Nutrients intake, physiological and behavioral pattern in cross-bred cow as influenced by different feed supplements during winter

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Abstract

A study was conducted on the fifteen lactating cross-bred for 90 days during winter. Cows were divided into three groups on basis of their milk yield/day and subjected to three dietary treatments were formulated with feed supplements, i.e. concentrate mixture (T1), concentrate mixture + UMMB (T2) and concentrate mixture + Azolla (T3) and the studied for nutrient intake, their physiological and behavioral pattern of crossbred cows. Average maximum and minimum temperature (°C) was 23.470±0.301 and 13.044±0.334 in closed barn. The averages DMI on 100 kg body weight were 2.734±0.189, 2.940±0.168 and 2.837±0.212 kg in T1, T2 and T3, respectively. The mean DCPI & TDNI on 100kg body weight were 0.183±0.021, 0.210±0.018 and 0.190±0.024 & 1.814±0.072, 1.958±0.182 and 1.840±0.144kg in T1, T2 and T3 group’s cows, respectively. The rectal temperature and respiration rate was not significantly affected (P<0.05) by the treatments. The animals spent more time (minutes) in eating during day than in night in all the groups. Average eating time (minutes)/day (24 hours) was more (P<0.05) in T2 (306.22) group as compared to T3 (300.00) and T1(283.95) groups. The average resting time (minutes)/day (24 hours) was higher (P<0.05) in T2 668.33 and as compared to T1 660.89. It may be inferred that feeding of concentrate mixture on low quality roughage diet with UMMB supplement was improved the nutrient intake, eating time and better physical performance of crossbred cows during winter season.

Keyword: Crossbred cows, UMMB, Azolla, Behavioral pattern, Physiological response.

Introduction

India has the largest population of dairy animals and is also highest producer of milk in the world. India stands first rank in milk production with annual milk production 155.5 million tones and milk availability is 337 g per capita / day. The livestock sector in India contributes to the rural economy by providing milk, meat, wool, manure, urine energy etc. Most of the developing countries are suffering from feed deficits. Nutritional quality of crop residues and other fibrous agro-industrial by products available for animal feeding is not adequate to meet even the maintenance requirements of animals (Ghosh et al, 1993) [6]. Feeding balanced ration plays a crucial role in any livestock development programme in order to exploit optimum genetic potential of animals. To increase the productivity of milk animals through supplementation of these poor quality roughages is necessary to fulfill the deficiency of nutrients by incorporating these in the feeding systems of animals (Sampath et al., 1995) [18]. The research for alternatives to concentrates led us wonderful plant Azolla and UMMB, which holds the promise providing sustainable feed for livestock. Introduction of UMMB lick technology is one of the methods developed in recent year to combat the nutritional status of dairy animals. Several experiments concludes that supplementation of UMMB licks significantly increase feed intake, milk yield, maintained body weight and body conditions score of the cows (Kayastha et al., 2012) [11]. Azolla is a floating fern on the surface of water by means of numerous, small, closely overlapping scale like leaves with their roots hanging in the water. Feed additive are used to enhance the animal performance by improving the balance of microbial flora in the gastrointestinal tract and nutrient utilization as reported by earlier workers (Khadem et al., 2007) [12]. Generally, in villages, Cattle are kept without access to adequate shelter reared on poor quality dry roughages which adversely affect their health and production performance. Keeping this in view, the present study was planned to investigate the Nutrients Intake, Physiological and Behavioral Pattern in Cross-bred Cow as influenced by different feed supplements during winter.
**Materials and Methods**

The experiment was conducted on fifteen lactating crossbred (Tharparkar/Sahiwal x Holstein Friesian) cows in early stage of lactation were selected during winter (90 days) from 20-10-2016 to 17-01-2016 in completely randomized design (CRD) at the animal farm of LPM department, SKNCOA, Jobner. The animals were randomly divided into three groups of five in each group on basis of nearest milk yield of average per day and were allotted to the following feed supplements/dietary treatments:-

- **T1 - Concentrate mixture (Control):** The group animals were maintained on conventional diet of wheat straw ad lib. and concentrate mixture (sarus feed). The CP content of concentrate mixture and wheat straw was 18.70% and 4.40%.

