Effect of Incorporation of Lungru (Diplazium esculentum) on Physico-chemical, Microbiological and Sensory Quality of Chicken Patties

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Abstract
The aim of the study was to optimize the level of incorporation of Lungru (a naturally grown seasonal vegetable in high hills of Himalaya) paste in chicken meat patty and evaluate their effect on proximate, physico-chemical, microbiological and organoleptic quality. Significant difference (p<0.05) were observed in fat, protein, ash, TBARS and juiciness of treated and control patties. No significant differences were observed in moisture, pH, cooking yield, total plate count (TPC) and other organoleptic parameters. However, overall higher moisture, lower pH, higher cooking yield, lower TPC and higher organoleptic values were observed for treated chicken patties compared to control. Therefore, it can be concluded that incorporation of Lungru in chicken patties successfully improved the functional and sensory quality attributes.

Keywords: Vegetable incorporation, Chicken patty, Lungru, Quality attributes.

1. Introduction
The non-meat ingredients are extensively incorporated as extenders, binders and fillers in comminuted chicken products to improve the quality attributes and reduce the production loss (Yadav et al., 2013; Mendiratta et al., 2013). However, recently there is incorporation of vegetables in comminuted meat products as non-meat ingredients due to the recent consumer demands for low fat and high fibre meat products (Yue, 2001). The incorporation of vegetables in comminuted meat products not only improves the quality attributes such as yield, texture, fibre contents, oxidative stability, nutritional value and sensory attributes but also reduces the production cost besides their inherent functional properties and health benefits (Devatkal et al., 2004; Choi et al., 2007; Eim et al., 2008; Viuda-Martos et al., 2010; Bhosale et al., 2011; Mendiratta et al., 2013).

In recent studies various fruits and vegetables were incorporated in meat products and it was reported that overall improvement in quality and shelf life due to their antioxidant and antimicrobial activity apart from other functional and health benefits (Bhosale et al., 2011; Mendiratta et al., 2013; Kumar et al., 2013). However, to the best of our knowledge, till now Lungru (Diplazium esculentum (Retz) Sw Athyriaceae or it may be called as Vegetable Fern or Paco Fern, the naturally grown seasonal vegetables available in May-June in high hills of Himalaya has not been used in meat products. So that keeping above point in view, the present study was planned to evaluate the effect of added Lungru on the quality characteristics of chicken patties.

2. Materials and Methods

2.1 Preparation of Meat and Lungru
The fresh deboned chicken breast meat was obtained from the local market and kept overnight in a refrigerator (4±1°C) for conditioning. The raw Lungru was procured from local market, analysed for its proximate composition (Table 1) and thoroughly washed with potable water. The clean Lungru was cut into pieces and ground into paste form in home mixer. The level of incorporation of Lungru was standardized (at the level of 7.5 %) after several preliminary trials. The chicken stored in the refrigerator for overnight was minced through 8 mm plate and patties were prepared by careful blending of minced meat with salt, phosphates and other ingredients in mini-bowl chopper (Table 2). The mixing was continued till a homogenous viscous emulsion was formed. The chicken patty were prepared in locally designed chicken patties mould and cooked for 30 minutes in preheated oven at 180°C with side turning after 15 minutes. The cooked ready to eat patties were cooled, packed in polythene bags and kept at refrigeration temperature for further study.

2.2 Proximate Analysis
The proximate analysis of ready to eat cooked chicken patties were estimated by the following gravimetrically method for moisture, Kjeldahl’s method
Anjali Kumari et al...Effect of Incorporation of Lungru (Diplazium esculentum) on Physico-chemical, Microbiological and Sensory Quality of Chicken Patty

2.3 Physico-Chemical Analysis

2.3.1 Determination of pH

The pH of ready to eat cooked chicken patties was determined by the method of Strange et al. (1977). Ten gram of sample was homogenized with 50 mL of distilled water. The pH of suspension was recorded by dipping combined glass electrode of digital pH meter in the suspension.

2.3.2 Cooking Yield

The weights of chicken patties were recorded before and after cooking and percent cooking yield were calculated as follows:

Cooking yield (%) = (Weight of chicken patties after cooking/Weight of chicken patties before cooking) X 100

2.3.3 TBARS Values

The distillation method of Tarladgis et al. (1960) was followed to estimate thiobarbituric acid reducing substance (TBARS) value as outlined by Garg and Mendiratta (2006). For estimating TBARS value, obtained Optic Density was multiplied by the factor of 7.8 and TBARS value was expressed as mg malonaldehyde / kg of sample as suggested by Koniecko (1979).

2.4 Microbiological (Total Plate Count, TPC) Estimation

The total plate counts of ready to eat cooked chicken Patties were determined by following the standard methods of APHA (1984). For that 10 g samples of chicken patties were ground in a sterile pestle and mortar with 90 mL sterile 0.1% peptone water. Appropriate serial dilutions of samples were prepared in 0.1 % peptone water and plates were inoculated in duplicate on the growth media using the pour plate method. After 24 h of incubation at 35 ± 2°C, the plate showing 30-300 colonies were counted and results were expressed as log 10 cfu / g of samples.

3.5 Sensory Evaluation

Experienced sensory panel consisting of faculty of Animal and Veterinary scientists / post graduate students of the institute evaluated the chicken patties for appearance (colour), flavour, juiciness, texture and overall palatability using 8 point descriptive scale (Keeton, 1983), where 8 denoted excellent; 1 denoted extremely poor.

