Development and Quality Evaluation of Meat based Seasoning Fryums from Mutton and Rice Flour

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Abstract

Seasoning fryums incorporated with 10, 20 and 30 % mutton were developed and their quality evaluated. Linear and significantly (P<0.01) increased values were observed from control to mutton incorporated seasoning fryums for pH, product yield, bulk density, moisture, protein and fat contents. Significantly (P<0.01) reverse trends were observed for hydratability, water absorption index and water solubility index. Results of sensory evaluation on 8-point hedonic scale showed appearance and colour, flavour, texture, crispness, after taste, meat flavour intensity and overall palatability were significantly(P<0.01) higher for 20% mutton incorporated seasoning fryums followed by 10% and 30% mutton incorporated seasoning fryums. Thus, it can be concluded that, 20% mutton can be successfully used preparation of meat based seasoning fryums.

Keywords: Mutton, Meat, Fryums, Quality, Evaluation, Acceptability.

1. Introduction

Fryums is basically a cereal based 'ready to fry' pellets. They are deep fried and served as an accompaniment along with rice and rasam or sambar in South India. They are also served at meals, especially on festive occasions. Most of the fryums available in the market are mainly based of cereals which are high in calorie and low in protein contents. Incorporation of animal proteins in such snack type food products can improve the nutritional quality especially with respect to amino acid composition, flavor, odor and taste (Kumar et al., 2016). Incorporation of meat in this type product is a good alteration in its nutritional value particularly high value animal protein (Anna Anandh et al., 2005; Singh et al., 2011). It is observed that in South Indian household is prepared by using leftover cooked rice, which is soaked in excess water and allowed to ferment overnight. The water is drained and rice is mashed and finely cut onions, chillies and lime are added and it is made into small vadam and sun-dried. Taking a clue from this practice and in order to diversify the available product range, the cost effective recipe for mutton based seasoning fryums was standardized and their quality characteristics were evaluated. In this study, a scientific approach was made to developed meat based fryums with different levels of mutton.

2. Materials and Methods

2.1 Source of Mutton

Deboned sheep meat was purchased from the local meat stall. It was cut into small chunks and frozen for 1-2 h to ensure easy mincing. The mutton chunks were minced twice through the meat mincer and the minced meat was used in the preparation of meat based seasoning fryums.

2.2 Formulation and Treatments

The formula for meat based seasoning fryums was developed after conducting a series of preliminary trails. The basic product formulation consists of rice flour, common salt, green chili paste, onion paste, cumin powder, spice mix, asafetida powder and curd. Meat based seasoning fryums prepared with incorporation of 10, 20 and 30 % minced mutton. The corresponding levels of rice flour were 90%, 80% and 70% in the respective formulations. Other ingredients used in the formulation i.e. common salt, green chili paste, onion paste, cumin powder, spice mix, asafetida powder and curd were added over and above rice flour and mutton combination. Control seasoning fryums contained 100% rice flour and no mutton (Table 1).

2.3 Preparation of Fryums

Required quantity of water (250% of the flour-
Table 1: Formulation of meat based seasoning fryums

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Control (%)</th>
<th>Level of mutton (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Mutton</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>Rice flour</td>
<td>100</td>
<td>90</td>
</tr>
<tr>
<td>Common salt</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>Green chili paste</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Cumin powder</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Asafetida powder</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>Onion paste</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Spice mix</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Curd</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

Water: 250% of the rice flour (on weight basis)

The weight of control and mutton incorporated seasoning fryums were recorded before drying and after drying and the yield was calculated (product yield = weight of dried products / weight of raw products ×100) and expressed as percentage.

2.4.4 Bulk Density

Bulk density of control and mutton incorporated seasoning fryums were determined based on the procedure of Mittal and Lawrie (1986). Pieces of extrudates were assumed to be cylindrical in shape and the volume was calculated using the formula (Π r² (Π X radius ² X length)). The extrudate of known length was weighed and bulk density was calculated as mass / volume (g / cm⁻³).

2.4.5 Hydratability

Hydratability of control and mutton incorporated seasoning fryums were determined based on the procedure of Mittal and Lawrie (1986). Weighed pieces of products (approximately 2.5 g) were placed in test tubes with excess boiling water for 5 min to hydrate the sample. The hydrated samples were drained for 5 min, blotted and weighed. Hydratability of control and mutton incorporated seasoning fryums were estimated as weight of water absorbed / weight of dry sample (g/g).

2.4.6 Water Absorption Index

Water absorption index was measured according to the method described by Anderson et al. (1969). 2.5 g of ground sample was weighed in 100 ml centrifuge tubes, 30 ml of distilled water was added and the sample was left equilibrated for 30 min with occasional stirring. After centrifugation at 3000 rpm for 10 min, the supernatant was carefully poured into the Petri dish and the remaining gel was weighed. The water
absorption index calculated as the ratio of gel obtained
to that of initial weight of sample (g/g).

