Meat is a rich source of energy, saturated fatty acids and cholesterol and deficient in dietary fiber. Cereals are rich in dietary fiber, protein, energy, minerals, vitamins, and antioxidants required for human health. Due to change in socio-economic lifestyle everyone is aware about the risk associated with food and demanding foods with health promoting properties like high-fiber and low-fat meat products which place a greater attention in meat industry for health aspect. Various researches have demonstrated with the inclusion of dietary fibers in the meat products for their functional and technological properties (Thebaudin et al., 1997). Various types of fibers have been used in meat products to increase the cooking yield due to their water and fat binding properties and to improve texture (Cofrades et al., 2000). Many of the characteristics of oat fiber such as its water absorption capacity could potentially benefit products such as fat free frankfurters and low-fat bologna (Fernandez-Gines et al., 2005). Oat bran and oat fiber provide the flavor, texture and mouth feel of fat in ground beef and pork sausages (Garcia et al., 2002). Hence oat bran was used as a dietary fiber source in the present study. Turkey (Meleagris gallopavo) occupies an important position next to chicken and plays a significant role in augmenting the economic and nutritional status of varied population. They are reared for meat only and its meat is the leanest among other domestic avian species. Turkey (Meleagris gallopavo) meat is one of the white meat choices and famous for its leanness and delicacy and it contains minimal total fat and saturated fat and rich source of protein, iron, zinc, potassium and phosphorus. Regular Skinless turkey meat consumption can help in lowering the cholesterol levels. Since it is low in cholesterol it is accepted by all age group. It also had better meat to bone ratio. Hence the turkey meat is used for emulsion product preparation.

MATERIALS AND METHODS
Six Turkey birds (Meleagris gallopavo) above one year of age were purchased from Poultry Farm Complex and slaughtered as per the standard procedure and the carcass was hygienically deboned and trimmed off all visible adipose and connective tissues. The deboned meat was minced through an 8-mm plate using a meat mincer. The oats and wheat flour were purchased from the local super market and the oats were used to incorporate to turkey meat balls at different levels

Preparation of turkey meat ball: For the experiment trial the following basic formulation was used. The non-meat ingredients were added one and above the per cent of meat.
Ingredients & Control (g) & T1 (g) & T2 (g) & T3 (g) \\
Lean Turkey meat & 1000 & 1000 & 1000 & 1000 \\
Vegetable oil & 50 & 50 & 50 & 50 \\
Salt & 20 & 20 & 20 & 20 \\
Garlic & 25 & 25 & 25 & 25 \\
Onion & 25 & 25 & 25 & 25 \\
Chicken masala & 20 & 20 & 20 & 20 \\
Maida & 50 & 50 & 50 & 50 \\
Wheat flour & - & - & - & - \\
Oats flour & - & 40 & 70 & 100 \\

Table 1: Treatment details

Crude protein (CP): A known quantity of the ground cooked turkey meat balls sample was digested with suitable quantity of concentrated H₂SO₄ in the presence of catalytic digestion mixture (CuSO₄ and K₂SO₄ in 1:10 ratio). An acid blank was also run along with the samples for correction of any nitrogen contribution by the acid itself. The digested sample was then quantitatively transferred in to a volumetric flask with repeated washing with distilled water. The nitrogen content of the sample was estimated by distilling a suitable aliquot into an auto analyzer (Kjeltec Auto 1013 Analyzer, Tecator, Sweden). The nitrogen content multiplied by the factor 6.25 gave the CP content of the sample, which was expressed as percentage on DM basis.

Crude fiber (CF): Crude fiber was estimated by treating the sample with 1.25 per cent H₂SO₄ and 1.25 per cent NaOH and the residue left was ashed in muffle furnace at 550-600°C. The loss due to ashing was considered as crude fiber.

Ether extract (EE): A known quantity of moisture free sample was extracted with petroleum ether (60-80°C) for 8 hours in a pre-weighed oil flask using Soxhlet extraction apparatus. The extracted crude fat in the oil flask was oven dried to a constant weight and expressed as EE percentage on dry matter basis.

Total ash: Weighed and decarbonized samples were ashed in muffle furnace at 550-600°C for three hours. The weight of residue left was expressed as per cent total ash on dry matter basis. Organic matter was obtained deducting the per cent total ash on dry matter basis from 100.

Estimation of gross energy: The gross energy (GE) or heat of combustion meat was estimated as per the procedure described in the manual of adiabatic microprocessor-based bomb colorimeter.

RESULTS AND DISCUSSION

The mean and standard error (SE) values of proximate composition of turkey meat balls with, wheat flour (3 per cent) and oats flour at 4, 7 and 10 per cent level are presented in Table 2.

