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Development and nutritional evaluation of *sev* prepared by incorporation of fresh betel leaves (*Piper betle* L.) slurry

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Abstract

The present investigation was planned to analyse the nutritional composition of *sev* prepared by incorporating betel leaves fresh slurry. *Sev* was developed by using varying proportions of fresh betel leaves slurry (20, 30 and 40%). The proximate composition of *sev* prepared by incorporating betel leaves was reported as moisture (2.73%), crude protein (22.06%), crude fat (26.68%), crude fiber (7.66%) and ash (5.66%) content. Total minerals such as calcium, iron and zinc were observed as 190.86, 5.55 and 0.63 mg/100g, respectively. The β -carotene and vitamin C content were found to be 1973.07 μ g/100g and 18.36 mg/100g, respectively.

Keywords: Betel leaves, proximate composition, antioxidants, dietary fiber, β -carotene, chickpea flour

Introduction

Betel vine (*Piper betle* L.) is a root climber with deep green heart shaped leaves. It belongs to the Piperaceae family. It originated from South and South East Asia including India, Bangladesh, Sri Lanka, and is typically too sensitive to grow outside the tropics geographic. The betel leaf commonly known as 'Paan' or 'Tambool' is an evergreen perennial creeper (Varier, 1995) [1]. Significance of leaves has been explained in relationship to every sphere of human life including social, cultural, religious and is very much relevant even in modern days (Guha, 2006) [2]. Betel leaves are consumed by about 15-20 million of people in India. It is available in most of South and Southeast Asia. This plant originates from the central and eastern part of peninsular Malaysia and is locally called Sirih. It is cultivated in India, Srilanka, Bangladesh, Burma and Nepal and has over 2000 species and indigenous to India. In Bangladesh, about 60-70 per cent of people usually consume betel leaf frequently. It is cultivated following the traditional methods on 55,000 hectare with an annual production worth about Rs. 9000 million in India (Majumder *et al.*, 2016).

Betel leaves are highly nutritive and contain considerable amount of vitamins and minerals, especially calcium, iron, magnesium and carotene. The betel leaves contain good amount of ash (2.59 gm), total dietary fibre (1.97 gm), insoluble dietary fibre (1.17gm), soluble dietary fibre (0.80gm), protein (2.62gm), β -carotene (4186-4676 μ g), vitamin-C (18.40-24.51mg), iron (2.8-3.0mg) and calcium (207.0mg) (Longvah *et al.*, 2017) [3]. According to Indian Council of medical Research, the betel leaves contains protein (2.62g), ash (2.59g), total dietary fibre (1.97g), insoluble dietary fibre (1.17g), soluble dietary fibre (0.80g), β -carotene (4186-4676 μ g), Vitamin-C (18.40-24.51mg), iron (2.8-3mg), calcium (207mg) per 100g (ICMR, 2017) on fresh weight basis.

In recent years, efforts have been made to develop human diets in such a way that it acts as valuable food in order to exploit several health benefits and to prevent increased diversity of diseases. Betel leaves has great potential to be incorporated as a multipurpose nutritional and medicinal source in the development of value added products its portions are organoleptic ally acceptable. In present study *sev* was developed by incorporating various proportion of betel leaves slurry.

Materials and Methods

The study was conducted in the department of Foods and Nutrition, I.C. College of Home Sciences, CCS Haryana Agricultural University, Hisar and Haryana.

Procurement of grains and betel leaves

The grains of chickpea (HC1) were procured from Wheat section and Pulses Section, respectively, Department of Genetics and Plant Breeding, College of Agriculture, CCS Haryana Agricultural University, Hisar in a single lot. Betel leaves and other ingredients required for product development were procured from local market as per required.

Processing of betel leaves

Sorting and washing of betel leaves

Healthy leaves were separated from their stalks and to remove adhering dirt and impurities leaves were washed thoroughly for 3 times with normal tap water and one time with distilled water.

Slurry preparation of betel leaves

Betel leaves firstly washed and cut into small pieces. Then betel leaves blend into blender with little amount of water till it became well mixture of slurry. The flow sheet for

preparation of slurry is as below:-



Table 1: Method of preparation of *sev*

Ingredients	Control Amount (g)	Type I Amount (g)	Type II Amount (g)	Type III Amount (g)
Chickpea flour	100	80	70	60
Betel leaves	-	20	30	40
Salt	2	2	2	2
Oil	For frying	For frying	For frying	For frying

- Sieved chickpea flour and add weighed amounts of fresh betel leaves slurry (20, 30 and 40 per cent) in the experimental *sev* except control
- Added salt and a table spoon oil
- Made stiff dough using water
- Filled dough in *Sev* machine and pressed to make thin *sev* from dough directly over *Karahi* containing hot oil
- Fried on low flame till golden brown

i.e. 8.10 whereas mean scores of colour for *sev* incorporated 20, 30 and 40 per cent of fresh betel leaves slurry (Type I, II and III) were ranged from 8.00 to 8.77 and all fell in category 'liked very much'. It was observed that the *sev* prepared by incorporating 30 per cent fresh betel leaves slurry had highest (8.77) score of colour which were observed to be declined on further inclusion therefore *sev* prepared with 40 per cent fresh betel leaves slurry had the lowest score (8.00) of colour. However, the colour of all these fresh betel leaves slurry incorporated *sev* (Type I, II and III) was found to be acceptable.

