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Available feed resources, feeding practices and nutritional status of horses in Budgam district of Kashmir valley

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ABSTRACT

A study was conducted in four major horse rearing tehsils (Beerwah, Khag, Chadoora and Budgam) of district Budgam in Kashmir valley regarding available feed resources, feeding practices being followed and nutritional status of horses. Twelve equine keeping families from each study area were selected at random. The daily dry matter (DM), crude protein (CP), digestible energy (DE) and macro minerals (Ca and P) intakes by different classes of horses were calculated from the feed intakes and compared with the nutrient requirement given in the feeding standard. Adult horses were being fed rice straw, rice bran and wheat bran; however, in addition to these, bengal gram was fed in areas of Chadoora and Khag only, while maize grains was fed to the horses in Chadoora only. The horses were fed blend of spicy ingredients locally called as 'masala'. None of the farmers offered any oil seeds/cakes, compound pelleted feed or mineral supplement to the horses, though, salt licks were allowed to the adult animals on daily basis in all the study areas. The chemical composition of all the feeds and fodders fed to horses in the study areas of district Budgam were within the ranges as prescribed for Indian feeds and fodders. While adult horses received optimum DM, the daily CP and DE intake was found to be deficient along with imbalanced Ca and P intake when compared to the standard requirements. Foals were found to get diets deficient in DM, DE, CP and Ca but surplus in P. Lactating mares received daily rations with optimum DM content, excess DE, slightly less CP and excessive Ca and P. It was concluded that the adult horses and lactating mares were being fed rations optimum in terms of quantity, but was not balanced in terms of nutrients; however, foals were fed diets deficient in both in quantity as well as quality.

Key words: Feeding practices, Feeds, Horses, Kashmir, Nutritional status

The horse have been among economically the most important domesticated animals since ancient times and has been used for work, pleasure, and companionship; however, with the introduction of mechanization the percentage of time devoted to these endeavors has changed greatly. The horse is a prominent figure in the ideals of religion, mythology and art as well as playing an important role in transportation, agriculture, sports and warfare. In Jammu and Kashmir, horses are being used for pulling carts and tongas, as saddle-horses providing entertainment at tourist places and during religious pilgrimage (Amarnath-Ji and Mata-Veshnu Devi yatras); besides, used by the army for carrying men and material in areas where vehicular traffic is still inaccessible due to rugged topography and poor infrastructure. Among the Indian states, Jammu and Kashmir ranks second after Uttar Pradesh with a contribution of 23.13% towards the total horses/ponies population of the country, and the share of population towards state's figure from district Budgam accounts to 11.91% (Anonymous 2014), being reared mainly as saddle horses at district's tourist places (Doodipahtri, Yousmarg etc.), means of transport (tongas and horse carts), tiller horses in agricultural operations and as draft power in brick kilns.

Horses have a significant impact on the socio-economic development of rural India *vis-a-vis* Jammu and Kashmir. In the contemporary, these animals are owned mainly by socially and economically deprived, landless, marginal and small farmers that play a very important role in socio-economic life of the population (Fazili and Kirmani 2011). Nutrition plays a pivotal role in livestock welfare in general and so does in equine management. For horse owner, nutritional and health status of animals is of primary concern

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regardless type of the horse or what or how they are fed. While health status can apparently be taken care of by a practicing veterinarian, a nutritionist has to observe the nutritional status of the horses through a continuous monitoring of feed intake and actual nutrient availability to the animal. However, hardly any literature is available on feed resources for equines and feeding practices adopted by the horse owners of Jammu and Kashmir. In order to ascertain the nutritional status of horses in Kashmir valley, the present study was carried out in one of the two central districts, viz. district Budgam on the existing feeding practices and their nutritional status.

MATERIALS AND METHODS

The study was conducted in four main horse rearing tehsils (Beerwa, Khag, Chadoora and Budgam) of district Budgam which ranks third in the state with respect to horses/ponies population (Anonymous 2014). District Budgam is a central district of Kashmir valley having nine tehsils-Budgam, Beerwah, B.K.Pora, Chadoora, Charisharief, Khag, Khansahib, Magam and Narbal, 86% of the population lives in its villages and are primarily involved in agricultural operations (Anonymous 2015). Twelve equine keeping families from each tehsil were selected randomly for the study. Each equine owner was interviewed for various equine feeding practices adopted by them for different classes of horses. Besides, the samples of feeds/fodders offered to horses in the study areas were collected and analyzed for proximate composition (AOAC 2005), fibre fractions (Van Soest *et al*. 1991) and for calcium and phosphorus (Talapatra *et al*. 1948). Digestible Energy (DE) of the available feeds/fodders was estimated by equations (NRC 2007).

