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Preparation of Tandulaja powder and its fortified Mathari

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Abstract

Tandulaja (*Amaranthus spinosus*) is a storehouse for many phytonutrients, antioxidants, minerals and vitamins which contribute immensely to health and wellness so we dry the leaves and form the powder and by using this powder prepared the value added products. For powder leaves are drying at five different temperatures namely 50 °C, 55 °C, 60 °C, 65 °C and 70 °C up to the final moisture content reached to 5.5 % in 11, 9, 7, 5, 3 hours respectively. The dried leaves at each individual temperature were finely grinded to yield a fine powder. The powder obtained by the drying at temperature of 65°C was selected for the preparation of the value added products.

We are made the mathari with incorporation of dried tandulaja powder because of mathari is a very popular snack in India. According to obtained results it was seen that this value addition enriched the nutritive value of the traditional recipe. The recipe containing 7g incorporation of the powder was highly acceptable with a score of 37. Moreover the study revealed that it contained 20.077% moisture, 11.5 g of protein, 24.45% fat and 2.5 g of ash. It may be concluded that dry tandulaja powder fortified Mathari being good source of fat, protein may be incorporated in the daily diets of the vulnerable sections of the population.

Mathari was developed with incorporation of dried tandulaja powder was organoleptically acceptable.

Keywords: Tandulaja leaves, tandulaja powder, Mathari, wheat flour, salt

Introduction

1. About the plant

Tandulaja is known as (*Amaranthus spinosus*). It is a genus of annual or short-lived perennial plants which belongs to Amaranthaceae family. *Amaranthus spinosus* knows by the various names such as in Hindi: Kanta chaulai, Manipuri: Chengkruk, Marathi: Tandulaja bhaji or kante math, Tamil: mullukkeerai, Malayalam: Kattumullenkeera, Tangkhul: Somchan, Telugu: mullatotakura, Bengali: Kantanotya, Sanskrit: Tanduliyayah.

Tandulaja is grown up to the height between 0.3 m to 2 m. depending on the species, growth habitat and environment. About 400 species of Tandulaja are distributed throughout the worldwide in temperate, subtropical, and various tropical climate zones.

There is no any evidence about the origin of tandulaja. But according to one view grain amaranth is being cultivated in the old world from time immemorial and probably originated there. The other view stated that India has been considered as one of the centers of distribution of tandulaja & in India about 20 species are cultivated.

The ornamental type (*A. tricolor*) believed that it originated in India and then introduced to the new world. Tandulaja leaves are mostly consumed in the form of leafy vegetables by cooking and salads.

2. Health benefits of tandulaja

- Tandulaja leaves are the storehouse of many phytonutrients, antioxidants, minerals and vitamins which contribute immensely to health and wellness.
- Tandulaja has many medicinal properties like astringent, diaphoretic, diuretic, emollient, febrifuge, galactagogue etc.
- Tandulaja leaves and juice are used in the various treatments such as a internal bleeding, excessive menstruation, snake bites, boils, stomach disorders, ulcerated mouths, vaginal discharges, nosebleeds and wounds.
- The leaves and stems are carrying a good amount of soluble and insoluble dietary fibers. So due to this reasons tandulaja recommended by dieticians in the cholesterol controlling and weight reduction programs.
- Fresh leaf of tandulaja contains good amount of iron. In that Iron is required for red blood cell (RBC's) production and as a co-factor for the oxidation-reduction enzyme, cytochrome oxidase during the cellular metabolism.

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-Tandulaja has several powerful antioxidant vitamins like Vit - C, Vit -E, Vit-A, (2917 IU or over 97% of daily recommended levels per 100 g) and flavonoid polyphenolic antioxidants such as lutein, zeaxanthin, and β -carotene. Together, these compounds help act as protective scavengers against oxygen-derived free radicals and reactive oxygen species (ROS), and thereby play role in maintaining healthy mucosa and skin, and is essential factor for ocular (eye) health.

-Tandulaja leaves contains small amounts of B-complex vitamins such as folates, vitamin-B6 (pyridoxine), riboflavin, thiamin (vitamin B-1), and niacin. Folate rich diet help prevent neural tube defects in the newborns.

-Tandulaja leaves carry more potassium, calcium, manganese, copper and zinc than spinach. Potassium is an important for the cell and body fluids that help regulate heart rate and blood pressure.

