Comparison Among the Qualities of Patties Prepared from Chicken Broiler, Spent Hen and Duck Meats

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A study was being conducted to compare and assess the quality of chicken and duck patties prepared from broiler, spent hen and duck. The meat emulsions were analyzed for pH, moisture, protein, fat, total plate count (TPC), total psychrophilic count (TPSC) and emulsion stability and the cooked patties were analyzed for pH, moisture, protein, fat, cooking yield, total plate count (TPC), total psychrophilic count (TPSC), thiobarbituric acid (TBA) value and sensory qualities such as, appearance, flavour, tenderness, juiciness and overall acceptability. The patties prepared from broiler meat showed significantly highest moisture content, emulsion stability and cooking yield and on the other hand, the fat content was significantly highest in duck patties. The TPC, TPSC, TBA values and sensory qualities of all the patties were within the acceptable level up to 14th day of refrigerated storage. There were no major drawbacks of the patties prepared from spent hen and duck in comparison to those of broilers. Therefore, as the values of the major parameters studied are within the range of standard values, the spent hen and duck meat can also be encouraged for preparing nutritionally sound and acceptable patties.

Key words : broiler, duck, patties, quality, spent hen

Introduction

The development of comminuted meat products and popularization of unconventional and less valued meats like those from duck and spent hen need to be emphasized upon as their demand is on decline due to increased availability of broilers (Singh and Verma, 2000). Amongst the various popular value-added meat products, patty is one which could find increasing popularity in food service industry, particularly at fast food outlets. The meat from the spent hens are sold at a very low price in retail market and though ducks occupy second place to chicken for the production of eggs in India with a population of almost 110 million (FAO, 2002), they are mainly reared for laying purpose. After 3-4 laying years, when the duck meat comes for human consumption it becomes less juicy, tougher, less palatable which are the hidden reasons for unacceptance of the duck meat by the consumers. Various workers have prepared spent hen meat patties (Roussete et al., 1984; Hollander et al., 1987; Kondaiah and Panda, 1992) and also duck meat patties (Reddy and Rao, 1997), still their popularity is low. Therefore, the present study was conducted to compare the quality and acceptability of chicken and duck patties prepared from broiler, spent hen and duck, in terms of phyico-chemical, microbiological and sensory qualities with an inherent view towards better utilization of such less...
valued and unconventional meat from spent hen and duck.

Materials and methods

Source of Meat

Culled white leghorn hens of around 72 weeks of age and broilers (8 weeks) were procured from the experimental farm of the Department of Animal Nutrition of West Bengal University of Animal and Fishery Sciences, Kolkata, India and the Indian desi ducks (36 weeks) were procured from local market (Shyambazar market, Kolkata, India). The slaughtering and dressing were done in the Poultry processing unit of the Department of Animal Products Technology and Marketing, West Bengal University of Animal and Fishery Sciences, Kolkata, India as per the standard procedure. For each trial, 3 birds of each group were taken and such nine trials were done. After dressing, the carcasses were chilled overnight at 4±1°C and then deboned manually as per the method of Staff and Darrow (1983). Then the meat was kept at freezer (−18°C) until further use. The meat meant for patties preparation was thoroughly screened for removing excess fat, tendons etc.

Mincing and Preparation of Meat Emulsion

The deboned meat was put in room temperature for about one hour and after adequate thawing, meat was weighed, cut into small chunks and placed in meat mincer (Stadler limited, Mumbai, India) in 10 mm diameter plate and 5 mm diameter plates respectively. The minced meat was then chopped in bowl chopper (Stadler limited, Mumbai, India). The mincer and chopper were sterilized using warm water (82°C) for two minutes prior to use.

The recipe for patties included meat (prime and non-prime cuts) 68.5%, fat (skin and visceral organs) 5.5%, salt 1.5%, preservatives 0.07%, sugar 1%, spice 3.3%, condiments 8%, soy protein 3.3%, whole egg 1.3%, baking powder 0.03%, ice cubes 5.5% and curd 2%. The emulsion was prepared in the bowl chopper and then was taken for preparation of patties.

