



# “A STUDY ON THE DEVELOPMENT, NUTRITIVE EVALUATION AND ASSESSMENT OF PROPERTIES ON DOUGHNUT INCORPORATED WITH PALMYRA SPROUT AND SWEET POTATO”

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**Abstract :** The demand for the fermented foods has been increased and people have been developed in their taste and sensory attributes and varieties. So that the Incorporation of the Palmyra sprout and sweet potato were tested to assess the suitability for the production of doughnuts. It can be developed as the tuberous root. Doughnuts are fermented bakery products, fried in hot oil to form sweet snacks. It can be good quality has a color crust, taste and crispy. The physio chemical characteristics of doughnut such as moisture and ash. The physical and functional properties are analysis and give a result and discussion such as bulk density, porosity, oil content, water absorption, swelling capacity, color crust and ph value. The nutrient are been analysis and give the value and chart in the result and discussion. The sensory evaluations are done by the mean and SD calculation. The interactions were found to be highly significant in case of crumb and overall acceptability. The cost and yield calculation are be used for the 100g of doughnut. Thus, it is from tuberous root are acceptable to the consumers as they are obtained maximum score followed. Therefore, this study indicates that good quality doughnuts could be prepared from Palmyra sprout and sweet potato.

**IndexTerms - Fermented foods, Doughnut, Palmyra sprout, fried product, Oil absorption, Vitamin A, Fiber rich.**

## INTRODUCTION

The root of the name doughnut (donut) has been taken from the English words “dough” which is the name for the mixture of flour and water and “nut” representing a round flat object with a hole in the center. This product is named so because of its shape. Doughnut a fermented, fried snack, is one of the most popular fried products throughout the world (*Hatae et al. 2003; Rehman et al. 2007*). Doughnuts are made by deep-frying the dough made from a mixture of flour, water, egg, oil, sugar and milk (*Hatae et al. 2003*). Doughnuts are fermented and fried sweet snacks. They are served quite extensively in hotels, restaurants and snack bars in many countries of the world. In yeast raised doughnuts, wheat flour of high protein content imparts strong visco-elastic property to dough (*Seib, 1997*)

Palmyra sprout (panamkizhangu) is obtained from *Borassus flabellifer* commonly known as toddy palm, is native to the Indian subcontinent and Southeast Asia (*Artnarong S, et al 2016*). *Borassus flabellifer* considered to be a nature’s perennial gift that could flourish well in arid conditions and also could withstand many adverse climatic conditions and natural calamities. In India, it has been cultivated mainly in Tamilnadu, Karnataka, Andhrapradesh and Kerala (*Chaudhary A et al., 2016*).

Sweet potato, *Ipomoea batatas* is one of the main root and tuber crops commonly grown in the tropical and subtropical parts of the world. It was described as the seventh most important food crop in the world (*Bhattiprolu S. 2000*). It originated from Central America but is now widely grown and consumed as subsistence staples in many parts of Africa (including Nigeria), Latin America, the Pacific Islands and Asia. Sweet potato is valued for its short growing period of about 3-4 months, high nutritional content and its sweetness. Sweet potato is considered as an important food security crop, especially in Nigeria and is also identified as the least expensive, year round source of dietary vitamin A, especially the orange fleshed type among the poor (*Okorie, S.U and Onyeneke, E.N. (2012)*). Sweet potatoes are among the major tropical staple foods utilized as food as well as livestock feed all over the world (*Dzomeku, B.M et al 2007*).

