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Development and nutritional evaluation of curry leaves supplemented *Idli*

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Abstract

Curry leaf (*Murraya koenigii*) is a marvelous leafy spice having culinary, medicinal and nutritional properties. Present study was aimed to standardize the process of development of *idli* using various proportions of curry leaves powder (CLP). The control *idli* was prepared using rice: black gram dhal (2:1) batter. In experimental (Type-I, Type-II and Type-III) *idli*, rice: black gram dhal (2:1) batter was substituted with 5, 7.5 and 10 per cent of CLP. It was found that *idli* prepared by supplementing 7.5 per cent of CLP was 'most liked' by the judges followed by Type-I *idli*. Nutrition evaluation revealed that the protein and fibre ranged from 11.96 to 12.59 g/100g and 0.85 to 1.34 g/100g, respectively in experimental products. Soluble dietary fibre content of experimental *idli* ranged from 4.25 to 5.25 per cent, whereas, Type-III *idli* contained highest amount (13.51%) of insoluble dietary fibre. Utilization of curry leaves in daily products should be promoted to get the benefits.

Keywords: Curry leaves, *idli*, sensory, nutritional evaluation, acceptability

Introduction

Curry leaf (*Murraya koenigii*) is a stunning leafy spice having medicinal, culinary and nutritional properties. The spice Curry Leaf (*Murraya koenigii*) is a sub-tropical to tropical fitting to the family Rutaceae. It is a captivating house plant native to Sri Lanka, India and other Asian countries^[1, 2] and easily available at very low cost. In South Indian cuisines, the cultivation of curry leaves is principally concomitant and the fresh leaves of the plant are commonly used in Asian cooking mostly for its characteristic aroma and versatile medicinal properties^[3].

The principal component liable for the flavour and aroma has been stated as caryophyllene, cadinol, sabinene, cadinene and pinene^[4]. The curry leaves are naturally packed with 65.33g of moisture, 7.41g of protein, 4.86 g of ash, 16.83 g of total dietary fiber, 117 µg of folic acid, 21,862 µg of carotene, 7663 µg of β-carotene, 659 mg of calcium, 83 mg of phosphorus and 8.67 mg of iron per 100 g of fresh leaves^[5]. It has been found to exhibit antihelmintic, antineoplastic, antibacterial, anti-tumour, anti-hypercholesterolemic, anti-diabetic, and antispasmodic activities^[6-11]. Traditionally, curry leaf has been reported to use in the treatment of diabetes^[12, 13].

Curry leaves are having slightly stiff texture, because of that these generally discarded from the food during eating and hence the nutritional potential remains underutilized. Curry leaves can be consumed either fresh or in dried form. Addition of dried curry leaf powder 3-7.5 per cent into *chapatti*, *mathri*, *idli*, *uttapam*, buns and *papad* did not affect the physical and sensory quality^[14-17].

In the vulnerable groups of the society the best way to provide nutritional benefits is in the form of value added products. The incorporation of these green leaves in dried forms in the various foods especially the traditional foods, fermented foods, bakery and confectionary items can meet the demand of the generation. Considering the easy availability, low cost and nutritional quality of the curry leaves, various supplementary food products can be prepared with addition of leaves to utilize its potential.

Material and Methods

Product development

Rice, black gram dhal and other ingredients for the product development were purchased from market in a single lot. Rice and black gram dhal were soaked and ground separately with occasional addition of water during grinding, and then mixed together. In different types of experimental batters of *idli* various amounts of curry leaves powder (5, 7.5 and 10 per cent)

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were added and mixed well. All the control and experimental batters (T_1 , T_2 and T_3) of *idli* as prepared above were kept in BOD incubator at 37 °C temperature for 12 hours for natural fermentation. Fermented batter was poured in the greased *idli* moulds and steam cooked for 10 minutes in *idli* cooker (Table 1).