Sample Preparation

Patties (90 mm diameter × 12 mm height) were prepared by moulding meat balls weighing 75 g each (Kumar et al., 2000). The moulded patties were cooked by dry heat cooking. They were first cooked upside down and cooked at 200°C for 10 more minutes so as to attain an internal temperature of 75 ±1°C which was measured by the probe thermometer. After cooling at ambient temperature they were packed in low density polyethylene films for storage leading to phyico-chemical, microbiological and sensory quality attributes.

The pH of the raw emulsion and cooked patties were measured by a digital pH meter (Century, Model: CP.901) equipped with a combined glass electrode (Trout et al., 1992) on 10 g of sample homogenized with 50 ml of distilled water using Ultra-Turrex T25 tissue homogenizer (Janke and Kenkel, IKA, Labor Tecnik, Germany) for 1 min. The emulsion stability (%) of meat emulsion and cooking loss (%) of patties were determined as per the method of Baliga and Madaiah (1971). Diameter of the patties were measured at six different places both before and after cooking using electronic digital Vernier Caliper. Product yield was determined as percentage by the following formula (Baliga and Madaiah, 1970):

Product yield (%) = Weight of the patties after cooking/Weight of the patties before cooking × 100.

Proximate Composition

The moisture, fat, protein and ash content were determined gravimetrically using the technique recommended by Association of Official Analytical Chemists (AOAC, 1995).

TBA-Value

The evaluation of TBA value was done by using the TBA test of Witte et al. (1970) with slight modification where the slurry was filtered through a Schleicher and Schuell ashless filter paper (E. Merck, India, Ltd, Mumbai, India) instead of Whatman filter paper No. 42. Evaluations were done at 0 day, 3rd, 7th, 14th and 21th day of the refrigerated samples.

Microbiological Analysis

The refrigerated samples were used to determine the total plate count (TPC) and total psychrophilic count (TPSC) as per the method described by APHA (1984) using standard plate count agar (Himedia Laboratories, Mumbai, India, Code. M091) and were expressed as log10 c.f.u/gm. These were studied at 0 day, 3rd, 7th, 14th and 21th day of the refrigerated samples.

Sensory Evaluation

The samples were cut into small pieces, oil fried in
shallow pan (Pal and Agnihotri, 1996) using refined sunflower oil (Sundrop, Manufactured and packed by Agro. Tech Food (P) Ltd, Jaipur, India) and served warm to a panel of 15 semi-trained judges for evaluating the sensory attributes such as, appearance, juiciness, tenderness, flavour and overall acceptability of the product using a 9 point hedonic scale (9-extremely desirable, 1-extremely poor) score card as per the method of Keeton (1983).

Statistical Analysis

The data were analysed by statistical method of one way ANOVA using the SPSS\textsuperscript{a} software package and as per the procedure of Snedecor and Cochran (1967) and the day wise means of 3 meat sources were compared using the Duncan’s test (Duncan, 1955) at 1\% level of significance. Quality and sensory parameters were also studied by one way ANOVA to compare the effect of meat sources for each stage of process and storage which was repeated further by the same method of analysis to compare the different stages of observations within each type of meat source. Such analysis was followed by Duncan’s test at 1\% level of significance if any significant effect was found.

Result and Discussions

Table 1 represents the quality characteristics of the emulsion and Table 2 represents the same of cooked patties with mean±SE prepared using the meat of broiler, spent hen and duck, whereas the Table 3 represents the mean values with standard error of TPC, TPSC and TBA of patties stored at refrigerated temperature for different storage periods, i.e. 0 day, 3\textsuperscript{rd}, 7\textsuperscript{th}, 14\textsuperscript{th} and 21\textsuperscript{st} day along with that of emulsion. The sensory qualities of the patties at different storage periods are described in Table 4.

pH

It was evident from the results that there were no significant differences in pH between broiler, spent hen and duck patties. Both in emulsion and cooked patties, the pH of duck patties were higher than those of chicken patties and this might be due to variation in glycogen reserves, quantity and quality of the glycolytic enzymes in these two species of birds (Brahma et al., 1984). At the same time, the pH of the cooked patties prepared from these three groups of birds, depicted a higher value than that of emulsion which is due to the higher degree of oxidation along with loss of free acidic groups from the meat protein subjected to heat (Lawrie, 1998; Reddy and Vijayalakshmi, 1998; Lingaiah and Reddy, 2001).

