QUALITY AND ACCEPTABILITY OF SMOKED BUFFALO RUMEN MEAT PRODUCT TREATED WITH BLADE TENDERIZATION AND GINGER EXTRACT

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ABSTRACT

A study was conducted to assess the effect of blade tenderization and ginger extract on quality and acceptability of smoked buffalo rumen meat product. Smoked buffalo rumen meat products were prepared from 3 times blade tenderized buffalo rumen meat with and without 5.0% ginger extract. Blade tenderization 3 times with 5.0 % ginger extract treatment were significantly increased the pH and degree of curing and decreased the product yield and shear force value as compared to 3 times blade tenderized smoked product and control smoked product. The proximate composition did not differ significantly between the treatments. The sensory scores for appearance and colour, flavour, juiciness, tenderness and overall palatability were significantly higher for 5.0% ginger extract treated smoked buffalo rumen meat product than 3 times blade tenderized and control smoked products.

Key words: Tripe, Blade tenderization, Ginger extract, Curing, Smoking, Meat quality.

INTRODUCTION

Cured smoked ham, bacon and other processed meat products are popular throughout the world. Curing and smoking are important processing techniques used primarily for pork and, to some extent also for beef or poultry (Paleari et al. 2000). Cured and smoked products are relished for their unique colour and flavour. The safety for consumption and shelf stability of such products has been proven over the years. Ginger extract is widely used as a condiment in household cooking. Ginger rhizome was identified as a new source of proteolytic enzyme zingibin by Japanese researchers (Thompson et al. 1973). Many reports claimed that ginger extract greatly enhances the tenderness of meat steaks. Lee et al. (1986) reported that application of 0.5 to 1.0 (w/w) crude ginger extract greatly enhanced the tenderness of beef steaks and sliced beef without any detrimental effect of mushiness, which was otherwise a problem with other proteolytic enzymes. Kim and Lee (1995) also reported that precooked lean beef treated with 0.5% (v/w) ginger extract in the absence of salt was sufficient to give acceptable tenderness of meat. Naveena et al. (2001) reported that ginger extract can be effectively utilized to improve the quality of tough meat and to produce convenient, attractive and highly palatable smoked product from spent hen meat with improved shelf life. In general, uniform penetration of curing ingredients has always posed problem during curing treatments. Blade tenderization is one of the most effective mechanical methods to tenderize the meat and open up the structure of meat and facilitate uniform penetration of ingredients in to meat (Devitre and Cunningham, 1985). Blade tenderization involves the penetration of meat by closely spaced blades with sharpened edges, which cut the muscle fibres into shorter segments (Benito-Delgado et al. 1994). Blade tenderization could be used to improve the quality characteristics of cured meat products (Kemp and Fox, 1985).

Rumen meat, otherwise known as 'tripe', is one of the important underutilized high

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proteinacious by product of buffaloes. The yield of buffalo rumen meat ranges from 4.36 to 5.45 kg per animal and it accounts for about 1.3 % of the slaughter weight. To overcome disposal problem and to find means of better utilization, very few attempts have been made to develop value added products exclusively from buffalo rumen meat (Anna Anandh et al. 2008). Hence, a study was undertaken for preparation of smoked product from buffalo rumen meat by use of ginger extract in conjunction with mechanical blade tenderization.

**MATERIALS AND METHODS**

Buffalo rumen meat: Fresh buffalo rumen meat was obtained from local buffalo offals market of Bareilly city. To reduce sampling error, the buffalo rumen meat for each trial was collected from single animal, packaged in polyethylene bag and brought to the laboratory. Before the meat was made into chunks, the fat and adhering extraneous materials were removed by using knife. The time lag between slaughter of animal and commencement of analysis was about 3 hr.

**Ginger extract:** Fresh ginger purchased from local market was washed, peeled and sliced. Sliced fresh ginger pieces 100 g were wet ground with 100 mil distilled water and squeezed through two layer of cheese cloth to produce a crude ginger extract. Crude extract was used for preparation of smoked products.