Table 2: Mean sensory scores of betel leaves incorporated *Sev*

Treatment	Colour	Appearance	Aroma	Texture	Taste	Overall acceptability
Control	8.10±0.18	8.40±0.16	8.20±0.20	8.00±0.21	8.60±0.16	8.26±0.11
Type I	8.50±0.14	8.20±0.08	8.15±0.10	8.15±0.10	8.35±0.13	8.27±0.07
Type II	8.77±0.10	8.86±0.07	8.25±0.11	8.10±0.06	8.75±0.08	8.54±0.02
Type III	8.00±0.16	7.85±0.18	7.95±0.17	8.00±0.12	8.04±0.10	7.96±0.11
CD (P< 0.05)	0.44	0.38	N/A	N/A	0.36	0.26

Values are mean ± SE of ten independent determinations

(Control: 100% CF; Type I: 80% CF+20% BL; Type II: 70% CF+30% BL; Type III: 60% CF+40% BL; CF: Chickpea flour, BL: Betel leaves)

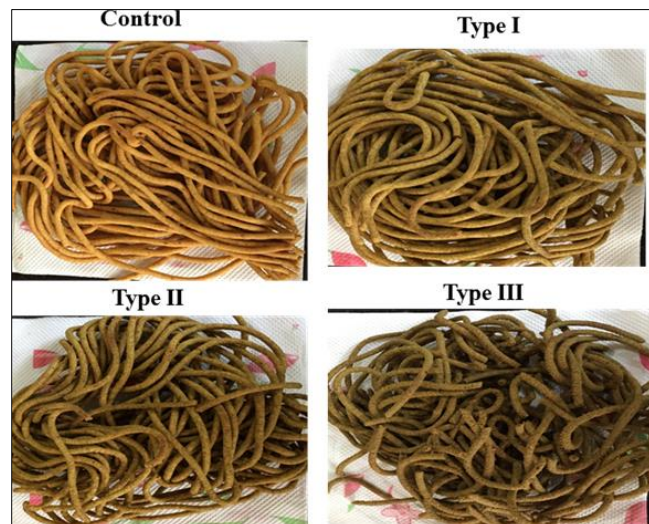


Fig 1: show the Sieved chickpea flour and add weighed amounts of fresh betel leaves slurry

Sensory evaluation of betel leaves incorporated *sev*

The mean score of sensory characteristics i.e. colour, appearance, texture, taste, aroma and overall acceptability of control as well fresh betel leaves slurry (20, 30 and 40%) supplemented *sev* was organoleptic ally evaluated for their acceptability using 9 point Hedonic Scale.

The mean scores for colour of *sev* prepared with chickpea flour (control) were found in category of 'liked very much'

As per the scores given to colour, appearance, aroma, texture and taste, the scores of overall acceptability (OAA) were calculated and control *sev* had 8.26 scores for OAA. As per results, the control *sev* fell in category of 'liked very much'. Mean scores of overall acceptability of Type I, II and III *sev*, were 8.27, 8.54 and 7.96 respectively. As per scores all the supplemented *sev* were acceptable and these were adjudged as 'liked moderately' to 'liked very much' by the panel of judges.

