



FORTIFICATION AND SENSORY EVALUATION OF THE PRODUCTS WITH CASSIA TORA LINN. LEAF POWDER

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ABSTRACT

The study of fortification and sensory evaluation of the products with powder was undertaken to enrich the traditional products with properties which may help reducing malnutrition and deficiency diseases of the common people in general and women, children and tribal people in special. consists of m.c. (%), ash (%), protein (%), ascorbic acid (mg/100g), chlorophyll (mg/100g), fiber (%), calcium (g/100g) and fat (%) of was 4.07, 8.15, 12.51, 19.6, 39.68, 27.42, 3.52 and 2.002, respectively. The colour values i.e. L*, a* and b* of powder were 58.608, 5.245 and 21.132, respectively showing acceptable colour values as leafy vegetable. This rich profile of *cassia tora* leaves was utilized to fortify the traditional food products Pakoda and Paratha. Sensory evaluation of Pakoda and Paratha fortified with 10% of leaf powder was found to obtain the highest score for colour, taste, texture and overall acceptability than 20 % and 30%. It indicates the scope of fortification of traditional products with *Cassia tora* leaf powder to control the malnutrition and other health benefits. asprotein, COH, *et al.*, 2011).

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INTRODUCTION

Cassia tora Linn., called tarwad in Marathi language, is a plant having many nutritional compositions such as lipids, fiber, Calcium, Iron, Sodium, Magnesium, Zinc, Manganese, Cobalt and Potassium (Kubmarawa, *et al.*, 2011). It has medicinal properties such as thermogenic, laxative depurative, antiperiodic, liver tonic, antihelmintic, cardiotoxic. It is useful in ringworm, pruritis, leprosy, skin disease, hepatopathy, helminthiasis, flatulence, dyspepsia, intermittent fevers, constipation, ophthalmopathy, cough, bronchitis, cardiac disorders, hemorrhoids, antifungal, hypolipidemic, hepatoprotective, and hypotensive activities. Seventeen amino acids are found in varying proportions in this plant and is claimed to be effective for various ailments in indigenous medicineslike treatment of jaundice. In Chinese medicine, it is highly valued for the treatment of hyperlipidemia. Several polyherbal formulations are available in Chinese market for preventing the formation of atherosclerosis plaque (Kuar, *et al.* 2004, Dubey *et al.* 2015). It grows in fallow land and road sides, not commonly used as food (Wealth of India, 1992). Government reports from India stress poor nutritional status of tribal people with stunting (63 %) of children and chronic energy deficiency in adults i.e. 49 % in men and 55 % in women. There is need to promote food-based approaches that

draw on indigenous food systems relevant to classic problems of hunger and nutrient deficiencies as well as addressing the chronic problem of non-communicable diseases (Nandi and Bhattacharjee, 2013). Considering the view of utilization of *cassia tora* leaves in food, the study was undertaken in the Dept. of Agricultural Process Engineering, in MPKV, Rahuri to make the CTL powder and use it to fortify the traditional products.

MATERIALS AND METHODS

Fresh tender leaves of *Cassia tora* were plucked early in the morning, washed, cleaned, tied in a muslin cloth and kept immersed in boiling water for two minutes and cooled immediately under running colander to remove excess water. To standardize the drying temperature, packaging, storage period, products fortified and *Cassia tora* leaf powder (CTL) composition, following treatments were selected

Temperature (°C) - T₁-40, T₂-50 and T₃- 60

Packaging (Polybags Gauge)- P₁- 100, P₂ - 200 and P₃ - 300

Storage period (Days)- S₁ - 60, S₂-120 and S₃ - 180

Products fortified – Paratha and Pakoda

CTL Powder (%) – 10, 20, 30

Cassia tora leaves were dried for 40, 50 and 60°C in cabinet dryer. Dried leaves were then milled to less than 0.5 mm sieve size powder. On visual observation powder obtained by drying leaves at 60 °C was found to retain good natural green colour

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and other constituents analyzed by used in further study. Powder was packed in polybags of 100, 200 and 300 gauge polybags and stored at room temperature. Two products; Paratha and Pakoda, were fortified with *Cassia tora* leaf powder *tora* leaf powder of 10 %, 20 % and 30 % after 60, 120 and 180 days storage. These products were evaluated for colour, texture, taste and overall acceptability by a panel of 10 judges on the basis of 9- point Hedonic scale. Average score of all the sensory parameters was recorded. Major ingredients of fortified Paratha and Pakoda were as

1. Paratha - Wheat Flour + Gram Flour (Besan) +CTLpowder (10, 20 and 30%)
2. Pakoda - Gram Flour (Besan) + CTLpowder (10, 20 and 30%)

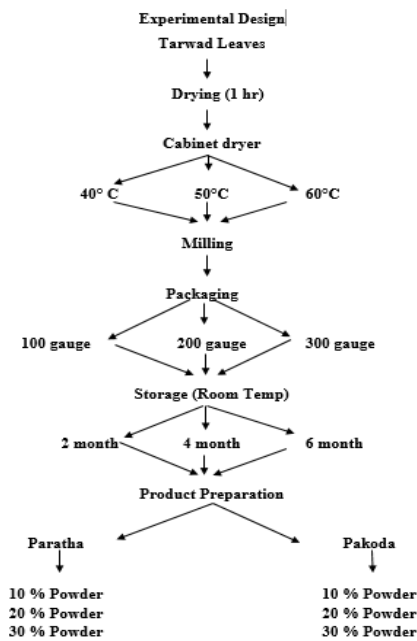


Fig 1 Experimental Design

Table 1 Chemical composition of *Cassia tora* leaf powder.

