International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2017; 5(4): 1616-1619

Received: 18-05-2017
Accepted: 20-06-2017

Jaswant Kumar Regar
A post graduate agriculture student, Department of LPM, S.K.N. College of Agriculture, Jobner, Jaipur (Raj.), India

RP Jat
Professor and Head, Department of LPM, S.K.N. College of Agriculture (Sri Karan Narendra Agriculture University)-Jobner, Jaipur (Raj.), India

Correspondence
Jaswant Kumar Regar
A post graduate agriculture student, Department of LPM, S.K.N. College of Agriculture, Jobner, Jaipur (Raj.), India

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

Jaswant Kumar Regar and RP Jat

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 (T_1), concentrate mixture + UMMB (T_2) and concentrate mixture + Azolla (T_3) 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 T_1, T_2 and T_3, 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 T_1, T_2 and T_3 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 T_2 (306.22) group as compared to T_3 (300.00) and T_1(283.95) groups. The average resting time (minutes)/day (24 hours) was higher (P<0.05) in T_2) 668.33 (and as compared to T_1)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 milch 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:-

- **T_1 - 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%.

- **T_2 - Concentrate mixture (Pelleted feed) + UMMB:** T_1 + 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%.

- **T_3 - Concentrate mixture + Azolla:** T_1 + 1.5 kg Azolla daily of each animal. The CP content of Azolla was 21.37 %.

Similar housing and managemental 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 for removing parasitic eggs before the start of actual experiment. All animals exist for 15 days pre-experimental trial as the adaptation period. All cows were fed wheat straw (*Triticum aestivum*) *ad lib.* as dry fodder during experiment. 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 feaces, 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-Cilmate 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 (^{O}C) in conventional barn system during experiment

	Parameter		
	Morning	**Evening**	**Mean**
Maximum temperature	22.085 ±0.353	24.854 ±0.303	23.470±0.301
Minimum temperature	12.069±0.360	14.019±0.372	13.044±0.334

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.

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

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 T_1, T_2 and T_3, 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) have been 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 T_2 was more than as compared to T_1 and T_3 ($P<0.05$). The mean DCPI/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 T_2 was higher than T_1 and T_3

(P<0.05). The higher crude protein and digestible crude protein intake in treatment T_2 group might be attributed to higher dry matter intake, which was due to better utility of nutrients through feed additive as UMMB conditions. Crude protein intake by the animals was sufficient to meet the body requirements. 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].

TDN intake

The average total digestible nutrients intakes (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 T_1, T_2 and T_3 group's cows, respectively. It was higher in T_2 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 Sihag *et al*., (2006) [22] Kumar *et al*., (2012) [13] and Choubey *et al.,* (2015) [3].

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

Parameters	T_1	T_2	T_3
DMI Kg /100 kg BW	2.734^{c}±0.141	2.940^{a}±0.168	2.837^{b}±0.212
CPI/100kg BW	0.273^{c}±0.020	0.313^{a}±0.037	0.285^{bc}±0.026
DCP intake/100kg BW	0.183^{c}±0.021	0.210^{a}±0.018	0.190^{bc}±0.024
TDN intake/100kg BW	1.814^{c}±0.072	1.958^{a}±0.182	1.840^{bc}±0.144

Means having different superscript differ significantly (P<0.05)

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 and body temperature of the animal (Raghavan and Mulick, 1961; Gangwar *et al*., 1980) [17, 5].

Rectal Temperature

The rectal temperature was presented in Table 4. The data on rectal temperature recorded at fortnightly interval. The average body temperature was 100.01±±0.235, 100.08±0.234 and 100.06±0.206°F in, respective treatment. The results showed that the average rectal temperature both morning and evening was non-significant (P<0.05) between treatments. The analysis of variance revealed that the effect of treatment on rectal temperature was non-significant. It was observed that the maximum variation in rectal temperature was during the mid of the experiment, while in the beginning and at the end of the experiment there were not much difference in rectal temperature of the crossbred cow. This shows that supplement feeds used have nothing to do with the variation in rectal temperature. The mean values of RT during morning varied from 99.91±0.242°F to 100.14±0.216°F. The results are in agreement with the findings of Thomas *et al*., (1978) [24] and Yadav and Choudhary (2010) [26].