## NEED OF THE STUDY.

- ❖ To formulate Palmyra sprout and sweet potato incorporated Doughnut
- ❖ To calculate the yield of Palmyra sprout and sweet potato incorporated Doughnut
- ❖ To determine the sensory characteristics of the formulated Doughnut
- ❖ To estimate the nutritive value of Palmyra sprout and sweet potato incorporated Doughnut
- ❖ To estimate the quality parameters of the formulated Doughnut
- ❖ To test the storage stability of the formulated Doughnut
- ❖ To calculate the cost of the Palmyra sprout and sweet potato incorporated Doughnut

## RESEARCH METHODOLOGY

The methodology section outlines the plan and method that how the study is conducted. This includes Universe of the study, sample of the study, Data and Sources of Data, study's variables and analytical framework. The details are as follows;

### 3.1 PROCUREMENT OF RAW MATERIALS

All the raw materials are procured from the local market. Good quality of palm sprout and sweet potato are selected, cleaning and graded. Both are washed, peeled and boiled evenly. They are sundried, ground to a fine powder. The powder was stored in air tight container to avoid spoilage and contamination. Milk and butter are stored at the refrigeration condition. Yeast, Maida, sugar, palm sprout and sweet potato are stored at the room temperature.

The following ingredients were used to develop palm sprout and sweet potato incorporated doughnut

- Palm sprout
- Sweet potato
- Maida
- Yeast
- Butter
- Milk
- Sugar

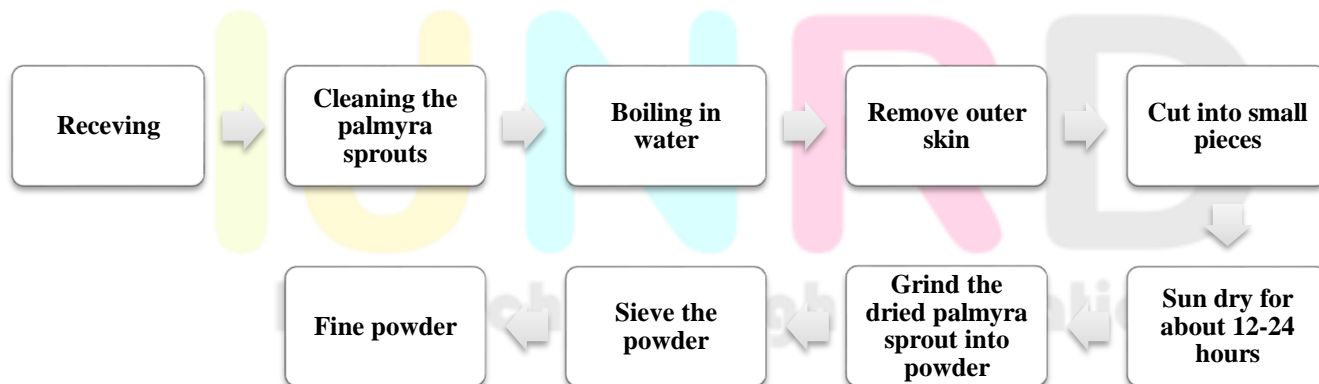
### 3.2 PROCESSING OF INGREDIENTS

The palm sprouts and sweet potato doughnut was formulated by palm sprouts flour, sweet potato flour, Maida, sugar, yeast along with milk and butter. The doughnut topping was formulated by the red rose petal along with the white chocolate and refined sugar.

#### Processing of Palmyra Sprouts:

The palm sprouts were received from the local market and cleaned. The cleaned palm sprouts are washed in the running water. The outer peel is removed. Cut into small pieces. The palm sprouts were cooked for about 30 minutes in pressure cooker until it become soft. Cool and remove the skin of the palm sprout peel the fibers. Sundry it for about 12 - 24 hours. Once it is completely dried. Grind the palm sprout into powder. Cool the powder for few minutes. Sieve it to get fine powder.

