

Organoleptic Evaluation of Dried Arbi Leaf (*Colocasia esculenta*) Powder Incorporated in *Gatte ki sabji* and *Mathari*

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Received: 8.07.2017 | Revised: 15.07.2017 | Accepted: 17.07.2017

ABSTRACT

“Arbi leaves”, (also known as Taro) in its dry form has been known as a good source of Calcium. Scientifically known as *Colocasia esculenta* and belongs to Araceae. The present study was conducted on “Organoleptic evaluation of dried *Colocasia* leaf powder incorporated in *Gatte ki Sabji* and *Mathari*”. In the present study dried *Colocasia* leaf powder was incorporated in different ratios in *Gatte ki Sabji* (4%, 5% and 6%) and *Mathari* (5%, 7% and 10%). A panel of 12 members was selected through Triangle Test for evaluation of the incorporated recipes. 9 Point Hedonic Rating Scale and Composite Scoring test was used for evaluation. Mean score, S.D, and p-value of t were used for statistical analysis of the scores of acceptability trials of all recipes. On the basis of scores two most acceptable recipes of *Gatte ki Sabji* (4% dried colocasia leaf powder incorporated) and *Mathari* (5% dried colocasia leaf powder incorporated) from all the samples were selected and their nutritive value was calculated. The nutrient calculation showed a good increase in calcium with the incorporation of dried colocasia leaf powder as compared to standard recipe. On the basis of scores 5% dried colocasia leaf powder incorporated *Mathari* was most acceptable. It was concluded that dried colocasia leaf powder could be successfully incorporated in recipes as it is a very good source of calcium and could be very beneficial for women having calcium deficiency.

Key words: organoleptic; incorporated; *Colocasia* leaf powder; dehydrated

INTRODUCTION

Colocasia (*colocasia esculenta*) a member of Aracea is the major and popular vegetable among the arum family due to its peculiar flavour and taste. It is widely grown and used as vegetable in India to offer a supplementary potential source of calories, vitamins and minerals¹ (CSIR, 1950); the versatility of this plant is reflected by the fact that not only the

tubers but also the leaves and petioles are used as vegetable in Himachal Pradesh⁵.

Several studies have shown that colocasia contains digestible starch (due to the small size of starch granules), high amount of good quality crude protein, vitamin C, thiamine, riboflavin, niacin, and high scores of amino acids; it has nutritional advantages over root crops and other tuber crops⁶.

Cite this article: Rani, A., Gupta, A. and Chopra, N., Organoleptic Evaluation of Dried Arbi Leaf (*Colocasia esculenta*) Powder Incorporated in *Gatte ki sabji* and *Mathari*, *Int. J. Pure App. Biosci.* 5(4): 635-640 (2017). doi: <http://dx.doi.org/10.18782/2320-7051.5155>

Leaves of Taro (Arbi leaves) are eaten as vegetable by humans, having β carotene iron, protein, vitamins and folic acid which protects against anaemia. The major nutrient in Taro corms is dietary energy, magnesium and calcium.

Nutritive value of dried colocasia leaves per 100 gm - Energy 277 kcal, Fat 5.9 gm, Carbohydrate 42.3 gm, Protein 13.7 gm, Calcium 1546 mg and Phosphorus 308 mg.

The leaves are often boiled with coconut milk to make a soup which is rich in iron.

Objectives of Study

Dry colocasia leaf powder may be beneficial if incorporated in the human diet as it is a good source of calcium. The research work had following objectives: -

1. To incorporate dried colocasia leaf powder in different ratios in *Gatte ki Sabji* and *Mathari*
2. To evaluate acceptability of the prepared recipes with different proportion of dried colocasia leaf powder
3. To calculate nutritional value of most acceptable recipe prepared by incorporating dried colocasia leaf powder.

MATERIAL AND METHODS

The methodological aspects of the study are discussed under the following heads-

1. Procurement of Materials

- (a) **Selection of leaves:** Fresh Green colocasia leaves were procured from Agra sabji mandi.
- (b) **Dehydration of leaves & preparation of powder.** Leaves were cleaned & washed with water. Sun drying of leaves was done for 7-8 days until leaves were properly dehydrated for further use. After dehydration the leaf powder made.

2. Product Development

- (a) **Recipe selection by initial trials:** Recipes selection is an important task. Initially steamed, deep fried, shallow fried, baked recipes were selected and incorporation was done of the dry leaf powder but it was observed that baked & shallow fried recipes were not so acceptable as compared to deep fried and steamed recipes. Therefore *Gatte ki Sabji* and *Mathari* were selected as final recipes for sensory evaluation. These trial recipes were evaluated informally.