3. Drying as a means of preservation

Among various methods of preservation, dehydration of vegetables is the oldest methods. Dehydration increases the storage period of green leafy vegetables and make them available in off-season and throughout the year. This concentrated form supplying important nutrients. Tandulaja leaves can easily dehydrated by several methods like sun drying, tray drying, and cabinet drying.

Drying a high moisture content of materials is a complicated processes it involving simultaneous heat and mass transfer. The several techniques are used for drying of materials but thin layer drying is popular due to faster drying rate and minimum loss of nutrients.

4. About the snack foods/ mathri

A snack food refer to sweet, spicy or salty, ready to eat foods and generally includes the items such as chips/crisps, Extruded snacks, Mathri, Namakpare, Chocolate confectionery, Biscuits, etc. Snacks are defined as a "quick small meals" between

regular meals. Snack meals have become an important substitution for traditional meals. Traditionally, snacks were prepared at the home level from commonly available ingredients. It has been found to be more convenient to prepare snack which at least partially meet the nutritional needs. Plain snacks like plain cereals, pasta and vegetables are very popular. Snack foods are typically designed to be portable, quick and satisfying.

Mathri is a ready to eat snack generally made by the addition of semolina flour, ajwain (carom seeds/bishop's weed), salt, refined oil, lukewarm water. It is served best with a hot beverage and is popular Indian snack especially in the middle-class.

5. Utilization of tandulaja leaves

This research carried out the preparation of dehydrated Tandulaja leaves powder & prepared value added food products from the dehydrated Tandulaja leaves. Tandulaja leaves are good nutritional values were selected for dehydration. Leaves were tray dried for 3-4 hours at 50-60 degrees till the moisture reached 6-7 %. These dehydrated leaves were incorporated at various levels in conventional foods.

Materials and Methods

The methodology adopted has been described under the following headings process, flow chart for preparation of Mathari.

1. Raw materials: In case of Tandulaja fortified snacks (mathri) we optimized the levels of incorporation of ajwain, salt, refined oil and tandulaja powder. Thus for the preparation of these value added products we used different materials according to the formulation. Many samples were prepared with different formulation (Table no.-1).

Table 1: Formulation of recipe for Tandulaja fortified Mathri.

Sample no.	Wheat Flour (gm) (Low gluten flour)	Tandulaja powder (gm)	Ajwain (gm)	Salt(gm)	Refined Oil (ml)
M1	100	0	1.54	3.50	40
M2	100	1	1.54	3.50	40
M3	100	3	1.54	3.50	40
M4	100	5	1.54	3.50	40
M5	100	7	1.54	3.50	40
M6	100	9	1.54	3.50	40

Where

M1:- Control Mathri Sample

M2:- Mathri Sample No-2

M3:- Mathri Sample No-3

M4:- Mathri Sample No-4

M5:- Mathri Sample No-5

M6:- Mathri Sample No-6

2. Methods of preparation

Raw Tandulaja leaves were procured from the local market. After their analysis they were dried at five different temperatures namely 50°C, 55°C, 60°C, 65°C, 70°C. The dried leaves were then grinded and then screened with a help of a 42.5 microns mesh size sieve. Then the proximate analysis of the dried leaves was done in comparison to the raw leaves so as to check the effect of drying on the nutritional value. On account of the results obtained a temperature was chosen which

displayed satisfactory results regarding the retention of the nutrients.

Then experiments were conducted for the preparation of Tandulaja fortified mathri we optimized the levels of incorporation of tandulaja powder and then sensory was done on a hedonic scale by a panel of judges. Thus for the preparation of these value added products we used different materials and methods.

a. Preparation of Tandulaja leaves powder from tandulaja leaves

Fresh tandulaja leaves were taken from the local market. They were washed and air dried until the external moisture was removed. Then they were placed in the aluminium trays and eventually in the tray drier. They were dried at 5 different temperatures (50 °C, 55 °C, 60 °C, 65 °C and 70 °C) till the moisture reached to 5-6% respectively. The data in terms of moisture content (dry basis) and weight (dry basis) and time

was recorded. Then the dried leaves were grinded to fine powder and then using a mesh size of 42.5 micron they were sieved. The fine powder was stored in air tight polyethylene bags for further use.