DE (Mcal/kg) for dry forages and roughages, pasture, range plants and forages fed fresh = {4.22 – 0.11(% ADF) + 0.0332 (% CP) + 0.00112 (% ADF^2)}

DE (Mcal/kg) for energy feeds and protein supplements = {4.07 – 0.055 (% ADF)}

The daily dry matter, crude protein, digestible energy and macro minerals (Ca and P) intakes by different categories of horses were calculated from the feed intake on the basis of average nutritive value of feeds and fodders from the particular study area. The estimated supply of DM, CP, DE and macro minerals (Ca and P) to animals was compared with the nutrient requirement given in the feeding standards (NRC 2007) to determine their nutritional status under study.

The data generated were analyzed by using descriptive statistical method for analysis of variance and significance of mean differences using using SPSS version 20.0 software for windows. The significance between different proportions was tested using test of proportions. The test statistic used was:

$$Z = p_1.p_2/\sqrt{p\ q(1/n_1+1/n_2)}$$

where p_1 and p_2 are two proportions and $p= x_1+x_2/\ n_1+n_2$ (x_1 and x_2 stand for number of occurrences in two samples of size n_1 and n_2, respectively; q= 1-p)

RESULTS AND DISCUSSION

Feeding practices: The most common feeds/fodders offered to horses in district Budgam included rice straw, rice bran and wheat bran; however, in addition bengal gram was offered in areas of Chadoora and Khag only, while maize grains was fed in Chadoora only. Instead of rice straw, oat hay was offered as the source of roughage in Khag area. None of the farmers offered oil seeds/cakes to the horses. It is evident that horse owners had narrow limits of selection for feed ingredients to formulate horse rations compared to other categories of livestock, contributing to deficient nutritional status with particular reference to foals.

Horses are used as work animals, roughages were offered in the evening only while concentrates were fed thrice a day. Though the pastures were denuded and overgrazed, grazing was allowed during the periods of rest or lack of work, subject to the availability of grazing area around the halt site. Animals never had the grazing opportunity beyond 1–2 h a day. Animals usually drank water from the streams and ponds during resting spans in the day but were refrained from heavy water sips during strenuous work. None of the farmers was observed to supplement the ration with mineral mixture; though, salt licks were allowed to the animals on daily basis in all the study areas. The farmers used to prepare a blend of wheat bran and rice bran together with crushed maize to be carried along for feeding the animal during the day. None of the farmers procured any compound feeds (pellets) for horse feeding.

The horses of the study area were fed blend of several spicy ingredients locally called as 'masala' which comprised onion, ginger, garlic, clove, green chilies, turmeric, black cumin and salt. About 250 grams of masala was fed to animals once, twice, thrice or four times in a month depending upon the individual choice and experience of farmer. Traditional masala was believed to maintain body temperature and appetite, removes infection from intestines and maintains intestinal health. Similar practice of feeding masala was reported by Bhat *et al.* (2012) in few districts of Kashmir valley.

Chemical composition of available feeds and fodders: The chemical composition (on % DM basis) of feeds and fodders offered to horses in the respective surveyed areas along with the overall means for district Budgam is presented in Table 1. The chemical composition of roughages fed to horses in the study areas of district Budgam were within the ranges as reported by Ganai *et al*. (2006) and Bhat *et al*. (2013) in various tehsils of district Kupwara. Our results also corroborates with the reports prescribed for Indian feeds and fodders by ICAR (2013) with slight variations as nutrient content of feeds and fodders is dependent on the agroclimatic and adaptec conditions being used in the region. The nutrient content of feed stuffs changes partly due to introduction of high yielding crop varieties, intensive crop cultivation and extensive use of various fertilizers. In turn, productivity and health status of animals of a region is largely dependent on the quantity

