

VALUE ADDED PRODUCT FROM *DIOSCOREA PENTAPHYLLA* FLOUR AND RICE FLOUR.

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Abstract

In the present scenario, consumers' preference for intake of healthy products, with high nutraceuticals that prevents or reduces certain diseases such as celiac, diabetes, etc., has been increasing. *Dioscorea Pentaphylla*, which is an underutilized tuber is one such natural rich source of high fiber, and starch with properties like gluten-free and anti-diabetic. The current study was conducted for the development of value-added product like murukku from *Dioscorea Pentaphylla* flour and Rice flour and other minor ingredients. Initially, the dehydrated flour was obtained by tray drying method. Further, using this flour for murukku preparation along with varying combinations of other flours and raw materials. Further, from all the combinations the superior products were selected based on overall acceptance using 9-point hedonic scale with semi-trained panelists and the proximate, organoleptic, shelf life, and microbial properties were analyzed. The results obtained from this study revealed that the dehydrated breadfruit flour (BF) had moisture (6.5±0.10%), protein (9.38±0.15%), fat (0.79±0.25%), carbohydrate (81.56±0.49%) fiber (8.27±0.05%), and ash (2.05±0.09%) and energy 387 kcal. C. Minerals had calcium (mg) 1200±0.06, Magnesium (mg) 623.63 ± 0.02, Manganese (mg) 4.31 ±0.01, Phosphorus (mg) 0.63 ±0.01, Sodium (mg) 0.09 ± 0.001 and Selenium (mg) 1.40 ±0.02.

Introduction

Dioscorea Pentaphylla is one of the easily available tuberous plants, used by many tribal communities as food and also as medicine (Kumar et al. 2012). Tubers of *D. pentaphylla* attribute antioxidant activity and antimicrobial activities due to the expression of browning properties and the presence of secondary metabolites in them (Kumar et al. 2017; Kumar 2017; Kumar and Jena 2017). Morphological characters of *D. pentaphylla*: *D. pentaphylla* (Dioscoreaceae; common name- five leaf yam, Kantaalu, Phalalu, Panjasanga) is a tuberous monocot prickly vine bearing aerial bulbils. It may reach up to 10 m in length. Tubers are oblong or clavate, proceeding directly from the base of the aerial stem and thickening downwards (Gucker 2009, Kumar et al. 2013; Plate 1). It is native to Bangladesh, Borneo, Cambodia, Caroline Island, China South-Central, China Southeast, East Himalayas, Hainan, India, Jawa, Laos, Lesser Sunda Island, Malaya, Maldives, Maluku, Myanmar, Nepal, New Guinea, Philippines, Queensland, Sri Lanka, Sulawesi, Sumatera, Taiwan, Thailand, Tibet, Vietnam and West Himalayas (Kumar 2017). This tuber is being used as and leave overnight in running water like stream and then boil it. The boiled tuber is consumed raw or cooked as a vegetable and developed value added products like murukku, cookies and chapatis.

MATERIALS AND METHODS

This chapter presents the details of the materials and instruments used, experimental procedures adopted, and data analysis employed for the study of gluten free products from Breadfruit.

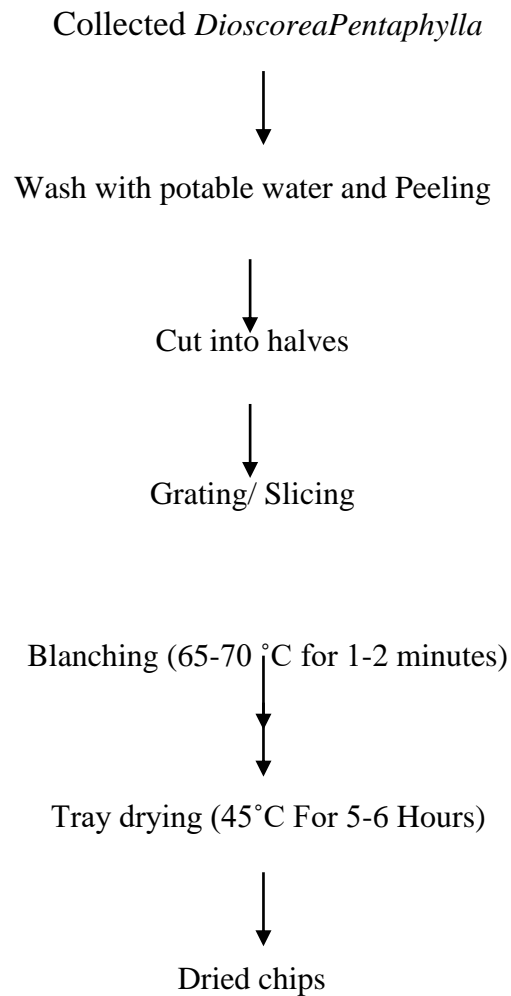
Raw Materials

The following raw materials are used for the preparation of murukku: Rice flour, Bengal gram flour, Maida, Spices, Salt, red chili powder,

