Optimum Age of Slaughter of Non-Descript Buffalo: Carcass and Yield Characteristics

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Abstract
Carcass and yield characteristics were studied in sixty south Indian non-descript buffaloes of both sexes in three different age groups viz. 6 months to 2 years, 2 to 4 years and above 4 years. A progressive increase in slaughter weight and carcass weight was observed with advance in age in both sexes. Females had more live weight than male non-descript buffaloes. The dressing percentage was greater in 2 to 4 years age group with males showing significantly higher dressing percent. A linear increase in weight of offals with age was observed, while the weight was significantly higher in females. The fat thickness was significantly greater in females of 2 to 4 years age. The percent chiller shrinkage was significantly higher in males, especially above 4 years age. The eye muscle area was significantly (P<0.01) larger in males than females. The meat: bone ratio and the eye muscle area was higher in 2 to 4 years age group. The results of the study indicated that south Indian non-descript buffaloes in the age group of 2 to 4 years are preferable for better meat production.

Keywords: non-descript buffalo, carcass yield, dressing percent

Introduction
Buffalo rearing has gained importance in recent years because of its innate ability to survive in adverse conditions and its ability to convert of low value roughages and agricultural byproducts into a good source of animal protein. The non-descript buffaloes/desi buffaloes are unrecognized breeds, which are being ignored and are present in large numbers. India holds the pride to have the largest population of buffaloes in the world, which accounts to about 53% of the total world buffalo population and 35.7% of total meat production in India (FAO, 2006).

Buffalo meat because of its low fat and calorie, are of great demand in India as well as in international market. Hence, buffalo meat industry in India has a good potential because of its large buffalo population and a competitive edge in international market due to availability of cheap labor. Buffalo meat industry is now being organized and growing very fast having an annual growth rate of 27%. India is the largest producer of buffalo meat followed by Pakistan and China.

The prospects of buffalo meat industry in India are bright, extensive and developing. It is estimated that by 2015 India will be able to produce 24 million tones of meat (worth Rs.100 thousand million) from only buffaloes. With an intention to contribute to increase the buffalo meat production in India and to give an insight on the potentialities of non-descript buffaloes for meat production, a study on the carcass yield characteristics of non-descript buffalo was undertaken so that the findings will enlighten the importance and usefulness of non-descript buffalo as a meat source, and to provide the processors and livestock producers
with adequate information on the optimum age of
slaughter of these animals for better returns.

Materials and Methods

A total number of sixty non-descript buffaloes
of both sexes in three different age groups, viz.
Group (I) – 6 months to 2 years; Group (II) – 2 to 4
years and Group (III) – above 4 years were
procured from open market in and around Chennai
city and used for this study. Each group was
allotted with 20 animals containing equal number
of both male and female animals. The animals were
given adequate rest and feed was withdrawn 12
hours prior to slaughter, during which period only
drinking water was provided. Animals were
slaughtered and dressed as per the standard
procedure (Frank Gerrard, 1977). Animals were
electrically stunned and bled. The weight of the
blood was recorded and weight of the skin was
noted after flaying. After evisceration, the carcass
was split along the vertebral column into two equal
halves. The weights of all edible and inedible
organs (viz. liver, spleen, kidneys, stomach
(includes rumen, reticulum, omasum and
abomasum with its contents, intestines, lungs,
heart, etc.) were recorded. The hot side weight of
both halves was recorded.

The subcutaneous fat depth (fat thickness) was
measured at the 10th rib, 25 mm from the lateral
boundary of longissimus dorsi muscle using
calipers/scale. Loin eye area or eye muscle area
was recorded by tracing the cross sectional area of
longissimus dorsi muscle at the 10th rib. The area
was measured by using a compensation polar
planimeter and expressed in cm². The hot carcass
sides were chilled for 24 hours at a temperature of
0±1°C. After 24 hours of chilling, weights of the
halves were recorded. The loss of weight after
chilling the carcass was recorded to calculate the
percent chiller shrinkage. Then the lean meat,
separable fat and bone were separated. The weight
of the lean along with fat and bone were recorded
to calculate the meat:bone ratio.