3.6 Statistical Analysis

The each experiment was replicated at least three times and the data generated was analyzed using standard statistical procedures (Snedecor and Cochran, 1994). Student’s Paired T-Test was used to determine significant differences (P<0.05) among means for the different treatments.

3. Results and Discussion

In the present study, the level of incorporation of Lungru, the locally available naturally grown seasonal vegetable and its effects on quality attributes of chicken patties were evaluated. No literature is available on incorporation of Lungru in meat products. Even very scanty literature is available about this stem vegetable. The details of the effects of incorporation of Lungru in chicken patties were presented in Table 3.

The incorporation of Lungru had no significant difference in moisture content of control and Lungru added chicken patties. However, significantly low fat content was observed in Lungru treated chicken patties. Similarly, significant high differences were observed in protein and ash content of chicken patties. The low level of protein content was found in Lungru treated chicken patties compared to control patties. However, very high level of ash content was found in Lungru treated chicken patties. The incorporation of Lungru might results in lowering of fat content in chicken patties. The low fat chicken products, results from the present study, may be able to meet out the present demand of the health conscious consumers (Bhosale et al., 2011). Further, incorporation of Lungru is also one of the reasons of low protein content and high ash content in chicken patties which altered the compositions. In the earlier studies, various researchers reported similar results (Devetkal et al., 2004;
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Table 3: Physico-chemical, microbiological and sensory quality of chicken meat patty incorporated with Lungru shoots paste

<table>
<thead>
<tr>
<th>Parameter</th>
<th>TC</th>
<th>T1</th>
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<tbody>
<tr>
<td><strong>a. Proximate Analysis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moisture</td>
<td>66.33±0.57</td>
<td>66.41±0.62</td>
</tr>
<tr>
<td>Fat</td>
<td>12.85±0.75</td>
<td>12.57±0.82</td>
</tr>
<tr>
<td>Protein</td>
<td>16.41±0.49</td>
<td>15.93±0.71</td>
</tr>
<tr>
<td>Ash</td>
<td>2.60±0.32</td>
<td>2.68±0.29</td>
</tr>
<tr>
<td><strong>b. Physico-Chemical Analysis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>6.28±0.23</td>
<td>6.24±0.20</td>
</tr>
<tr>
<td>Cooking Yield</td>
<td>96.38±0.80</td>
<td>96.61±0.77</td>
</tr>
<tr>
<td>TBARS</td>
<td>0.30±0.11</td>
<td>0.28±0.13</td>
</tr>
<tr>
<td><strong>c. Microbiological Analysis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Plate Count</td>
<td>2.20±0.51</td>
<td>2.08±0.47</td>
</tr>
<tr>
<td><strong>d. Sensory Analysis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Appearance</td>
<td>7.13±0.51</td>
<td>7.08±0.55</td>
</tr>
<tr>
<td>Flavour</td>
<td>6.88±0.51</td>
<td>6.88±0.51</td>
</tr>
<tr>
<td>Juiciness</td>
<td>6.83±0.45</td>
<td>7.25±0.47</td>
</tr>
<tr>
<td>Tenderness</td>
<td>6.8±0.43</td>
<td>6.88±0.51</td>
</tr>
<tr>
<td>Overall Acceptability</td>
<td>6.96±0.32</td>
<td>7.04±0.43</td>
</tr>
</tbody>
</table>

In percent; mg malonaldehyde/kg; log10 cfu/g; Values (mean ± SE, n=6) followed by different letters within raw-wise differ significantly (p<0.05).

Mendiratta et al., 2013; Bhosale et al., 2011; Para, 2014; Kumar et al., 2013) that with increasing level of vegetables and fruits results in significant improvement in quality of meat products.

No significant difference was found in pH, cooking yield but highly significant difference was observed in TBARS value. The low TBARS value in Lungru treated chicken patties indicates anti-oxidative properties and high keeping quality. Similar results were reported in earlier works that incorporations of fruits and vegetables results in lowering of TBARS value due to phenolic and carotenoid compounds (Bhosale et al., 2011; Kumar et al., 2013). Even the difference was not significant, but high cooking yield was observed in Lungru treated chicken patties. Further, low pH of Lungru treated chicken patties also indicates the longer shelf life.

No significant difference was found in total plate count, but comparatively very low value was observed in Lungru treated chicken patties. This might be due to low pH value of treated chicken patties. This low value indicates longer shelf life of treated products.

No significant differences were found in appearance, flavour, tenderness and overall acceptability, but values were comparatively high in Lungru treated chicken patties. However, high significant difference was observed in juiciness of Lungru treated chicken patties. This might be results due to higher water binding capacity of Lungru. Even overall acceptability value is on higher side in Lungru treated chicken patties. In most of the study, overall improvement of the quality of meat products due to incorporation vegetables and fruits were reported (Bhosale et al., 2011; Mendiratta et al., 2013; Para, 2014)

4. Conclusion

There was overall improvement in quality attributes of chicken patties incorporated with Lungru. This indicates that incorporation of Lungru not only improves the physico-chemical, proximate and microbial quality but it is also acceptable organoleptically. This work opens the possibility of further research and high end use of Lungru in various meat products.

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References