Processing of *Dioscorea Pentaphylla*

The *Dioscorea Pentaphylla* in fresh form which was collected is cleaned and processed into;

a) Breadfruit chips and b) *Dioscorea pentaphylla* flour

Process flow chart of DioscoreaPentaphyllainto chips**PROCESS DESCRIPTION:**

According to figure (3.1) *DioscoreaPentaphyllatuberis* cleaned thoroughly with potable water and the skin of fruit is peeled off using a hand peeler, then the tuber is cut into slices in the form of thin chips using a knife. These chips are blanched in hot water maintained at a temperature of 65-70°C for about 1-2 minutes with 2 -3% sodium chloride salt, then drained well. Three times washing with water is done to remove excess sodiummetabisulphite. (This will prevent enzymatic browning of the fruit flesh and prevent formation of bitter taste). Then these thin chips are dried using a tray drier maintained at a temperature of 50°C until the chips are fully dry. Breadfruit chips should be dried to approximately 4 to 5% final moisture content.

Processing of *dioscoreapentaphylla* chips into flour
DRIED *DIOSCOREA PENTAPHYLLA* CHIPS

GRINDING



POWDER



SIEVED



FLOUR

PROCESS DESCRIPTION:

Dried *DioscoreaPentaphylla*chips were ground into flour using semi-automatic single-phase electric model stainless steel pulverizer, then pass through sieve (sieve size 177 micron) for several times (2 to 3 times) until a powder substance is obtained and leaving coarse material remains used as semolina. Storage of flour and coarse material in separate clean airtight Low-density polythene (LDPE) zip lock bags and used as per required.

PRODUCTS PREPARATION

The combinations of the raw ingredients are standardized in the preparation of murukku and the proportions used are given in Table.

VALUE ADDED PRODUCT

Preparation of Murukku

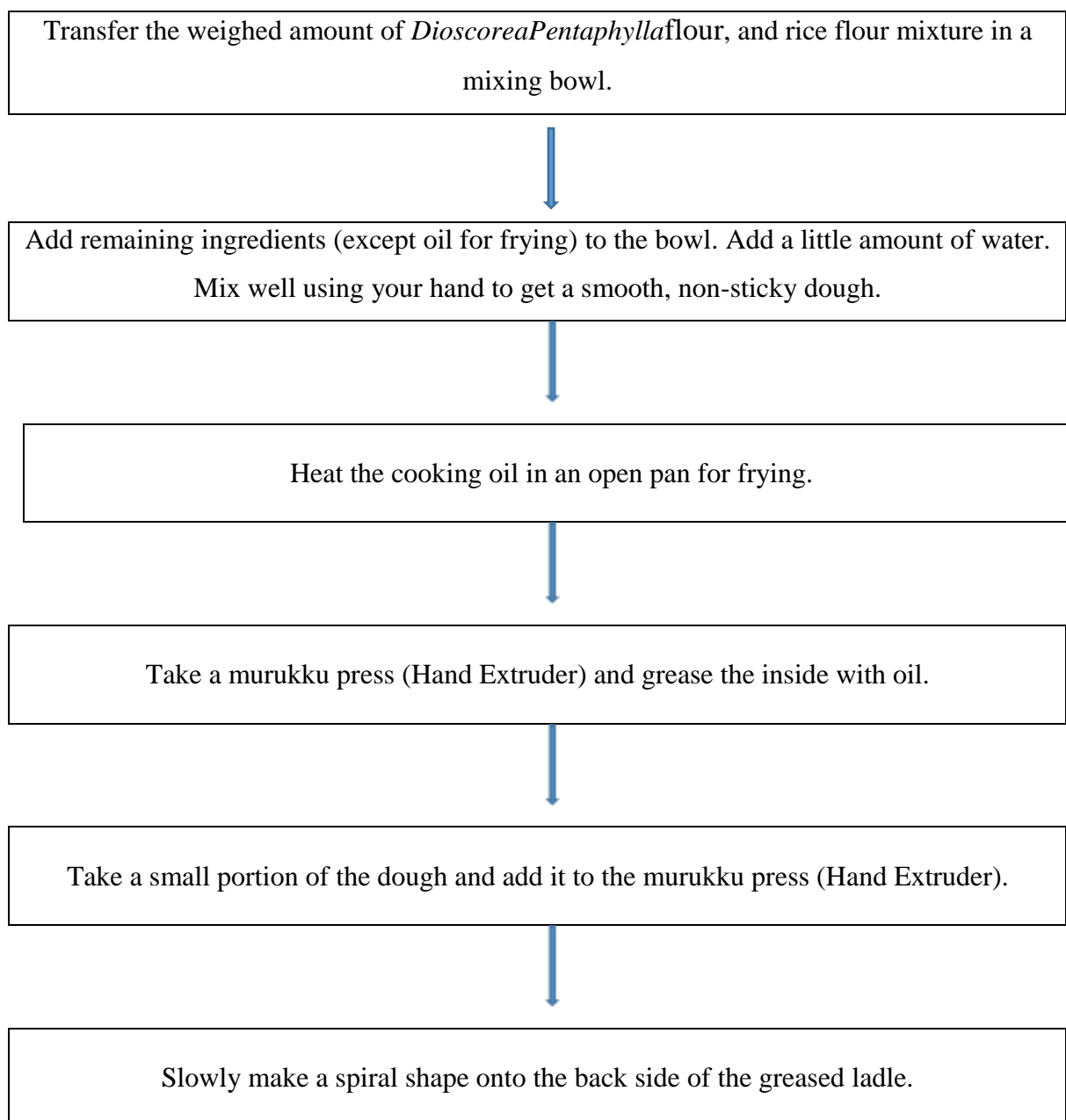
Ingredients are *DioscoreaPentaphylla*flour, Rice flour, Bengal gram flour, Red chilli powder, Salt and Cumin seeds