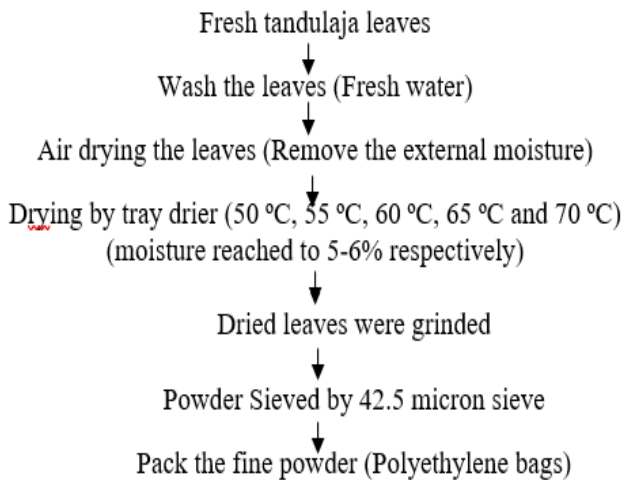







Chart 1: Preparation of tandulaja leaves powder

Table 2: Preparation of tandulaja leaves powder

Sapmle No.	Temperature (°C)	Time taken (hr)	Prepared Sample
TA	50 °C	11	
TB	55 °C	9	
TC	60 °C	7	
TD	65 °C	5	
TE	70 °C	3	

b. Preparation of the instant tandulaja fortified mathri

A common method of preparing mathri was standardized for one serving. Firstly we taken the low gluten contain refined wheat flour (semolina (100g)). It was sieved with a mesh of size 42.5 microns. Then a constant amount of salt (3.50 g) g and ajwain (1.54g) individually were added in all the six samples. After that the powder from the dried tandulaja leaves was blended in 5 different ratios 1, 3, 5, 7, 9 %. Water 60 ml was added and kneaded well to make stiff dough. The dough was kept a side for 10 minutes, kneaded again and divided into small portions. Mathri was deep fried in oil (40 ml) for 5 minutes until they were golden brown in colour. Thus 5 recipes were prepared for the sensory evaluation as shown in the table no.1. Then sensory evaluation based on a hedonic scale was done by a panel of judges.

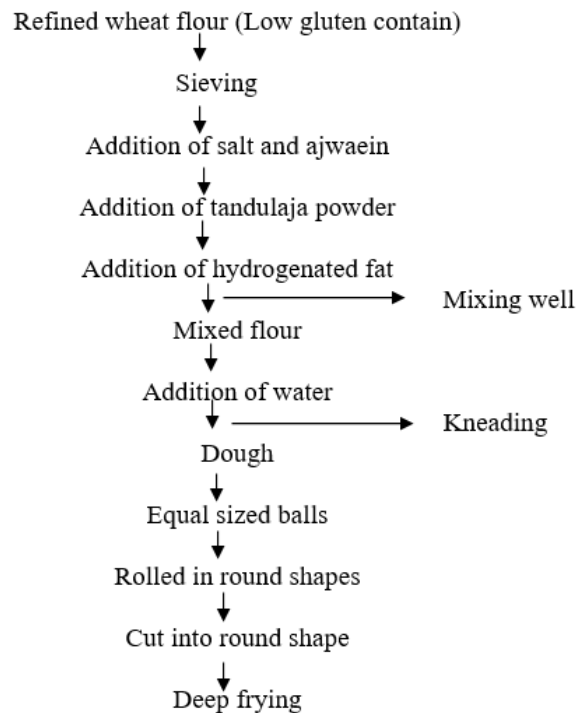


Chart 2: Preparation of tandulaja Fortified Mathari



Fig 1: Mathri at 7gm Tandulaja powder incorporation

Results and Discussions

1. Nutritional composition of tandulaja leaves

Table 3: Nutritional value of tandulaja leaves per 100g

Sr. No.	Principle	Nutrient Value
1	Moisture	88 %
2	Carbohydrates	6.5 g
3	Protein	3.5g
4	Fat	0.5 %
5	Ash	0.34 %
6	Ascorbic acid	80 mg
7	Calcium	267 mg

2. Drying characteristics of the tandulaja leaves

Drying of the fresh tandulaja leaves were conducted at temperatures 50, 55, 60, 65, 70 °C degrees respectively. The initial moisture content of the leaves was estimated to be 700 % (d.b.) and the leaves were dried to a final moisture content of 5.5% (d.b.) as shown by Table No.4.