- (b) **Standardization of recipes (*Gatte ki sabji* and *Mathari*):** *Gatte ki sabji* and *Mathari*, were selected for standardization, the proportion of ingredients for standardized recipes were taken from Kumud Khanna³, Usha Raina⁴. Table 1 showing the Basic and dehydrated colocasia leaf powder incorporated recipe of *Gatte ki sabji* and *Mathari*.

- (c) **Preparation of dehydrated Colocasia leaf powder incorporated recipes:** Four variations at different percentage (standard, 4%, 5% and 6% in *Gatte ki sabji* and 5%, 7% and 10% in *Mathari*) of each recipe incorporated with dehydrated colocasia leaf powder were prepared. The basic recipe was also prepared as standard for sensory evaluation.

3. Sensory Evaluation of Recipes: Sensory evaluation of recipes prepared by the incorporation of dehydrated colocasia leaf powder was done with respect to colour, appearance, texture, mouth feel, after taste and overall acceptability.

a) Selection of panel members The panel members were selected using triangle difference test.

12 students and teachers, who were able to discriminate the odd sample correctly identifying the taste, were selected to constitute the trained panel for the sensory evaluation.

b) Sensory Evaluation of colocasia leaf incorporated recipes Nine Point Hedonic scale was used for the sensory evaluation of products and it incorporated all attributes ranging from 'like extremely' to 'dislike extremely' so that very minute differences in the acceptability of product can be detected.

c. Selecting the two best acceptable recipes out of both sample The most acceptable recipe among *Gatte ki sabji* and *Mathari* were selected from all colocasia leaf powder incorporated recipes on the basis of mean scores given by panel members.

4. Nutritive value of the two best selected samples was calculated Nutritive value of two most acceptable samples (4% colocasia leaf powder incorporated *Gatte ki sabji* and 5% colocasia leaf incorporated *Mathari*) were calculated by using "Nutritive Value of Indian Foods" NIN (2012)²

RESULT AND DISCUSSION

The two best acceptable ratio selected by the panel members were 4% and 5% incorporated dried colocasia leaf powder in *Gatte ki sabji* and *Mathari* respectively.

The table 2 shows the percentage of dry colocasia leaf powder incorporated in *Gatte ki sabji* and *Mathari* in three variations 4%, 5% and 6% in samples B₁, C₁ and D₁ and 5%, 7% and 10% in B₂, C₂ and D₂ respectively along with standard basic recipes A₁, A₂.

The table 3 shows the mean and standard deviation of sensory evaluation of all attributes in all the samples. Nine Point Hedonic Rating Scale was used for sensory evaluation. The most acceptable recipe sample in overall acceptability among all incorporated recipes was *Mathari* (5% colocasia leaf powder incorporated).

The table 4 depicts the ‘p value of t’ for various organoleptic attributes of

dehydrated colocasia leaf powder incorporated recipes. All colocasia leaf powder incorporated recipes samples of B, C and D series were compared with standard basic recipe ‘A’. The overall acceptability was found significant in all the samples.

All the samples of *Gatte ki sabji* and *Mathari* were statistically significant with regard to colour, appearance, texture, mouth feel, after taste and overall acceptability except C₁, C₂ in colour and mouth feel and B₁, B₂ in after taste.

Out of the two acceptable B samples of the 2 recipe as compared with their standard there was an increase of 42.5 mg calcium in *Gatte ki sabji* and 76.15 mg calcium in *Mathari* depicted in figure 1 and 2. There was remarkable increase of more than 100% calcium in the most acceptable B sample (5% dried colocasia leaf Powder incorporated) in *Mathari*.

Table 1: showing the Basic and dehydrated colocasia leaf powder incorporated recipe of *Gatte ki sabji* and *Mathari*