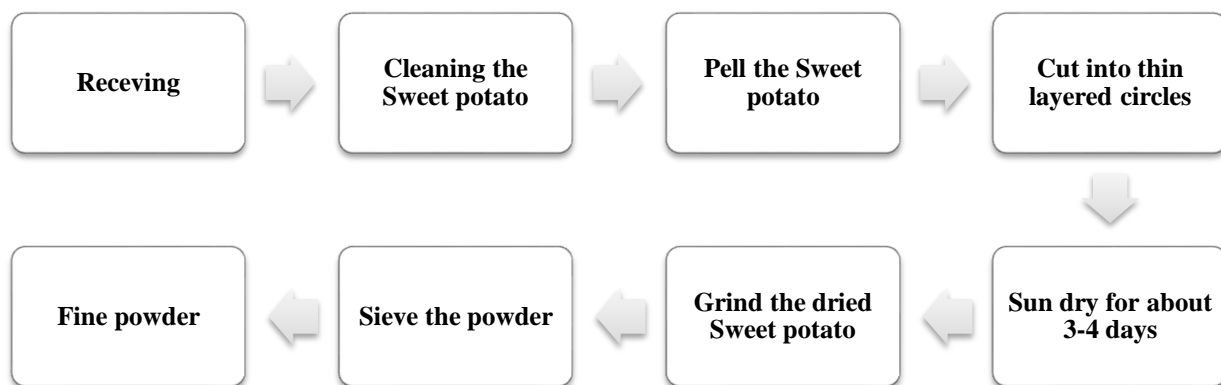
Flow chart



#### Processing of sweet potato:

The sweet potatoes are washed in the running water. Peel the outer skin and cut into pieces. Sundry it for 3-4 days. Once it is completely dried, Grind the sweet potato into powder. Cool the powder for few minutes. Sieve it to get fine powder.

Flowchart



**3.3 PRODUCT DEVELOPMENT**

**3.3.1 STANDARDIZATION AND DEVELOPMENT OF PALM SPROUTS**

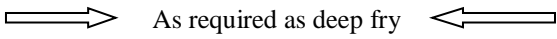
Palm sprout was cleaned and cooked for 30 minutes in boiling water. The sweet potato was cleaned and peeled for skin removal. The ingredient was cut into different shape for sun drying. Both are dried for about 3-4 days to remove moisture. Grind the dried ingredients separately and sieve the powder to get fine powder. Add palm sprout powder and sweet potato flour in varying proportion and mix well. To that add flour and mix well. Add a little bit of sugar for prepare yeast froth. Make into dough and leave it for 1-2 hour as it is the feed for yeast to grow and ferment. Heat oil in a pan. Sheet the dough and cut it into required shape. The ingredients selected for the development with the holes at centre. Deep fry the doughnut till it turn golden brown. Rose petal was cleaned and boil with water till water color will change and sugar for the thick consistency. The White chocolate is melted using double boiling method added the rose essence and mix well. Doughnuts were formulated into 4 different variations such as V1, V2, V3, and V4. The formulated variations are added as with varying proportions of ingredients.

Flow chart



**STANDARDISATION OF THE PRODUCT**

Ingredients	Variation 1	Variation 2	Variation 3	Variation 4
Sweet potato flour	75	65	55	45
Palm sprouts flour	40	45	50	55
Maida	35	40	45	50
Yeast	20	20	20	20
Milk	50	50	50	50

Sugar	30	30	30	30
Oil	 As required as deep fry			
Total	200	200	200	200

### 3.4 PHYSICAL AND FUNCTIONAL PROPERTIES

Important developments about the physical properties of foods include the significant efforts in measuring properties include: bulk density, porosity. A functional property describes how ingredients behave during preparation and cooking, how they affect the finished food product in terms of how it looks, tastes, and feels. Functional properties include: oil absorption, water absorption, swelling capacity, color crust, Ph value.

### 3.5 NUTRIENT ANALYSIS:

The selected sample of donut were analyzed for various principles, Ash, Moisture, Energy was analyzed by calorimeter method, Carbohydrate by anthrone method. Protein by Lowry's method, fat by soxhlet method. The product is analyzed for nutrients such as Fiber, Iron, Calcium, Magnesium, Vitamin- A by AOAC method of evaluation.

### 3.6 MICROBIAL ANALYSIS:

The doughnut were analyzed for the microbial growth and total bacteria count of yeast, fungi and mold at initial and end of the study period (12 days) at room temperature which were than subjected to microbial analysis using standard procedure

### 3.7 PACKAGING AND LABELING:

Paperboard grades are used to package food and to protect products for shipment. There are two major forms of packaging corrugating containers. New paper based packaging system for food product are continually being development, and the area of meal solution or take home heat and eat meals.