**Product preparation:** Buffalo rumen meat was cut into small chunks of 2.5 x 2.5 cm size and deodorized by immersion in 5% trisodium phosphate solution for 30 min (Anna Anandh et al. 2008). The deodorized buffalo rumen meat chunks were subjected to blade tenderization 3 times using blade type mechanical blade tenderizer (Hobart, Germany) to open up the structure of meat and facilitate uniform penetration of curing solution into the meat chunks. For each experiment, 250 gm of 3 times blade tenderized buffalo rumen meat chunks were used. The tenderized buffalo rumen meat chunks were immersed in curing solution consisting of 5% sodium chloride, 2.0% cane sugar, 0.5% sodium tripolyphosphate, 0.01% sodium ascorbate, 0.05% sodium nitrite and incorporated with 5.0% ginger extract. For control (no treatment) and 3 times blade tenderization treatment, buffalo rumen meat chunks were immersed in the standard curing solution without 5.0% ginger extract. All buffalo rumen meat chunks were immersed in curing solution in non-corrosive stainless steel containers for 12 h at 4±2ºC to facilitate equilibration. The buffalo rumen meat chunks were thoroughly mixed once in the curing solution by using a stainless steel stirrer after 6 hr of chilling. After equilibration, the meat chunks were drained and smoked using 3 stage schedules in an automatic microprocessor smoke oven (Enviro- Pak, USA) : drying for 30 min, smoking for 5 hr at 45 C to attain attractive and desirable brown colour and cooked to an internal temperature of 85 ± 2ºC for 30 min to ensure proper cooking. After removing from the smoke oven, the smoked buffalo rumen meat products were allowed to cool down, packed in LDPE pouches and chilled in the refrigerator. After 12 hr of chilling, samples were sliced using meat slicer to uniform size of 5 mm thickness and packaged in LDPE pouches aerobically by using the thermal sealing machine.

**Physico – chemical analysis:** The pH of the smoked buffalo rumen meat products were determined by using digital pH meter. The procedure of Paleari et al. (2000) was followed for estimation of product yield. The shear force value was assessed by using Warner – Bratzler shear press. The degree of curing was determined by the procedure outlined by Pearson and Tauber (1984) The proximate composition such as moisture, protein and fat content of smoked buffalo rumen meat products were determined by using oven drying, Kjeldahl assembly and Soxhlet ether extraction apparatus, respectively, as per AOAC(1995).

**Sensory evaluation:** Five sensory panel members were evaluated the smoked buffalo rumen meat products for appearance and colour, flavour, juiciness, tenderness and overall palatability on a 8-point descriptive scale (where in 1 is extremely undesirable and 8 is extremely desirable).

**Statistical analysis:** All experiments were repeated four times and the data generated from each trial were analyzed by following standard procedure described by Snedecor and Cochran (1989) for comparing the means and to determine the effect of treatments.
**RESULTS AND DISCUSSION**

**Physico-chemical characteristics:** Physico-chemical parameters of various samples are presented in Table 1. Mean pH value was significantly (p<0.01) higher for ginger extract treated product as compared to blade tenderized smoked product and the control. Higher pH values of ginger extract treated product might be due to higher pH of ginger extract. Similar results were also reported in roasted buffalo meat chunks by Naveena and Mendiratta (2004). The mean pH values of smoked product in our study are in agreement with those of Sofos *et al.* (1979) and Buchananan (1986) Product yield value was significantly (p<0.01) higher in control smoked product. Than blade tenderized smoked product and ginger extract treated smoked product. Decrease in cooking losses of roasted buffalo meat chunks treated with 5.0% ginger extract was also reported by Naveena and Mendiratta (2004). Jeremiah *et al.* (1999) showed an extra loss of 2.75% during in coking of blade tenderized bovine muscle cuts. The increased cooking losses are probably due to moisture loss through the holes made by blade tenderizer (Davis *et al.* 1975). Shear force value was significantly (p<0.01) lower in ginger extract treated smoked buffalo rumen meat product as compared to blade tenderized smoked product and control. Lee *et al.* (1986) reported linear decrease of shear force value with increasing amount of ginger extract in beef steaks. Thompson *et al.* (1973) also reported decreased shear force values from 4.27 to 2.80 kg/cm3 by ginger extract treatment in ovine muscle. Probably both blade tenderization and ginger extract treatment have contributed to decrease in shear force values in our experiment. Degree of curing was significantly (p<0.01) higher for ginger extract treated and blade tenderized smoked buffalo rumen meat products as compared to control which might be due to combined effect of blade tenderization and ginger extract. Tyszkiewick *et al.* (1997) reported that blade tenderization caused appreciable increase of myofibrillar proteins by disruption of the contractile

### TABLE 1: Effect of blade tenderization and ginger extract on physico-chemical characteristics of smoked buffalo rumen meat products (Mean ± S.E).