Results and Discussion

Mean±SE with analysis of variance for slaughter
weight (in kg), carcass weight (in kg) and dressing
percent of buffaloes of both sexes in different age
groups are presented in Table 1

Slaughter Weight

It was observed that there was a progressive
increase in slaughter weight as age advances in
both sexes. Chantalakhana et al. (1979) recorded
almost similar weights in age groups. Agnihotri
(1992) has stated that to reach a marketable weight
of 200 kg, it takes around 2 years in non-descript
buffaloes. It was observed that females had more
weights than male non-descript buffaloes. There
was a highly significant (P<0.01) difference
between age groups and between sexes; the age and
sex interaction were also significant (P<0.05). The
weights recorded in different age groups in this
study were below the slaughter weights recorded by
Cockril (1981, 1987). The lesser weight recorded
in the study could be due to non-descript type. The
females which have greater slaughter weight in this
study could be due to greater care and attention
paid by the farmers to the nutritional status of
females when compared to the deprived or underfed
males, at different ages.

There was a highly significant (P<0.01)
difference between age groups and between sexes
for both carcass weight and dressing percent. It
was observed that there was significant difference
in the carcass weight and dressing percent as the
age advances in both sexes. The mean carcass
weights indicated that there was a increase in
carcass weight as the age advances. These findings
were in congruent with the findings of Ragab et al.
(1966); Zeiden et al. (1978) and Liang et al. (1982).
The overall mean weight of the sexes indicated that
female carcasses of non-descript buffalo had more
weights than male carcasses which was in
agreement with the findings of Kondaiah et al
(1983). The overall mean dressing percent for
different age groups indicated that 2 to 4 years age
group of non-descript buffalo had more dressing
percent than other groups. The dressing percent in
female is significantly (P<0.01) lower than the male
though the dressed carcass weight is greater in
females. The lower dressing percent in females
may be due to the poor growth and consequent poor
body condition of the animals as indicated by
Ramamohana rao (1978) and Abdallah et al.
(1982).
Table 1 Mean (± SE) values of live weight, carcass weight (in kg) and dressing per cent of non-descript buffaloes of different sex and age groups.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sex</th>
<th>Group I (6 months-2 years)</th>
<th>Group II (2-4 years)</th>
<th>Group III (&gt;4 years)</th>
<th>Overall mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Live weight (kg)</td>
<td>Male</td>
<td>97.06 ± 10.30</td>
<td>147.12 ± 5.50</td>
<td>204.04 ± 6.53</td>
<td>149.41 ± 7.44</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>157.91 ± 11.12</td>
<td>248.80 ± 13.64</td>
<td>241.00 ± 13.06</td>
<td>215.90 ± 12.61</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
<td>127.49 ± 10.71</td>
<td>197.96 ± 9.57</td>
<td>222.52 ± 9.80</td>
<td>--</td>
</tr>
<tr>
<td>Carcass weight (kg)</td>
<td>Male</td>
<td>41.00 ± 4.27</td>
<td>71.20 ± 2.15</td>
<td>95.45 ± 4.35</td>
<td>69.22 ± 3.59</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>68.50 ± 4.89</td>
<td>110.25 ± 7.99</td>
<td>102.30 ± 5.68</td>
<td>93.68 ± 6.19</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
<td>54.75 ± 4.58</td>
<td>90.73 ± 5.07</td>
<td>98.88 ± 5.02</td>
<td>--</td>
</tr>
<tr>
<td>Dressing percent</td>
<td>Male</td>
<td>42.38 ± 0.69</td>
<td>48.76 ± 0.63</td>
<td>47.76 ± 0.75</td>
<td>46.30 ± 0.69</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>43.62 ± 0.72</td>
<td>43.91 ± 1.39</td>
<td>42.58 ± 1.29</td>
<td>43.37 ± 1.13</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
<td>43.00 ± 0.71</td>
<td>46.34 ± 1.01</td>
<td>45.17 ± 1.02</td>
<td>--</td>
</tr>
</tbody>
</table>

\(^1\) Values in parentheses are Arcsin \(\sqrt{\text{P mean}}\); Means bearing different superscripts between the individual cells (P<0.05) and overall mean for sex and ages (P<0.01) differ significantly.

