SURVEY OF EXISTING RURAL FEEDING PRACTICES AND NUTRIENT STATUS OF LACTATING BUFFALOES IN INDORE DISTRICT OF MADHYA PRADESH

Anil Kumar Yadav*, Ravindra Kumar Jain, Dinesh Thakur and Mukesh Kumar Mehta

ABSTRACT

In Indore district of Madhya Pradesh, farmers are following traditional feeding practices. Dairy animals are mostly fed on straw based ration. Due to non- availability of balanced ration to dairy animals, productive performance is not up to the level of the satisfaction. Keeping this in view the survey of existing feeding practices in lactating buffaloes was done in the 10 villages around College of Veterinary Science and Animal Husbandry, Mhow. Eight to twelve farmers from each village were selected randomly and information about herd strength, available feedstuffs, use of mineral-vitamin supplements, daily feed offered, residue left and milk yield of individual animal were collected in a questionnaire. Quantities of feed offered/residue left and milk yield were verified randomly by weighing through portable digital balance. Milk samples were collected randomly and analysed for fat content. Body weights of animals were determined from body measurements. The representative sample of each feed ingredient was collected and analyzed for proximate principles, Ca and P. The carotene was calculated from reported values of feedstuffs. Then nutrient (DCP, TDN, Ca, P and Carotene) supply was calculated and compared with standard requirements to work out nutrient excess/deficit. It has been observed that five types of feeding patterns were followed by farmers, out of 104 dairy farmers visited having 347 buffaloes, all most all of the farmers practice stall feeding and offer feeds twice in a day.

The available feedstuffs were straws (wheat/ gram/masoor/soybean) uncultivated natural local grass, MP chari, maize fodder, cotton seed cake (un-decorticated), wheat bran and compounded feed. Majority of farmers were feeding mixture of straws (wheat straw + gram straw) + local grasses + cotton seed cake + wheat bran. Very few farmers were supplementing mineral mixture and salt. No farmer is supplementing vitamins. Studies on nutrient availability in different feeding patterns indicated that DCP was excess (4.91 to 28.52%), while TDN (3.28 to 10.93%), phosphorous (18.17 to 43.73%) and carotene (17.90 to 57.54%) were deficient in all five feeding patterns. Calcium was deficient in Pattern I (4.16%), II (54.83%) and III (17.16%) and excess in feeding Pattern IV (8.03%) and Pattern V (65.66%). Ca: P ratios in rations of buffaloes under different feeding pattern ranged between 1.25:1 to 3.55:1 against optimum ratio 1.56:1. It was concluded that DCP was moderately high and TDN was marginally deficient while phosphorous and carotene were moderate to highly deficient in the rations of lactating buffaloes of the region. Calcium was deficient in feeding Pattern I, II and III and adequate in Pattern IV while excess

Department of Animal Nutrition College of Veterinary Science and Animal Husbandry, Nanaji Deshmukh Veterinary Science University, Mhow, India, *E-mail: anilyadavvet@gmail.com

in Pattern V.

Keywords: *Bubalus bubalis*, buffaloes, feeding practices, nutrient status, lactating, Madhya Pradesh, India

INTRODUCTION

Most of the animals in developing countries including India are fed on agriculture by-products and low quality crop residues, which have got inherent low nutritive value and digestibility. The shortage of feed resources coupled with their poor nutritive value is of major concern to low productivity of dairy animals. High producing buffaloes in early lactation do not consume sufficient dry matter to support maximal production of milk (Goff and Horst, 1997). Demand for energy is very high during early stage of lactation but supply is not commensurate with demand due physiological stage or limited intake may affects production potential of animal in the whole lactation length (Sirohi *et al*., 2010). Hence, during early lactation, dairy animals are often forced to draw on body reserves to satisfy energy requirements (negative energy balance); this leads to substantial loss in body weight which adversely affects production, resulting in lower yield (Kim *et al*., 1993).

