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[ijirset@gmail.com](mailto:ijirset@gmail.com)

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# Nutritional Analysis of Palmyra Tuber

Sandhiyadevi P<sup>1</sup>, Abul Kalam Azad S<sup>2</sup>, Kavin Kumar D<sup>3</sup>, Logu P<sup>4</sup>, Naveen Kumar P<sup>5</sup>

Assistant Professor, Department of Agriculture Engineering, Nandha Engineering College, Erode, Tamil Nadu, India<sup>1</sup>

U.G. Students, Department of Agriculture Engineering, Nandha Engineering College, Erode, Tamil Nadu, India<sup>2,3,4,5</sup>

**ABSTRACT:** Palmyra sprout also known as Palmyra tuber. Palmyra sprouts are cultivated in Tamilnadu they are most common in the Vellore, Thiruvannamalai and Villupuram Districts. The seeds of Palmyra are planted and germinate the fleshy stem and harvested. They are boiled or roasted and eaten. They are very fibrous and nutritious. These sprouts have also hidden fantastic nutritional properties. In Palmyra tuber, the crushed Palmyra tuber flour is used for nutritional analysis. The analysis says the value of nutritional parameters. We found that nutritional values Iron, Carbohydrate, Calcium, and Energy are changed with compared to Palmyra tuber flour and Palmyra sweet puffery. The Nutritional values of Iron is (1.7mg for Flour and 0.94mg for sweet) per 100g, Carbohydrate is (85.1g for Flour and 36.92g for sweet) per 100g, Calcium is (53mg for Flour and 41mg for sweet) per 100g, and Energy is (384 Kcal for Flour and 247 Kcal for sweet) per 100g.

**KEYWORDS:** Palmyra sprout, germinate, boiled, fibrous, nutritional properties, Energy, calcium, Carbohydrate, Iron.

## I. INTRODUCTION

Palmyra sprout is also known as Palmyra tuber. It is an underground sprout of the Palmyra palm. It can be dried or boiled to eat. It has many Nutritional properties. These are helps in medical purposes.

### 1.1 PALMYRA PALM

The Palmyra palm is known simply as Palmyra, which is based on the Portuguese palmeira, the tree was named originally for the resemblance of the leaf to the palm of a hand. The botanical name of Palmyra tree is *Borassus flabellifer* L. The palm which belongs to the family *Arecaceae*, subfamily *Borassoideae* and genus *Borassus*. The Palmyra trees are slow growing dioecious perennials and not to identify the sex until flowering. The palm tree becomes flowering only after 12–15 years of maturity.

Palmyra tree fruit are economically useful and widely cultivated, mostly in South Asia and Southeast Asia.



Fig 1.1 Palmyra palm

### 1.2 PALMYRA LEAVES

Olden days in India, Palmyra leaves are used as paper for writing, with their parallel veins providing a useful rule. In India, mature leaves of Palmyra tree with suitable size, shape and texture were chosen and preserved by boiling in salt water with turmeric powder. Once dry the leaves of Palmyra tree, the Palmyra leaf surfaces were polished with pumice, cut to the proper size and a hole was cut in one corner. Each Palmyra tree leaf has four pages and a stylus is used to write, the style is cursive and interconnected. Completed leaves are then tied up as sheaves.



Fig 1.2 Palmyra leaf

### 1.3 PALMYRA STEM

The black timber is very hard, heavy, and durable and valued for constructions, mainly in structures exposed to water, such as wharves, fences and boats.

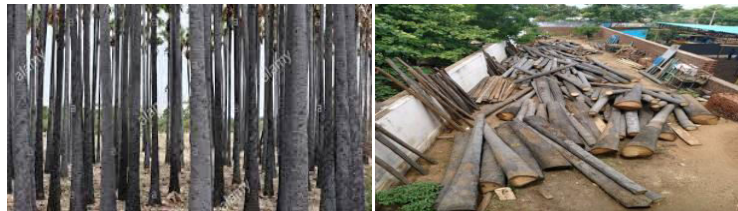


Fig 1.3 Palmyra stem

### 1.4 PALMYRA PALM INFLORESCENCES

Inflorescences are interfoliar; the male inflorescence has stout terete branches, while the female inflorescences are more sparingly branched.