Table 1. Chemical composition (% DM) of feeds and fodders of district Budgam

Tehsil	Feed/Fodder	DM	CP	EE	CF	TA	NDF	ADF	Ca	P
Chadoora	Wheat bran	91.51	14.1	3.91	11.25	6.18	40.57	12.32	0.59	0.10
	Rice bran	90.32	13.02	3.20	18.99	15.01	63.84	34.39	0.69	0.97
	Bengal gram	96.41	18.9	3.10	10.05	4.96	32.21	8.42	0.05	0.30
	Maize	89.74	8.99	4.57	2.01	2.49	16.98	3.02	0.20	0.28
	Rice straw	87.76	6.24	2.19	34.91	14.01	73.15	57.5	0.57	0.29
Budgam	Wheat bran	91.92	13.69	3.49	12.98	5.90	42.31	9.99	0.60	0.09
	Rice bran	91.48	12.98	2.76	18.99	14.79	54.12	27.9	0.54	0.89
	Rice straw	89.83	6.19	1.67	36.59	14.25	74.25	57.72	0.30	0.03
Khag	Wheat bran	90.77	13.11	3.30	15.3	6.60	38.10	10.5	0.64	0.10
	Rice bran	91.14	11.62	2.78	19.15	15.01	59.61	28.9	0.76	0.71
	Bengal gram	96.90	18.70	3.20	10.10	5.00	29.9	7.60	0.19	0.17
	Oat hay	87.39	8.51	4.35	28.95	9.98	55.74	52.01	0.49	0.99
Beerwah	Wheat bran	91.12	15.99	3.85	13.54	5.69	40.81	10.98	0.60	0.10
	Rice bran	90.70	15.01	2.68	19.95	15.32	65.45	28.32	0.57	0.89
	Rice straw	86.15	6.25	2.89	36.95	13.34	73.25	56.72	0.29	0.01
Mean values of chemical constituents (% DM)										
Wheat bran		91.33±0.24	14.22±0.62	3.63±0.14	13.26±0.83	6.09±0.19	40.44±0.87	10.94±0.5	0.60±0.01	0.09±0.02
Rice bran		90.91±0.25	13.15±0.69	2.85±0.11	19.27±0.22	15.03±0.1	60.75±2.53	29.87±1.51	0.64±0.05	0.86±0.05
Bengal gram		96.65±0.24	18.80±0.1	3.10±0.09	10.07±0.02	4.98±0.01	31.05±1.16	8.01±0.4	0.12±0.06	0.23±0.06
Maize		89.74±0.00	8.99±0.00	4.57±0.00	2.01±0.00	2.49±0.00	16.98±0.00	3.02±0.00	0.2±0.00	0.28±0.00
Rice straw		87.91±1.06	6.22±0.01	2.25±0.35	36.15±0.62	13.86±0.27	73.55±0.34	57.31±0.30	0.38±0.08	0.11±0.08
Oat hay		87.39±0.00	8.51±0.00	4.35±0.00	28.95±0.00	9.98±0.00	55.74±0.00	52.01±0.00	0.49±0.00	0.99±0.00

Table 2. Daily nutrient intake by adult horses in district Budgam

Parameter	Chadoora	Budgam	Khag	Beerwah	Mean
Dry matter					
DMI R (kg)	2.72^{ab}±0.13	3.14^{b}±0.28	2.18^{a}±0.16	2.18^{a}±0.15	2.60±0.09
DMI C (kg)	4.55^{b}±0.18	4.05^{ab}±0.28	4.04^{ab}±0.21	3.74^{a}±0.28	4.22±0.12
Total DMI (kg)	7.28^{b}±0.26	7.19^{b}±0.56	6.22^{ab}±0.34	5.92^{a}±0.41	6.82±0.19
DMI (% BW)	2.78^{c}±0.08	2.70^{bc}±0.11	2.38^{ab}±0.13	2.30^{a}±0.06	2.60±0.05
Requirement (NRC 2007)	6.54±0.15 to 9.16±0.21	6.58±0.49 to 9.21±0.68	6.58±0.29 to 9.21±0.41	6.34±0.33 to 8.88±0.46	6.52±0.11 to 9.16±0.17
Excess/deficit (%)	Optimum	Optimum	-5.40	-6.62	Optimum
Digestible energy					
DE intake (Mcal)	19.03^{b}±0.68	17.91^{ab}±1.36	16.54^{ab}±0.83	15.06^{a}±1.07	17.65±0.49
Requirement (NRC 2007)	21.46±0.46	21.58±0.87	21.57±0.91	20.80±1.08	21.37±0.36
Excess/deficit (%)	-11.32	-17.00	-23.31	-27.50	-17.04
Crude protein					
CP intake (g)	743.93^{b}±34.33	734.49^{b}±55.26	746.58^{b}±37.30	475.64^{a}±34.31	692.20±23.95
Requirement (NRC 2007)	733.25±16.88	737.54±31.99	737.10±33.51	660.00±34.40	720.86±13.14
Excess/deficit (%)	+1.45	Optimum	+1.28	-27.90	-3.96
Calcium					
Ca Intake (g)	37.50^{b}±1.34	32.51^{ab}±2.46	34.05^{ab}±2.40	28.04^{a}±2.00	34.25±1.01
Requirement (NRC 2007)	26.18±0.60	26.34±1.14	26.32±1.19	25.38±1.32	26.08±0.46
Excess/deficit (%)	+43.20	+23.42	+22.70	+10.48	+31.3
Phosphorus					
P intake (g)	28.42^{b}±1.05	20.78^{a}±1.48	35.46^{c}±2.37	18.73^{a}±1.41	30.04±0.88
Requirement (NRC 2007)	19.64±0.45	19.75±0.85	19.74±0.89	19.03±0.99	19.56±0.34
Excess/deficit (%)	+44.70	+5.21	+79.63	-1.58	+53.58