Respiration Rate

The respiration rate was presented in Table 4. The data on respiration rate recorded at fortnightly interval. The average respiration was 20.46±0.30, 20.91±0.34 and 20.82±0.31 breath per minutes in, respective treatment. There was no significant difference between T_1, T_2 and T_3 treatments. The average respiration rate in the evening was higher than morning 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 4: Average daily rectal temperature (°F) and respiration rate (br/min.) of crossbred cow under different treatments

Parameters	(A) Rectal temperature (°F)		
	T_1	T_2	T_3
Morning	99.91±0.242	100.14±0.216	100.10±0.201
Evening	100.11±0.244	100.03±0.315	100.02±0.262
Average	100.01±0.235	100.08±0.234	100.06±0.206
	(B) Respiration rate (br/min.)		
Morning	19.65+0.30	20.12+0.31	19.97+0.28
Evening	21.19+0.34	21.69+0.40	21.56+0.37
Average	20.46+0.30	20.91+0.34	20.82+0.31

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 T_1, T_2 and T_3, 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 of eating time was 283.95±11.21, 306.22±5.45 and 300.00±3.76 minutes per day in T_1, T_2 and T_3, respectively. The data of analysis of variance (Table 20) revealed that the average eating time was significantly affected (P<0.05) in T_2 than T_3 and T_1. The result indicated that the eating time of cows under T_2 and T_3 was higher (P<0.05) as compared to T_1 treatment. The difference between T_2 and T_3 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 T_1, T_2 and T_3, 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 T_1, T_2 and T_3, respectively. The result indicated that the resting time of cows under T_2 and T_3 was higher as compared to T_1 treatment. The difference between T_2 and T_3 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

Parameter	T_1	T_2	T_3
(A) Eating time			
Day	158.73^{c}±7.39	170.78^{ab}±5.85	170.67^{b}±4.96
Night	125.22^{c}±4.48	135.44^{a}±1.44	129.33^{b}±1.63
24 hour	283.95^{c}±11.21	306.22^{a}±5.45	300.00^{b}±3.76
(B) Resting time			
Day	255.56^{b}±6.57	249.89^{c}±13.02	258.00^{a}±11.28
Night	405.33^{c}±15.44	418.44^{a}±14.25	410.67^{b}±8.26
24 hour	660.89^{c}±14.28	668.33^{a}±16.46	668.67^{ab}±15.04

