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Macro and Micro-Mineral Status of Feeds and Fodders in Sardarkhrushinagar Dantiwada Agricultural University Adopted Villages of Datiwada Taluka

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Abstract

A survey was carried out in ten villages of Dantiwada taluka of the Banaskantha district which are adopted by Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar to identify the macro and micro-minerals status in feeds and fodders by samples at random.The samples were analysed for macro minerals, calcium and phosphorus with micro minerals cupper, manganese and zinc. The concentrate samples were analysed individuals and combination with other ingredients both, as per as their practically implementation to dairy animals. The results of analysis were compared with the critical level for particular micro minerals level and percentages of samples which contain micro minerals below critical level were calculated.

Keywords: Macro and Micro minerals; Survey; Feeds; Fodders.

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Introduction

Mineral imbalances are of common occurrences in livestock throughout the world in affecting them in a number of ways (McDowell *et at.*, 1983). A numbers of researches in the world have reported a high incidence of forage samples below critical levels for different mineral elements, especially copper, zinc, phosphorus, magnesium and calcium (Miles and McDowell, 1983; Underwood and Suttle, 1999). It is obligatory to assess feeds and fodders for minerals, which are dietary essentials, with the objective to recommend quantities needed extra in the ration. At the same time, it is advisable not to recommend excess, so as to avoid the problem of animal waste and toxicity (Garg*et al*., 2003). The study was undertaken to assess the macro and micro-nutrients status in feeds and fodders.

Materials and methods

The survey was conducted in Sardarkrushinagar Dantiwada Agricultural University adopted villages in DantiwadaTaluka. The names of villages are Vaghrol, Nilpur, Lodapa, Fatepura, Dhaneri, Jegol, Dantiwada, Bhadali, NaniBhakhar, and MotiBhakhar. Random sampling technique was used to select the respondents. In each village, 10 farmers who own dairy cattle producing at least 10 kg or more milk per day were selected. Information regarding the

Table 1: Mineral content in of feeds and fodders samples
(Figure in parathion denote the number of sample analysed)

Name of the sample	P	Ca	Cu	Mn	Zn
	%		ppm		
Concentrates					
Banasdan + CSC (25)	0.81	0.96	9.01	65.68	67.26
Banasdan + CSC + Bajri (26)	0.78	1.03	6.85	51.30	84.70
CSC + Wheat bhardo+ Guar bhardo (21)	0.73	1.17	8.21	60.43	64.50
Banasdan + Bajri + Isabgullali(19)	1.01	0.56	11.24	71.58	84.89
Banasdan + CSC+ Tuarchunni (16)	0.53	1.05	12.86	87.43	70.12
Banasdan+ Wheat bhardo + CSC + Isabgullali (10)	0.82	1.24	11.36	79.57	68.57
Guar bhardo (12)	0.33±0.01	0.19±0.02	5.89±1.18	16.37±1.26	39.87±2.87
Wheat bhardo (18)	0.34±0.01	0.15±0.01	5.66±1.02	31.48±1.44	36.75±3.39
Bajri (14)	0.44±0.01	0.19±0.01	3.56±0.24	15.24±1.27	19.27±2.34
Jowar (22)	0.37±0.01	0.15±0.02	3.14±0.31	14.85±1.02	22.76± 2.41
Banasdan (30)	1.12±0.11	1.27±0.13	24.10±0.63	86.65±3.32	100.26±3.58
IsabgulGola (15)	0.37±0.01	0.56±0.07	14.00±0.47	50.68±2.26	48.87±.2.13
Cotton Seed Cake(15)	0.43±0.04	0.39±0.03	8.06±0.45	34.68±1.75	34.00±1.53
Green Roughages					
Jowar green (32)	0.32±0.10	0.56±0.05	7.56±0.20	72.01±2.35	29.33±5.22
RajkaBajri (35)	0.36±0.04	0.94±0.06	9.25±1.43	64.56±3.42	39.67±2.29
Chickory leaves (28)	0.70±0.05	0.78±0.03	8.69±1.04	60.24±4.26	28.14±2.03
Lucerne (28)	0..78±0.08	1.37±0.05	7.21±0.34	36.24±1.86	27.46±1.46
Local mixed grass (25)	0.35±0.01	0.78±0.02	9.57±0.54	59.74±2.52	26.64±1.63
Dry Roughages					
Bajra straw (35)	0.16±0.05	0.61±0.04	3.76±0.41	40.36±1.87	19.79±1.34
Wheat straw (32)	0.14±0.03	0.32±0.04	4.38±1.30	46.65±2.14	14.29±1.15
Jowar straw (35)	0.32±0.04	0.48±0.04	6.46±0.34	56.83±1.13	17.40±2.16
Ground nut straw (30)	0.23±0.02	0.42±0.03	8.56±0.28	22.76±1.56	18.25±0.56
Wheat bhoosa (25)	0.16±0.02	0.37±0.04	5.65±0.30	50.15±2.88	16.93±1.67