Moisture

The moisture content of the three types of patties showed in Table 1&2, revealed that they differed significantly (P<0.01) both in case of emulsion and cooked patties. The moisture percentage of emulsion and cooked patties prepared from broiler car-

### Table 1. Quality characteristics of emulsion prepared from broiler, spent hen and duck meat (Mean±SE)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Broiler (n=9)</th>
<th>Spent hen (n=9)</th>
<th>Duck (n=9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emulsion stability (%)</td>
<td>92.56±0.18\textsuperscript{a}</td>
<td>92.31±0.25\textsuperscript{a}</td>
<td>91.12±0.23\textsuperscript{a}</td>
</tr>
<tr>
<td>pH</td>
<td>6.07±0.03</td>
<td>6.14±0.05</td>
<td>6.20±0.01</td>
</tr>
<tr>
<td>Moisture (%)</td>
<td>65.39±0.26\textsuperscript{a}</td>
<td>63.27±0.32\textsuperscript{b}</td>
<td>63.14±0.56\textsuperscript{a}</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>21.96±0.42</td>
<td>22.54±0.15</td>
<td>22.04±0.27</td>
</tr>
<tr>
<td>Fat (%)</td>
<td>11.39±0.18\textsuperscript{a}</td>
<td>12.15±0.08\textsuperscript{b}</td>
<td>13.66±0.22\textsuperscript{a}</td>
</tr>
</tbody>
</table>

Means bearing different superscripts differ significantly (P<0.01) among the three types of patties emulsion.

### Table 2. Quality characteristics of cooked patties prepared from broiler, spent hen and duck meat (Mean±SE)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Broiler (n=9)</th>
<th>Spent hen (n=9)</th>
<th>Duck (n=9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooking yield (%)</td>
<td>93.09±0.21\textsuperscript{a}</td>
<td>90.22±0.25\textsuperscript{b}</td>
<td>84.59±0.32\textsuperscript{c}</td>
</tr>
<tr>
<td>pH</td>
<td>6.23±0.02</td>
<td>6.36±0.05</td>
<td>6.41±0.05</td>
</tr>
<tr>
<td>Moisture (%)</td>
<td>59.28±0.45\textsuperscript{a}</td>
<td>57.58±0.25\textsuperscript{b}</td>
<td>57.21±0.42\textsuperscript{a}</td>
</tr>
<tr>
<td>Protein (%)</td>
<td>21.43±0.30</td>
<td>22.41±0.11</td>
<td>23.02±0.19</td>
</tr>
<tr>
<td>Fat (%)</td>
<td>13.43±0.17\textsuperscript{a}</td>
<td>14.10±0.09\textsuperscript{b}</td>
<td>14.54±0.32\textsuperscript{a}</td>
</tr>
</tbody>
</table>