RECIPE NAME	INGREDIENT	AMOUNT				
		Sample A ₁	Sample B ₁	Sample C ₁	Sample D ₁	
<i>Gatte ki sabji</i> For dough	Basan	45 gm.	40.6 gm.	39.5 gm.	38.5 gm.	
	Dehydrated colocasia leaf powder	-	4.4 gm.	5.5 gm.	6.6 gm.	
	Baking soda	1/6 t	1/6 t	1/6 t	1/6 t	
	Salt	¼ t	¼ t	¼ t	¼ t	
	Ginger	1 cm	1 cm	1 cm	1 cm	
	Coriander chopped	A few	A few	A few	A few	
	Curd	1 T	1 T	1 T	1 T	
	Oil	1 t	1 t	1 t	1 t	
	For gravy	Water	1 ½ T	1 ½ T	1 ½ T	1 ½ T
		Oil	1 T	1 T	1 T	1 T
		Asafoetida	1 pinch	1 pinch	1 pinch	1 pinch
		Clove	1	1	1	1
		Cinnamon	1	1	1	1
		Cumin seed	¼ t	¼ t	¼ t	¼ t
		Onion	30 gm.	30 gm.	30 gm.	30 gm.
		Tomato	30 gm.	30 gm.	30 gm.	30 gm.
		Curd	50 gm.	50 gm.	50 gm.	50 gm.
		Salt	¼ t	¼ t	¼ t	¼ t
		Chilli	¼ t	¼ t	¼ t	¼ t
		Coriander powder	½ t	½ t	½ t	½ t
Turmeric	¼ t	¼ t	¼ t	¼ t		
Garam masala	¼ t	¼ t	¼ t	¼ t		
Green cardamom powder	1	1	1	1		
Coriander leaves	A few	A few	A few	A few		
<i>Mathari</i>	Maida	A ₂ 100 gm	B ₂ 95gm	C ₂ 93gm	D ₂ 90gm	
	Oil	2 T	2 T	2 T	2 T	
	Salt	1/2 t	1/2 t	1/2 t	1/2 t	
	Ajwain	1/4 t	1/4 t	1/4 t	1/4 t	
	Black pepper powder	½ t	½ t	½ t	½ t	
	Fat	for frying	for frying	for frying	for frying	
	Dehydrated colocasia leaf powder	-	5 gm.	7 gm.	10 gm.	

Table 2: Table showing percentage of dried colocasia leaf powder incorporated in *Gatte ki sabji* and *Mathari*

S. No.	Recipes	Sample	Percentage of ingredient	
			Basic ingredients percentage(%)	Dry colocasia leaf powder percentage (%)
1	Standard <i>Gatte ki sabji</i>	A ₁	100	-
2	Colocasia leaf powder incorporated <i>Gatte ki sabji</i>	B ₁	96	4
3	Colocasia leaf powder incorporated <i>Gatte ki sabji</i>	C ₁	95	5
4	Colocasia leaf powder incorporated <i>Gatte ki sabji</i>	D ₁	94	6
5	Standard <i>Mathari</i>	A ₂	100	-
6	Colocasia leaf powder incorporated <i>Mathari</i>	B ₂	95	5
7	Colocasia leaf powder incorporated <i>Mathari</i>	C ₂	93	7
8	Colocasia leaf powder incorporated <i>Mathari</i>	D ₂	90	10

Table 3: Table showing mean scores and standard deviation of organoleptic attributes of dehydrated Colocasia leaf powder incorporated recipes

Dehydrated colocasia leaf powder incorporate recipes	Sample	% of incorporation	Colour	Appearance	texture	Mouth feel	After taste	Overall acceptability
			M±SD	M±SD	M±SD	M±SD	M±SD	M±SD
Standard <i>Gatte ki sabji</i>	A ₁	-	7.42±1.44	7.50±1.38	7±2.04	7.17±1.9	7.33±1.67	7.42±1.44
Incorporated <i>Gatte ki sabji</i>	B ₁	4	7.08±1.51	7.25±1.42	6.75±1.86	6.58±2.07	6.58±1.73	6.92±1.73
Incorporated <i>Gatte ki sabji</i>	C ₁	5	7.25±1.48	7.33±1.56	6.33±1.97	6.08±1.98	6.50±1.62	6.17±1.59
Incorporated <i>Gatte ki sabji</i>	D ₁	6	6.58±1.44	6.83±1.75	5.92±1.93	5.92±2.19	5.92±1.98	6.25±1.82
Standard <i>Mathari</i>	A ₂	-	8.42±0.67	8.08±0.79	8.33±0.78	8.33±0.89	8.25±0.87	7.75±1.82
Incorporated <i>Mathari</i>	B ₂	5	7.42±1.88	7.42±1.08	8.08±0.90	7.42±1.62	7.42±1.38	7.91±0.90
Incorporated <i>Mathari</i>	C ₂	7	6.92±1.98	7.17±1.19	7.17±1.03	6.92±1.31	6.92±1.00	7.25±0.87
Incorporated <i>Mathari</i>	D ₂	10	6.00±1.95	6.08±1.62	6.17±1.70	5.42±1.68	5.58±1.44	5.75±1.36

Table 4: Table showing ‘p value of t’ for various organoleptic attributes of dehydrated Colocasia leaf powder incorporated recipes compared with standard basic recipes