2.4.7 Water Solubility Index
The water solubility index was measured
according to the method described by Machado et al.
(1998). The supernatant liquid obtained from water
absorption index determination was used for
determination of water solubility index. The
supernatant liquid was kept in hot air oven to evaporate
dryness. After drying, the petridishes were cooled and
weighed. The water solubility index was calculated as
weight of solids to the initial weight of the sample
(g/g).

2.5 Sensory Evaluation
Sensory evaluation was conducted with semi-
trained panelists. Control and mutton based seasoning
fryums were served to the panelists. The sensory
attributes like appearance and colour, flavour, texture,
crispiness, after taste, meat flavour intensity and
overall palatability were evaluated on 8 - point
descriptive scale (where in 1 is extremely undesira ble
and 8 is extremely desirable) as suggested by Keeton
(1983).

2.6 Statistical Analysis
The experiment was repeated four times. The
data generated from each trial were analyzed
statistically by following standard procedures
(Snedecor and Cochran, 1989) for comparing the
means and to determine the effect of treatment.

3. Results and discussion

3.1 Physico-chemical Characteristics Mutton
Incorporated Seasoning Fryums
Results of physico -chemical parameters of
control and mutton based seasoning fryums are
presented in Table 2. The mean ± SE pH value for
control, 10%, 20% and 30% mutton incorporated
seasoning fryums were found to be 6.22± 0.05, 6.30±
0.04, 6.45± 0.04 and 6.50± 0.04, respectively. The
values for pH progressively and significantly (P<0.01)
increased from control to treatments. Significantly
(P<0.01) higher pH value was observed in 30% mutton
incorporated seasoning fryums followed by 20% and
10% mutton incorporated seasoning fryums and
control. The pH value of mutton based seasoning
fryums could be attributed to increased level of meat in
the product formulation. The mean ± SE product yield
for control, 10%, 20% and 30% mutton incorporated
seasoning fryums were found to be 49.52±0.10,
52.22±0.12, 56.42±0.10 and 58.12±0.10, respectively.
The product yield increased significantly from control
to mutton incorporated seasoning fryums. Among
mutton incorporated seasoning fryums, higher product
yield observed in 30% mutton incorporated seasoning
fryums followed by 20% and 10% mutton incorporated
seasoning fryums. The increased product yield of
mutton incorporated seasoning fryums could be
attributed due to incorporation of mutton in the
product. The mean ± SE product bulk density value for
control, 10%, 20% and 30% mutton incorporated
seasoning fryums were found to be 2.28± 0.02, 2.52±
0.04,2.72+ 0.05 and 2.94± 0.02, respectively. The bulk
density values of control and mutton incorporated
seasoning fryums differ significantly (P<0.01) between
them and the value were significantly (P<0.01)
increasing with increasing level of mutton in the
formulation. Among mutton incorporated seasoning
fryums, bulk density value was higher in 30% mutton
incorporated seasoning fryums followed by 20% and
10% mutton incorporated seasoning fryums and
control. Increased moisture content of extrudate
contributed to increased bulk density (Barrett and Ross,
1990; Kavya Reddy et al., 2014). Breen et al. (1977)
reported that combination of high concentration of
starch, high protein and high fiber snack foods tend to
decreased the bulk density. The present findings are in
agreement with the above findings. The mean ± SE
hydratability value for control, 10%, 20% and 30%
mutton incorporated seasoning fryums were found to
be 2.62+0.04,2.24±0.02,1.82±0.06 and 1.28±0.04,
respectively. The value of hydratability values
decreased significantly (P<0.01) from control to
mutton incorporated seasoning fryums. Among meat
based seasoning fryums, higher hydratability value
observed in 10% mutton incorporated seasoning
fryums followed by 20% and 30% mutton incorporated
seasoning fryums. These finding are in conformity with
those of Mittal and Lawrie (1984) who reported that
presence of meat in extrudates lowered the ability of
hydrate the products. The mean ± SE water absorption
index value for control, 10%, 20% and 30% mutton
incorporated seasoning fryums were found to be
6.82±0.02, 5.74±0.04, 4.68±0.02 and 4.05±0.04,
respectively. Water absorption index value was
significantly (P<0.01) higher in control as compared
meat incorporated seasoning fryums. Among mutton
incorporated seasoning fryums, higher water absorption
index value observed in 10% mutton incorporated
seasoning fryums and the value differ significantly between them. This is in agreement with
findings of Davidson et al. (1984) and Cheftel (1986).
They reported that when starch was used in large
quantity, water absorption index of –