Means bearing different superscripts differ significantly (P<0.01) among the three types of patties.
Table 3. **Quality characteristics of cooked patties prepared from broiler, spent hen and duck meat (Mean±SE) at different storage periods**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Meat source</th>
<th>Emulsion</th>
<th>0 day (n=9)</th>
<th>3rd day (n=9)</th>
<th>7th day (n=9)</th>
<th>14th day (n=9)</th>
<th>21st day (n=9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPC (log c.f.u/g)</td>
<td>Broiler</td>
<td>4.48±0.05 a</td>
<td>2.66±0.03 d</td>
<td>2.82±0.02 c</td>
<td>3.09±0.02 b</td>
<td>3.67±0.03 b</td>
<td>4.36±0.05 a</td>
</tr>
<tr>
<td></td>
<td>Spent hen</td>
<td>4.51±0.02 a</td>
<td>2.81±0.02 d</td>
<td>2.94±0.03 c</td>
<td>3.12±0.02 b</td>
<td>3.76±0.02 b</td>
<td>4.61±0.04 a</td>
</tr>
<tr>
<td></td>
<td>Duck</td>
<td>4.36±0.05 a</td>
<td>2.94±0.22 d</td>
<td>2.98±0.02 c</td>
<td>3.29±0.03 b</td>
<td>3.99±0.03 b</td>
<td>4.68±0.02 a</td>
</tr>
<tr>
<td>TPS (log c.f.u/g)</td>
<td>Broiler</td>
<td>3.68±0.11 a</td>
<td>2.11±0.15 d</td>
<td>2.21±0.23 c</td>
<td>2.51±0.21 b</td>
<td>3.08±0.19 b</td>
<td>4.21±0.12 a</td>
</tr>
<tr>
<td></td>
<td>Spent hen</td>
<td>3.72±0.16 a</td>
<td>2.34±0.09 d</td>
<td>2.42±0.18 c</td>
<td>2.63±0.16 b</td>
<td>3.16±0.14 b</td>
<td>4.15±0.20 a</td>
</tr>
<tr>
<td></td>
<td>Duck</td>
<td>3.83±0.08 a</td>
<td>2.52±0.14 d</td>
<td>2.71±0.15 c</td>
<td>2.93±0.22 b</td>
<td>3.49±0.13 b</td>
<td>4.30±0.26 a</td>
</tr>
<tr>
<td>TBA (mg/kg)</td>
<td>Broiler</td>
<td>0.146±0.04 a</td>
<td>0.173±0.02 c</td>
<td>0.185±0.02 b</td>
<td>0.285±0.05 b</td>
<td>0.552±0.03 b</td>
<td>0.591±0.03 b</td>
</tr>
<tr>
<td></td>
<td>Spent hen</td>
<td>0.168±0.02 a</td>
<td>0.184±0.02 c</td>
<td>0.194±0.03 b</td>
<td>0.326±0.02 b</td>
<td>0.563±0.05 b</td>
<td>0.591±0.03 b</td>
</tr>
<tr>
<td></td>
<td>Duck</td>
<td>0.188±0.02 a</td>
<td>0.211±0.03 c</td>
<td>0.235±0.02 b</td>
<td>0.381±0.02 b</td>
<td>0.591±0.03 b</td>
<td>0.591±0.03 b</td>
</tr>
</tbody>
</table>

Means bearing different superscripts differ significantly (P<0.01) among the three types of patties.