Imbalanced feeding leads to excess feeding of some nutrients whilst others remain deficient. This not only reduces milk production and increases costs per kg milk, but also affects various physiological functions including long term animal health, fertility and productivity (Garg *et al*., 2000). To ensure improved productivity it is necessary to augment and secure feed resources through short and long term planning. It is also essential that milk producers feed their animals the nutrients in amounts that match the physiological needs and objective of keeping the animal. Recent studies suggested that ration balancing also reduce methane emissions due to improved feed utilization and enhanced overall production (Capper *et al*., 2009; Kannan *et al*., 2011).

In Indore district of Madhya Pradesh, farmers are following traditional feeding practices. Dairy buffaloes are mainly fed on straw based ration. Cotton seed cake is the only cake fed on the name of concentrate without any mineral-vitamin supplementation. Few farmers offer seasonal green fodders like maize, MP chari, local green grasses during kharib and berseem and lucerne during rabi (Tewari *et al*., 2012). Due to Inadequacy of some of the nutrients in the ration of dairy animals, productive performance is not up to the level of the satisfaction. Keeping this in view the present study was carried out to observe the existing feeding practices to work out nutrient status in lactating buffaloes under field conditions which is essential for strategic nutrient supplementation for enhancing productivity and profit to farmers.

MATERIALS AND METHODS

Survey of existing feeding practices in lactating buffaloes was done in the 10 villages (Bhaislai, Sonwai, Borkhedi, Panda, Navda, Harsola, Santer, Kavti, Rangwasa and Umriya) around College of Veterinary Science and Animal Husbandry, Mhow. Eight to twelve farmers from each village were selected randomly and information about herd strength, available feedstuffs, use of mineral-vitamin supplements, daily feed offered, residue left and milk yield of individual animal were collected in a questionnaire. Quantities of feed offered/residue left and milk

yield were verified randomly by weighing through portable digital balance. Milk samples were collected randomly and analyzed for fat content by using automatic fat tester. Body weights of animals were determined from body measurements by using the Shaeffer's formula (Sastry *et al*., 1982).

Samples of various feed stuffs available with farmers were collected and analyzed for proximate principles *viz*. dry matter (DM), crude protein (CP), ether extract (EE), crude fibre (CF), nitrogen-free extract (NFE) and total ash by the standard methods (AOAC, 1995). Nutritive value in terms of DCP and TDN of feedstuffs was calculated with the help of digestibility coefficients reported in the literature (Morrison, 1961; Sen *et al*., 1978; Pal *et al*., 1985). Calcium in feed samples was determined by modified method of Talpatra *et al*. (1940) and Phosphorus in feed samples was estimated by Metavan date method (AOAC, 1995). The carotene content of feeds was calculated by using the values reported in the literature (Morrison, 1961; Sen *et al*., 1978). The average availability of carotene was converted to vitamin A (IU) by using formula i.e.1 mg β-carotene = 400 IU vitamin A activity (Kearl, 1982). The feed intake of individual animal was work out and nutrient (DCP, TDN, Ca, P and Carotene) supply was calculated and then compared with standard requirements (Paul and Lal, 2010) to work out nutrient excess/ deficit.