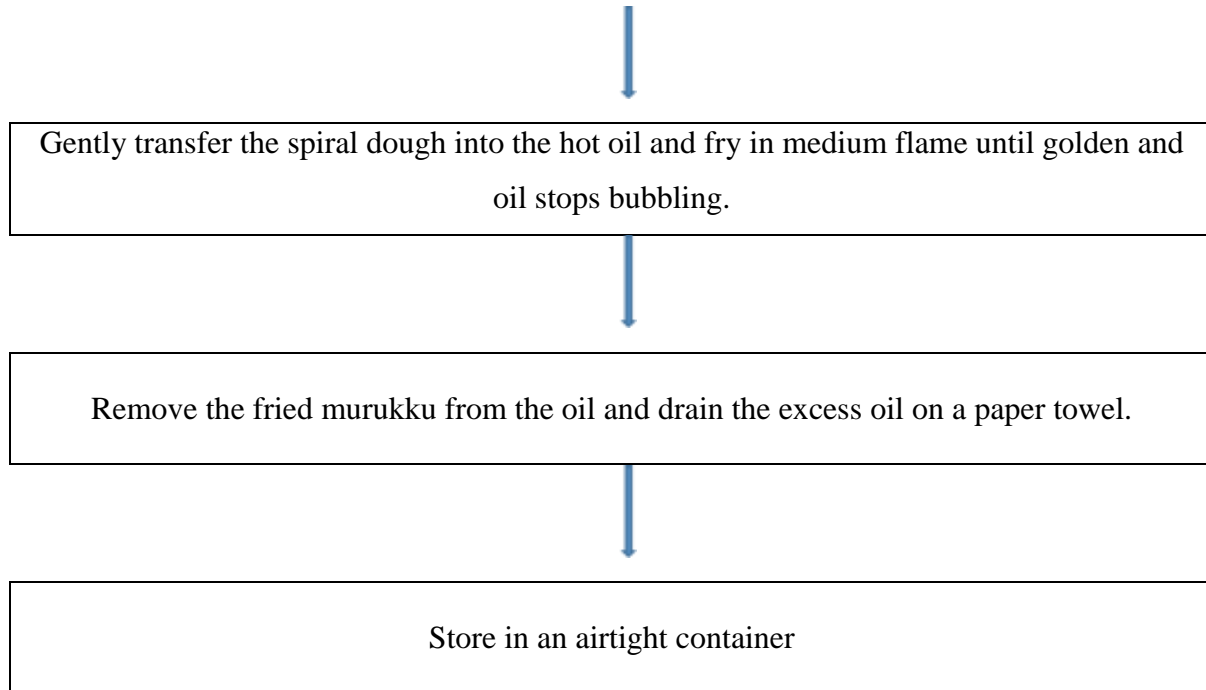
PRODUCT FORMULATION: Six combinations of the raw ingredients were standardized in the preparation of Murukku and the proportions used are given in Table