Table 4. **Sensory qualities of patties prepared from broiler, spent hen and duck meat (Mean±SE) at different storage periods**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Meat source</th>
<th>0 day (n=9)</th>
<th>3rd day (n=9)</th>
<th>7th day (n=9)</th>
<th>14th day (n=9)</th>
<th>21st day (n=9)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Broiler</td>
<td>7.67±0.19 a</td>
<td>7.50±0.18 a</td>
<td>7.00±0.31 b</td>
<td>6.83±0.19 b</td>
<td>5.66±0.21 a</td>
</tr>
<tr>
<td></td>
<td>Spent hen</td>
<td>7.50±0.18 a</td>
<td>7.33±0.17 a</td>
<td>6.83±0.20 b</td>
<td>6.50±0.18 b</td>
<td>5.33±0.24 a</td>
</tr>
<tr>
<td></td>
<td>Duck</td>
<td>7.33±0.17 a</td>
<td>7.17±0.28 a</td>
<td>6.33±0.20 b</td>
<td>6.17±0.31 b</td>
<td>5.17±0.26 a</td>
</tr>
<tr>
<td>Flavour</td>
<td>Broiler</td>
<td>7.33±0.17 a</td>
<td>7.17±0.28 a</td>
<td>6.17±0.31 b</td>
<td>6.00±0.25 a</td>
<td>5.33±0.24 a</td>
</tr>
<tr>
<td></td>
<td>Spent hen</td>
<td>7.17±0.28 a</td>
<td>7.00±0.31 a</td>
<td>6.66±0.21 b</td>
<td>6.17±0.31 a</td>
<td>5.33±0.24 a</td>
</tr>
<tr>
<td></td>
<td>Duck</td>
<td>7.00±0.31 a</td>
<td>6.83±0.21 a</td>
<td>6.50±0.18 b</td>
<td>6.17±0.31 a</td>
<td>5.00±0.32 a</td>
</tr>
<tr>
<td>Tenderness</td>
<td>Broiler</td>
<td>7.67±0.19 a</td>
<td>7.50±0.18 a</td>
<td>6.83±0.21 b</td>
<td>6.50±0.18 a</td>
<td>5.50±0.22 a</td>
</tr>
<tr>
<td></td>
<td>Spent hen</td>
<td>7.50±0.15 a</td>
<td>7.33±0.17 a</td>
<td>6.50±0.18 b</td>
<td>6.33±0.20 a</td>
<td>5.00±0.32 a</td>
</tr>
<tr>
<td></td>
<td>Duck</td>
<td>7.33±0.17 a</td>
<td>7.17±0.28 a</td>
<td>6.33±0.20 b</td>
<td>6.17±0.31 b</td>
<td>5.17±0.26 a</td>
</tr>
<tr>
<td>Juiciness</td>
<td>Broiler</td>
<td>7.67±0.19 a</td>
<td>7.50±0.18 a</td>
<td>6.83±0.21 b</td>
<td>6.50±0.18 a</td>
<td>5.50±0.22 a</td>
</tr>
<tr>
<td></td>
<td>Spent hen</td>
<td>7.50±0.18 a</td>
<td>7.33±0.17 a</td>
<td>6.50±0.18 b</td>
<td>6.33±0.20 a</td>
<td>5.00±0.32 a</td>
</tr>
<tr>
<td></td>
<td>Duck</td>
<td>7.33±0.17 a</td>
<td>7.17±0.28 a</td>
<td>6.33±0.20 b</td>
<td>6.17±0.31 b</td>
<td>5.17±0.26 a</td>
</tr>
<tr>
<td>Overall acceptability</td>
<td>Broiler</td>
<td>7.33±0.17 a</td>
<td>7.17±0.28 a</td>
<td>6.66±0.21 b</td>
<td>6.17±0.31 b</td>
<td>5.33±0.24 a</td>
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<td>5.17±0.26 a</td>
</tr>
</tbody>
</table>

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Cass was higher than that of spent hen and duck carcass because moisture content of muscle decreases with increase in age (Lawrie et al., 1998). The moisture content of patties prepared from broiler and spent hen was higher than the duck due to the similar compositional difference between chicken and duck meat (Brahma et al., 1985; Sharma, 1999). There was also reduction in the moisture percentage of the cooked patties than that of patties emulsion in all the three types of patties as cooking was responsible for the loss of moisture due to the coagulation of myofibrillar and sarcoplastic protein of muscle fibre (Warris, 2000).

**Protein**

The protein% of the three types of patties didn’t vary significantly both in case of emulsion and cooked patties. The protein content of all these three patties was within the permissible limit of similar type of products as noted in Bureau of Indian Standards (BIS, 1992b) which specified that the minimum protein content of such products should be 14%. The protein% of the duck patties both in emulsion and cooked patties were higher than that of spent hen and broiler and this can be explained by the normal proximate composition of chicken and duck (Brahma et al., 1984).

**Fat**

It is evident from the Table-1&2 that the fat content of the patties emulsion and cooked patties prepared from duck meat showed significantly high-
level of aerobic plate count in similar type of uncooked and cooked meat products should not be more than $6\log$ c.f.u/g and $4\log$ c.f.u/g respectively. The TPC also increased significantly with advancement of storage period in all the patties. Up to 3$^{rd}$ day, the difference was not significant and up to 14$^{th}$ day of storage at refrigerator temperature, all the patties were acceptable as per BIS (1992 a) and also as per the report of Cremer and Chipley (1977). The resultant decrease of TPC in cooked patties was due to the effect of heat on microbes (Herman et al., 1974 ; Mahapatra et al., 1998).