- **T2 - Concentrate mixture (Pelleted feed) + UMMB: T1 + UMMB (Urea Molasses mineral bricks) additionally ad lib. as approximate @ 300g/head/day by licking. UMMB was prepared by Govt. Dairy Plant and CP content was 31.73%.

- **T3 - Concentrate mixture + Azolla: T1 + 1.5 kg Azolla daily of each animal. The CP content of Azolla was 21.37%.

Similar housing and managerial facilities were provided to all the groups. The experimental crossbred cows were kept individually tied day and night during experimental period in cattle shed. The animals were offered individual feeding. All crossbred cows were dewormed with suitable anthelmentics before the start of actual experiment. All animals exist for 15 days pre-experimental period. The experimental crossbred cows were kept and managed in similar housing and managemental facilities provided to the animals and concentrate mixture (sarus feed). The CP content of concentrate mixture and wheat straw was 18.70% and 4.40%.

The concentrate as Concentrate mixture contained 18.70% CP, 3.40% EE and 9.80% CF as well as DCP and TDN were 6.28 and 74.35%. The animals were fed in the morning as per their requirement (ICAR, 1998) [8]. UMMB (Urea Molasses Mineral bricks) provided additionally ad lib. as approximate @ 300 g/head/day by licking for 30 minutes in morning for supplementary as well as value addition of such poor quality feed resources of ruminants. If any animal not licking but biting of bricks, use of plastic box for UMMB to better licking was adopted. The main aim is to improve the nutritive value of the traditional straw based diet and thereby increasing the milk productivity of dairy animals. The fresh Azolla collected then incorporated in the concentrate mixture. All animals were offered ad-lib water in the morning and evening daily. The experimental animal had free access to clean and fresh drinking water during the experimental period.

Meteorological observations like maximum and minimum temperatures were recorded at 9.00 AM and 3.00 PM during experiment at fortnightly interval. Rectal temperature (°F) and Respiration rate (counts/minute) were recorded at 9 AM and 3 PM at fortnightly interval during experiment. The body temperature was recorded by inserting the clinical thermometer into the rectum of animal for one minute. Respiration rate was recorded by counting movements of right flank (counts/minute) of cows (Bhatnager and Chaudhary, 1960) [2]. The actual feeding and resting behavior of cows will be recorded (time spent in eating of feed & fodder) for day and night recorded at monthly interval during experiment.

The samples of feed, fodder and feces, residue left over were analyzed for proximate principles (AOAC, 2000) [1]. The experiment data were statistically analyzed by completely randomized design (CRD) using standard statistical methods (Snedecor and Cochran, 1994) [23].

**Results and Discussion**

**Micro-Climate in Experimental House**

The mean values of meteorological parameters recorded under closed barn condition are presented in Table 1. The mean maximum temperature was 23.470±0.301°C and the mean minimum temperature was 13.044±0.334°C, respectively. These values are in agreement with findings by Thomas et al., (1978) [24]. Both maximum and minimum temperature values in closed barn the fell gradually from the beginning of experiment (October 3rd week) to the mid of December and thereafter also decline trend flow up to the end of the experiment. This may be because house was completely closed by walls except windows. So that cows were protected from cold stress. Similar trend were reported by Jat and Yadav (2010) [9] and Shekhawat and Chaudhary (2012) [20].

**Table 1: Average maximum and minimum temperature (°C) in conventional barn system during experiment**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Morning</th>
<th>Evening</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum temperature</td>
<td>22.085±0.353</td>
<td>24.854±0.303</td>
<td>23.470±0.301</td>
</tr>
<tr>
<td>Minimum temperature</td>
<td>12.069±0.360</td>
<td>14.019±0.372</td>
<td>13.044±0.334</td>
</tr>
</tbody>
</table>

**Proximate Composition of Feed and Fodders**

The Chemical composition of different feed and fodders fed to crossbred cows in the experiment is presented in Table 2. The level of nutrients in the total diet was sufficient to meet the nutrients requirement of cows as per ICAR (1998) [8].