RESULTS AND DISCUSSION

The results of survey of existing feeding practices in lactating buffaloes showed that out of 104 dairy farmers visited having 347 buffaloes, all most all of the farmers practice stall feeding and offer feeds twice in a day. Five types of feeding patterns were observed as presented in Table 1. Feeding Pattern I [Mixture of straw {wheat straw (WS) + gram straw (GS)} + local grasses (LG) + cotton seed cake (CSC) + wheat bran (WB)], feeding Pattern II [Wheat straw (WS) + local grasses (LG) + cotton seed cake (CSC) + compounded feed (CF)], feeding Pattern III [Mixture of straw {wheat straw (WS) + soybean straw (SS)} + MP chari + cotton seed cake (CSC) + wheat bran (WB)], feeding Pattern IV [Mixture of straw {wheat straw (WS) + masoor straw (MS)} + maize fodder (MF) + cotton seed cake (CSC) + compounded feed (CF)], and feeding Pattern V [mixture of straw {gram straw (GS) + masoor straw (MS)} + maize fodder (MF) + cotton seed cake (CSC) + wheat bran (WB)]. The majority of farmers (47%) were feeding mixture of straws (WS + GS) + LG + CSC + WB, followed by WS + LG + CSC + CF (17%), mixture of straws (WS + SS) + MP chari + CSC + WB (15%), mixture of straws (WS + MS) + MF + CSC + CF (13%) and mixture of straws (GS + MS) + MF + CSC + WB (8%). Similarly, in villages of Punjab, Haryana and Madhya pradesh wheat straw and cotton seed cake are the predominant feeds for lactating buffaloes, in addition this farmers also use grains and green fodder (Lal *et al*., 1995; Tomar and Thakur, 2002; Sihag *et al*., 2002; Mudgal *et al*., 2003).

The average chemical composition and nutritive value (CP, EE, CF, NFE, TA, AIA Ca, P, DCP and TDN) of available feed stuffs are presented in the Table 2. Results indicated that among dry roughages (wheat, gram, soybean and masoor straws) CP ranged between 3.92 to 6.52%, EE from 0.63 to 1.50%, CF from 33.03 to 41.77%, TA from 6.59 to 11.64%, AIA from 0.69 to 5.84%, Ca from 0.23 to 1.54%, P from 0.04 to 0.15%, DCP from 0.31 to 3.84% and TDN from 42.07 to 53.51%. Among green roughages (local grasses, maize fodder, MP

chari) CP varied from 4.29 to 7.00%, EE from 1.14 to 1.48%, TA from 7.95 to 10.69%, AIA from 1.61 to 3.96%, Ca from 0.36 to 0.75%, P from 0.18 to 0.28%, DCP from 1.32 to 4.27% and TDN from 51.15 to 65.87%. Among concentrate feeds (cotton seed cake, wheat bran and compounded feeds) CP ranged between 13.99 to 22.60%, EE 3.45 to 10.22%, CF 9.99 to 27.15%, TA 4.25 to 13.98% and AIA 0.18 to 6.08%. The proximate composition of feedstuffs used for feeding buffaloes in the area of study is more or less in the same range as reported by other workers (Morrison, 1961; Sen *et al*., 1978; Kearl, 1982; NRC, 1989; Ranjhan, 1991; NRC, 2001; Mudgal *et al*., 2003; Das *et al*., 2005; Singh *et al*., 2005; Anonymous, 2007; Tiwary *et al*., 2007; Patil *et al*., 2014; Thakur *et al*., 2016). The Cacontent was within the range in available straws and concentrate feeds except in gram straw, which was much higher in Ca content in the present study as compared to values reported by the above workers.

The P content in straws, concentrate feeds and green roughages were within the range reported by the above workers except masoor straw and cotton seed cake were lower than the reported values. Ca: P ratios in rations of buffaloes under different feeding pattern ranged between 1.25:1 to 3.55:1 against optimum ratio 1.56:1 as shown in Table 3. Wider Ca: P ratios in Pattern IV (2.76:1) and V (3.55:1) are because of greater proportion of leguminous straw in the rations having higher level of Ca. Daily requirements and availability of nutrients in the rations of lactating buffaloes are presented in Table 3. Data indicated excess of DCP (24.11%) and shortage of TDN (4.87%), Ca (4.16%), P (18.17%) and Carotene (18.27%) in feeding Pattern I. Similar trends were also observed in feeding Pattern II and III i.e. excess of DCP (4.91%) and shortage of TDN (10.93%), Ca (54.83%), P (43.73%) and carotene (17.90%) in feeding Pattern II and excess of DCP (10.74%) and shortage of TDN (4.55%), Ca (17.16%), P (20.11%) and carotene (45.11%) in feeding Pattern III. While, in feeding Pattern IV and V trends were slightly different i.e. excess of DCP (27.87%) and Ca (8.03%) and shortage of TDN (5.24%), P (39.03%) and carotene (57.54%) in feeding Pattern IV and similar, excess of DCP (28.52%) and Ca (65.66%) and shortage of TDN (3.28%), P (27.19%) and carotene (51.29%) were also observed in feeding pattern V. In different feeding patterns followed by the farmers for feeding lactating buffaloes in this region, rations of buffaloes was marginally (4.91%) to moderately (28.52%) excess in DCP. Similar excess of DCP was also recorded by earlier workers (Garg *et al*., 2009; Garg *et al*., 2013[a]; Garg *et al*., 2013[b]; Garg *et al*., 2014b; Sherasia *et al*., 2016) in lactating buffaloes of western and southern region (Gujarat) of the country. Rations were marginally deficient in TDN (3.28 to 10.93%) and the average daily TDN intake in lactating buffaloes was 7.73±0.02 kg, which was slightly lower than recommended by Paul and Lal (2010).

