Nutri choco Bites Variation 2 (Jackfruit seeds: 30% + Coconut: 10% + Milk: 20% + Dates: 10% + Milkchocolate: 30%) was found to be best rated and highly acceptable with a total mean

score of 51.48. The mean scores ranged from 8.77 to 8.42 with lowest score for flavor (8.42) and highest score for appearance (8.77). Variation 3 has score of 0.89 for overall acceptability followed by variation 2 with standard deviation of 0.24, 0.24, 0.44 and 0.35 with respect to texture, taste, flavour and overall acceptability.

**Figure 1-Development and standardization of Nutri Choco Bites (Variation 2)**

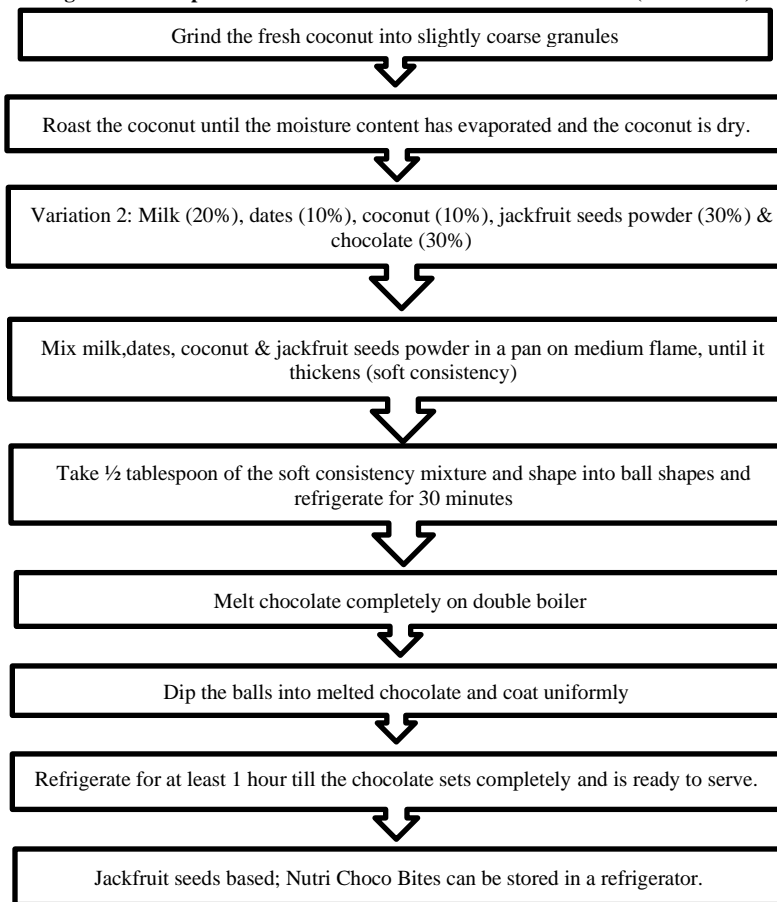


Figure 2 -Ingredient composition of standardized Nutri Choco Bites (V2 best rated variation)

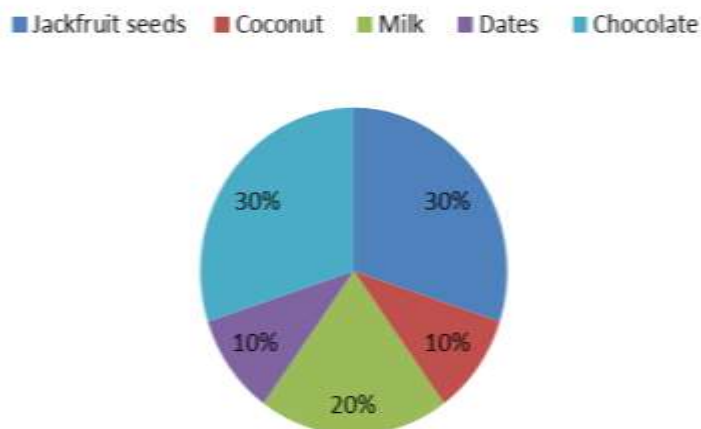


Table 3: Proximate analysis of the standardized Nutri Choco Bites

Nutrients	Value per 100g
Energy	382.9 kcal
Protein	5.06 g
Carbohydrates	55.16 g
Fat	15.54 g
Fibre	2.65 g
Calcium	163.11 mg
Potassium	456.92 mg

Table: 3, shows the proximate composition of the standardized nutri choco bite composition per 100g. It contains 382.9 kcal of Energy, 5.60 g of Protein, 55.16 g of Carbohydrate, 15.54g of Fat, 2.65 g Fibre, 163.11mg Calcium and 454.92 mg Potassium. The combination of jackfruit seed, dates, and coconut is a good source of macro and micronutrients.

Table 4: Shelf-life study of Choco bite (Basic)

Characteristics	Days					
	1-5		6-10		11- 15	
	Room temperature 25 <sup>o</sup> C	Refrigeration temperature 2 <sup>o</sup> -8 <sup>o</sup> C	Room temperature 25 <sup>o</sup> C	Refrigeration temperature 2 <sup>o</sup> -8 <sup>o</sup> C	Room temperature 25 <sup>o</sup> C	Refrigeration temperature 2 <sup>o</sup> -8 <sup>o</sup> C
Appearance	Good	Good	Good	Good	-	Good
Colour	Brown	Brown	Brown	Brown	-	Brown
Texture	Creamy	Creamy	Creamy	Creamy	-	Creamy
Taste	Sweet	Sweet	Off odour Unacceptable	Sweet	-	Off odour Unacceptable

Table 5: Shelf-life study of Nutri choco Bites (V2) \*

Characteristics	Days					
	1-4		5-10		12	
	Room temperature 25 <sup>o</sup> C	Refrigeration temperature 2 <sup>o</sup> -8 <sup>o</sup> C	Room temperature 25 <sup>o</sup> C	Refrigeration temperature 2 <sup>o</sup> -8 <sup>o</sup> C	Room temperature 25 <sup>o</sup> C	Refrigeration temperature 2 <sup>o</sup> -8 <sup>o</sup> C
Appearance	Good	Good	Good	Good	-	Good
Colour	Brown	Brown	Brown	Brown	-	Brown
Texture	Creamy	Creamy	Creamy	Creamy	-	Creamy
Taste	Sweet	Sweet	Off odour Unacceptable	Sweet	-	Off odour Unacceptable

(V2) \* Variation 2, is best rated Nutri Choco Bites.

Results of Table 5, shows the standardized Nutri choco bites (V2, best rated variation) were found to be stable at room temperature

for 4 days without any change in appearance; texture and taste. After 4 days there was development of slight off flavor and it was

unacceptable. At refrigeration temperature, shelf-life study of (V2) reveals there was no change in appearance; texture and taste, upto 12 days and was found to be good and acceptable for consumption within 1- 12 days at 2<sup>0</sup>-8<sup>0</sup>C.

## CONCLUSION

Jackfruit seed-based Nutri Choco Bites developed and standardized in this investigation are nutri dense and can be recommended to all age groups. It provides a good amount of dietary fibre, proteins, B-Complex vitamins and Potassium. The developed Nutri Choco Bites encourages people to consume and use jackfruit seeds which are usually discarded.

The developed jackfruit seed choco bite is nutrititious, healthy, with good shelf life. Jackfruit seeds are widely available in our country, which can be effectively used to make a variety of low-cost nutritious sweets.

## Declaration by Authors

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**Conflict of Interest:** The authors declare no conflict of interest.

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