Fig 1.4.1. Palmyra male inflorescence



Fig 1.4.2. Palmyra female inflorescence

### 1.5. PALMYRA PALM FRUIT

Fruits are semi-globose to globose and deep brown to black when ripe. The palmyra palm (*Borassus flabellifer* Linn.) fruit is one of the less known tropical fruits. The coconut-like fruits are three-sided or two-sided or three-sided when young, rounded or more or less oval, 12-15 cm wide and capped at the base with overlapping sepals. The outer covering of the fruit is smooth, thin, leathery and brown, turning nearly black after harvest. Inside is like a juicy mass of long, white fibres coated with yellow or orange pulp.



Fig 1.6 Palmyra palm fruit



## 1.6. PALMYRA PALM SPROUTS

In Indian states of Tamil Nadu, Andhra Pradesh, Telangana and in Jaffna Sri Lanka, the seeds are planted and made to germinate and the fleshy stems (below the surface) are boiled or roasted and eaten. It is very fibrous and nutritious. It is known as Panangkizhangu in Tamil.

## II. LITERATURE SURVEY

V.A.Tsygankova [1] et al in 2016 said that, Based on the obtained results it is possible to assume that high growth stimulating activity of synthetic heterocyclic compounds phosphorylated derivatives of oxazole and pyrimidine, which is similar to activity of phytohormones auxins, may be explained by their inducing effect on the plant cell division, cell elongation, cell proliferation, cell differentiation, on the increase of cell metabolism and photosynthetic processes in the leaves of maize seedlings resulting in an improving of growth and development of maize (*Zea mays L.*) hybrid Palmyra FAO 190.

H.Jayalakshmi [2] et al in 2020 said that, the results show that good quality jam could be prepared from Palmyra pulp and stored with minimum damages. From the findings of the results, it can be concluded that the production of Palmyra fruit jam would be feasible Process with high Nutritional value. It is further concluded that storage and treatment have significant effect on the quality and stability of jam. The sensory analysis, nutritional analysis, moisture content test and pH test of the jam were performed. The results showed that a good quality jam can be produced with high nutritional values like Carbohydrates (74.8 g/100g), Energy (312 kcal/100g), Fat (0.50 g/100g), Protein (2.10 g/100g), Dietary Fiber (1.60 g/100g), Sodium (8.70 mg/100g), Calcium (64.1 mg/100g), Iron (3.21 mg/100g).

B.Anil Kumar Reddy [3] et al in 2019 said that, The mechanical properties of Kenaf fiber/ Palmyra Sprout/Glass fiber natural fibre composites were prepared by Epoxy resin matrix. We have obtained from the S-N ratio Palmyra Sprout (A) (15 Wt. %), Kenaf (B) (0 wt. %) Glass (C) (0 wt %) and Combination (A3B1C1) have maximum strength compared to the other weight fraction combinations for tensile and we have obtained from the s-n ratio Palmyra Sprout (A) (7.5 wt. %), Kenaf (B) (7.5 wt. %) and Glass (C) (15 wt %) Combination (A2B2C3) have maximum strength compared to The other weight fraction combinations for impact.

M.Anil Kumar [4] et al in 2018 said that, Dynamic mechanical properties of asian Palmyra Fiber reinforced epoxy composites are greatly dependent on the percentage of fiber loading.

Nadendla Srinivasababu [5] et al in 2014 said that, Hand lay-up technique is successfully employed in manufacturing PPP FRP composites with relative ease and Accuracy.

Sarmini, M [6] et al in 2018 said that, Harvesting of leaves at an early stage will affect the growth of the palms. Crude protein, CF, IVDMD and ME content of the leaves harvested between 10 and 30 months of the mature stage showed acceptable values for feeding ruminants

A.Guru Sathiya [7] et al in 2018 said that, The present green synthesis is a low cost approach, capable of producing Au NPs at room temperature. It is confirmed that Au NPs are capable of rendering high antibacterial efficacy and hence has a great potential in the preparation of drugs used against bacterial diseases.

Dennis Johnson [8] in 1992 said that, During the 1980s, there was a wealth of new and important studies published on all aspects of palms. Currently there is strong interest in the valorization of non timber forest products as a contribution toward sustainable forest management, ecosystem conservation and the welfare of native peoples. The Palm family is in an excellent position to benefit from this general interest, and it can make a major contribution. If we make our case strongly and astutely, the 1990s could be the decade of palm development.

T.R.Sridevi Krishnaveni [9] et al in 2020 said that, Palmyra production and processing industry ensure food security, livelihood security and ecological security of the country.