Dietary deficiency of TDN was also observed by others (Lal *et al*., 1995; Garg *et al*., 2012; Sherasia *et al*., 2014). Whereas, Garg *et al.* (2013a, 2013b); Garg *et al.* (2014b); Sherasia *et al.* (2016) found excess TDN in the ration of lactating buffaloes, while, adequate TDN levels were observed by Kannan *et al*. (2010, 2011) in the ration of lactating buffaloes of Raebareli district in Uttar Pradesh and Chitoor district of Andhra Pradesh. Rations of lactating buffaloes were deficient in P (18.17 to 43.73%) and Ca supply was variable. It was deficient in feeding Pattern I, II and III and adequate in Pattern IV while excess in Pattern V depending upon the availability of cereal or leguminous straw. Ca content in leguminous

Table 1. Feeding patterns and milk yield of lactating buffaloes.

S. No.	Name of village	No. of farmers	No. of buffaloes	Avg. milk yield (kg/h/d)	Feeding patterns and no. of farmers				
					(WS+GS)+ local grasses +CSC+WB (I)	WS+local grasses +CSC+CF (II)	(WS+SS) MP chari +CSC+WB (III)	(WS+MS)+Maize fodder+CSC+CF (IV)	(GS+MS)+ Maize fodder +CSC+WB (V)
1	Bhaislai	11	33	7.52	6	2	2	1	-
2	Sonwai	10	25	6.80	8	1	1	-	-
3	Borkhedi	10	30	7.17	6	2	-	1	1
4	Panda	12	40	7.50	2	3	1	4	2
5	Navda	9	32	7.80	4	2	2	1	-
6	Harsola	12	42	7.60	5	1	2	2	2
7	Santer	11	43	7.91	4	2	3	1	1
8	Kavti	12	55	7.27	6	3	2	-	1
9	Rangwasa	09	23	8.50	5	1	2	1	-
10	Umriya	08	24	6.36	3	1	1	2	1
Total		104	347	-	49	18	16	13	8
%		-	-	-	47.12	17.31	15.38	12.50	7.69

WS = Wheat Straw, GS = Gram Straw, MS = Masoor Straw, SS = Soybean Straw, CSC = Cotton Seed Cake, CF = Compounded Feed.

Table 2. Average chemical composition and nutritive value of feed stuffs (% DM basis).