Anna-Anandh…Development and Quality Evaluation of Meat based Seasoning Fryums from Mutton and Rice Flour

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extrudates increased due to increased starch gelatinization. Park et al. (1993) also reported that high starch and low fat level resulted in higher water absorption index of products. The mean ± SE water solubility index value for control, 10%, 20% and 30% mutton incorporated seasoning fryums were found to be 1.28±0.02, 0.92±0.02, 0.83±0.04 and 0.72±0.04, respectively. Water solubility index significantly (P<0.01) decreased from control to mutton incorporated seasoning fryums. Higher water solubility index value was observed in control followed by 10%, 20% and 30% mutton incorporated seasoning fryums. Water solubility index of control as compared to mutton incorporated seasoning fryums differed significantly (P<0.01) between them. The high water solubility index of control as compared to mutton incorporated seasoning fryums could be attributed to higher level of starch with increased fragmentation and starch conversion resulting in higher water solubility characteristics (Gomez and Aguillera, 1983; Wen et al., 1990; Siriburi and Hill, 2000). The results of this present study are also in conformity with above findings.

Table 2: Physico-chemical characteristics of mutton incorporated seasoning fryums (Mean ± SE)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control</th>
<th>Level of mutton</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>pH</td>
<td>6.22±0.05a</td>
<td>6.30±0.04b</td>
</tr>
<tr>
<td>Product yield (%)</td>
<td>49.52±0.10a</td>
<td>52.22±0.12b</td>
</tr>
<tr>
<td>Bulk density (g/cm-3)</td>
<td>2.28±0.02a</td>
<td>2.52±0.04b</td>
</tr>
<tr>
<td>Hydratability (g/g)</td>
<td>2.62±0.04a</td>
<td>2.24±0.02b</td>
</tr>
<tr>
<td>Water absorption index (g/g)</td>
<td>6.82±0.02a</td>
<td>5.74±0.04b</td>
</tr>
<tr>
<td>Water solubility index (g/g)</td>
<td>1.28±0.02a</td>
<td>0.92±0.02b</td>
</tr>
<tr>
<td>Moisture (%)</td>
<td>4.52±0.10a</td>
<td>5.28±0.10b</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>11.15±0.10a</td>
<td>16.80±0.14b</td>
</tr>
<tr>
<td>Fat (%)</td>
<td>2.92±0.11a</td>
<td>6.42±0.12b</td>
</tr>
</tbody>
</table>

Number of observations: * = 4; Means bearing same superscripts row-wise do not differ significantly (P<0.01).

Table 3: Sensory attributes of mutton incorporated seasoning fryums (Mean ± SE)

<table>
<thead>
<tr>
<th>Sensory attributes**</th>
<th>Control</th>
<th>Level of chicken meat</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Appearance and colour</td>
<td>6.52±0.10a</td>
<td>7.12±0.14b</td>
</tr>
<tr>
<td>Flavour</td>
<td>6.42±0.12b</td>
<td>6.45±0.10b</td>
</tr>
<tr>
<td>Texture</td>
<td>7.16±0.10a</td>
<td>6.92±0.14b</td>
</tr>
<tr>
<td>Crispiness</td>
<td>7.28±0.14a</td>
<td>7.22±0.12c</td>
</tr>
<tr>
<td>Aftertaste</td>
<td>6.88±0.12a</td>
<td>6.96±0.10b</td>
</tr>
<tr>
<td>Meat flavour intensity</td>
<td>-</td>
<td>6.22±0.12c</td>
</tr>
<tr>
<td>Overall acceptability</td>
<td>6.86±0.12a</td>
<td>6.82±0.12b</td>
</tr>
</tbody>
</table>

Number of observations: ** = 20; Sensory attributes were evaluated on a 8 - point descriptive scale (wherein 1 = extremely undesirable; 8 = extremely desirable); Means bearing same superscripts row-wise do not differ significantly (P<0.01).

The mean ± SE moisture, protein and fat contents for control, 10%, 20% and 30% mutton incorporated seasoning fryums were found to be 4.52±0.10, 5.28±0.10, 5.82±0.14 and 6.18±0.12, respectively. Mean moisture, protein and fat contents of 10% and 20% mutton incorporated extruded seasoning fryums did not differ significantly (P<0.01) from 30% mutton incorporated seasoning fryums significantly (P<0.01) higher as compared to control. Mean moisture contents progressively and significantly (P<0.01) increased from control to treatments. Significantly (P<0.01) lower moisture contents observed in control as compared to mutton incorporated seasoning fryums. Jean et al. (1996) reported that snack foods should have moisture content of less than 5% to make the product brittle. Though the mutton incorporated seasoning fryums of this study showed slightly higher moisture content. The mean protein and fat contents also significantly (P<0.01) increased from control to mutton incorporated seasoning fryums. The mean protein and fat contents of 10% and 20% chicken meat incorporated seasoning fryums did not differ significantly between them but differ significantly (P<0.01) from 30% mutton.
incorporated seasoning fryums and control. The results are in agreement with the findings of Singh et al. (2014) who reported increased protein, fat and ash contents in dried snack food products with increasing levels of incorporation of meat. Similar findings are also reported by Jean et al. (1996); Rhee et al. (1999); Singh et al. (2002).