P.Sharmila [10] et al in 2019 said that, The results prove that Palmyra palm tuber has potential to be used in value added products. It recommended that further research into the toxicity levels in these products should be under taken to increase the marketability of the product.



Mahan Makado Romuald [11] et al in 2017 said that, This study showed that the enrichment of the flour of young shoots of *B. aethiopicum* to the powders of *Moringa oleifera* leaves and cowpea seeds is a considerable improvement of the nutritive characteristics of these flours.

### III. METHODOLOGY

Nutritional analysis explains the hidden nutritional values of Palmyra tuber. The fully matured Palmyra sprout is taken and clean the soil in the layer and remove the first layer. The layer removed Palmyra sprout is boiled for 30minutes and peeling fibres from the boiled tuber. After that slice the tuber into small pieces and dry for three days for removal of moisture content. At last take the dried tuber for crushing to make flour. The tuber flour is analysed and the hidden nutritional values are noticed. The flour is further used for making the value added products.

### IV. NUTRITIONAL ANALYSIS

Nutritional analysis is the process of determining the nutritional content of the food. It gives the detail analysed information about the chemical composition, quality, contamination of food.

#### 4.1 PALMYRA TUBER

Palmyra sprout (also known as Palmyra tuber) is an underground sprout of the Palmyra palm or *Borassus flabellifer*. It can be dried or boiled to a hard chewable snack.



Fig 4.1.1 Palmyra tuber

#### 4.2 DRYING

Sun drying is a traditional drying method for reducing the moisture content of boiled Palmyra tuber by spreading the cutted pieces under the sun. The solar radiation heats up the tuber pieces as well as the surrounding air and thus increases the rate of water evaporating from the tuber.

Table 4.2.1 Drying rate of Palmyra tuber

| S.No | Periods | Morning Weight (g) | Evening Weight (g) | Moisture Reduction (g) | Drying efficiency (%) |
|------|---------|--------------------|--------------------|------------------------|-----------------------|
| 1    | Day1    | 550                | 380.52             | 169.4                  | 69.01%                |
| 2    | Day2    | 380.52             | 338.49             | 42.03                  | 88.96%                |
| 3    | Day3    | 338.49             | 297.68             | 40.81                  | 87.94%                |

#### 4.3 CRUSHING

Burr mills are used for crushing of grains into flour. The burr mill has two roughened cast iron plates. One stationary and another one is rotate able. So the grains are fully crushed and sheared.



Fig. 4.3.1 Cutted pieces of Palmyra tuber



Fig 4.3.2 Burr Mill

#### 4.4 PALMYRA SWEET

It is the value added product from palmyra tuber flour. This sweet is eatable by all persons through the year. It has high carbohydrates.

#### 4.5 IRON

Iron is the mineral which helps to the proper function of hemoglobin. The iron level in body which reduces can lead to health problems, such as iron deficiency anemia.

#### PROCEDURE

- Weight accurately, a suitable quantity of well homogenised sample, into a cleaned and tared silica dish.
- If sample contains more water, dry on the water bath. Char the sample on low flame of a burner till all the volatile matter escapes and smoking ceases.
- Transfer the dish to a cold muffle furnace and raise the temperature slowly to 450°C. Continue ashing at 450°C till practically carbon-free ash is obtained.



- After the ash free carbon-free remove the dish from furnace and cool. Add 5 ml of conc. HCL Letting acid rinse the upper portion of the dish and evaporate to dryness on a water bath.
- Dissolve residue by adding exactly 2.0 ml of conc. HCl, heat for 5 min on steam bath with watch glass covering the dish.
- Rinse watch glass with water, filter into a 100 ml volumetric flask, cool and dilute to volume.

**Determination of Iron**

- Pipette 10 ml aliquot of ash solution into 25 ml volumetric flask.
- Add 1 ml hydroxylamine hydrochloride solution.
- After 5 min, add 5 ml buffer solution and 1 ml phenanthroline solution or 2 ml of dipyrldyl solution and dilute to volume.
- Determine absorbance of solution at 510 nm

**Table 4.5.1 Comparison of Nutritional Analysis of Iron content in Palmyra Flour and Palmyra Sweet**

| S.No           | No.of Trails | Palmyra flour for iron content in mg/100g | Palmyra sweet for iron content in mg/100g |
|----------------|--------------|-------------------------------------------|-------------------------------------------|
| 1              | Trail 1      | 1.7                                       | 0.94                                      |
| 2              | Trail 2      | 1.8                                       | 0.93                                      |
| 3              | Trail 3      | 1.6                                       | 0.95                                      |
| <b>Average</b> |              | <b>1.7</b>                                | <b>0.94</b>                               |

- The average value of iron content in Palmyra flour is **1.7mg** per 100g
- The average value of iron content in Palmyra sweet is **0.94mg** per 100g

**4.6 CARBOHYDRATES**

Carbohydrates are sugar molecules, its is found in all foods and drinks. In our body carbohydrates are breaks down into glucose. Glucose is the energy source of our body cells, tissues and organs.