Feed stuffs	CP	EE	CF	NFE	TA	AIA	Ca	P	Carotene (ppm)	DCP	TDN
Wheat straw	3.92±0.22	0.99±0.06	33.07±0.61	50.38±0.66	11.64±0.64	5.84±0.16	0.23±0.02	0.06±0.30	0.20	0.31±0.01	42.07±0.27
Gram straw	6.24±0.24	0.63±0.50	39.16±0.74	42.95±1.20	7.98±0.34	2.44±0.15	1.54±0.08	0.04±0.01	1.00	2.80±0.11	42.81±0.27
Masoor straw	6.52±0.32	1.50±0.11	36.91±0.82	46.21±0.87	8.84±0.30	4.17±0.23	1.46±0.06	0.05±0.01	1.00	3.84±0.19	53.51±0.23
Soybean straw	6.14±0.34	0.80±0.06	41.77±1.46	45.52±1.74	6.59±0.38	0.69±0.06	0.94±0.04	0.15±0.02	Traces	1.77±1.10	43.76±0.55
Local grasses (Baroo)	4.29±0.67	1.48±0.04	26.94±0.45	56.74±0.60	10.55±0.01	3.61±0.26	0.36±1.02	0.18±0.01	94.48	2.44±0.09	51.15±0.76
Maize fodder (32% DM)	7.00±0.03	1.14±0.04	30.64±0.64	50.55±0.02	10.69±0.76	1.61±0.84	0.75±0.01	0.28±0.01	58.74	4.27±0.02	65.87±0.03
MP chari	6.30±0.02	1.18±0.01	31.62±0.23	52.95±0.11	7.95±0.09	3.96±0.31	0.61±0.20	0.18±0.01	67.71	1.32±0.10	55.84±0.05
Cotton seed cake	22.60±0.42	10.22±0.64	27.15±1.72	35.75±1.15	4.25±0.22	0.18±0.02	0.22±0.01	0.51±0.02	0.20	19.02±0.38	78.96±1.48
Wheat bran	13.99±0.52	3.45±0.11	9.99±0.92	68.06±1.63	4.51±0.74	0.48±0.10	0.21±0.01	0.61±0.05	0.10	11.32±0.42	74.85±0.58
Compounded feed	18.25±0.06	3.41±1.20	12.20±0.97	48.63±0.08	14.77±0.06	2.59±0.56	0.32±0.05	0.73±0.02	NA	13.14±0.12	64.18±0.06

NA = Not available

Table 3. Average daily requirement and availability of nutrients in different feeding patterns for lactating buffaloes.

Feeding Pattern I [Mixutre of straw (WS+GS)+LG+CSC+WB]										
Particulars	Body weight (Kg)	Milk yield (Kg)	Milk fat (%)	DM (Kg)	DCP (g)	TDN (Kg)	Ca (g)	P (g)	Ca:P Ratio	Carotene (ppm)
1	2	3	4	5	7	8	9	10	11	12
Requirement (Paul and Lal, 2010)	575	8.50	6.50	13.19	864.83	7.81	69.91	44.85	1.56:1	109.25
Availability (Per head/day)	562±8.10	8.50±1.20	6.50±0.80	12.53±0.61	1073.30±4.62	7.43±0.03	67.00±0.21	36.70±0.10	1.83:1	89.29
Excess (+) /Deficient (-)					(+) 208.47	(-) 0.38	(-) 2.91	(-) 8.15	-	(-) 19.96
Deficiency (-) / Excess (+) (%)					(+) 24.11	(-) 4.87	(-) 4.16	(-) 18.17	-	(-) 18.27

Table 3. Average daily requirement and availability of nutrients in different feeding patterns for lactating buffaloes. (Continue)

Particulars	Body weight (Kg)	Milk yield (Kg)	Milk fat (%)	DM (Kg)	DCP (g)	TDN (Kg)	Ca (g)	P (g)	Ca:P Ratio	Carotene (ppm)
1	2	3	4	5	7	8	9	10	11	12
Feeding Pattern II (WS+LG+CSC+CF)										
Requirement (Paul and Lal, 2010)	550	7.25	6.00	11.74	757.49	6.95	62.22	39.99	1.56:1	104.50
Availability (Per head/day)	551±7.10	7.13±0.03	5.90±0.10	11.16±0.51	794.70±5.62	6.19±0.01	28.10±0.20	22.50±0.15	1.25:1	85.79
Excess (+) /Deficient (-)					(+) 37.21	(-) 0.76	(-) 34.12	(-) 17.49	-	(-) 18.71
Deficiency (-) / Excess (+) (%)					(+) 4.91	(-) 10.93	(-) 54.83	(-) 43.73	-	(-) 17.90
Feeding Pattern III [Mixture of straw (WS+SS)+MP chari+CSC+WB]										
Requirement (Paul and Lal, 2010)	525	6.50	5.50	10.75	682.50	6.37	56.98	36.55	1.56:1	99.75
Availability (Per head/day)	515±6.50	6.20±0.05	5.45±0.12	10.61±0.62	755.80±6.65	6.08±0.02	47.20±0.24	29.20±0.14	1.62:1	54.66
Excess (+) /Deficient (-)					(+) 73.30	(-) 0.29	(-) 9.78	(-) 7.35	-	(-) 45.09
Deficiency (-) / Excess (+) (%)					(+) 10.74	(-) 4.55	(-) 17.16	(-) 20.11	-	(-) 45.20