amount and types of feeds and fodders being offered to the animals, approximate rate of daily feed intake by individual animal were collected with the fair degree of precision on a questionnaire from individual farmer using standard sampling procedure, samples of green fodder, dry roughage, individual concentrate ingredients, compound concentrate mixtures and homemade concentrate mixtures were collected from all the respondents. The Ca content was analyzed by the method of Talapatra*et al.* (1940) and the Phosphorus content was analyzed colorimetrically by AOAC (1999) method. The contents of Cu, Mn and Zn were analyzed using Atomic Absorption Spectrophotometer (ECIL, AAS 4141).The data were subjected to statistical analysis using methods of Snedecor and Cochran (1980).

Results and discussion

Most of the dairy animal owners keep the animals stall-fed either at home or at farm within a limited area. Crop residues, predominantly wheat and bajri straw, were found to be the main source of roughages in the ration of animals in the area. They store dry fodder like straws of bajri, wheat, jowar and groundnut haulms. Most of them grow green fodders like Jowar, 'rajaka-bajari (multicut), Chicory leaves, hybrid Napier and Lucerne. They also feed local mixed grasses.It was found that the dairy animals were fed roughage three times and concentrates offered twice a day at the time of milking. Among the concentrate they feed Banasdan (compound cattle concentrate) manufactured by Banaskantha District Co-operative Milk Producers' Union Limited (Banas Dairy), commercial concentrate mixtures, maize grain, bajri grain, jowar grain, wheat grain, guar grain, cottonseed cake, Isabgullali etc.

Table 2: Percentage of feed samples containing Cu, Mn and Zn below critical levels in SDAU adopted villages.

Particulars	Cu (<8.0ppm)	Mn (<40.0ppm)	Zn (<30.0ppm)
Concentrates	32.50	25.40	26.80
Green roughages	44.20	16.80	60.50
Dry Roughages	76.40	20.50	100.00

The minerals composition of feeds and fodder collected during the survey is given in Table 1. The data on and Ca and P content of the feedstuffs are in agreement with the reports of Anonymous (1983), Desai *et al.* (1984), Desai *et al.* (1985), Garg *et al.* (1999) and Garg *et al.* (2003).The Cu content seemed to be lower in most of the feedstuffs collected. The feeds like Wheat straw, jowar straw, bajri straw, groundnut straw, paddy straw, wheat bhoosa, etc. and green roughage like lucerne, rajaka-bajari, chickoryleaves,jowar green, Gajaraj, local mixed grass etc., the quantities were under 16.95 ppm. These findings are in agreement with Garg*et al.* (1999). However, Desai *et al.* (1985) reported slightly higher values of Cu content in these feedstuffs. Most of the homemade concentrate mixtures contained more than 12 ppm and Banasdan contained 24.10±0.63ppm Cu, which might have been achieved by using mineral mixture as per BIS specifications during manufacture of compound concentrate.

Most of the green fodders offered to the animals contained reasonable amount of Mn (36.24±1.86 to 72.01±2.35 ppm).it were apparent that most of the dry roughage was low in Zn content. Jowar straw, groundnut straw, paddy straw, wheat bhoosa etc. showed less than 26.38 ppm Zn. This is in agreement with the findings of Desai*et al.* (1985) and Sanjeev Kumar (2009).

The perusal of data on Cu, Mn and Zn content of feedstuffs collected during the survey showed variation when compared with the values obtained in the surveys of feeds and fodders in North Gujarat and other part of Gujarat. The possible reason for such variations may be that with the introduction of high yielding crop varieties, intensive crop systems and extensive fertilizer application; the mineral profile in soil, plants or animal feedstuffs are rapidly changing, which in thern affect the mineral status of animals (Miller, 1979; Singh and Sangwan, 1987; Vasudevan, 1987; Underwood and Suttle, 1999).