**Table 4.6.1 Comparison of Nutritional Analysis of Carbohydrate Content in Palmyra Flour and Palmyra Sweet**

| S.No           | No.of.Trails | Palmyra Flour for Carbohydrate content, in g/100g | Palmyra sweet for Carbohydrate content, in g/100g |
|----------------|--------------|---------------------------------------------------|---------------------------------------------------|
| 1              | Trail 1      | 85.0                                              | 36.93                                             |
| 2              | Trail 2      | 85.2                                              | 36.91                                             |
| 3              | Trail 3      | 85.1                                              | 39.92                                             |
| <b>AVERAGE</b> |              | <b>85.1</b>                                       | <b>36.92</b>                                      |

- The average value of Carbohydrates content in Palmyra Flour is **85.1g** per 100g
- The average value of Carbohydrates content in Palmyra Sweet is **36.92g** per 100g

**4.7 CALCIUM**

Calcium is a mineral, these are founds in foods, mainly in dairy products. It maintains the strength of bones, teeth. It is essential for growth of children/

Table 4.7.1 Comparison of Nutritional Analysis of Calcium Content in Palmyra Flour and Palmyra Sweet

| S.No           | No.of.Trails | Palmyra Flour for calcium content, in mg/100g | Palmyra Sweet for calcium content, in mg/100g |
|----------------|--------------|-----------------------------------------------|-----------------------------------------------|
| 1              | Trail 1      | 54                                            | 42                                            |
| 2              | Trail 2      | 52                                            | 41                                            |
| 3              | Trail 3      | 53                                            | 40                                            |
| <b>AVERAGE</b> |              | <b>53</b>                                     | <b>41</b>                                     |

- The average value of Calcium content in Palmyra Flour is **53mg** per 100g
- The average value of Calcium content in Palmyra Sweet is **41mg** per 100g

#### 4.8 ENERGY

Energy is defined as the capacity to do work. The process of digestion the food materials are digested and convert into energy. These are calculated as Calories or kilocalories.

Table 4.8.1 Comparison of Nutritional Analysis of Energy Content in Palmyra flour and Palmyra Sweet

| S.No           | No.Of .Trails | Palmyra Flour ,in Kcal/100g | Palmyra Sweet,in Kcal/100g |
|----------------|---------------|-----------------------------|----------------------------|
| 1              | Trail 1       | 385                         | 247                        |
| 2              | Trail 2       | 384                         | 248                        |
| 3              | Trail 3       | 386                         | 246                        |
| <b>AVERAGE</b> |               | <b>384</b>                  | <b>247</b>                 |

- The average value of Energy content in Palmyra Flour is **384 Kcal** per 100g
- The average value of Energy content in Palmyra Sweet is **247 Kcal** per 100g

#### v. CONCLUSION

As all study and analysis of Palmyra tuber has high nutritional content, fiber, energy, carbohydrates, calcium, minerals, etc.. It helps to increase immune to human body. Extraction from Palmyra tuber is taken as powder then it use in different ways for the future usage. As we detailed analysis on Palmyra tuber it contains nutritional value like energy (384 kcal/100g), carbohydrates (85.1g/100g), fat (1.73g/100g), protein (2.92 g/100g), total sugar (1.7g/100g), dietary fiber (2.79 g/100g), calcium (53mg), iron (1.7mg). In value added product Palmyra sweet, the nutritional contents are varied. So we concluded that added sugar for making Palmyra sweet affects the nutritional content of Palmyra flour. That Palmyra sweet has high total sugar (19.38 g/100g), cholesterol (17.13mg/100mg), fat (8.2g/100g),





and it reduces energy value (247 kcal/100g), also reduces carbohydrates (36.92g/100g), calcium (41mg/100mg), iron (0.94mg/100mg).

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