Means within the same row with different superscripts differ significantly ($P<0.05$).

Table 3. Daily nutrient intake by foals in district Budgam

Parameter	Chadoora	Budgam	Khag	Beerwah	Mean
Dry matter					
DMI R (kg)	1.16±0.29	0.89±0.00	NA	NA	1.06±0.17
DMI C (kg)	1.37±0.26	1.83±0.00	NA	NA	1.56±0.18
Total DMI (kg)	2.54±0.53	2.73±0.00	NA	NA	2.62±0.29
DMI (% BW)	1.31±0.13	1.45±0.10	NA	NA	1.37±0.08
Requirement (NRC 2007)	3.37±0.40 to 5.68±0.61	3.78±0.26 to 5.67±0.39	NA	NA	3.78±0.23 to 5.67±0.35
Excess/deficit (%)	–24.62	–27.77	NA	NA	–30.68
Digestible energy					
DE intake (Mcal)	6.61±1.34	7.15±0.00	NA	NA	6.82±0.75
Requirement (NRC 2007)	7.63±0.06	7.50±0.0	NA	NA	7.58±0.04
Excess/deficit (%)	–13.36	–4.67	NA	NA	–10.02
Crude protein					
CP intake (g)	261.82±52.93	305.90±0.00	NA	NA	279.45±30.93
Requirement (NRC 2007)	316.00±4.00	308.00±0.00	NA	NA	312.80±2.94
Excess/deficit (%)	–17.14	Optimum	NA	NA	–10.66
Calcium					
Ca intake (g)	11.90±2.58	10.45±0.00	NA	NA	11.32±1.46
Requirement (NRC 2007)	14.76±0.03	14.70±0.00	NA	NA	14.74±0.02
Excess/deficit (%)	–19.37	–28.91	NA	NA	–23.20
Phosphorus					
P intake (g)	9.04±1.87	9.25±0.00	NA	NA	9.14±0.10
Requirement (NRC 2007)	8.16±0.03	8.10±0.00	NA	NA	8.14±0.02
Excess/deficit (%)	+10.78	+14.20	NA	NA	+12.28

Table 4. Daily nutrient intake by lactating mares in district Budgam

Parameter	Chadoora	Budgam	Khag	Beerwah	Mean
Dry matter					
DMI R (kg)	2.34±0.29	3.44±0.44	2.18±0.43	NA	2.52±0.23
DMI C (kg)	3.67±0.26	5.02±1.30	4.64±0.00	NA	4.34±0.39
Total DMI (kg)	6.01±0.53	8.17±1.8	6.83±0.43	NA	6.86±0.56
DMI (% BW)	2.30±0.19	3.07±0.74	2.46±0.01	NA	2.56±0.24
Requirement (NRC 2007)	6.51±0.03 to 9.12±0.04	6.66±0.13 to 9.33±0.18	6.92±0.46 to 9.69±0.65	NA	6.67±0.12 to 9.34±0.17
Excess/deficit (%)	–7.5	Optimum	Optimum	NA	Optimum
Digestible energy					
DE intake (Mcal)	15.69±1.30	20.86±4.95	18.80±0.78	NA	18.05±1.49
Requirement (NRC 2007)	12.07±0.04	12.25±0.15	12.55±0.55	NA	12.26±0.15
Excess/deficit (%)	+29.9	+70.20	+49.8	NA	+47.22
Crude protein					
CP intake (g)	629.28±68.94	864.71±210.55	858.05±37.14	NA	761.91±71.10
Requirement (NRC 2007)	782.10±4.05	800.10±15.90	830.70±55.80	NA	801.12±15.17
Excess/deficit (%)	–19.5	+8.08	+3.7	NA	-4.89
Calcium					
Ca intake (g)	30.75±2.75	38.08±9.16	35.33±2.14	NA	34.15±2.63
Requirement (NRC 2007)	32.58±0.16	33.33±0.66	34.61±2.32	NA	33.38±0.63
Excess/deficit (%)	–5.6	+14.3	+2.06	NA	+2.30
Phosphorus					
P intake (g)	23.34±1.97	25.57±6.82	36.49±4.32	NA	27.74±2.98
Requirement (NRC 2007)	19.55±0.10	20.00±0.39	20.76±1.39	NA	20.02±0.37
Excess/deficit (%)	+16.23	+27.8	+75.01	NA	+38.56