### 3.8 STATISTICAL ANALYSIS:

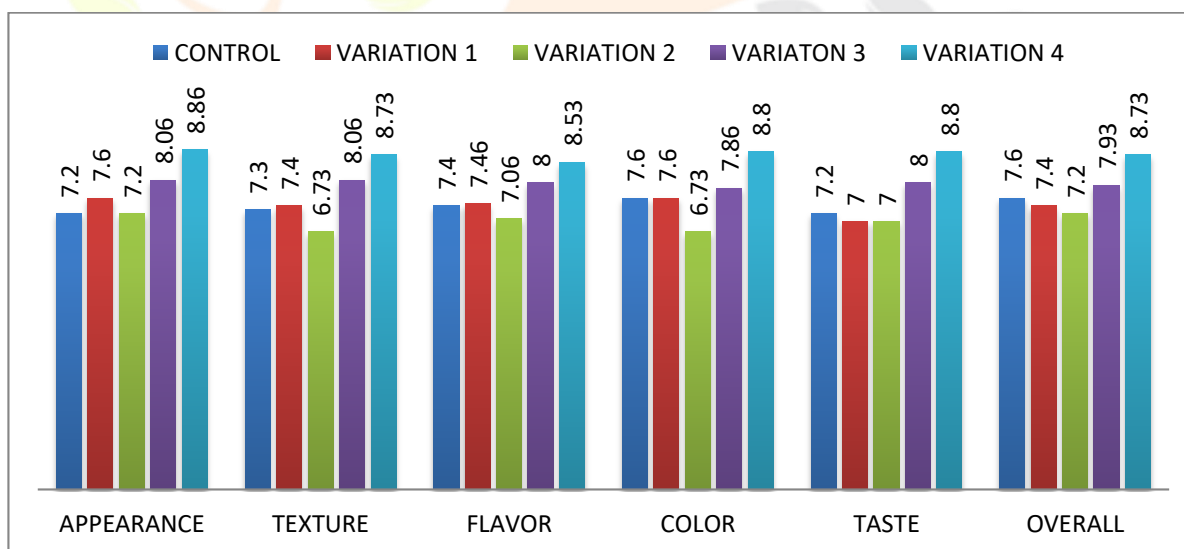
The data was obtained for each variation were statistically calculated as mean and Standard Deviation and student's t-test analysis been carried out to the level of significance

#### IV. RESULTS AND DISCUSSION

##### 4.1 MEAN SENSORY SCORE OF THE DEVELOPMENT AND ORGANOLEPTIC EVALUATION OF PALMYRA SPROUT DOUGHNUT

MEAN SENSORY SCORE

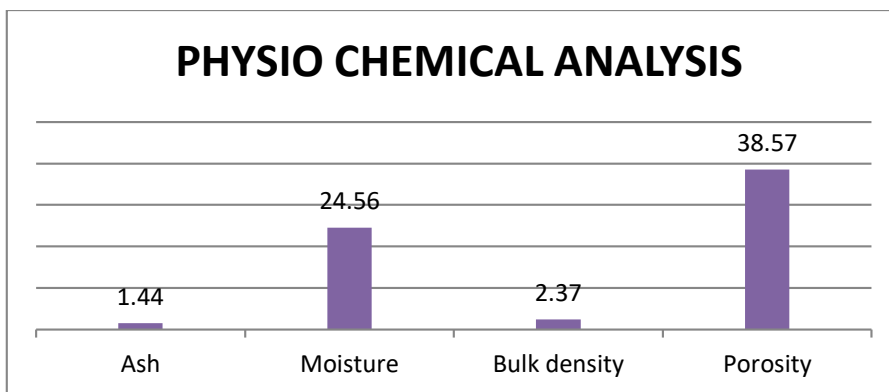
CRITERIA	CONTROL	V1	V2	V3	V4
APPEARANCE	7.2± 0.593	7.6±0.593	7.6±1.183	8.06±0.798	8.86±0.351
TEXTURE	7.3±0.617	7.4±0.617	7.4±1.055	8.06±0.798	8.73±0.457
FLOVOR	7.4± 0.743	7.46±0.743	7.46±0.743	8.0±0.845	8.53±0.639
COLOR	7.6± 1.046	7.6±1.046	7.6±1.121	7.86±0.915	8.8±0.414
TASTE	7.2±0.703	7.0±0.703	7.0±1.0	8.0±0.925	8.8±0.414
OVERALL ACCEPTABILITY	7.6± 0.816	7.4±0.816	7.4±0.833	7.93±0.703	8.73±0.457