The percentage of the feed samples collected during survey and containing Cu, Mn and Zn below critical levels (Cu < 8ppm, Mn< 40ppm and Zn <30ppm) has also been worked out for developing a better understanding on the subject and the data is given in Table 2.

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Effect of Herbiotic FS on Performance of Broiler Chicks in Hot Arid Zone of Rajasthan

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Abstract

Ninety (90) unsexed day-old, commercial broiler chicks were purchased from Sandhu Poultry farm, Bikaner. These chicks were weighed individually and uniformly distributed as 45 chicks in each of three groups. Each group was divided into three replicates with 15 chicks in each. The birds were offered feed and water ad-libitum. The chicks were fed with starter mash which contained crude protein 23% and metabolizable energy 2905 Kcal / kg up to three weeks of age. For next 3 weeks i.e. from 4 to 6 weeks of age with finisher mash which contained crude protein 20% and metabolizable energy 3120 Kcal/ kg. Group T_1 (control group) was fed standard broiler mash. Group T_2 was fed broiler mash + herbiotic FS @ 250 g/ ton of feed. Growth, feed consumption and feed conversion ratio of broilers in group T_2 (broiler mash + herbiotic FS @ 250 g/ ton of feed) was better than that recorded on control diet. Findings of present study suggested that supplementation of herbiotic FS was effective in improving performance in broiler chickens.

Keywords: Herbiotic FS; Broiler; Performance; Feed conversion ratio.

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Introduction

Antimicrobial growth promoters are used in poultry feed to increase growth, improve feed efficiency and decrease the incidence of diseases. A well established intestinal microflora competes with pathogens and hence, decreases the possibilities of salmonellosis, necrotic enteritis, colibacillosis etc. Use of synthetic antimicrobial growth promoters leads to resistance development to these and related antibiotics among pathogenic bacteria and makes them inert for the treatment of livestock, poultry and human. Different regulatory body for organic farming standards such as IFOAM basic standards (1998), EU regulation (1804/1999), Codex Alimentarius Guidelines (99/22A/1999) do not allow the addition of synthetic antimicrobial growth promoters to the animal and poultry feed because of the potential development of antibiotic resistant pathogenic bacteria after long use of antibiotic growth promoters in livestock and poultry diets. Therefore, alternative non antibiotic growth promoters are of great importance (Laughout, 2000; Parks *et al.*, 2001; Humphrey *et al.*, 2002).

Herbal growth promoters have been known to be useful in many ways in the diet of commercial broilers. These herbal products are well known for better health, production with minimum side effects in animals and human beings and proven efficiency. These herbal growth promoters are cheaper and easily available as compared to these synthetic growth promoters (Rekhate *et al.*, 2004; Kumar *et al.*, 2005).

Keeping in view the above facts, the present study was undertaken to study the effect of Growth promoter on broiler performance and on economics of broiler production.

Materials and Methods

Ninety (90) unsexed day-old, commercial broiler chicks were purchased from Sandhu Poultry farm, Bikaner. These chicks were weighed individually and uniformly distributed as 45 chicks in each of two groups. Each group was divided into three replicates with 15 chicks in each. The birds were offered feed and water ad-libitum. The chicks were fed with starter mash which contained crude protein 23% and metabolizable energy 2905 Kcal / kg up to three weeks of age. For next 3 weeks i.e. from 4 to 6 weeks of age with finisher mash which contained crude protein 20% and metabolizable energy 3120 Kcal/ kg. Group T1 (control group) was fed standard broiler mash. Group T_2 was fed broiler mash + herbiotic @ 250 g/ ton of feed.

Table 1: Means with respective standard errors for body weight (g) at different weeks

Treatment	Age in weeks					
	I	II	III	IV	V	VI
T_1	104.09±0.77	257.25±1.84	507.26±4.60	865.00±9.11	1179.95±15.60	1396.72±21.28
T_2	117.46±0.70	290.39±1.80	646.73±4.73	1064.82±10.03	1409.28±16.56	1718.78±22.99

Results and Discussion

The parameters studied were average weekly live body weight, weekly gain in body weight, weekly feed consumption and feed conversion ratio.