Sr.No.	Component	Temperature (60°C)
1	Moisture (%)	04.00
2	Ash Content (%)	08.15
3	Protein (%)	12.51
4	Ascorbic acid (mg/100g)	19.60
5	Chlorophyll (mg/100g)	39.68
6	Dietary fiber (%)	27.42
7	Calcium (g/100g)	03.52
8	Fat content (%)	02.00
9	Colour values	
	L*	58.608
	a*	-5.245
	b*	21.132
	ΔE*	41.917

Table 2 Effect of storage period and packaging of CTL Powder on sensory qualities of fortified Paratha

Sr.No.	Treatment	Colour			Taste			Texture			Overall Acceptability		
		CTL Powder (%)			CTL Powder (%)			CTL Powder (%)			CTL Powder (%)		
		10	20	30	10	20	30	10	20	30	10	20	30
1	P1S1	8	7	6	8	7	6	7	6	6	8	7	6
2	P1S2	8	7	6	8	7	6	7	7	6	8	7	6
3	P1S3	8	7	6	8	7	6	7	7	6	8	7	6
4	P2S1	8	7	6	8	7	6	7	7	6	8	7	6
5	P2S2	8	7	6	8	7	6	7	7	6	8	7	6
6	P2S3	8	7	6	8	7	6	7	7	6	8	7	6
7	P3S1	8	7	6	8	7	6	7	7	6	8	7	6
8	P3S2	8	7	6	8	7	6	7	7	6	8	7	6
9	P3S3	8	7	6	8	7	6	7	7	6	8	7	6
10	P1S1	8	7	6	8	7	6	7	7	6	8	7	6
11	P1S2	8	7	6	8	7	6	7	7	6	8	7	6
12	P1S3	8	7	6	8	7	6	7	7	6	8	7	6
13	P2S1	8	7	6	8	7	6	7	7	6	8	7	6

14	P2S2	8	7	6	8	7	6	7	7	7	8	7	6
15	P2S3	8	7	6	8	7	6	7	7	7	8	7	6
16	P3S1	8	7	6	8	7	6	7	7	7	8	7	6
17	P3S2	8	7	5	8	7	5	7	7	7	8	7	6
18	P3S3	8	7	6	8	7	6	7	7	7	8	7	6
19	P1S1	8	7	6	8	7	6	7	7	7	8	7	6
20	P1S2	8	7	6	8	7	6	7	7	7	8	7	6
21	P1S3	8	7	6	8	7	6	7	7	7	8	7	6
22	P2S1	8	7	6	8	7	6	7	7	7	8	7	6
23	P2S2	8	7	6	8	7	6	7	7	7	8	7	6
24	P2S3	8	7	6	8	7	6	7	7	7	8	7	6
25	P3S1	8	7	6	8	7	6	7	7	7	8	7	6
26	P3S2	8	7	6	8	7	6	7	7	7	8	7	6
27	P3S3	8	7	6	8	7	6	7	7	7	8	7	6
	SEm(±)	0.07	0.07	0.10	0.047	0.069	0.097	0.07	0.25	0.14	0.07	0.07	0.10
	CD @5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	GM	8	7	6	8	7	6	7	7	7	8	7	6
	CV (%)	1.49	1.68	2.88	0.994	1.68	2.88	1.68	6.27	3.57	1.49	1.68	2.88

(P1- 100, P2- 200 gauge, P3-300 gauge and S1-60 days, S2 -120 days, S3 -180 days)

Table 3 Effect of storage period and packaging of CTL Powder on sensory qualities of fortified Pakoda

