Development and nutritional evaluation of curry leaves supplemented Idli

Sonia, Varsha Rani, Sangeeta C Sindhu and Neha

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, sabine, cadinene and pinene [4]. The curry leaves are naturally packed with 65.33 g of moisture, 7.41 g 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, 639 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 exhibits 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 chappatti, 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)
were added and mixed well. All the control and experimental batters (T1, T2, and T3) 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

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Control Amount(g)</th>
<th>T1 Amount(g)</th>
<th>T2 Amount(g)</th>
<th>T3 Amount(g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rice: Black gram dhal (2:1)</td>
<td>100</td>
<td>95</td>
<td>92.5</td>
<td>90</td>
</tr>
<tr>
<td>Curry leaves powder</td>
<td>-</td>
<td>5</td>
<td>7.5</td>
<td>10</td>
</tr>
<tr>
<td>Salt</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Water</td>
<td>100±5 ml</td>
<td>100±5 ml</td>
<td>100±5 ml</td>
<td>100±5 ml</td>
</tr>
<tr>
<td>Oil</td>
<td>For greasing</td>
<td>For greasing</td>
<td>For greasing</td>
<td>For greasing</td>
</tr>
</tbody>
</table>

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≤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 T1 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 T1, T2 and T3 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.

Nutritional Evaluation
The contents of moisture, crude protein, crude fat, crude fibre, ash and total carbohydrates of T1, T2 and T3 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 T3 idli, whereas the maximum contents of moisture and crude fat were found in T1 idli (Table 2).

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

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Moisture*</th>
<th>Crude protein</th>
<th>Crude fat</th>
<th>Crude fibre</th>
<th>Ash</th>
<th>Total CHO’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>54.73±0.08</td>
<td>11.78±0.02</td>
<td>0.81±0.02</td>
<td>0.38±0.02</td>
<td>0.71±0.02</td>
<td>31.56±0.06</td>
</tr>
<tr>
<td>T1</td>
<td>53.28±0.06</td>
<td>11.96±0.02</td>
<td>0.65±0.02</td>
<td>0.85±0.03</td>
<td>1.29±0.02</td>
<td>31.94±0.03</td>
</tr>
<tr>
<td>T2</td>
<td>51.51±0.12</td>
<td>12.20±0.04</td>
<td>0.55±0.02</td>
<td>1.09±0.01</td>
<td>1.55±0.02</td>
<td>33.13±0.07</td>
</tr>
<tr>
<td>T3</td>
<td>49.48±0.17</td>
<td>12.59±0.02</td>
<td>0.43±0.01</td>
<td>1.34±0.03</td>
<td>1.85±0.02</td>
<td>34.30±0.09</td>
</tr>
<tr>
<td>CD (p&lt;0.05)</td>
<td>0.38</td>
<td>0.10</td>
<td>0.05</td>
<td>0.07</td>
<td>0.08</td>
<td>0.22</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Soluble dietary fibre</th>
<th>Insoluble dietary fibre</th>
<th>Total dietary fibre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>3.73±0.08</td>
<td>8.54±0.04</td>
<td>12.27±0.06</td>
</tr>
<tr>
<td>T1</td>
<td>4.25±0.07</td>
<td>10.54±0.05</td>
<td>14.79±0.06</td>
</tr>
<tr>
<td>T2</td>
<td>4.83±0.03</td>
<td>11.55±0.04</td>
<td>16.39±0.03</td>
</tr>
<tr>
<td>T3</td>
<td>5.25±0.07</td>
<td>13.51±0.08</td>
<td>18.75±0.04</td>
</tr>
<tr>
<td>CD (P&lt; 0.05)</td>
<td>0.22</td>
<td>0.18</td>
<td>0.16</td>
</tr>
</tbody>
</table>

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.

References

13. Gaikwad V, Ray S. Effectiveness of curry leaves on