Yield of Offals on Slaughter Weight Basis

It was observed in this study that the weight of all offals increased significantly (P<0.01) as the age advances (Table 2). The yield of offals (%) such as skin, head, lungs, liver, kidneys, stomach and intestines and heart did not show significant (P>0.05) difference between groups. Significantly higher percent yield of head (P<0.01) and skin were recorded in this study in males than females, which are congruent to the results obtained by Abdallah et al. (1982) and Kondaiah et al. (1983). The present study showed percent yield of blood was significantly (P<0.01) lower in group I than group II. Kondaiah et al. (1983) also reported lesser percent yield of blood in younger animals than aged and spent buffaloes. Similarly the weight of head, skin and feet recorded significant (P<0.01) increase in values as the age increased. These results are in agreement with Salem et al. (1983). The weight of stomach and intestines was significantly higher in females than males. Abdallah et al. (1982) and Ragab et al. (1966) suggested that the higher weight of stomach and intestines in females may be the reason for lower dressing percent yield of female buffalo carcasses than the males.

Fat Thickness

The measures of fat thickness of the carcasses are used to assess the quality and grades. The results obtained in this study indicated significant (P<0.01) increase in fat thickness as the age advanced up to 4 years with higher fat thickness recorded in 2 to 4 years age group Table 3. It was observed that the females recorded significantly (P<0.01) higher fat thickness than the male buffalo carcasses. Kondaiah et al. (1982) also reported similar results with higher fat score and fat thickness in females than males and suggested that the females were more fatty than males because the males are generally used for draft purposes, hence less fat deposition. Cockril (1985) opined that the greater fat deposition as age advances may be due to the fact that when the nutrient availability exceeds the capacity for skeletal and muscle growth, it results in dramatic increase in body fat, which occurs mostly when the animal attains approximately half of its physiological maturity. Similar results were also recorded by Ivanov and Zahariev (1966). The results revealed that there was highly significant (P<0.01) difference between age groups and between sexes for fat thickness. The age and sex interaction for fat thickness was not significant (P>0.05).
Table 2 Mean (± SE) values of yield of edible and inedible offals of south Indian non-descript buffaloes of different sex and age groups.