Table 3. Average daily requirement and availability of nutrients in different feeding patterns for lactating buffaloes. (Continue)

Particulars	Body weight (Kg)	Milk yield (Kg)	Milk fat (%)	DM (Kg)	DCP (g)	TDN (Kg)	Ca (g)	P (g)	Ca:P Ratio	Carotene (ppm)
1	2	3	4	5	7	8	9	10	11	12
Feeding Pattern IV [Mixture of straw (WS+MS)+MF+CSC+CF]										
Requirement (Paul and Lal, 2010)	550	7.00	6.00	11.58	743.00	6.86	61.37	39.37	1.56:1	104.50
Availability (Per head/day)	548±6.10	6.73±0.03	5.80±0.14	11.31±0.41	950.10±5.60	6.50±0.04	66.30±0.18	24.00±0.11	2.76:1	44.37
Excess (+) /Deficient (-)					(+) 207.10	(-) 0.36	(+) 4.93	(-) 15.37	-	(-) 60.13
Deficiency (-) / Excess (+) (%)					(+) 27.87	(-) 5.24	(+) 8.03	(-) 39.03	-	(-) 57.54
Feeding Pattern V [Mixture of straw (GS+MS)+MF+CSC+WB]										
Requirement (Paul and Lal, 2010)	550	6.50	6.00	11.23	716.00	6.70	59.52	38.18	1.56:1	104.50
Availability (Per head/day)	541±7.20	6.20±0.01	5.80±0.14	10.60±0.41	920.20±6.30	6.48±0.06	98.60±0.18	27.80±0.13	3.55:1	50.90
Excess (+) /Deficient (-)				(-) 0.63	(+) 204.20	(-) 0.22	(+) 39.08	(-) 10.38	-	(-) 53.60
Deficiency (-) / Excess (+) (%)					(+) 28.52	(-) 3.28	(+) 65.66	(-) 27.19	-	(-) 51.29

straw was quite higher than cereal strawin the present study. Garg*et al.* (2013b) reported excess Ca. While, others (Garg *et al*., 2009; Kannan *et al*., 2010, 2011; Garg *et al*., 2012; Garg *et al*., 2013a; Garg *et al*., 2014ab; Sherasia *et al.*, 2014; Sherasia*et al*., 2016) were reported shortage of both Ca and P in the ration of lactating buffaloes. There was shortage of carotene by 17.29 to 57.54% in different patterns, due to less availability of greens, similar findings were also recorded by Patil*et al.* (2016) and Thakur *et al.* (2016) in the ration of buffaloes of Malwa region of M.P.

CONCLUSION

It was concluded that lactating buffaloes were fed on straw based rations, mainly mixture of cereal (wheat and leguminous straws (gram/masoor/ soybean) with little green either local grasses/ MP chari/ maize fodder and un-decorticated cotton seed cake/wheat bran/compounded feed as concent rate. DCP was moderately high and TDN was marginally deficient while phosphorous and carotene were moderate to highly deficient in the rations of lactating buffaloes of the region. Calcium was deficient in feeding Pattern I, II and III and adequate in Pattern IV while excess in Pattern V.

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