Table 1: Product development

Ingredients	Control Amount(g)	T ₁ Amount(g)	T ₂ Amount(g)	T ₃ Amount(g)
Rice: Black gram dhal (2:1) batter	100	95	92.5	90
Curry leaves powder	-	5	7.5	10
Salt	5	5	5	5
Water	100±5 ml	100±5 ml	100±5 ml	100±5 ml
Oil	For greasing	For greasing	For greasing	For greasing

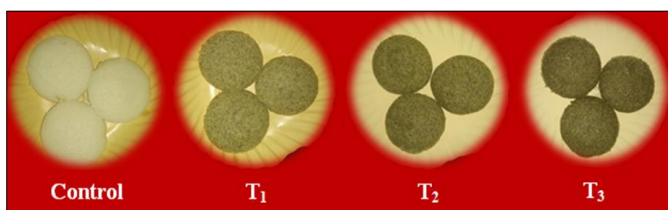


Plate 1: *Idli* supplemented with CLP

Sensory evaluation

The developed *idli*(s) were evaluated organoleptically in terms of colour, appearance, aroma, texture, taste and overall

acceptability using 9 point Hedonic scale by a panel of semi-trained judges.

Nutritional evaluation

Moisture, crude fibre and ash content were determined by employing the standard method of analysis [18]. Crude protein was estimated using KEL PLUS Automatic Nitrogen Estimation System. A factor of 6.25 was applied to convert the amount of nitrogen to crude protein. Crude fat was estimated using the Automatic SOCS plus Solvent Extraction System. Total dietary fibre constituents were determined by enzymatic method [19]. The data obtained were analysed statistically by using ANOVA. Critical difference value was used to analyse significance of difference at CD ($p \leq 0.05$).

Results and Discussion

Sensory evaluation

As per the scores given to colour, appearance, aroma, texture and taste, the overall acceptability (OAA) of *idli* (Fig.1) were calculated and it was found that *idli* prepared by supplementing 7.5 per cent of CLP was most liked by the judges followed by T_1 *idli*. Mean scores of overall acceptability of control *idli* was 8.20, as a result, it falls in the category of 'liked very much'. On the other hand OAA of T_1 , T_2 and T_3 *idli* varied from 6.51 to 8.11 and consequently curry leaves powder supplemented *idli* were adjudged between 'liked slightly' to 'liked very much' by the judges.

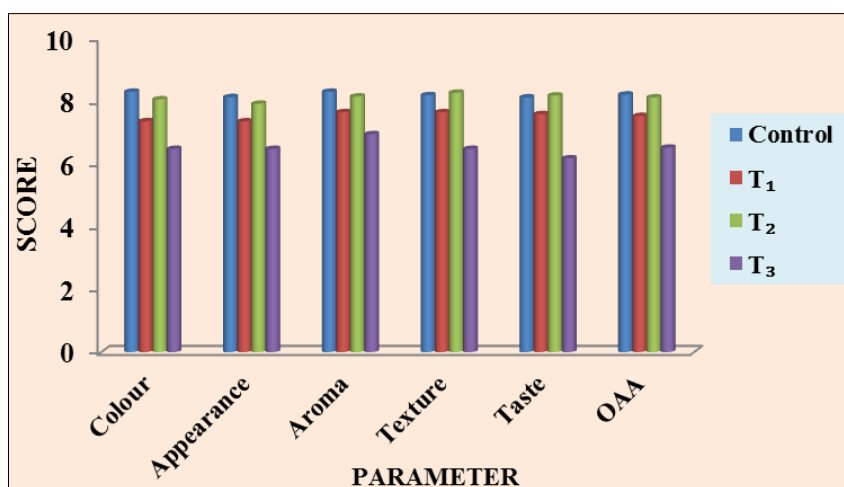


Fig 1: Organoleptic characteristics of *idli*

Nutritional Evaluation

The contents of moisture, crude protein, crude fat, crude fibre, ash and total carbohydrates of T_1 , T_2 and T_3 *idli* ranged from 49.48 to 53.28, 11.96 to 12.59, 0.43 to 0.65, 0.85 to 1.34, 1.29 to 1.85 and 31.94 to 34.30 per cent, respectively. Maximum

contents of crude protein, crude fibre, ash and total carbohydrates were observed in T_3 *idli*, whereas the maximum contents of moisture and crude fat were found in T_1 *idli* (Table 2).