Moisture percentage was 63.66 ± 0.17, 65.44 ± 0.34, 64.69 ± 0.36 and 63.61 ± 0.13 for control T1, T2 and T3, respectively. Highly significant (P ≤ 0.01) differences were found among the treatments. Moisture was high in T1 compared to control.
Table 2: Mean (±S.E.) Proximate composition of turkey (*Meleagris gallopavo*) meat balls incorporated with oats flour

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Control</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture (%)</td>
<td>63.66±0.17</td>
<td>65.44±0.34</td>
<td>64.69±0.36</td>
<td>63.61±0.13</td>
</tr>
<tr>
<td>Crude Protein (%)</td>
<td>15.26±0.27</td>
<td>16.88±0.13</td>
<td>17.90±0.09</td>
<td>18.05±0.10</td>
</tr>
<tr>
<td>Crude Fibre (%)</td>
<td>1.27 ±0.01</td>
<td>1.09±0.03</td>
<td>1.40±0.03</td>
<td>1.50±0.04</td>
</tr>
<tr>
<td>Ether Extract (%)</td>
<td>3.37±0.02</td>
<td>3.09±0.02</td>
<td>3.17±0.04</td>
<td>2.52±0.08</td>
</tr>
<tr>
<td>Total Ash (%)</td>
<td>1.55±0.03</td>
<td>1.56±0.03</td>
<td>1.51±0.02</td>
<td>1.59±0.15</td>
</tr>
<tr>
<td>Gross Energy**</td>
<td>1860.33±4.35</td>
<td>1733.16±4.75</td>
<td>1847.16±1.35</td>
<td>1808.66±1.97</td>
</tr>
</tbody>
</table>

Means bearing different superscripts differ significantly

* - Significant (P ≤ 0.05)
** - Significant (P ≤ 0.01)

Control - Wheat flour 3 %
T1 - Oat flour 4 %
T2 - Oat flour 7 %
T3 - Oat flour 10 %

Similar to this present study Maheswara Reddy and Vani, (2017) reported that in oat fibre enriched chicken meat ball the moisture percentage increases with the addition of oat fibre upto 15 per cent compared to control. Santhi and Kalaikkannan (2014) found that in chicken nuggets the addition of oat flour increases the moisture percentage. But as the oats level increases the moisture percentage decreases. Similar to the present study Dawkins et al., (1999) also observed decrease in moisture, protein contents with addition of oat bran in chevon patties. Talukder and Sharma (2010) also found that in chicken meat patties the addition of oat bran upto 15 per cent level cause the decrease in moisture percentage. Yilmaz and Daglioglu (2003) also found a decrease in the moisture percentage and an increase in the protein percentage, with an increase in the oat bran addition in the meat balls prepared from veal. These differences in results may be due to the absorption and retention of moisture, which varies with the type of meat, form of oats and cooking method (Talukder and Sharma, 2010). Crude protein percentage was 15.26 ±0.27, 16.88 ±0.13, 17.90 ±0.09 and 18.05 ±0.10 for control T1, T2 and T3, respectively. A significant difference was found in the crude protein level of turkey meat balls incorporated with oat flour at difference level. This observation was made similar to that of Talukdar and Sharma (2010) Kerr et al. (2005). This might be due to the contribution of carbohydrate from oats flour.

Crude fiber percentage of cooked turkey meat balls were 1.27 ±0.01, 1.09 ±0.03, 1.40 ±0.03 and 1.50 ±0.04 for control T1, T2 and T3, respectively. There was high significant (P ≤ 0.01) difference among the treatments. The crude fiber was high in T3 compared to control. The crude fiber was significantly higher in the oat flour added cooked meat balls. Similar observations were also made by Dawkins et al. (1999). Similar to our present study Maheswara Reddy and Vani, (2017) reported that in oat fibre enriched chicken meat ball the crude fibre percentage increases with the addition of oat fibre upto 15 per cent compared to control. Higher percentage of crude fiber might be due to higher concentration of insoluble fiber in oats than in meat (Huang et al., 2011) in sausages prepared with wheat and oat fiber.

Ether extract percentage of cooked turkey meat balls was 3.37±0.02, 3.09±0.02, 3.17±0.04 and 2.52±0.08 for control T1, T2 and T3, respectively. The ether extract percentage showed significant difference between treatments and control. The ether extract was high in control compared to treatments. As the oats flour level increases the ether extract percentage decreases. Similar to the present study, Kerr et al., (2005) observed a decrease in fat levels with increase in the levels of oat flour. Santhi and Kalaikkannan (2014) found that in chicken nuggets the addition of oat flour decreases the fat percentage in chicken nuggets. The results obtained in the present investigation were similar with findings of Yang et al., (2007, 2009) in pork and duck meat sausages respectively.
al., (2009) in chicken and mutton kofta respectively. The lower percentage of crude protein and crude fat in the product were due to lower moisture losses during processing at higher concentration of oat flour.

Total ash was 1.55 ± 0.03, 1.56 ± 0.03, 1.51 ± 0.02 and 1.59 ± 0.15 for control T1, T2 and T3 respectively. There was no significant difference found among the treatments with the control. Whereas, Gross energy was 1860.33 ± 4.35, 1733.16 ± 4.75, 1847.16 ± 1.35 and 1808.66 ± 1.97 for control T1, T2 and T3 respectively. There was highly significant (P ≤ 0.01) difference among the treatments with the highest value of control. The total ash and Gross energy level were significantly higher in oats included at level of 10 per cent. The present study was in accordance with Similar to our present study, Santhi and Kalaikannan (2014) who found that the addition of oat flour causes the changes in the gross energy level in chicken nuggets.

CONCLUSION
The result revealed that moisture, crude protein, crude fibre, ether extract and gross energy show high significant difference. Moisture was high in T1 compared to control. The crude fibre, crude protein and gross energy were high in T3, whereas ether extract was low in T3. Hence it was concluded that turkey meat ball enriched with oats flour with 10 per cent level has more Crude fibre, crude protein and Gross energy.

REFERENCES


http://jebsharidwar.org/