Body Weight

The body weight at sixth week of age revealed significantly higher body weight in group T_2 (1718.78 ± 22.92g) than that in control group T_1 (139672 ± 21.28g). The results of the body weight in the present study indicated

Table 2: Means with respective standard errors for body weight gain (g) at different weeks

Treatment	Age in weeks						
	I	II	III	IV	V	VI	1-VI
T_1	60.14 ±1.06	153.16 ±3.23	250.01 ±4.5	357.73 ±6.49	314.95 ±5.69	233.56 ±9.3	1299.75 ±47.44
T_2	73.37 ±1.11	172.93 ±2.97	356.33 ±5.5	418.09 ±6.68	344.45 ±7.43	309.50 ±6.06	1673.70 ±26.06

Table 3: Means with respective standard errors for feed consumption (g) at different weeks

Treatment	Age in weeks						
	I	II	III	IV	V	VI	I-VI
T_1	172.75 ±1.54	458.05 ±8.31	747.57 ±18	703.90 ±34.95	926.83 ±43.41	1099.57 ±26.4	4108.70 ±116.2
T_2	186.98 ±3.59	453.13 ±6.73	928.64 ±8.6	786.14 ±10.57	871.53 ±17.47	1067.95 ±3.84	4294.39 ±31.32

Table 4: Mean feed conversion ratio with respective standard errors at I - III, IV-VI and I-VI weeks

Treatment	Age in weeks		
	I-III	IV-VI	I-VI
T_1	2.95± 0.02	3.00± 0.02	2.97 ± 0.009
T_2	2.60± 0.01	2.54 ± 0.02	2.57 ± 0.011

significant effect of Herbiotic FS/Herbal preparation are in agreement with those reported by Dey and Samantai (1993), Wheeler (1994), Sundaramanna *et al.* (1996), Rajamane *et al.* (1997), Ye *et al.* (1998). (Details are in Table 1).

Body Weight Gain

Overall mean body weight gain (week I-VI) observed in T_2 group (1673.70 ± 26.06g) was significantly higher than control group T_1 (1299.75 ± 47.44g).The results of the body weight gain in the present study indicating significant effect of Herbiotic FS/Herbal preparation or control are in agreement with those reported by Qiao *et al.* (1998), Biswas *et al.* (1999), Akram *et al.* (2000), Gou *et al.* (2000), Sapcotei *et al.* (2000), Rekhate *et al.* (2004), Kumar *et al.* (2005) and Sabina *et al.* (2005). (Details in Table 2)

Feed Consumption

The overall feed consumption throughout the experiment (I-VI weeks) revealed that the significantly higher feed intake was of group T_2 (4294.39 ± 31.32g), Significantly lower average feed consumption was found in control group T_1 (4108.70 ± 116.2g). The results of the feed consumption in the present study indicating significant affect of Herbiotic FS/ Herbal preparation or control are in agreement with those reported by Rajamane *et al.* (1997), Akram *et al.* (2000), Chitra *et al.* (2004) and Dani *et al.* (2008). (Details in Table 3)

Feed Conversion Ratio

The overall feed conversion efficiency (week I-VI) showed almost similar trend to that of starter phase, in which best feed conversion efficiency was observed in T_2 group (2.57 ± 0.01). The mean feed conversion ratio of control group T_1 (2.97 ± 0.00) was found to be significantly higher/poor. The results of FCR in the present study indicated that Herbiotic FS proved to be significantly effective in improving FCR. The results of the feed conversion ratio in the present study indicating significant affect of Herbiotic FS/Herbal

preparation are in agreement with those reported by Wheeler *et al.* (1994), Rajamane *et al.* (1997), Ye *et al.* (1998), Rekhate *et al.* (2004), Bharat *et al.* (2008), Dani *et al.* (2008) and Panda *et al.* (2009). (Table 4).