<table>
<thead>
<tr>
<th></th>
<th>Group I (6 months-2 years)</th>
<th>Group II (2-4 years)</th>
<th>Group III (&gt;4 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>Blood Weight</td>
<td>97.06±10.30</td>
<td>157.91±11.12</td>
<td>147.12±5.50</td>
</tr>
<tr>
<td>Yield</td>
<td>4.34±0.20</td>
<td>4.30±0.17</td>
<td>4.98±0.15</td>
</tr>
<tr>
<td>Skin Weight</td>
<td>9.60±1.24</td>
<td>15.83±1.07</td>
<td>16.55±0.85</td>
</tr>
<tr>
<td>Yield</td>
<td>9.67±0.38</td>
<td>10.08±0.26</td>
<td>11.25±0.36</td>
</tr>
<tr>
<td>(18.09)</td>
<td>(18.49)</td>
<td>(19.57)</td>
<td>(18.57)</td>
</tr>
<tr>
<td>Head Weight</td>
<td>5.90±0.36</td>
<td>8.75±0.61</td>
<td>8.70±0.33</td>
</tr>
<tr>
<td>Yield</td>
<td>6.47±0.40</td>
<td>5.56±0.11</td>
<td>5.93±0.14</td>
</tr>
<tr>
<td>Feet Weight</td>
<td>2.61±0.19</td>
<td>3.51±0.20</td>
<td>3.46±0.09</td>
</tr>
<tr>
<td>Yield</td>
<td>2.81±0.13</td>
<td>2.31±0.16</td>
<td>2.37±0.07</td>
</tr>
<tr>
<td>(9.64)</td>
<td>(8.68)</td>
<td>(8.88)</td>
<td>(7.66)</td>
</tr>
<tr>
<td>Lungs Weight</td>
<td>1.54±0.15</td>
<td>2.52±0.24</td>
<td>2.08±0.15</td>
</tr>
<tr>
<td>Yield</td>
<td>1.66±0.12</td>
<td>1.59±0.08</td>
<td>1.48±0.10</td>
</tr>
<tr>
<td>(7.40)</td>
<td>(7.27)</td>
<td>(6.99)</td>
<td>(7.71)</td>
</tr>
<tr>
<td>Liver Weight</td>
<td>1.19±0.15</td>
<td>1.91±0.21</td>
<td>1.85±0.10</td>
</tr>
<tr>
<td>Yield</td>
<td>1.20±0.06</td>
<td>1.24±0.09</td>
<td>1.26±0.06</td>
</tr>
<tr>
<td>Kidneys Weight</td>
<td>0.29±0.03</td>
<td>0.39±0.05</td>
<td>0.36±0.03</td>
</tr>
<tr>
<td>Yield</td>
<td>0.31±0.02</td>
<td>0.25±0.02</td>
<td>0.24±0.02</td>
</tr>
<tr>
<td>(3.18)</td>
<td>(2.85)</td>
<td>(2.81)</td>
<td>(2.73)</td>
</tr>
<tr>
<td>Spleen Weight</td>
<td>0.23±0.03</td>
<td>0.44±0.06</td>
<td>0.41±0.03</td>
</tr>
<tr>
<td>Yield</td>
<td>0.23±0.01</td>
<td>0.28±0.03</td>
<td>0.28±0.02</td>
</tr>
<tr>
<td>(2.72)</td>
<td>(2.98)</td>
<td>(3.04)</td>
<td>(3.25)</td>
</tr>
<tr>
<td>Stomach &amp; Intestines Weight</td>
<td>29.55±3.07</td>
<td>42.05±4.08</td>
<td>45.40±2.53</td>
</tr>
<tr>
<td>Yield</td>
<td>30.71±0.96</td>
<td>26.63±1.73</td>
<td>30.48±1.43</td>
</tr>
<tr>
<td>(33.62)</td>
<td>(30.95)</td>
<td>(33.45)</td>
<td>(31.74)</td>
</tr>
<tr>
<td>Heart Weight</td>
<td>0.52±0.10</td>
<td>0.69±0.05</td>
<td>0.64±0.03</td>
</tr>
<tr>
<td>Yield</td>
<td>0.60±0.17</td>
<td>0.44±0.01</td>
<td>0.44±0.02</td>
</tr>
<tr>
<td>(4.19)</td>
<td>(3.81)</td>
<td>(3.78)</td>
<td>(3.88)</td>
</tr>
</tbody>
</table>

Values in parentheses are Arcsin √P mean; Means bearing different superscripts in each sub cell and in overall mean for sex and ages differ significantly (P<0.01 or P<0.05).

Eye Muscle Area

The measurement of eye muscle area is used as a yard stick of muscle development in animals. The analysis of variance revealed that there was a highly significant (P<0.01) difference between age groups and between sexes for eye muscle area (Table 3). The results of this study indicated that there was significant (P<0.01) increase in eye muscle area as age increased up to 4 years. The results were in agreement with the findings of Ramamohana Rao (1978). He opined that the loin muscle cross-sectional area increased as the slaughter weight increased and can be used as an index of muscling in the animal.