Table 4: Drying characteristics of the dried tandulaja leaves

Time	M.C (d.b.) 50°C	M.C (d.b.) 55°C	M.C (d.b.) 60°C	M.C (d.b.) 65°C	M.C (d.b.) 70°C
5	636.377	591.13	546.32	502.33	450.99
10	582.12	516.889	450.23	400.7	330.65
15	529.23	446.342	385.13	301.32	220.94
20	476.132	378.56	320.31	222.23	150.59
25	435.75	318.508	260.54	162.66	95.84
30	380.763	268.4	172.99	112	39.11
35	340.567	226.99	160.45	77	30.87
40	310.79	196.6	151.09	57	21.37
45	266.453	171.45	114.3	45	14.07
50	241.65	150.32	78.89	35	10
55	210.5	132.33	45.87	25	8.6
60	184.65	116.88	28.83	17	7.7
75	162.554	101.78	17	11	7
90	139.678	87.905	12.5	6.8	6.9
105	117.325	74.654	9.03	6.7	6.4
120	97.674	60.44	7.24	6.5	6
150	74.86	49.67	7.21	6.2	5.7
180	59.67	39.65	7	5.9	5.5
210	47.67	28.54	6.9	5.8	
240	37.85	20.37	6.8	5.7	
270	31.654	15.75	6.7	5.6	
300	26.89	11.54	6.5	5.5	
330	23.76	8.02	6.3		
360	20.9	7.64	6		
390	17.7	7.3	5.8		
420	15.6	7	5.5		
450	12.9	6.6			
480	10.2	6.2			
510	9.4	5.8			
540	8.3	5.5			
570	7.4				
600	6.7				
630	6				
660	5.5				

3. Chemical analysis of 7g tandulaja powder fortified Mathri.

Composition of the control Sample and the tandulaja powder fortified mathri were presented in table no.5. Moisture content varied significantly and ranged in control sample and the 7 gm incorporation sample from 21.45% to 20.077%. The protein content too varied from 9 g to 11.5 g in control and the tandulaja powder fortified mathri. Fat varied from 22 % to 24.45 % and ash 1.34 g to 2.5 g.

Table 5: Chemical analysis of 7g tandulaja powder fortified Mathri

Sr. No.	Nutrients	Control Mathri	Tandulaja fortified Mathri at 7 gm
1	Moisture (%)	21.45%	20.077%
2	Protein (g)	9 g	11.5 g
3	Carbohydrates	12.10 g	16.21 g
4	Fat (%)	22%	24.45%
5	Ash (g)	1.34g	2.5 g

4. Sensory evaluation of tandulaja powder fortified Mathri.

Through the 9 point hedonic scale method sensory analysis was done for the entire 5 recipe. We analyze the quality parameters like color, texture, appearance, flavor and overall acceptance and the results are shown in the table 6. Hence it was concluded that the 7 g tandulaja powder incorporation was highly acceptable with a maximum score 37.

Table 6: Sensory evaluation of tandulaja powder fortified Mathri

Parameters	Maximum score	Sample					
		M1	M2	M3	M4	M5	M6
Color	9	7	6	6	8	8	5
Texture	9	7	7	7	6	7	6
Appearance	9	8	5	6	5	7	6
Flavor	9	9	6	6	6	8	5
Overall acceptance	9	8	6	6	6	7	6
Total	45	39	30	31	32	37	28

Conclusion

Drying of Tandulaja leaves which was done at five temperatures namely 50 °C, 55 °C, 60 °C, 65 °C and 70 °C showed that the final moisture content reached to 5.5 % in 11, 9, 7, 5, 3 hours respectively. The dried leaves at each individual temperature were finely grinded to yield a fine powder. The powder obtained by the drying at temperature of 65°C was selected for the preparation of the value added products.

From the results it was seen that the value addition enriched the nutritive value of the traditional recipe. There was a substantial increase in the nutritive value of all the products enriched by dried green vegetables. Food products developed with incorporation of dried tandulaja powder were organoleptically acceptable.

Mathri which is also a very popular Indian snack was fortified with the help of the powder from the dried tandulaja leaves. The recipe containing 7g incorporation of the powder was highly acceptable with a score of 37 Moreover the study revealed that it contained 20.077% moisture, 11.5 g of protein and 24.45% fat and 2.5 g of ash. It may be concluded that dry tandulaja powder fortified mathri being good source of fat, protein may be incorporated in the daily diets of the vulnerable sections of the population.

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