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Effect of Probiotics Supplementation on Nutrient Intake and Feed Conversion Efficiency in Lactating Kankrej Cows

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Abstract

An on-farm trial of 90 days was conducted at Kushkal village, Palanpur taluka in Banaskantha district of Gujarat to study the effects of probiotics supplementation on nutrient utilization and feed conversion of lactating kankrej cows. Fourteen lactating Kankrej cows of uniform body weight, milk yield and with 2nd and/or 3rd lactation number in the initial stages of lactation were selected for the experiment to observe the effect of probiotic supplementation and were divided into two dietary treatments i) T1 (control: concentrate mixture + Green fodder + Dry fodder) and ii) T2, Probiotics supplementation (15 g/d/animal probiotics containing *Saccharomyces cerevisiae*; 1.5 x 10^8 cfu/g and bacteria, *Lactobacillus sporogens*; 5 x10^7cfu/g + T1) were fed. The results revealed that supplementing probiotics to lactating Kankrej cows significantly improved intake of DM, CP and TDN while DCP intake, water intake and feed conversion efficiency of nutrients like DM, CP, DCP and TDN in relation to milk yield and FCM remained statistically similar as compared to control. The average DM intake of experimental cows during digestion trial in treatment groups T1 and T2 were 10.03±0.04 and 10.27±0.04 kg/d and when expressed as kg/100kg B.wt. it was 2.66±0.06 and 2.75±0.09 and in terms of g/kg $W^{0.75}$ was 117.15±2.03 and 120.69±3.02. The treatment group T2 recorded significantly higher (Pd"0.01) DM intake. The average CP and TDN intake of T1 and T2 groups were 1012.03±1.53 and 1057.91±9.40 g/d and 6135.39±254.17 and 6919.64±262.35 g/d, respectively, differ (Pd"0.05) statistically but the average DCP intake was 576.44±35.88 and 665.75±39.63 g/d, respectively, remained statistically (Pe"0.05) similar.

The average digestibility coefficient of OM, CP, CF and NFE in T1 and T2 were remain statistically (Pe"0.05) similar except DM (65.21±1.88 and 70.89±1.76) and EE (46.92±2.78 and 59.78±3.47). The feed conversion efficiency of experimental Kankrej cows in treatment groups T1 and T2 in terms of intake of DM (kg/kg milk yield), CP (g/kg FCM), DCP (g/kg milk yield) and TDN (kg/kg FCM yield) respectively, were statistically (Pe"0.05) similar.

Keywords: DCP; Feed conversion efficiency; Kankrej cows; Nutrient utilization; Probiotics.

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Introduction

Successful strategies are need for the time to increase the efficiency of feed intake and nutrient utilization by manipulating rumen fruitful microbial population. The microbial environment of the gastro-intestinal tract influences the performance of the animals (Baghel et al. 2005). The rumen harbors a dense and complex microbial population responsible for 60-70 % of total digestion therefor, the potential prospective benefits of probiotic are greater with ruminants than with monogastrics (Fuller 1992). The use of Probiotics culture in large and small ruminants has been appreciated for the improvement in feed intake and nutrient utilization (Nocek and Kautz 2006). Probiotics has potential to improve nutrient utilization of dairy animal which directly or indirectly helps in increased milk production, milk fat, milk protein and lactose content in milk (Williams 1989, Adams et al. 1995).

Further the large majority of descript cattle belongs to draught and dual-purpose breeds among which Kankrej is a well established dual-purpose breed of cattle, giving sustainability to the marginal farmers and contributing to agriculture based economy of the nation (Singh 2006). Hence present study was carried out to study the effects of probiotics supplementation on nutrient utilization and feed conversion of lactating kankrej cows.

Material and Methods

An on-farm trial of 15 days preliminary feeding and 90 days experimental period was conducted in village Kushkal, Palanpur taluka of Banaskantha district. Fourteen lactating Kankrej cows of uniform body weight, milk yield and with 2nd and/or 3rd lactation number in the initial stages of lactation were selected for the experiment to observe the effect of probiotics supplementation. Seven healthy animals, each allotted to two dietary treatments in completely randomized design. Two dietary treatments i) T1 (control concentrate mixture + Green fodder + Dry fodder) and ii) T2 (T1+15 g/d/animal probiotics containing *Saccharomyces cerevisiae*; 1.5 x 10^8 cfu/g and bacteria, *Lactobacillus sporogens*; 5 x10^7cfu/g) were given. All the animals were individually fed and their nutrient requirements were met as per ICAR feeding standards (1998). Daily feed intake and residue leftover by individual animal were accurately measured and on the basis of that nutrient intake of DM, CP, DCP and TDN of individual animal were worked out. At the end of experiment, digestion trial of 7 days was conducted. The water intake of each animal was measured only during digestion trial. The samples of feeds and fodder were analyzed for proximate principals by AOAC (1999) method.