and quality of feed offered to them.

Similarly, chemical composition of concentrates offered to horse in district Budgam under present study corroborate with the reported values of Ganai *et al.* (2006), Bhat *et al.* (2013) and ICAR (2013). The chemical composition of bengal gram reported in the present study corroborates with finding of ICAR (2013) for various nutrient constituents.

Nutritional status of horses: The results of nutritional status with respect to intake of DM, DE, CP and macro-minerals compared to the NRC (2007) standards have been summarised in Table 2 for adult horses, Table 3 for foals and Table 4 for lactating mares. While foals were not observed in Khag and Beerwah areas, no lactating mare was observed in Beerwah area of district Budgam during the survey. The DMI for adult horses and lactating mares was within range (NRC 2007) or marginally low for adult horses by 5.4% in Khag and 6.62% in Beerwah; whereas for the foals, the DMI was 24–27% less than their requirement (NRC 2007) probably due to the fact that adult horses and lactating mares were used for work and hence were taken more care whereas foals were not put to work. These findings are comparable to the results of Owens (1998) and corroborate well with the observation of Pal *et al.* (2013) and Bhat *et al.* (2013). However, Gallagher *et al.* (1992) reported higher DMI by horses than the requirements. The variety and quantity of feeds fed to various classes of horses depends upon many factors and this explains the variation in many of the parameters measured. There was no relationship between the amount of roughage and concentrate fed to the animals under present study which could be attributed to inability for quantifying the roughage uptake from the pastures making the determination of true roughage intake impossible.

Energy intake (DE as Mcal/day) was lower than recommendations (NRC 2007) for adult horses as well as foals in all surveyed areas while it was quite high in lactating mares. This may be due to feeding extra diet to lactating mares as compared to adult horses. The horse owners were not properly aware about feeding management and had narrow range for selection of feed ingredients. DE intake of 36.04 Mcal/day for 500 kg corresponding to 18.02 Mcal/day for 250 kg horse was reported by Glade (1983), which are comparable to results of the present study. Gallagher *et al.* (1992) also reported that equines consumed DE as per recommendations. However, Hallebeek *et al.* (2000) reported 30% high intake of DE on daily basis, which corresponds with the results for lactating mares of the present study.

Presuming the daily minimum requirement of CP for a horse of 240–260 kg body weight in light to moderate work is 648–702 g (NRC 2007), CP intake was optimum in Chadoora, Budgam, Khag for adult horses and in Budgam, Khag for lactating mares, while it was 19–27% less than recommendations in Beerwah for adult horses and Chadoora for lactating mares. For foals, CP intake was also low in all study areas. The results of the present study are comparable to the reports of Bhat *et al.* (2012). However, contrarily to our results, higher intake of CP was recorded by Riond *et al.* (2000). The variation in results could be attributed to variations in feeding practices, unawareness about balanced and precise feeding by the farmers as well as narrow scope of selection of feed ingredients.

The mean daily intake of Ca was either optimum or above the recommendation for adult equines and lactating mares except for lactating mares of Chadoora area where it was 5–6% lower than recommendations (NRC 2007); however, for foals the Ca intake was lower than the recommended values in all study areas probably due to low DM intake by the animals. P intake was well above the recommendations (NRC 2007) in all the study areas and for all categories of horses owing to feeding of diets rich in P content. Similarly, Southwood *et al.* (1993) reported much higher intake of both these minerals as compared to the recommendations.

From the present study, it was inferred that the horse owners in district Budgam lack basic understanding on equine nutrition resulting in an improper diet optimum in terms of bulk, but un-balanced in terms of nutrients. As such, they need to be educated regarding balancing of ration for horses using the available feeds and fodders, cereals and the agro-industrial by-products. A proper combination of these ingredients should be fed to equines. Crop residues and mineral supplements should be kept in mind for better growth and performance of the equines.

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