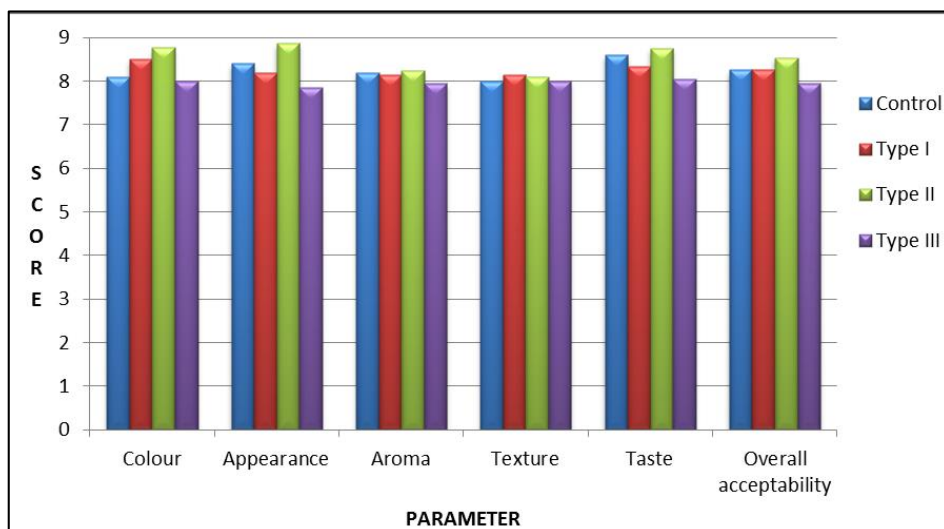


Fig 2: The mean sensory score of fresh betel leaves slurry incorporated *Sev*

Nutritional evaluation of *sev* prepared by incorporating betel leaves:

The study was planned to analyse the nutritional composition of *sev* prepared by incorporating betel leaves fresh slurry. *Sev* was developed by using varying proportions of fresh betel leaves slurry (20, 30 and 40%). Out of three variations of *sev* developed using various levels of betel leaves, the most acceptable product among three categories was analyzed for nutritional evaluation.

Proximate composition

Data regarding the proximate composition of control and betel leaves incorporated *sev* is given in table 3. On mean basis, significant differences were observed in moisture crude

protein, crude fat, crude fibre and ash content of control and betel leaves incorporated *sev*. In control *sev*, moisture content was 3.23 per cent which decreased to 2.73 per cent in betel leaves incorporated *sev*. The crude protein was significantly ($P < 0.05$) high in fresh betel leaves slurry incorporated *sev* i.e. 22.06 per cent than control *sev* i.e. 12.90 per cent. In control *sev*, crude fat content was 24.46 per cent which increased to 26.68 per cent in betel leaves incorporated *sev*. The crude fibre was significantly ($P < 0.05$) high in fresh betel leaves slurry incorporated *sev* i.e. 7.66 per cent than control *sev* i.e. 4.33 per cent. In control *sev*, ash content was 5.33 per cent which increased to 5.66 per cent in betel leaves incorporated *sev*.

Table 3: Proximate composition and total minerals of betel leaves incorporated *sev* (dry weight basis)

Nutrients	Control <i>sev</i>	Betel leaves <i>sev</i>	CD(p<0.05)
Moisture* (%)	3.23±0.12	2.73±0.06	2.91
Crude protein (%)	12.90±1.01	22.06±0.52	2.30
Crude fat (%)	24.46±0.54	26.68±1.66	3.72
Crude fibre (%)	4.33±0.24	7.66±0.33	0.94
Ash (%)	5.33±0.31	5.66±0.33	1.19
Calcium (mg/100g)	70.91±0.31	190.86±0.35	2.42
Iron (mg/100g)	1.71±0.19	5.55±0.47	1.33
Zinc (mg/100g)	0.57±0.02	0.63±0.04	0.23

Values are mean ± SE of three independent determinations

Total mineral contents

Data regarding the total mineral contents of control and betel leaves incorporated *sev* is given in table 4. Calcium content of control *sev* was found 70.91 mg/100g and that was varied from betel leaves incorporated *sev* i.e. 190.86 mg/100g. The iron content of control *sev* was found 1.71 mg/100g and that was increased in betel leaves incorporated *sev* i.e. 5.55 mg/100g. The zinc content for control *sev* was reported 0.57 mg/100g and 0.63 mg/100g was for betel leaves incorporated *sev*. The concentration for calcium, iron and zinc contents were significantly ($P < 0.05$) increased in fresh betel leaves slurry incorporated *sev* as compared to the control *sev*.

Carbohydrates

The amount of total soluble, reducing and non-reducing sugar content of control *sev* was observed as 1.60, 0.27 and 1.44 g/100g, respectively. The betel leaves incorporated *sev* showed significant ($P < 0.05$) difference in sugar contents. Total soluble, reducing and non-reducing sugar content of

betel leaves incorporated *sev* were 2.28, 0.48 and 3.64 g/100g, respectively. The data showed that the total soluble, reducing and non-reducing sugar contents were significantly ($P < 0.05$) high in fresh betel leaves incorporated *sev* as compared to the control *sev*. Starch content of control *sev* was 40.75 g/100g, which was increased significantly ($P < 0.05$) in betel leaves incorporated *sev* i.e. 52.25 g/100g.