Table 1: Chemical Composition of concentrate mixture (Banas Dan), Dry fodder and green fodder being fed to lactating Kankrej cows (on % DM basis)

Principles	Concentrate Mixture (Banas Dan)	Dry fodder (Jowar)	Green Fodder (Maize/Oat)
Dry matter	92.00	90.15	21.79
Organic matter	91.00	92.65	90.79
Crude protein	21.50	2.78	9.15
Ether extract	3.83	1.25	2.16
Crude fibre	8.48	39.25	31.76
Nitrogen free extractives	57.19	49.37	47.72
Total ash	9.00	7.35	9.21

Results and Discussion

All the feeds offered to the lactating Kankrej cows during the digestion trial period were analyzed for the chemical composition i.e dry matter (DM), Organic matter (OM), Crude protein (CP), Ether extract (EE), Nitrogen free extract (NFE) and Total ash (TA) content. The chemical compostion of feeds offered during the trial period have been shown in Table 1. The intakes of DM, CP and TDN from the experimental rations fed to lactating Kankrej cows during digestibility trial are presented in Table2. The average DM intake of experimental cows during digestion trial in treatment groups T1 and T2 were 10.03±0.04 and 10.27±0.04 kg/d and when expressed as kg/100kg B.wt. it was 2.66±0.06 and 2.75±0.09 and in terms of g/kg $W^{0.75}$ was 117.15±2.03 and 120.69±3.02. The treatment group T2 recorded significantly higher (Pd"0.01) DM intake. The average CP and TDN intake of T1 and T2 groups were 1012.03±1.53 and 1057.91±9.40 g/d and 6135.39±254.17 and 6919.64±262.35 g/d, respectively, differ (Pd"0.05) statistically but the average DCP intake was 576.44±35.88 and 665.75±39.63 g/d, respectively, remained statistically (Pe"0.05) similar. Findings of

Table 2: Effect of Probiotics on nutrient utilization of lactating Kankrej cows

Parameters	T1 (Control, Without Probiotics)	T2 Treatment, With Probiotics)	P value
Water intake (L/d)	38.39±0.34	38.21±0.33	NS
DM Intake (kg/d)	10.03±0.04[a]	10.27±0.04[b]	(P<0.01)
CP intake (g/d)	1012.03±1.53[a]	1057.91±9.40[b]	(P<0.01)
DCP intake (g/d)	576.43±35.88	665.75±39.63	NS
TDN Intake (g/d)	6135.39±254.17[a]	6919.64±262.35[b]	(P<0.05)

Means with different superscripts in rows differ significantly (Pd"0.05, Pd"0.01)

NS =Non-significant

Table 3: Digestibility coefficient (%) of various nutrients fed lactating Kankrej cows during digestibility trial

Parameters	T1 (Control, Without Probiotics)	T2 Treatment, With Probiotics)	P Value
DM	65.27±1.88[a]	70.89±1.76[b]	(P<0.05)
OM	56.64±2.12	61.86±2.10	NS
CP	56.91±3.41	62.85±3.42	NS
CF	36.52±3.73	43.53±4.80	NS
EE	46.92±2.78[a]	59.78±3.47[b]	(P<0.05)
NFE	69.75±1.82	74.50±1.52	NS

Means with different superscripts in rows differ significantly (Pd"0.05)

NS =Non-significant

Table 4: Effect of Probiotics on feed conversion efficiency of different nutrients in lactating Kankrej cows

Parameters		T1 (Control, Without Probiotics)	T2 Treatment, With Probiotics)	P value
DM	milk yield(Kg/Kg Milk Yield)	1.20±0.07	1.15±0.05	NS
	FCM yield(Kg/Kg FCM Yield)	1.10±0.07	0.96±0.04	NS
CP	milk yield (g/kg milk yield)	121.88±7.54	117.88±4.93	NS
	FCM yield (g/kg FCM yield)	62.42±3.63	61.54.±2.04	NS
DCP	milk yield (g/kg milk yield)	68.34±7.54	73.58±3.79	NS
	FCM yield (g/kg FCM yield)	111.15±6.97	98.94±3.98	NS
TDN	milk yield (kg/kg milk yield)	0.73±0.05	0.77±0.03	NS
	FCM yield (kg/kg FCM yield)	0.67±0.04	0.64±0.02	NS

NS =Non-significant

present study in relation to nutrients intake are supported by Nocek and Kautz (2006) and Dann et al. 2000 while Raeth-Knight et al. 2007 and Dutta and Kundu (2008) found contrasting results with present experiment. Average daily voluntary water intake remained statistically non-significant.