**Table 2: Chemical composition (%) of feed and fodders (DM basis) offered to crossbred cows.**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Ingredients</th>
<th>DM</th>
<th>CP</th>
<th>EE</th>
<th>CF</th>
<th>NFE</th>
<th>ASH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Wheat straw</td>
<td>90.67</td>
<td>4.40</td>
<td>1.85</td>
<td>32.40</td>
<td>48.85</td>
<td>12.50</td>
</tr>
<tr>
<td>2.</td>
<td>Concentrate mix.</td>
<td>90.20</td>
<td>18.70</td>
<td>3.40</td>
<td>09.80</td>
<td>57.92</td>
<td>10.18</td>
</tr>
<tr>
<td>3.</td>
<td>UMMB</td>
<td>82.15</td>
<td>31.73</td>
<td>4.89</td>
<td>05.70</td>
<td>34.51</td>
<td>23.17</td>
</tr>
<tr>
<td>4.</td>
<td>Azolla</td>
<td>07.80</td>
<td>21.37</td>
<td>2.80</td>
<td>13.20</td>
<td>46.42</td>
<td>16.21</td>
</tr>
</tbody>
</table>

**Dry Matter Intake**

The average daily dry matter intake (DMI) of cows in different treatments is presented in Table 3. The averages DMI on 100 kg body weight were 2.734±0.189, 2.940±0.168 and 2.837±0.212 kg in T1, T2 and T3, respectively. This clearly indicated that wheat straw, which is deficient in nitrogen, energy and minerals, was consumed in higher quantities when these deficiencies were removed by supplementing with UMMB + pellet feed. This may be due to better palatability improving voluntary feed intake (Tiwari et al., 1990) [25].

**Nutrients Intake**

**CP & DCP Intake**

The average crude protein intakes (CPI) of cows in different treatments is given in Table 3. The mean CPI/100kg body weight was 0.273±0.020, 0.313±0.037 and 0.285±0.026 kg, respectively. The CP intake in the treatment T2 was more than as compared to T1 and T3 (P<0.05). The mean DCP/100kg body weight was 0.183±0.021, 0.210±0.018 and 0.190±0.024 kg, respectively. The DCP intake in the treatment T2 was higher than T1 and T3.
TDN intake

The average total digestible nutrients intake (TDNI) have been given in Table 3. When TDN intake was calculated on 100kg body weight basis was 1.814±0.072, 1.958±0.182 and 1.840±0.144kg in T1, T2 and T3 group’s cows, respectively. It was higher in T2 group than other two groups. Improved nutrient utilization with higher feed intake resulted higher TDN intake in UMMB supplemented group. The results are in agreement with the findings of Kumar et al., (2012) [13], Parashuramulu et al., (2013) [16] and Meel et al., (2015) [14].

Physiological Responses

Physiological responses have been considered as in index of animal comfort and discomfort. The concept of adaptation refers to physiological changes taking place in an animal with respect to external and internal stimuli. High and low ambient temperature has been shown to increase the respiration rate in all groups irrespective of treatment. The respiration rate both in morning and evening was not affected (P<0.05) by feed supplements. A slight increase in respiration rate in the latter part of the experiment was observed which may be attributed to decrease in temperature being the Fag end of the winter season. The results are in agreement with the findings of Thomas et al., (1978) [24], Singh et al., (2008) [21] and Yadav and Choudhary (2010) [26].