Ingredient	Control (%)	M1(%)	M2(%)	M3(%)	M4(%)	M5(%)
DioscoreaPentaphyllaflour	0	10	20	30	40	50

Rice flour	100	90	80	70	60	50
Red chilli powder	5	5	5	5	5	5
Salt	5	5	5	5	5	5
Cumin seeds	5	5	5	5	5	5
Water (ml)	50	50	50	50	50	50

PROCESS FLOWCHART:



**Figure: 3.3****Product Description:**

The snack is golden-brown and has a crunchy texture. It is made from *DioscoreaPentaphylla* flour, and Rice flour. As per the product formulation shown in table, mix all the ingredients with composite flour, is then kneaded and shaped into concentric circles, and subsequently deep fried in cooking oil until it gets golden brown colour as shown in figure 3.3. Most of these savory snacks are additionally flavored with cumin, onion powder.

Results

The results obtained from the *DioscoreaPentaphylla* flour which was used to prepare value-added product like murukku was analyzed for physico-chemical, organoleptic qualities, and microbiological safety.

Proximate composition of *DioscoreaPentaphylla* chips before and after tray drying

Components	Tray drying	
	Before	After
Moisture (%)	70.6±0.55	6.5±0.01
Protein (gm)	1.73±0.15	9.38±0.05
Fat (gm)	0.08±0.01	0.79±0.02
Carbohydrate (gm)	20.1±0.76	81.56±0.14
Fibre (gm)	2.9±0.01	8.27±0.02
Ash (%)	1.05±.0.05	2.05±0.05
Energy (Kcal)	82±0.72	387±0.41

Sensory evaluation of murukku

Murukku is normally made using rice flour 50-90 gm, redchilli powder 5 gm, salt 5 gm, cumin seeds 5 gm. Variations were made as given in Table. by incorporating different levels of *DioscoreaPentaphylla* flour. The developed product was subjected to sensory evaluation and assessed by semi-trained panel members (N=30) using a 9-point hedonic scale. The results of the sensory evaluation for appearance, texture, taste, flavour and overall acceptability showed the maximum sensorial quality for the combination of *DioscoreaPentaphylla* flour 20%, rice flour 80% supplemented.

Sensory attributes of murukku samples

Samples	Sensory Attributes				
	Appearance	Colour	Taste	Texture	Overall acceptability
	Mean± S.D.	Mean± S.D.	Mean± S.D.	Mean± S.D.	Mean± S.D.
Control	9.13±0.41	9.13±0.42	9.31±0.45	9.26±0.44	9.40±0.50
M1	9.15±0.35	9.23±0.50	9.23±0.43	9.20±0.45	9.13±0.34
M2	9.76±0.57	9.66±0.44	9.43±0.47	9.40±0.47	9.56±0.49
M3	7.01±0.38	7.13±0.37	6.93±0.63	6.80±0.66	7.96±0.88
M4	6.36±0.51	5.40±0.49	5.36±0.49	5.63±0.48	5.36±0.49
M5	6.05±0.45	5.15±0.44	4.01±0.51	5.55±0.45	5.22±0.55

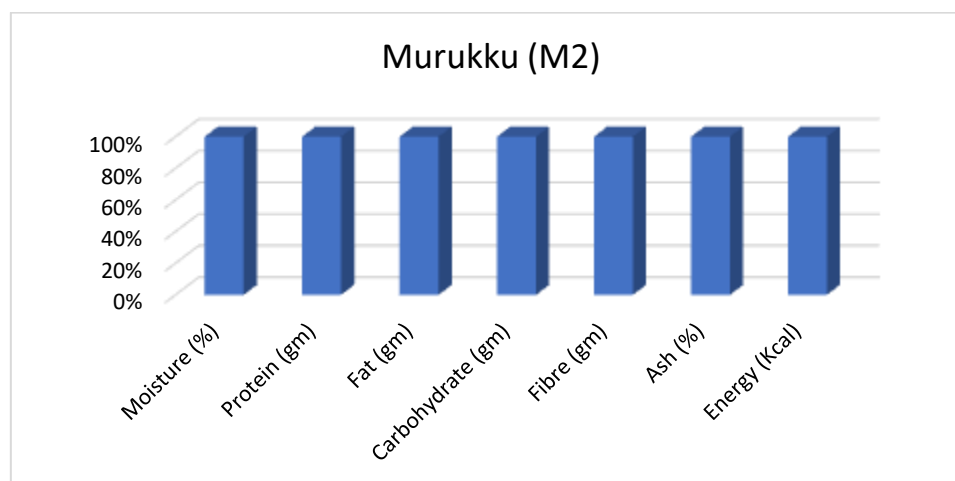
The results of the F-test showed M2 was superior among all samples with 9.56±0.49 overall acceptability. Therefore, the sample that showed maximum overall acceptability through sensorial and F-test was further analyzed for proximate, mineral, and shelf-life studies.