The average digestibility coefficient of OM, CP, CF and NFE in T1 and T2 were remain statistically (Pe"0.05) similar except DM (65.21±1.88 and 70.89±1.76) and EE (46.92±2.78 and 59.78±3.47). Digestibility coefficient of different nutrients was presented in the Table 3. Findings of present study corroborate with Gomez-Alarcon et al. (1991) and Putnam et al. (1997) while contrasting results found by Doreau and Jouany (1998) and Dutta and Kundu (2008). The data on feed conversion efficiency in terms of DM, CP, DCP and TDN are presented in Table 4.

The feed conversion efficiency of experimental Kankrej cows in treatment groups T1 and T2 in terms of intake of DM (1.20±0.07 and1.15±0.05kg/kg milk yield, 1.10±0.07 and 0.96±0.04kg/kg FCM yield), CP (121.88±7.54 and 117.88±4.93g/kg milk yield, 62.42±3.63 and 61.54.±2.04g/kg FCM yield), DCP (68.34±7.54 and 73.58±3.79g/kg milk yield, 111.15±6.97 and 98.94±3.98g/kg FCM yield) and TDN (0.73±0.05 and 0.77±0.03kg/kg milk yield, 0.67±0.04 and 0.64±0.02kg/kg FCM yield), respectively, were statistically (Pe"0.05) similar. Thus, results of present study indicate that supplementation of probiotics (*Lactobacillus sporogens* and *Saccharomyces cerevisiae*) culture in ration of experimental Kankrej cows did not have adverse effect on feed conversion efficiency of DM, CP, DCP and TDN in relation to milk yield and FCM and remained statistically similar as compared to control.

Conclusion

Supplementing probiotics to lactating Kankrej cows significantly improved CP and TDN intake while DCP intake and digestibility coefficients of OM, CP, CF and NFE except DM and EE remained statistically similar as compared to control. Daily voluntary water intake and feed conversion efficiency of nutrients in relation to milk yield and FCM remained statistically similar as compared to control.

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Effect of Feeding and Housing Systems on T_3, T_4 and Cortisol Concentration of Kankrej Cows During Different Seasons

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Abstract

Eighteen lactating Kankrej cows were subjected to three housing systems viz., RCC shed (T_1), Thatched roof (T_2) and Tree shelter (T_3). Serum concentration of T_3 (Tri-iodothyronine), T_4 (Thyroxin) and Cortisol hormones was estimated once in a season for one year. The overall average serum concentration (ng/ml) of Tri-iodo thyronine (T_3) recorded under T_1, T_2 and T_3 was 0.96 ±0.01, 0.89 ±0.02 and 0.90 ±0.02 respectively. The difference due to treatments, seasons and their interaction was non-significant. The overall average serum concentration (ng/ml) of Thyroxin (T_4) recorded under T_1, T_2 and T_3 was 25.17 ±0.9, 26.41 ±1.0 and 26.39 ±0.8, respectively. It was significantly ($P < 0.05$) higher in winter (37.30 ±1.0) as compared to monsoon (27.03 ±1.0) and summer (13.65 ±0.70), while difference due to treatments was non-significant. The average serum concentration (ng/ml) of Cortisol recorded under T_1, T_2 and T_3 was 11.41 ±0.5, 12.57 ±0.5 and 12.11 ±0.6 respectively. The difference due to treatment was non-significant.

Keywords: Hormone; Cattle; Stress.

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Introduction

Milk and milk products are widely accepted source of animal protein. Milk plays a major role in economic significance in cattle and buffaloes. India has emerged as leading milk producing country in the world (FAO, 2002). Milk harvesting is an art and science as well as it is the most important aspects on a dairy farm management (Bhagat *et al.*, 1992). Full co-operation of the milch animal is required for harvesting clean and maximum milk. In flush season higher milk production is seen while reverse trend is observed in lean season. Thus, the present experiment was conducted to find out effect of season on different milking attributes in Kankrej cows.