**Total Psychrophilic Count (TPSC)**

It is also evident from Table 3 that the TPSC of patties emulsion and cooked patties didn’t vary significantly among the three types of patties. With the advancement of storage period, the TPSC increased significantly (Nath and Mahapatra, 1995). Up to 7$^{th}$ day, the difference was insignificant. Similar trend was also observed by Bhoyar et al., 1997. The reason for the lower values of TPSC in cooked patties than that of emulsion was same as in case of TPC. During the storage period, the TPSC of cooked patties never crossed the acceptable limit as reported by Cremer and Chipley (1977).

**TBA Value**

It is clear from the Table 3 that all the three types of patties didn’t vary significantly in terms of TBA value. This value of patties prepared from duck meat was highest followed by those prepared from spent hen and broiler. Such higher value of TBA in duck patties was due to higher percentage of fat in duck meat as compared to chicken meat and this higher fat content was responsible for more oxidation in the concerned patties as per the finding of Rao and Reddy (2000). These TBA values showed a significantly ($P<0.01$) ascending trend throughout the storage period and never exceeded the values expected to produce detectable off-odours or off-flavours as TBA value of 0.69 to 2.0 mg/kg is indicative of rancidity (Greene and Cumuze, 1982).

**Sensory Qualities**

There were no significant differences among the three types of patties in sensory qualities like, appearance, flavour, tenderness, juiciness and overall acceptability as shown in Table 4. The appearance of the duck patties was better due to it’s darker colour. The duck patties scored an insignificantly less value in respect of flavour due to the inherent

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**Emulsion Stability**

Emulsion stability indicates the ability of the emulsion to hold liquid at the time of performances of the emulsion and is influenced by fat contents of the emulsion. The amount of fat, water and solids released per 100 gms of emulsion score were recorded to measure the emulsion stability upon heating (Townsend et al., 1968). The duck muscles have comparatively lower water holding capacity than chicken muscle, resulting into greater cooking loss and less emulsion stability (Joseph et al., 1992). The emulsion stability also varied significantly among these three types of patties emulsion and is shown in Table 1. The emulsion prepared from broiler carcass showed significantly ($P<0.01$) highest stability followed by that of spent hen and duck. The duck patties emulsion had comparatively lower emulsion stability due to higher fat percentage (Froning, 1972 ; Froning et al., 1973 ; Baker and Dafler, 1975).

**Cooking Yield**

Table 2 shows that the patties prepared from broiler meat showed significantly ($P<0.01$) highest value in terms of cooking yield followed by that of spent hen and duck and this is due to the highest stability of emulsion from broiler meat resulting into better retention of water and fat in meat matrix (Girish et al., 2003).

**Microbiological Analysis**

The TPC of the emulsion and cooked patties didn’t vary significantly among these three types of patties. The results in Table 3 showed that TPC in patties emulsion and cooked patties up to 14$^{th}$ day of storage were within the permissible limit of BIS (1969 and 1992 a) which specified that maximum

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**Emulsion Stability**

Emulsion stability indicates the ability of the emulsion to hold liquid at the time of performances of the emulsion and is influenced by fat contents of the emulsion. The amount of fat, water and solids released per 100 gms of emulsion score were recorded to measure the emulsion stability upon heating (Townsend et al., 1968). The duck muscles have comparatively lower water holding capacity than chicken muscle, resulting into greater cooking loss and less emulsion stability (Joseph et al., 1992). The emulsion stability also varied significantly among these three types of patties emulsion and is shown in Table 1. The emulsion prepared from broiler carcass showed significantly ($P<0.01$) highest stability followed by that of spent hen and duck. The duck patties emulsion had comparatively lower emulsion stability due to higher fat percentage (Froning, 1972 ; Froning et al., 1973 ; Baker and Dafler, 1975).