It was also observed in this study that the males possessed (P<0.01) larger eye muscle area (17.40 cm²) than the females (15.62 cm²). Kondaiah et al. (1983) reported slightly higher eye muscle area in
Table 3 Mean (± SE) values of fat thickness, eye muscle area, chiller shrinkage and meat : bone ratio of non-descript buffaloes of different sex and age groups.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sex</th>
<th>Group I (6 months-2 years)</th>
<th>Group II (2-4 years)</th>
<th>Group III (&gt;4 years)</th>
<th>Overall mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fat thickness</td>
<td>Male</td>
<td>0.06 ± 0.02</td>
<td>0.11 ± 0.01</td>
<td>0.13 ± 0.02</td>
<td>0.10± ± 0.02</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>0.14 ± 0.02</td>
<td>0.26 ± 0.02</td>
<td>0.21 ± 0.02</td>
<td>0.20± ± 0.02</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
<td>0.18 ± 0.02</td>
<td>0.18 ± 0.02</td>
<td>0.17 ± 0.02</td>
<td>--</td>
</tr>
<tr>
<td>Eye muscle area</td>
<td>Male</td>
<td>14.19 ± 0.86</td>
<td>19.20 ± 0.49</td>
<td>18.81 ± 0.64</td>
<td>17.40± ± 0.66</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>12.73 ± 0.62</td>
<td>17.53 ± 0.88</td>
<td>16.59 ± 0.68</td>
<td>15.62± ± 0.73</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
<td>13.46 ± 0.74</td>
<td>18.37 ± 0.69</td>
<td>17.70 ± 0.66</td>
<td>--</td>
</tr>
<tr>
<td>Chiller shrinkage</td>
<td>Male</td>
<td>4.35 ± 0.38</td>
<td>4.29 ± 0.54</td>
<td>5.35 ± 0.78</td>
<td>4.66 ± 0.57</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>2.85 ± 0.30</td>
<td>2.39 ± 0.30</td>
<td>3.46 ± 0.28</td>
<td>2.90 ± 0.44</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
<td>3.60 ± 0.34</td>
<td>3.34 ± 0.42</td>
<td>4.40 ± 0.53</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(11.91)</td>
<td>(11.75)</td>
<td>(12.97)</td>
<td>(12.21)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(9.59)</td>
<td>(8.74)</td>
<td>(10.63)</td>
<td>(9.65)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(10.75)</td>
<td>(10.24)</td>
<td>(11.80)</td>
<td>--</td>
</tr>
<tr>
<td>Meat : Bone ratio</td>
<td>Male</td>
<td>3.66 ± 0.35</td>
<td>3.03 ± 0.22</td>
<td>2.26 ± 0.08</td>
<td>2.98 ± 0.22</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3.16 ± 0.37</td>
<td>3.36 ± 0.29</td>
<td>2.91 ± 0.46</td>
<td>3.14 ± 0.37</td>
</tr>
<tr>
<td></td>
<td>Overall</td>
<td>3.41± ± 0.36</td>
<td>3.19± ± 0.26</td>
<td>2.58± ± 0.27</td>
<td>--</td>
</tr>
</tbody>
</table>

Values in parentheses are Arcsin √P mean; Means bearing different superscripts between the individual cells (P<0.05) and overall mean for sex and ages (P<0.01) differ significantly.

males than female buffaloes. Ramamohana Rao (1978) also noticed similar observations of lowest eye muscle area in females.

**Chiller Shrinkage**

Assessment of chiller shrinkage plays an important role in meat handling, processing and merchandising. The different age groups did not show any significant (P>0.05) difference in their chiller shrinkage (Table 3). It was observed that chiller shrinkage (%) was significantly (P<0.01) higher in males (4.66%) than females (2.90 %), indicating male buffalo carcasses suffered higher chilling loss than the females. Abdallah et al. (1982) noticed a similar findings comparable to this study in chiller shrinkage and reported that cooler shrink was higher in buffalo bull carcasses than buffalo cow carcasses which may be due to less fat cover in bulls than in cow carcasses.

**Meat:Bone Ratio**

It was observed that the meat : bone ratio decreased with increase in age (Table 3). There was a significant (P<0.05) decrease in meat : bone ratio in Group III (above 4 years age). Ivanov and Zahariev (1966) opined that with increasing age the percentage of fat in the carcass also increased at the expense of lean. Zeiden et al. (1978) recorded lower proportion of bone percent in 24 months old buffaloes than 15 and 18 months old buffaloes. Similar results were also observed by Zakhariev and Petrov (1981). Meat : bone ratio between sexes did not differ significantly (P>0.05). Though statistically insignificant the females showed higher meat : bone ratio than males.

The results of the study indicated that slaughter of 2 to 4 years age non-descript buffaloes can be advocated for meat production considering the various favorable characteristics like live weight, higher carcass yield, yield of offals, fat thickness, meat to bone ratio, eye muscle area and chiller shrinkage. Since fat percentage of buffalo milk is high, it is in high demand in most places and considering this proper rearing of male buffaloes and slaughtering will meet the present day meat production.
References


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