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Preparation of instant Tandulja-raita powder mix

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Abstract
Tandulja (*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 50ºC, 55ºC, 60ºC, 65ºC and 70ºC 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 65ºC was selected for the preparation of the value added products. We are made the Instant Tandulja-raita powder mix with incorporation of dried Tandulja powder. According to obtained results it was seen that this value addition enriched the nutritive value of the traditional recipe. Instant Tandulja-raita powder mix made by the incorporation of the 3 g Tandulja powder, 10 g dried curd powder, 2.25 g black salt and the 1.5 g roasted cumin seeds powder. On the analysis of the instant Tandulja-raita powder mix it was revealed that it contained 10.9% moisture, 5 gm of protein, 16.10% fat, 3.6% ash and 6.8 gm Carbohydrates. Instant raita powder mix developed with incorporation of dried Tandulja powder was organoleptically acceptable.

Keywords: tandulja leaves, tandulja powder, curd powder, black salt, cumin seeds

Introduction: About the plant

Tandulja (*Amaranthus spinosus*) collectively known as Amaranth, it is a genus of annual or short-lived perennial plants which belongs to Amaranthaceae family. Tandulja 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 Tandulja are distributed throughout the worldwide in temperate, subtropical, and various tropical climate zones.

There is no any evidence about the origin of Tandulja.

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 Tandulja & 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. Tandulja leaves are mostly consumed in the form of leafy vegetables by cooking and salads.

Fig 1

Health Benefits of Tandulja

- Tandulja leaves are the storehouse of many phytonutrients, antioxidants, minerals and vitamins which contribute immensely to health and wellness.
- Tandulja has many medicinal properties like astringent, diaphoretic, diuretic, emollient, febrifuge, galactagogue etc.
- Tandulja leaves and juice are used in the various treatments such as an 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 Tandulja recommended by dieticians in the cholesterol controlling and weight reduction programs.
- Fresh leaf of Tandulja 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.
- Tandulja 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.
- Tandulja leaves contains small amounts of B-complex vitamins such as folates, vitamin-B6 (pyridoxine), riboflavin, thiamin (vitamin B-1), and niacin. Folates rich diet help prevent neural tube defects in the newborns.

- Tandulja 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.

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. Tandulja 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.

Homemade Beverages (Raita)

Raita is a very famous homemade drink, resembling to the buttermilk in its consistency, can be fortified with the addition of the Tandulja powder to increase its nutritive value. The key ingredients in the raita preparation along with the dried Tandulja powder are dried curd powder, roasted cumin seeds powder, black salt which are rehydrated as per the consistency needed by the consumer.

Keeping the nutritional value of Tandulja leaves and its possibilities to be added in the conventional foods to increase the nutritional quality of those food products.

Utilization of Tandulja Leaves

This research carried out the preparation of dehydrated Tandulja leaves powder & prepared value added food products from the dehydrated Tandulja leaves. Tandulja 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 instant Tandulja-raita powder mix.

Raw Materials

Tandulja leaves powder, Curd powder, Black salt, Cumin seeds powder is used according to the formulation. Many samples were prepared with different formulation (Table no.:-1). In that according to the acceptable result final product was done as follow:

1. Tandulja powder - 3 gm
2. Dried curd powder -10 gm
3. Black salt - 2.25 gm
4. Roasted cumin seeds powder - 1.5 gm
5. Temperature -50ºC, 55ºC, 60ºC, 65ºC, 70ºC.

Table 1: Formulation of recipe for Tandulja-raita powder mix

Sample No.	Dried curd powder (gm)	Tandulja powder (gm)	Black salt (gm)	Roasted cumin seeds powder (gm)
TA	10	1	1	1
TB	10	2	1.5	1
TC	10	3	2.25	1.5
TD	10	3.75	2.40	2
TE	10	4	3	2.5

Instant Tandulja-raita powder mix made by the incorporation of the 3 g Tandulja powder, 10 g dried curd powder, 2.25 g black salt and the 1.5 g roasted cumin seeds powder gained the highest score and thus proved to be highly acceptable. On the proximate analysis of the instant Tandulja- raita powder mix it was revealed that it contained 16.10% fat, 10.9% moisture, 3.6% ash, 5 gm of protein, 6.8 gm Carbohydrates.

Methods of Preparation

Raw Tandulja leaves were procured from the local market. After their analysis they were dried at five different temperatures namely 50ºC, 55ºC, 60ºC, 65ºC, 70ºC. 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 instant Tandulja raita powder mix. During the preparation of instant Tandulja raita powder mix we optimized the level of incorporation of the dried curd powder followed with the optimization of the spices like black salt and the roasted cumin seeds powder which form basic ingredients for the Tandulja raita ***mix***. Then the level of incorporation of the dried Tandulja leaves powder was optimized as per the sensory ratings given by the panel of judges on a hedonic scale.

4 ingredients i.e. curd powder, bathua powder, black salt, roasted cumin seeds powder (finely grinded) were blended in various ratios to check the best sample. Firstly the rehydration ratio of the curd powder to water was optimized. Then the ratio of the black salt and cumin seeds powder was optimized. Then the ***Tandulja*** powder was added in all the samples to optimize the best sample i.e. instant ***Tandulja***- raita powder mix.