Proximate composition of murukku (M2)

The Proximate composition of murukku (M2) per 100 g has been presented in table 4.6. The result of the composition analysis of superior sample showed moisture, ash, fat, protein, carbohydrate, and dietary fiber with 7.2±0.25%, 2.1±0.05%, 4.4±0.09gm, 7.8±0.13gm, 6.2±0.06gm and 2.2±0.09gm respectively.

Proximate composition of murukku sample (M2) per 100 gm

Component	Murukku (M2)
Moisture (%)	7.2±
Protein (gm)	7.9±
Fat (gm)	3.4±
Carbohydrate (gm)	10.2±
Fibre (gm)	2.05±
Ash (%)	2.1±
Energy (Kcal)	355±



Mineral composition of murukku (M2)

Minerals had calcium (mg) 1200 ± 0.06 , Magnesium (mg) 623.63 ± 0.02 , Manganese (mg) 4.31 ± 0.01 , Phosphorus (mg) 0.63 ± 0.01 , Sodium (mg) 0.09 ± 0.001 and Selenium (mg) 1.40 ± 0.02 .

Table 4.7. Mineral composition of murukku sample (M2) per 100 g

Mineral content	Murukku (M2)
Sodium (mg)	0.09 ± 0.001
Calcium (mg)	1200 ± 0.06
Selenium (mg)	1.40 ± 0.02
Magnesium (mg)	623.63 ± 0.02
Phosphorous(mg)	0.63 ± 0.01
Manganese (mg)	4.31 ± 0.01

Shelf-life studies of murukku (M2)**Sensory evaluation of murukku (M2)**

The product was stored for a period of 60 days and their organoleptic evaluation was conducted once in 15 days for different sensory attributes by semi trained panel members. The mean values were shown in the Tables 4.8. As the storage period progressed from zero to 60 days mean values of overall acceptability decreased from 4.40 ± 0.49 to 3.2 ± 0.44 . Similar trend was seen for appearance, color, taste and texture. The overall acceptability of the sample decreased significantly (0.05) from 30- 60 days of storage compared to control (Figure. 4.4). Similar trends was observed for control sample.

Changes in sensory attributes during storage of murukku sample (M2)

Sensory attributes	Initial Day	15 Days of storage	30 Days of Storage	45 Days of Storage	60 Days of storage
	Mean± S.D.	Mean± S.D.	Mean± S.D.	Mean± S.D.	Mean± S.D.
Appearance	9.76±0.57 (9.13±0.43)	9.26±0.52 (9.01±0.44)	8.96±0.18 (8.84±0.16)	7.32±0.46 (7.19±0.3)	6.22±0.43 (6.05±0.2)
Colour	9.66±0.44 (9.18±0.42)	9.03±0.18 (8.92±0.18)	8.93±0.44 (7.82±0.14)	7.78±0.46 (7.63±0.33)	6.45±0.50 (6.34±0.35)
Taste	9.43±0.47 (9.21±0.45)	8.03±0.60 (8.82±0.16)	7.76±0.61 (7.64±0.18)	6.61±0.66 (6.42±0.24)	5.45±0.62 (5.32±0.45)
Texture	9.40±0.47 (9.23±0.44)	7.06±0.44 (6.87±0.11)	7.83±0.43 (7.75±0.17)	6.58±0.62 (6.43±0.21)	5.45±0.47 (5.25±0.33)
Overall Acceptability	9.56±0.49 (9.31±0.50)	5.32±0.52 (5.23±0.45)	5.19±0.75 (5.03±0.32)	5.93±0.37 (5.82±0.42)	4.75±0.44 (4.55±0.43)

Figures in parenthesis indicate control

Microbialevaluation of murukku sample (M2)

The total plate count (CFU X 10^4 /gm of sample) was presented in Table. As the storage period increased the number of colonies increased both in murukku (M2) and control samples, but in murukku sample (M2) no growth was observed up to 30 days. The total plate count increased from 2 to 15 respectively.

Microbial evaluation of murukku sample (M2)

Sample	Total Plate Count (CFU X 10 ⁴ /gm of sample)				
	Initial Day of Storage	15 Days of storage	30 Days of storage	45 Days of storage	60 Days of storage
Control	00	02	05	09	15
Murukku (M2)	00	00	01	05	09

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