‘p value of t’	Colour	Appearance	Texture	Mouth feel	After taste	Overall acceptability
Standard <i>Gatte ki sabji</i> -A ₁ VS Incorporated <i>Gatte ki sabji</i> -B ₁	0.0043*	0.0170*	0.0003*	0.0238*	0.0576	0.0007*
Standard <i>Gatte ki sabji</i> -A ₁ VS Incorporated <i>Gatte ki sabji</i> -C ₁	0.2750	0.0476*	0.0004*	0.38300	0.0053*	0.0002*
Standard <i>Gatte ki sabji</i> -A ₁ VS Incorporated <i>Gatte ki sabji</i> -D ₁	0.0063*	0.0038*	0.0001*	0.0123*	0.0185*	0.0001*
Standard <i>Mathari</i> -A ₂ VS Incorporated <i>Mathari</i> -B ₂	0.0967*	0.0207*	0.0005*	0.0995*	0.0373	0.0009*
Standard <i>Mathari</i> -A ₂ VS Incorporated <i>Mathari</i> -C ₂	0.4745	0.0049*	0.0006*	0.0999	0.0052*	0.0001*
Standard <i>Mathari</i> -A ₂ VS Incorporated <i>Mathari</i> -D ₂	0.0901*	0.0020*	0.0001*	0.0999*	0.0052*	0.0001*

*-significant at 5% level

Table 5: Table showing the nutrient value of 5% incorporated dried colocasia leaf powder in B1 (4%) *Gatte ki sabji* and B2 (5%) *Mathari* along with the standard A1 and A2

	Serving Size	Sample	Percentage	Energy (kcal)	Protein (g)	Fat (g)	Carbo-hydrate (gm)	Calcium (mg)	Iron (mg)
Standard <i>Gatte ki sabji</i>	1 bowl	A ₁	Standard	408.69	13.26	25.02	33.03	113.1	4.90
Incorporated <i>Gatte ki sabji</i>		B ₁	4%	404.63	12.89	25.06	32.33	155.60	4.48
Standard <i>Mathari</i>	1 bowl	A ₂	Standard	811.34	11.57	51.47	75.37	62.7	3.19
Incorporated <i>Mathari</i>		B ₂	5%	801.79	11.70	51.72	73.79	138.85	3.06

The nutritive value of recipes was calculated using Nutritive Value of Indian Food by C. Gopalan² (NIN) 2012.

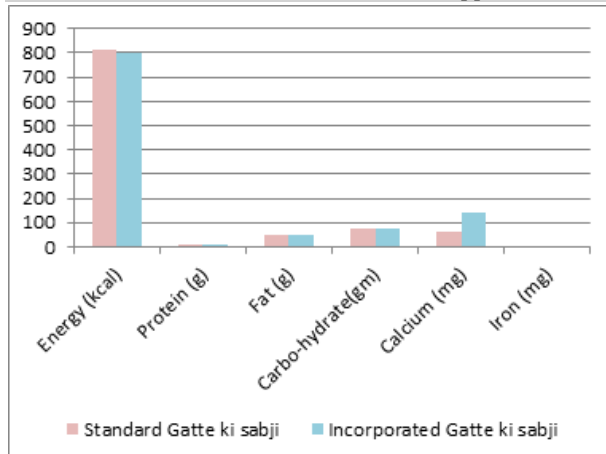


Fig. 1:

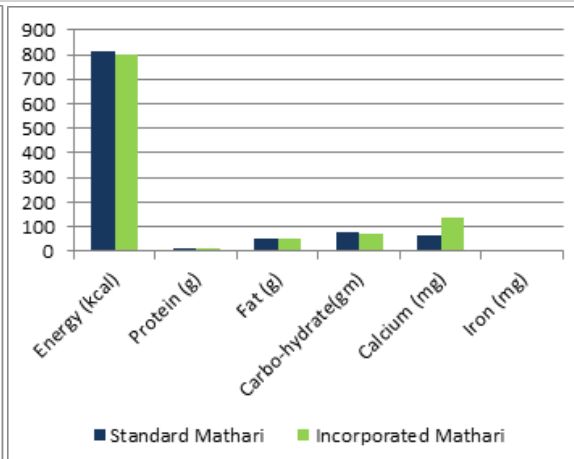


Fig. 2:

Nutritive value of standard and most acceptable incorporated recipe

CONCLUSION

This study revealed that dried colocasia leaf powder is a very good source of calcium as the nutrient calculation showed a good increase in calcium with the incorporation of dried colocasia leaf powder in the recipes. It was concluded that dried colocasia leaf powder could be successfully incorporated in recipes and could be very beneficial for women having calcium deficiency.

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