3.2 Sensory Characteristics of Mutton Incorporated Seasoning Fryums

Results of sensory evaluation of control and mutton incorporated seasoning fryums are presented in Table 3. The mean ± SE appearance and colour scores for control, 10%, 20% and 30% mutton incorporated seasoning fryums were found to be 6.52±0.10, 7.12±0.14, 7.16±0.10 and 6.58±0.12, respectively. There was significant (P<0.01) improvement in appearance scores in all mutton incorporated based seasoning fryums as compared to control. Although, appearance and colour scores for 20% mutton incorporated seasoning fryums were higher as compared to 10% and 30% mutton incorporated seasoning fryums. The difference in appearance and color scores between 10% and 20% mutton incorporated seasoning fryums did not differ significantly between them. Appearance and colour scores between control and 30% mutton incorporated seasoning fryums were also non-significant. The mean ± SE flavor scores for control, 10%, 20% and 30% mutton incorporated seasoning fryums were found to be 6.42±0.12, 6.45±0.10, 7.24±0.12 and 7.24±0.12, respectively. Mean flavour scores significantly (P<0.01) higher in 20% mutton incorporated seasoning fryums followed by 30%, 10% mutton incorporated seasoning fryums and control. The flavour score of between controls, 10% and 30% meat incorporated seasoning fryums did not differ significantly between them but differ significantly from 20% mutton incorporated seasoning fryums. The mean ± SE texture scores for control, 10%, 20% and 30% mutton incorporated seasoning fryums were found to be 7.16±0.10, 6.92±0.14, 6.88±0.12 and 6.82±0.12, respectively. Texture scores were significantly (P<0.01) decreased as increasing level of meat in the formulation. Mean texture scores significantly (P<0.01) higher for control as compared to mutton incorporated seasoning fryums. Texture scores between mutton incorporated seasoning fryums did not differ significantly between them but differ significantly from control. The mean ± SE crispiness scores for control, 10%, 20% and 30% mutton incorporated seasoning fryums were found to be 7.28±0.14, 7.22±0.12, 7.20±0.12 and 6.48±0.10, respectively. Crispiness scores also significantly (P<0.01) decreased with increasing level of meat in the seasoning fryums. Crispiness scores were significantly (P<0.01) lower in 30% mutton incorporated seasoning fryums. Crispiness scores between controls, 10% and 20% mutton incorporated seasoning fryums did not differ significantly between them but differ significantly from 30% mutton incorporated seasoning fryums. The mean ± SE after taste scores for control, 10%, 20% and 30% mutton incorporated seasoning fryums were found to be 6.88±0.12, 6.96±0.10, 7.10±0.12 and 6.22±0.12, respectively. After taste scores significantly (P<0.01) higher for 20% mutton incorporated seasoning fryums as compared to other mutton incorporated seasoning fryums and control. The mean ± SE meat flavor intensity scores for 10%, 20% and 30% mutton incorporated seasoning fryums were found to be 6.22±0.12, 7.28±0.10 and 7.12±0.12, respectively. Significantly (P<0.01) higher meat flavour intensity scores were observed in 30% mutton incorporated seasoning fryums followed 20% and 10% mutton incorporated seasoning fryums. However, meat flavor intensity scores between 10% and 30% mutton incorporated seasoning fryums did not differ significantly between them but differ significantly (P<0.01) from 10% mutton incorporated seasoning fryums. The mean ± SE overall acceptability scores for control, 10%, 20% and 30% mutton incorporated seasoning fryums were found to be 6.86±0.12, 6.82±0.12, 7.14±0.12 and 6.62±0.12, respectively. Significantly (P<0.01) higher overall acceptability scores observed in 20% mutton incorporated seasoning fryums as compared to other mutton incorporated seasoning fryums and control. Overall acceptability scores between controls, 10% and 30% mutton incorporated seasoning fryums did not differ significantly between them.

4. Conclusion

Finding of this study has shown that the 20% minced mutton can be effectively used for preparation of a meat based seasoning fryums of acceptable quality with improved nutritional value.

References


Anna Anandh M, Lakshmanan V, Mendiratta SK, Anjaneyulu ASR and Bisht GS (2005). Development and quality characteristics of extruded tripe snack from...