1. Preparation of *Tandulja* leaves powder *from* Tandulja leaves

Fresh Tandulja 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 (50ºC, 55ºC, 60ºC, 65ºC and 70ºC) 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.

Fresh tandulaja leaves
↓
Wash the leaves (Fresh water)
↓
Air drying the leaves (Remove the external moisture)
↓
Drying by tray drier (50ºC, 55ºC, 60ºC, 65ºC and 70ºC)
(moisture reached to 5-6% respectively)
↓
Dried leaves were grinded
↓
Powder Sieved by 42.5 micron sieve
↓
Pack the fine powder (Polyethylene bags)

Flow Chart 1:- Preparation of Tandulja leaves powder

Table 2: Preparation of Tandulja leaves powder

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

2. Preparation of *curd* powder *from curd*

Select the Pasteurized Curd (Amul Masti Dahi) with 3% fat content was used for preparation of curd powder. Drying of the curd was carried out by placing a sample each containing 1 kg of the curd in the tray drier. The drying was carried out at three different temperatures namely 50ºC, 60ºC, 70ºC. The results or selection was based on the parameters like product obtained in gms,% recovery, rehydration ratio and consistency.

Table 3: Preparation of Curd powder

Sample No.	Temperature (ºC)	Time taken (hrs)	Product obtained
CA	50ºC	30	86 g
CB	60ºC	25	96 g
CC	70ºC	20	83 g

3. Preparation of the instant Tandulja-raita powder mix

Dried curd powder

Fig 2: Instant Tandulja -raita mix prepared

Results and Discussions

1. Nutritional Value of Tandulja leaves

Table 4: Nutritional Value of Tandulja 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 Tandulja leaves

Drying of the fresh Tandulja leaves were conducted at temperatures 50, 55, 60, 65, 70ºC 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. 5.

Table 5: Drying characteristics of the dried Tandulja leaves

Time	M.C (d.b.) 50ºC	M.C (d.b.) 55ºC	M.C (d.b.) 60ºC	M.C (d.b.) 65ºC	M.C (d.b.) 70ºC
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. Rehydration, % recovery of curd Powder

Table 6: Comparison of the drying methods for curd powder (Tray drier)

Temperature (ºC)	Time taken (hrs)	Product obtained	% recovery	Rehydration and appearance
50ºC	30	86 g	8.6%	Poor
60ºC	25	96 g	9.6%	Good
70ºC	20	83 g	8.3%	Poor

4. Sensory quality of the curd powder

Table 7: Sensory quality of the curd powder

S. No.	Temperature	Colour	Flavour	Consistency	Overall acceptability
CA	50ºC	5	4	5	5
AB	60ºC	**8**	**7**	**7**	**8**
CC	70ºC	6	6	5	5

5. Chemical Analysis of the dried curd powder

Data in the table no. 8 shows the quality parameters of the dried curd powder. The dried curd contained 10.8% moisture, 3% ash, fat 16%, 4.2 g protein with a characteristic flavour.

Table 8: Chemical Analysis of the dried curd powder

Sr. No.	Principle	Nutrient Value
1	Moisture	10.8%
2	Ash	3%
3	Protein	4.2 g
4	Fat	16%

6. Chemical analysis of instant Tandulja-raita powder mix

Data in the table No. 9 shows the quality parameters of the standardized the instant Tandulja-raita powder mix. The final product contained 10% fat, 10% moisture, 1.6% ash, 5g of protein.

Table 9: Chemical analysis of instant Tandulja-raita powder mix

Sr. No.	Nutrients	Value
1	Moisture	10.9%
2	Carbohydrates	6.8 gm
3	Protein	5 gm
4	Fat	16.10%
5	Ash	3.6%

7. Rehydration ratio of the instant Tandulja raita

Table 10: Rehydration ratio of the instant Tandulja raita

Sr. No.	Curd Powder(g): Drinking water (ml)	Consistency
TA	10:50	Not good (viscous)
TB	10:75	Not good
TC	10:100	Good
TD	10:150	Very Good
TE	10:125	good

8. Sensory evaluation of instant Tandulja-raita powder mix

Table 11: Sensory evaluation of instant Tandulja-raita powder mix

Sr. No	Tandulja powder (g)	Colour	Flavour	Taste	Rehydration	Overall Acceptability
TA	1	3.5	1.5	2	2	3
TB	2	3.5	2	3	3	3
TC	3	8	7	7	7	7
TD	4	7	4.5	4	5	3
TE	5	7	3	2	6	3

Conclusion

Drying of Tandulja leaves which was done at five temperatures namely 50ºC, 55ºC, 60ºC, 65ºC and 70ºC 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 65ºC 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 Tandulja powder were organoleptically acceptable.

Instant Tandulja-raita powder mix made by the incorporation of the 3 g Tandulja powder, 10 g dried curd powder, 2.25 g black salt and the 1.5 g roasted cumin seeds powder gained the highest score and thus proved to be highly acceptable. On the proximate analysis of the instant Tandulja- raita powder mix it was revealed that it contained 16.10% fat, 10.9% moisture, 3.6% ash, 5 gm of protein, 6.8 gm Carbohydrates.

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