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

1. AOAC. Official Methods of Analysis of the AOAC international. 17TH Edition, AOAC International, Gaitherburg, MD, USA, 2000, 1-2.
2. Bhatnager DS, Chaudhary NC. Influence of climate on the physiological reactions in Murrah buffalo calves. Indian Vet. J. 1960; 37:404-408.
3. Choubey M, Wadhwa M, Bakshi MPS. Evaluation of urea molasses multi-nutrient blocks containing alternate feed resources in buffaloes. Buffalo Bulletin, 2015; 34(1).
4. Cook NB, Bennett TB, Nordlund KV. Effect of free stall surface on daily activity patterns in dairy cows, with relevance to lameness prevalence. J. Dairy Sci. 2004; 87:2912-2922.
5. Gangwar PC, Soni PL, Mehta SN. Effect of environmental cooling on certain physiological and milk ejection responses of buffaloes. Indian J. Nutr. & Dietetics. 1980; 17:302-308.
6. Ghosh A, Alam MGS, Akbar MA. Effect of urea molasses mineral block supplementation on post partum ovaries activity in Zebu cows. Anim. Reprod. Sci. 1993; 31:61-67.
7. Hafez ESE. The behavior of domestic animals. 3rd edn. Baillere; Tindall and Cox Ltd., London, 1975.
8. ICAR. Nutrient Requirements of Livestock and Poultry. 2nd ed. Indian Council of Agriculture Research, New Delhi, 1998.
9. Jat RP, Yadav BL. Growth and behavioural pattern of buffalo calves under different shelter modifications during winter. Indian J. Ani. Sci. 2010; 80(7):686-689.
10. Jensen MB, Pedersen LJ, Munksgaard L. The effect of reward duration on demand functions for rest in dairy heifers and lying requirements as measured by demand functions. Appl. Anim. Behav. Sci. 2005; 90:207-217.
11. Kayastha TB, Dutta S, Roy RK. Impact of supplementation of UMMB licks in the ration of dairy animals. VETSCAN. 2012; 7(1):107-110.
12. Khadem AA, Pahlavan M, Afzalzadeh A, Rezaeian M. Effects of live yeast *S. cerevisiae* on fermentation parameters and microbial populations of rumen, total tract digestibility of diet nutrients and on the in situ degradability of alfalfa hay in Iranian Chall sheep. Pak. J. Biol. Sci. 2007; 10(4):590.
13. Kumar DS, Prasad RMV, Kishore KR, Rao ER. Effect of azolla *(Azolla pinnata*) based concentrate mixture on nutrient utilization in buffalo bulls. Indian J. Anim. Res. 2012; 46(3):268-271.
14. Meel S, Sharma V, Sharma S, kaushik P. Effect of Feeding Urea Mineral Molasses Block on Milk Production Traits and Economics in Jersey Crossbred Cows. International Journal of Scientific Research. 2015; 4(2):368-369.
15. Munksgaard L, Jensen MB, Pedersen LJ, Hansen SW, Matthews L. Quantifying behavioural priorities-effects of time constraints on behavior of dairy cows. Appl. Anim. Behav. Sci. 2005; 92:3-14.
16. Parashuramulu S, Swain PS, Nagalakshmi D. Protein fractionation and in vitro digestibility of Azolla in ruminants. Online J. Anim. Feed Res. 2013; 3(3):129-132.
17. Raghavan GV, Mullick DN. Effect of air temperature and humidity on the pulse rate, respiration rate and rectal temperature in buffalo bulls. Indian Vet. J. 1961; 38:391-399.
18. Sampath TK, Saha RC, Prasad CS, Singh GP, Walli TK. Supplementation of straws. *Handbook of Straw Feeding System*, (Eds. Kiran Singh and J.B. Schiere), Indian Council of Agriculture Research, New Delhi, India and Department of Tropical Animal Production, Agricultural University, Wageningen, The Netherlands, 1995; p. 203.
19. Sharma P, Singh K. Shelter seeking behaviour of dairy cattle in various types of housing systems. Indian J. Anim. Sci. 2002; 72(1):91-95.
20. Shekhawat LS, Chaudhary JL. Effect of roof modifications in loose house on intake and utilization of nutrients and milk yield in lactating crossbred cows during winter season. J. Dai. Sci. 2012; 65(6):501-07.
21. Singh SV, Soly MJ, Kund SS. Feed intake, growth rate and physiological responses during spring and hot dry season in karan fries males. Indian J. Anirn. Nutr. 2008; 25(2):163-167.
22. Sihag ZS, Punia BS, Kishore N. Effect of feeding urea molasses mineral blocks on productive performance of lactating buffaloes. Indian J. Anim. Nutr. 2006; 24(1):24-26.
23. Snedecor GW, Cochran WG. Statistical methods. 8th Edn. Lowa state University Press, Ames, lowa, 1994.
24. Thomas CK, Tripathi VN, Sastry NSR, Yadav RS, Gupta LR, Singh K, *et al*. Loose housing was versus conventional tie- barn for lactating crossbred and buffalo cows during winter under two levels of feeding. Indian J. Dairy Sci. 1978; 31:128-134.
25. Tiwari SP, Singh UB, Mehra UR. Urea molasses mineral blocks as a supplement: effect on growth and nutrient utilization in buffalo calves. Anim. Feed Sci. Technoogyl. 1990; 29:333-341.
26. Yadav CM, Chaudhary JL. Effect of feeding protected protein on growth performance and physiological reaction in crossbred Heifers. Indian J. Anim. Nutr. 2010; 27(4):401-407.