Table 4: Sugar, starch and dietary fibre content of betel leaves incorporated *sev* (g/100g, dry weight basis)

Nutrients	Control <i>sev</i>	Betel leaves <i>sev</i>	CD(p<0.05)
Total soluble sugars	1.60±0.26	2.28±0.04	0.39
Reducing sugars	0.27±0.03	0.48±0.02	0.09
Non- reducing sugars	1.44±0.05	3.64±0.05	0.22
Starch	40.75±0.08	52.25±0.21	1.12
Total dietary fiber	10.54±0.23	13.37±0.13	0.51
Soluble dietary fiber	3.12±0.05	4.40±0.21	0.36
Insoluble dietary fiber	7.46±0.20	7.60±0.20	0.63

Values are mean ± SE of three independent determinations

Dietary fiber

The soluble dietary fibre content of control *sev* was 3.12 g/100g. The soluble dietary fibre content of betel leaves incorporated *sev* was increased significantly ($P < 0.05$). Soluble dietary fibre content of betel leaves incorporated *sev* was reported 4.40 g/100g. Insoluble dietary fibre content of control *sev* was observed to be 7.46 g/100g, which was increased with incorporation of fresh betel leaves slurry i.e. 7.60 g/100g. With respect to total dietary fibre content of control *sev* prepared using chickpea flour had 10.54 g/100g, which was increased significantly ($P < 0.05$) in *sev* prepared with incorporation of betel leaves slurry i.e. 13.37 g/100g.

Antioxidant activity

Control and fresh betel leaves slurry incorporated *sev* exhibited significant differences for antioxidant activity. Total phenolic content, total flavonoid content, FRAP and DPPH of control *sev* were observed as 45.44 mgGAE/100g, 38.21 mgRE/100g, 957.26 mgTE/100g and 10.49 mgTE/100g, respectively. As per the data betel leaves incorporated *sev* showed significant ($P < 0.05$) high amount of antioxidant activity. The data regarding total phenolic content, total flavonoid content, FRAP and DPPH of betel leaves incorporated *sev* were reported as 52.79 mgGAE/100g, 45.69 mgRE/100g, 1715.38 mgTE/100g and 23.66 mgTE/100g, respectively.

Table 5: Antioxidant activity, β - Carotene and vitamin C content of betel leaves incorporated *sev*

Antioxidants	Control <i>sev</i>	Betel leaves <i>sev</i>	CD ($p < 0.05$)
Total Phenolic content (mgGAE/100g)	45.44±0.25	52.79±0.39	0.71
Total Flavonoid content(mgRE/100g)	38.21±0.36	45.69±0.19	0.76
FRAP (mgTE/100g)	957.26±1.02	1715.38±1.97	3.09
DPPH (mgTE/100g)	10.49±0.10	23.66±0.31	0.52
β - Carotene (μ g/100g)	21.66±0.13	1973.07±7.29	17.44
Vitamin-C (mg/100g)	9.79±0.12	18.36±0.09	1.32

Values are mean \pm SE of three independent determinations

β - carotene and Vitamin C contents

The amount of β - carotene in control *sev* prepared with 100 per cent of chickpea flour was found to be 21.66 μ g/100g, which was varied from the fresh betel leaves slurry incorporated *sev*. The β - carotene content for betel leaves incorporated *sev* was observed to be 1973.07 μ g/100g.

As per data the control and fresh betel leaves slurry incorporated *sev* exhibited significant differences for vitamin C. Vitamin C content was increased with incorporation of fresh betel leaves slurry in control formulation of *sev*. The amount of vitamin C for Control and betel leaves incorporated *sev* was observed to be 9.79 and 18.36 mg/100g, respectively.

Discussion

Keeping in mind, the importance of nutritional composition of betel leaves, value added food product *sev* was developed utilizing betel leaves by using varying proportions of fresh betel leaves slurry (20, 30 and 40%). Mean sensory scores of overall acceptability of Type I, Type II and Type III *sev* (7.96-8.54) indicated that all types of *sev* were adjudged within liked moderately to liked very much by the judges and all the products were found acceptable by the judges. Results of the present study are in close agreement with those of earlier workers who also incorporated betel leaves at various

levels in development of *papad* (Vernekar and Vijayalaxmi 2018), *ladoo*, *namkeen* and *cutlet* (Bhargava and Tyagi 2011) ^[1], *khakhra* (Vernekar *et al.* 2018) ^[2], It was observed in present study as well as in cited literature that level beyond 30 per cent in fresh betel leaves adversely affected the sensory acceptability as the scores for the colour, appearance and overall quality were found to be decreased in developed products.

Conclusion

Betel leaves are highly nutritive and contain considerable amount of vitamins and minerals, especially calcium, iron, zinc, and antioxidants. Betel leaves help to heal the illnesses such as headache, obstructed urination, weakness of nerves, boils, respiratory disorders, inflammation, wounds and problem of breast milk secretion. We can prepare inexpensive and nutritionally rich recipes from betel leaves. The utilization of betel leaves in day-to-day life through various recipes can help to overcome deficiencies of micronutrients such as carotene, iron and calcium.

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