Sr.No.	Treatment	Colour			Taste			Texture			Overall Acceptability		
		CTL Powder (%)			CTL Powder (%)			CTL Powder (%)			CTL Powder (%)		
		10	20	30	10	20	30	10	20	30	10	20	30
1	T1P1S1	6	8	6	8	7	6	7	7	6	7	7	6
2	T1P1S2	6	8	6	8	7	6	7	7	6	7	7	6
3	T1P1S3	6	8	6	8	7	6	7	7	6	7	7	6
4	T1P2S1	6	8	6	8	7	6	7	7	6	7	7	6
5	T1P2S2	6	8	6	8	7	5	7	7	6	7	7	6
6	T1P2S3	6	8	6	8	7	5	7	7	6	7	7	6
7	T1P3S1	6	8	6	8	7	6	7	7	6	7	7	6
8	T1P3S2	6	8	7	8	7	6	7	7	6	7	7	6
9	T1P3S3	6	8	7	8	7	6	7	7	6	7	7	6
10	T2P1S1	6	8	6	8	7	6	7	7	6	7	7	6
11	T2P1S2	6	8	7	8	7	6	7	7	6	7	7	6
12	T2P1S3	6	8	7	8	7	6	7	7	6	7	7	6
13	T2P2S1	6	8	7	8	7	6	7	7	6	7	7	6
14	T2P2S2	6	8	7	8	7	6	7	7	6	7	7	6
15	T2P2S3	6	8	7	8	7	6	7	7	6	7	7	6
16	T2P3S1	6	8	7	8	7	6	7	7	6	7	7	6
17	T2P3S2	6	8	6	8	7	5	7	7	6	7	7	6
18	T2P3S3	6	8	7	8	7	6	7	7	6	7	7	6
19	T3P1S1	6	8	7	8	7	6	7	7	6	7	7	6
20	T3P1S2	6	8	7	8	7	6	7	7	6	7	7	6
21	T3P1S3	6	8	7	8	7	6	7	7	6	7	7	6
22	T3P2S1	6	8	7	8	7	6	7	7	6	7	7	6
23	T3P2S2	6	8	7	8	7	6	7	7	6	7	7	6
24	T3P2S3	6	8	7	8	7	6	7	7	6	7	7	6
25	T3P3S1	6	8	7	8	7	6	7	7	6	7	7	6
26	T3P3S2	6	8	7	8	7	6	7	7	6	7	7	6
27	T3P3S3	6	8	7	8	7	6	7	7	6	7	7	6
	SEm(±)	0.24	0.35	0.42	0.34	0.19	0.14	0.26	0.25	0.36	0.42	0.42	0.24
	CD @ 5%	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	GM	6	8	7	8	7	6	7	7	6	7	7	6
	CV (%)	6.72	7.61	11.12	7.53	4.72	4.15	6.59	6.30	10.31	11.12	11.12	6.72

(P1- 100, P2- 200 gauge, P3-300 gauge and S1-60 days, S2 -120 days, S3 -180 days)

The data obtained for various sensory parameters of the products was analyzed for statistical significance according to the Completely Randomized Design (CRD) given by Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Cassia tora leaf powder obtained by drying at 60°C temperature was found to have better in colour and other nutritional constituents such as protein (12.51 %), ascorbic acid (19.60mg/100g), chlorophyll (39.68mg/100g), dietary fiber (27.42%), Calcium (03.52g/100g), fat content (02.00%) as in Table 1. This powder was used for packing and further storage studies.

Effect of storage of CTL powder on the sensory qualities of Paratha

Table 2 shows that paratha fortified with 10 % CTL powder has obtained the highest (8) colour, taste, texture and overall acceptability score followed by fortification with 20 (7) and 30% (6) CTL powder, respectively. No significant effect of packaging (P1-100 gauge, P2 -200gauge and P3-200gauge) and storage period (60, 120 and 180 days) was observed on the sensory qualities of paratha.

Effect of packaging and storage on the sensory quality of CTL powder is found to be non-significant but the highest score is recorded for the paratha made by addition of 10% CTL powder. Similar results are reported by Manchekar *et al.* (2008) in sensory quality of curry leaves and Singh *et al.* (2006) for amaranths, fenugreek, spinach and curry leaves.

Effect of storage of CTL powder on taste of Paratha and Pakoda

Table 3 shows that pakoda fortified with 20 % CTL powder has obtained the highest (8) colour score as followed by fortification with 20% (6) and 30% (6) CTL powder. The highest score (8) for the taste of pakoda was found by fortification with 10% CTL powder. Whereas the equal score (7) was found for the texture and overall acceptability of pakoda fortified with 10% (7) and 20% (7) CTL powder. The lowest score (6) for colour, taste, texture and overall acceptability was obtained by the pakoda fortified with 30% CTL powder. No significant effect of packaging (P1-100gauge, P2 -200gauge and P3-200gauge) and storage period (60,120 and 180 days) was observed on the sensory qualities of pakoda. Similar results are reported by Manchekar *et al.* (2008) in sensory quality of curry leaves.

SUMMARY AND CONCLUSIONS

Cassia tora green leaves consists of very good amount of nutritional composition. Although rich in nutrients, minerals and vitamins, it is available for a short period and highly perishable in nature having very low shelf-life. On the other side *Cassia tora* leaves are neglected or treated as weed and not commonly used as vegetable. Many deficiency diseases and poor nutritional diet problems are there in India. By using these leaves as vegetable in diet, health benefits can be harvested up to some extent. Hence, an investigation was undertaken to study the effect of fortification of paratha and pakoda with *Cassia tora* Linn. leaf powder on sensory properties. From the data obtained and analyzed following conclusions were drawn.

1. Drying of tarwad leaves can be done at 60°C to obtain good quality powder.
1. 2. Fortification of paratha and pakoda with 10% and 20% *Cassia tora* Linn. leaf powder, respectively can be done to obtain the acceptable sensory properties with good nutritional value.

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