Table 2: Proximate composition of CLP supplemented *idli* (% , on dry weight basis)

Treatments	Moisture*	Crude protein	Crude fat	Crude fibre	Ash	Total CHO's
Control	54.73±0.08	11.78±0.02	0.81±0.02	0.38±0.02	0.71±0.02	31.56±0.06
T ₁	53.28±0.06	11.96±0.02	0.65±0.02	0.85±0.03	1.29±0.02	31.94±0.03
T ₂	51.51±0.12	12.20±0.04	0.55±0.02	1.09±0.01	1.55±0.02	33.13±0.07
T ₃	49.48±0.17	12.59±0.02	0.43±0.01	1.34±0.03	1.85±0.02	34.30±0.09
CD ($P < 0.05$)	0.38	0.10	0.05	0.07	0.08	0.22

Values are mean ± SD of three independent determinations

*Moisture was analyzed on fresh weight basis

With the incorporation of 5, 7.5 and 10 per cent of curry leaves powder the soluble dietary fibre content of *idli* was increased significantly. Soluble dietary fibre content of curry leaves powder supplemented *idli* was ranged from 4.25 to 5.25 per cent. Among the supplemented *idli*, T₃ *idli* had the highest amount of soluble dietary fibre (5.25%) whereas, T₁ had lowest amount of soluble dietary fibre (3.73%). Insoluble dietary fibre content of control *idli* was observed as 8.54 per cent, which was increased significantly with each level of incorporation of curry leaves powder. Among the three types of supplemented *idli*, T₃ *idli* contained maximum amounts (13.51%) of insoluble dietary fibre followed by T₂ (11.55%) and T₁ (10.54%) *idli* (Table 3).

Table 3: Dietary fibre content of CLP supplemented *idli* (% , on dry weight basis)

Treatments	Soluble dietary fibre	Insoluble dietary fibre	Total dietary fibre
<i>Idli</i>			
Control	3.73±0.08	8.54±0.04	12.27±0.06
T ₁	4.25±0.07	10.54±0.05	14.79±0.06
T ₂	4.83±0.03	11.55±0.04	16.39±0.03
T ₃	5.25±0.07	13.51±0.08	18.75±0.04
CD (P< 0.05)	0.22	0.18	0.16

Values are mean ± SD of three independent determinations

Discussion

Drying curry leaves also ensures shelf stability and convenience for use when required. Curry leaves were dried to maximize their use as these are generally discarded from dishes and primarily used to impart aroma in Indian cuisine. Drying has been the oldest method to preserve leaves and to ensure consumption in large quantity [20]. Results of the present study are in close agreement with those of earlier workers who also incorporated curry leaves powder at various levels i.e. 3, 4, 5 and 10 per cent in the development of *chapatti*, cooked rice and seasoned potatoes [14], *mathri*, *uttapam*, *idli* and lemon rice [21], buns [16], biscuits [22], *idli* [17], *naan*, *vadiyan*, *bhatura*, *vada* [23], *upma* [24] and *shrikhand* [25]. It was observed in present study as well as in cited literature that level beyond 8 per cent adversely affected the sensory acceptability as the scores for the crust colour, crumb colour, grain and overall quality were found to be decreased in developed products.

Results of proximate composition of CLP supplemented products of present study are in the agreement of those reported earlier by investigators in India and abroad [14, 16, 17, 21-24]. It was revealed that the incorporation of 5 per cent of curry leaves powder in to *idli* increased the dietary fibre content by 18.6 per cent as compared to control [17]. Addition of curry leaves powder in *idli* slightly improved the crude protein content (11.89 to 12.25 per cent), fat content (0.19 to 0.54 per cent), carbohydrate content (17.13 to 18.46 per cent) and ash content (0.21 to 3.76 per cent) [17]. Results of present study were found in close agreement with Lal & Kaur (2019) [25]. They developed value added fermented foods viz. *naan*, *kulche*, bread, *bhatura*, *vada* and *wadiyan*. Dehydrated curry leaves can be successfully incorporated in various products which are beneficial to health.

Conclusion

From the present study, it may be concluded that the developed *idli* had significantly higher contents of crude protein, crude fibre and soluble and insoluble dietary fibre

than the control products. All the experimental *idli*(s) were found acceptable, while, the overall sensory acceptability of products developed using 7.5 per cent level of incorporation of CLP was found maximum. To develop value added products CLP can be successfully incorporated up to 10 per cent without affecting the organoleptic characteristics except colour. Consumption of curry leaves powder supplemented products should be promoted to get the nutritional benefits in vulnerable group.

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