##### 4.2 PHYSIO-CHEMICAL ANALYSIS OF DOUGHNUT

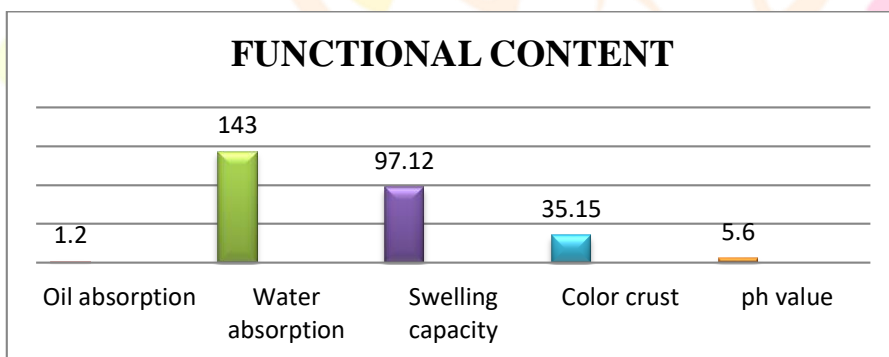
The physico-chemical properties such as Ash and Moisture were carried out using standard procedure for the developed Palmyra sprout and sweet potato doughnut.

PHYSIO CHEMICAL	GRAM(g)
ASH	1.44
MOISTURE	24.56
BULK DENSITY	2.37
POROSITY	38.67



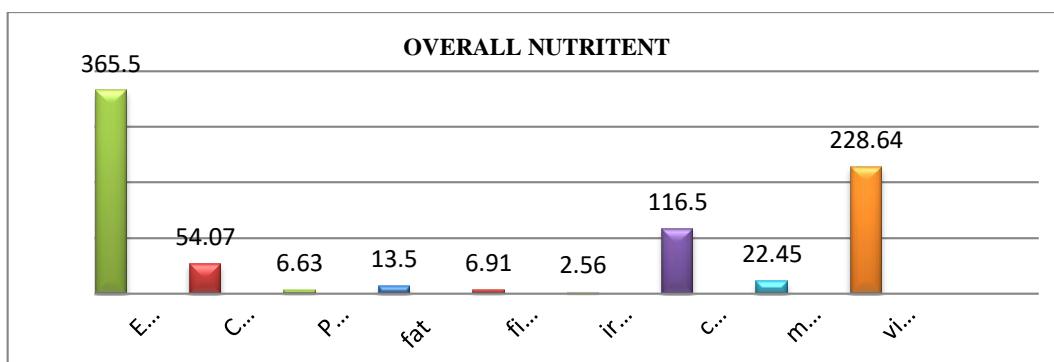
**4.3 FUNCTIONAL PROPERTIES OF PALMYRA SPROUTS SWEET POTATO DONUT:**

S.NO	FUNCTIONAL PROPERTIES	VARIATION IV
1.	Oil absorption	1.20
2.	Water absorption	143
3.	Swelling capacity	97.12
4.	Color crust	35.15
5.	Ph value	5.6