**Cooking Yield**

Table 2 shows that the patties prepared from broiler meat showed significantly ($P<0.01$) highest value in terms of cooking yield followed by that of spent hen and duck and this is due to the highest stability of emulsion from broiler meat resulting into better retention of water and fat in meat matrix (Girish et al., 2003).

**Microbiological Analysis**

The TPC of the emulsion and cooked patties didn’t vary significantly among these three types of patties. The results in Table 3 showed that TPC in patties emulsion and cooked patties up to 14$^{th}$ day of storage were within the permissible limit of BIS (1969 and 1992 a) which specified that maximum

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**Total Psychrophilic Count (TPSC)**

It is also evident from Table 3 that the TPSC of patties emulsion and cooked patties didn’t vary significantly among the three types of patties. With the advancement of storage period, the TPSC increased significantly (Nath and Mahapatra, 1995). Up to 7$^{th}$ day, the difference was insignificant. Similar trend was also observed by Bhoyar et al., 1997. The reason for the lower values of TPSC in cooked patties than that of emulsion was same as in case of TPC. During the storage period, the TPSC of cooked patties never crossed the acceptable limit as reported by Cremer and Chipley (1977).

**TBA Value**

It is clear from the Table 3 that all the three types of patties didn’t vary significantly in terms of TBA value. This value of patties prepared from duck meat was highest followed by those prepared from spent hen and broiler. Such higher value of TBA in duck patties was due to higher percentage of fat in duck meat as compared to chicken meat and this higher fat content was responsible for more oxidation in the concerned patties as per the finding of Rao and Reddy (2000). These TBA values showed a significantly ($P<0.01$) ascending trend throughout the storage period and never exceeded the values expected to produce detectable off-odours or off-flavours as TBA value of 0.69 to 2.0 mg/kg is indicative of rancidity (Greene and Cumuze, 1982).

**Sensory Qualities**

There were no significant differences among the three types of patties in sensory qualities like, appearance, flavour, tenderness, juiciness and overall acceptability as shown in Table 4. The appearance of the duck patties was better due to it’s darker colour. The duck patties scored an insignificantly less value in respect of flavour due to the inherent
characteristic ducky odour that couldn’t be masked by the spices and condiments added to prepare the emulsion. The tenderness value also didn’t vary significantly in spite of the fact that duck meat is having coarser fibre. The patties prepared from broiler scored a little higher value in respect of juiciness and this may be due to its finer fibre and higher moisture percentage. Therefore, the overall acceptability differed insignificantly among the three types of patties providing strong base for the acceptability of the spent hen and duck meat.

The storage study depicted that all the sensory quality values decreased significantly with the advancement of storage period. The decrease was insignificant up to 3rd day of storage but at the 7th day they decreased significantly (P<0.01). The values of all the sensory parameters decreased insignificantly from 14th day to 21st day of storage and the patties were unacceptable after 14th day of refrigerated storage. These findings are in agreement with the findings of Reddy and Vijayalakshmi (1998).

It is quite evident that emulsions and cooked patties prepared from broiler meat had the lowest pH as well as the lowest protein values, but the moisture content was quite higher in both the cases. The emulsion and cooked patties prepared from broiler meat also showed significantly lower fat content and highest emulsion stability and cooking yield. Regarding microbiological profile, the TPC and TPSC among these three types of patties didn’t vary significantly during the storage period and there was a definite decrease in microbiological load during cooking. The TBA value of the duck patties was highest and this value in all the three types of patties increased significantly (P<0.01) with storage period. The sensory parameters like, appearance, flavour, tenderness, juiciness and overall acceptability didn’t vary significantly among the different categories of patties.

The patties irrespective of the type of meat (whether broiler, spent hen or duck) can be stored in refrigerator up to 14th days and there is also very insignificant difference in consumers acceptability towards these different types of patties. It is quite clear from the above discussion that the spent hen and duck meat which are otherwise having less value in retail market can be utilized for preparation of patties with good nutritive value and well acceptability, ensuring better economic return to both producers and consumers. Patties prepared from these two less valued birds can also generate a good market demand with the changing food habits of the people and increased popularity of fast food items.

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