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>3 times blade tenderization</th>
<th>3 times blade tenderization + 5.0 % ginger extract</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6.47 ± 0.01a</td>
<td>6.66 ± 0.03 a</td>
<td>7.86 ± 0.09 b</td>
</tr>
<tr>
<td>Product yield (%)</td>
<td>72.26 ± 0.52 a</td>
<td>66.50 ± 0.62 b</td>
<td>68.42 ± 0.42 b</td>
</tr>
<tr>
<td>Shear force value (kg/cm³)</td>
<td>5.03 ± 0.09 a</td>
<td>4.42 ± 0.03 b</td>
<td>2.52 ± 0.06 c</td>
</tr>
<tr>
<td>Degree of Curing (%)</td>
<td>28.26 ± 0.66 a</td>
<td>35.17 ± 0.10 b</td>
<td>39.25 ± 0.06 c</td>
</tr>
<tr>
<td>Moisture (%)</td>
<td>64.29 ± 1.06</td>
<td>63.18 ± 1.20</td>
<td>63.86 ± 0.67</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>22.61 ± 0.19</td>
<td>22.42 ± 0.93</td>
<td>22.58 ± 0.23</td>
</tr>
<tr>
<td>Fat (%)</td>
<td>2.52 ± 0.08</td>
<td>2.57 ± 0.10</td>
<td>2.50 ± 0.06</td>
</tr>
</tbody>
</table>

Number of observations: = 4

Means bearing different superscripts row-wise differ significantly (P<0.01).

### TABLE 2: Effect of Blade Tenderization and Ginger extract on sensory attributes of smoked buffalo rumen meat products (Mean ± S.E).

<table>
<thead>
<tr>
<th>Sensory attributes*</th>
<th>Control</th>
<th>3 times blade tenderization</th>
<th>3 times blade tenderization + 5.0 % ginger extract</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance and colour</td>
<td>5.1 ± 0.01a</td>
<td>5.2 ± 0.02 a</td>
<td>6.9 ± 0.02 b</td>
</tr>
<tr>
<td>Flavour</td>
<td>5.0 ± 0.01a</td>
<td>5.1 ± 0.01a</td>
<td>6.8 ± 0.01 b</td>
</tr>
<tr>
<td>Juiciness</td>
<td>5.0 ± 0.01a</td>
<td>5.6 ± 0.01 b</td>
<td>6.6 ± 0.02 c</td>
</tr>
<tr>
<td>Tenderness</td>
<td>4.5 ± 0.01a</td>
<td>5.4 ± 0.01 b</td>
<td>6.5 ± 0.01 c</td>
</tr>
<tr>
<td>Overall palatability</td>
<td>5.0 ± 0.01a</td>
<td>5.5 ± 0.01b</td>
<td>6.4 ± 0.01 c</td>
</tr>
</tbody>
</table>

Number of observations: = 20

*Sensory attributes of fried tripe products were evaluated on a 8 – point descriptive scale (wherein 1 = extremely undesirable; 8 = extremely desirable)*

Means bearing different superscripts row-wise differ significantly (P<0.01).
structure integrity. The increased availability of proteins facilitates curing reaction and responsible for increased degree of curing in treated buffalo tripe products.

The mean moisture, protein and fat contents in control, blade tenderized and ginger extract treated products did not differ significantly. However, moisture, protein and fat contents were comparatively higher in ginger extract treated samples followed by blade tenderized and control products.

**Sensory characteristics:** Sensory attributes of smoked buffalo rumen meat products prepared by 3 times blade tenderization + 5.0 % ginger extract, 3 times blade tenderization without ginger in Table 2. Mean scores for appearance and colour, flavour, juiciness, tenderness and overall palatability were significantly (P<0.01) higher for ginger extract treated smoked buffalo rumen meat products as compared to blade tenderized and control samples. Improvements in colour or appearance and juiciness of smoked rumen meat products with ginger extract treatment are in agreement with the finding Syedziauddin et al. (1995). Labell (1987) reported an increase in the flavour of poultry meat treated with 2 % ginger powder. He mentioned that the increase in flavour of ginger extract treated samples might be due to flavour enhancement occurring during cooking. These findings are consistent with the reports of Thompson et al. (1973), Lee et al (1986), Labell et al. (1987) and Naveena and Mendiratta (2004). Becherel (1991) reported that blade tenderization significantly improved tenderness without affecting other sensory attributes. Improvement in sensory attributes of smoked tripe products in our study might be due to combined effect of blade tenderization and ginger extract.

**CONCLUSIONS**

It can be concluded that smoked buffalo rumen meat product prepared with 5.0 % ginger extract with 3 times blade tenderization is rated higher in all sensory attributes and physico-chemical characteristics. Three times blade tenderization alone did not give any beneficial effect on quality and acceptability of smoked buffalo rumen meat products. Therefore, blade tenderization with 5.0 % ginger extract can be successfully used for preparation of smoked tripe products of acceptable quality with substantial value addition.

**REFERENCES**