**4.4 NUTRIENT ANALYSIS OF THE PALMYRA SPROUT AND SWEET POTATO DOUGHNUT**

S.NO	NUTRITENT	VALUE
1.	Energy	365.5kcal
2.	Carbohydrate	54.07g
3.	Protein	6.43g
4.	Fat	13.5g
5.	Fiber	6.91g
6.	Iron	2.56mg
7.	Calcium	0.087mg
8.	Magnesium	0.816mg
9.	Vitamin A	228.64µg



**4.5 MICROBIAL ANALYSIS FOR THE DEVELOPED OF PALMYRA SPROUT AND SWEET POTATO INCORPORATE WITH DOUGHNUT**

Microbial spoilage is the major part which destroys the food product. Bacteria are the main cause of spoilage. The total bacterial count is given below.

S.NO	DAYS	NUMBEROF COLONY	TOTAL PLATE COUNT
1	1st	19	$19 \times 10^{-6}$ cfu/gm
2	7th	TMTC	$TMTC \times 10^{-7}$ cfu/gm
3.	1st	Absent	$Absent \times 10^{-3}$ cfu/gm
4.	7th	TMTC	$TMTL \times 10^4$ cfu/gm

**SHELF LIFE**

Foods are perishable by nature. Numerous changes take place in foods during processing and storage. One or more quality attributes of a food may reach an undesirable state. The food is considered unsuitable for consumption and it is having reached the end of its shelf life. The shelf life of the product can be determined by keeping the product in air tight container in room temperature for about 2 week and to study the shelf life of the selected variation. It developed deterioration after 2 week and had bad odor and flavor due to the microbial count.



**4.6 YIELD CALCULATION OF THE DEVELOPMENT OF PALMYRA SPROUTS INCORPORATED DOUGHNUTS**

**YIELD CALCULATION**

Donut	Control	Variation 4
Weight of final product	250g	280g
Weight of raw materials	300g	300g
Yield%	83%	93%

From the table it is shown that the yield of control sample is and the yield of variation 4 is 83% and 93%

**4.7 COST CALCULATION FOR THE DEVELOPMENT DOUGHNUT**

Cost calculation is done to find the cost of the selected product that may help during the selling of the products. It may also do to identify the profit or loss. Calculated by the standard price of the ingredients procured the local market.

## COST CALCULATON

S. No	Ingredients	Quantity	Price of the ingredients	Quantity of Ingredients used	Price for quantity used
1.	Palmyra sprout	250g	80Rs	45g	14.4Rs
2.	Sweet potato	200g	60Rs	55g	16.5Rs
3.	Refined wheat flour	500g	37Rs	50g	3.7Rs
4.	Sugar	100g	10Rs	20g	2Rs
5.	Milk	250g	13Rs	25g	1.3Rs
6.	Butter	200g	130Rs	25g	16.25Rs
7.	Yeast	25g	45Rs	20g	36Rs
8.	White chocolate	150g	100Rs	60g	40Rs
TOTAL				300g	130.15

## Cost Calculation

**Overall cost (300g) =Rs.130.15**

Cost of the product =Total cost+10% (OVERHEAD COST)  
 =130.15+13  
 =Rs.143.16

Cost of the product for 100g =143.16/300×100  
 = 47.6

Therefore, the cost of the Palmyra sprout and Sweet potato Doughnut for 100g is Rs.47

The cost of each raw material was calculated using the standard price list from where the raw materials were purchased. The cost was calculated according to the quality of raw materials used for the production quantity and by calculating the yield of the product.

## CONCLUSION

From the finding of this study it was concluded that the variation IV was selected among the control and the other variations. The developed Palmyra sprout and sweet potato Doughnut was good terms of nutrient composition such as Energy, Carbohydrate, Protein, Fat, Fibre, Iron, Calcium, Magnesium, Vitamin A are present in the developed product which helps in several health benefits such as increase immunity, improve vision, weight management and control blood pressure. The Doughnut was developed with the ingredients such as Palmyra sprout, Sweet potato, refined wheat flour, Butter, Yeast, Milk, Sugar due to valuable nutrient content and its health Benefits.

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