Table 3: Effect of different feed supplements on Nutrient intake of crossbred cow during winter.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMI Kg/100 kg BW</td>
<td>2.73±0.141</td>
<td>2.94±0.168</td>
<td>2.83±0.212</td>
</tr>
<tr>
<td>CPI/100 kg BW</td>
<td>0.273±0.020</td>
<td>0.313±0.037</td>
<td>0.285±0.026</td>
</tr>
<tr>
<td>DCP intake/100 kg BW</td>
<td>0.183±0.021</td>
<td>0.210±0.018</td>
<td>0.190±0.024</td>
</tr>
<tr>
<td>TDN intake/100 kg BW</td>
<td>1.814±0.072</td>
<td>1.958±0.182</td>
<td>1.840±0.144</td>
</tr>
</tbody>
</table>

Means having different superscript differ significantly (P<0.05)

Animal Behaviour

Each animal species has characteristic ways of performing certain functions and rarely departs from them. Although animals of a particular species have some common specific behavioral pattern yet several factors may influence variation in the same. In fact an animal’s makes behavioral adjustments to adapt to any change in microenvironment. Thereby in the present study feeding and resting time of crossbred cows have been investigated.

Eating Time

The eating time was presented in Table 5 and along with monthly interval. The average eating time was 158.73±7.39, 170.78±5.85 and 170.67±4.96 minutes during day time in T1, T2 and T3, respectively. The average eating time was 125.22±4.48, 135.44±1.44 and 129.33±1.63 minutes during night time in respective treatments. The overall mean eating time was 283.95±11.21, 306.22±5.45 and 300.00±3.76 minutes per day in T1, T2 and T3, respectively. The data of analysis of variance (Table 20) revealed that the average eating time was significantly affected (P<0.05) in T3 than T2 and T1. The result indicated that the eating time of cows under T2 and T3 was higher (P<0.05) as compared to T1 treatment. The difference between T2 and T1 were also significant. This is in agreement with the eating times found in well designed with Cook et al., (2004) [4] and Sharma and Singh, (2002) [19].

Resting Time

The resting time was presented in Table 5 and along with monthly interval. The average resting during day time was 255.56±6.57, 249.89±13.02 and 258.00±11.28 minutes in T1, T2 and T3, respectively. The average resting time was 405.33±15.44, 418.44±14.25and 410.67±8.26 minutes during night in respective treatments. The overall mean of resting time was 660.89±14.28, 668.33±16.46 and 668.67±15.04 minutes per day in T1, T2 and T3, respectively. The result indicated that the resting time of cows under T2 and T3 was higher as compared to T1 treatment. The difference between T2 and T1 were significant. From studies designed to make cattle work for access to a place to rest, it would appear that cows target around 9-12 h/d target lying time. Similar results were obtained by Hafez (1975) [7], Jensen et al., (2005) [10-15] and Munksgaard et al., (2005) [10-15].
Table 5: Average eating and resting time (minutes) of crossbred cow under different treatments

<table>
<thead>
<tr>
<th>Parameter</th>
<th>T₁</th>
<th>T₂</th>
<th>T₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A) Eating time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day</td>
<td>158.73±7.39</td>
<td>170.78±5.85</td>
<td>170.67±4.96</td>
</tr>
<tr>
<td>Night</td>
<td>125.22±4.48</td>
<td>135.44±1.44</td>
<td>129.33±1.63</td>
</tr>
<tr>
<td>24 hour</td>
<td>283.95±11.21</td>
<td>306.22±5.45</td>
<td>300.00±3.76</td>
</tr>
<tr>
<td>(B) Resting time</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Day</td>
<td>255.58±6.57</td>
<td>249.89±13.02</td>
<td>258.00±11.28</td>
</tr>
<tr>
<td>Night</td>
<td>405.33±15.44</td>
<td>418.44±14.25</td>
<td>410.67±8.26</td>
</tr>
<tr>
<td>24 hour</td>
<td>660.89±14.28</td>
<td>668.33±16.46</td>
<td>668.67±15.04</td>
</tr>
</tbody>
</table>

Means having different superscript differ significantly (P<0.05)

Conclusion
It concluded that feeding of concentrate mixture on wheat straw diet with UMMB supplement was improved the nutrient intake, eating time & better physical performance of crossbred cows during winter season.

References