Material and Methods

Eighteen lactating Kankrej cows of almost same stage of lactation, level of production and body weight were selected for present study. These cows were divided into three groups of six animals each. Each group was randomly allotted to one of the three treatments viz., RCC shed (T_1), Thatched roof (T_2) and Tree shelter (T_3). The experiment was conducted for one year covering all the three seasons. Individual feed and water consumption was recorded by providing measured quantity of roughages, concentrate and water to each cow at fortnightly interval every month. Individual serum hormone concentration was analysed for T_3(Tri-iodo thyronine), T_4 (Thyroxine) and Cortisol hormones once in a season for one year by using ready made kit supplied by Jainam biomedicals. The collected data were analyzed by standard statistical methods (Snedecor and Cochran, 1994).

Results and Discussion

Feed intake

The overall average daily feed intake (kg/animal/day) recorded in T_1, T_2 and T_3 were 12.41±0.17, 11.65± 0.19and 10.64±0.14, respectively and was significantly (Pd"0.05) higher in T_1, T_2 and T_3.

Water intake

The overall average water intake recorded under T_1, T_2 and T_3 were 40.0±0.23, 36.28±0.17 and 36.10±0.26 litre / animal / day, respectively and the differences were statistically significant.

Table 1: Mean sum of squares of different hormones in Kankrej cows

Source	d.f.	Tri-iodothyronine (T-3)	Thyroxin (T-4)	Cortisol
Treatment (T)	2	0.004	11.81	0.292
Season (S)	2	0.001	51.75*	1.803
T x S	4	0.002	6.066	1.892
Error	45	0.01	16.172	0.975

* Significant ($P < 0.05$).

Tri-iodothyronine (T-3)

The overall average serum concentration (ng/ml) of hormone T-3 recorded under T_1 (RCC shed), T_2 (Thatched roof shed) and T_3

Table 2: Mean sum of squares of different hormones in Kankrej cows

Straw type	Quantity			End use & Total		
	(000 tonnes)	Fodder	Manure	Burnt	Sold	Miscelaneous
Rice straw	09.852	06.5	00.9	81.4	04.8	05.8
Wheat straw	18.972	42.6	00.2	48.2	08.1	01.0

* Significant ($P < 0.05$)

(Under tree) was 0.96 ± 0.01, 0.89 ± 0.02 and 0.90 ± 0.02, respectively. In summer season, the average serum concentration (ng/ml) of T-3 for T_1 was 0.86 ± 0.01. The corresponding value for T_2 and T_3 was 0.82 ± 0.03 and 0.79 ± 0.02, respectively. In monsoon season, average serum concentration of Tri-iodothyronine for T_1 was 0.91 ± 0.01. The corresponding values for T_2 and T_3 were 0.89 ± 0.02 and 0.93 ± 0.01, respectively. In winter season, average serum concentration of Tri-iodothyronine for T_1, T_2 & T_3 were 1.1 ± 0.02., 0.96 ± 0.01 and 0.97 ± 0.04, respectively.

The analysis of variance (Table 4.3.2) revealed that there were non-significant differences between treatments, seasons and their interaction. These findings are corroborated with findings of Vazhapilly *et al*. (1990), while Yousef *et al*. (1997) and Kataktalware (2004) found significant effect due to different shelters. This might be due to those experiments were carried out at different places and in other breeds.

Thyroxin (T-4)

The overall average Thyroxin concentration (ng/ml) in T_1 (RCC shed), T_2 (Thatched roof shed) and T_3 (Under tree) was 25.17 ± 0.9, 26.41 ± 1.0 and 26.39 ± 0.8, respectively.

In summer season, the average serum T-4 concentration (ng/ml) for T_1 was 11.15 ± 0.6. The corresponding values for T_2 and T_3 were 16.45 ± 0.90 and 13.34 ± 0.80, respectively. In monsoon season, the average serum T-4 concentration for T_1, T_2 and T_3 was 27.43 ± 1.2, 25.36 ± 0.80 and 28.30 ± 0.90, respectively. In winter season, the average serum T-4 concentration for T_1, T_2 and T_3 was 38.22 ± 0.90, 36.93 ± 1.30 and 37.43 ± 0.80, respectively.

Analysis of variance showed non-significant difference in serum T-4 concentration. However, the difference due to season was significant (Table 4.3.2). It was significantly ($P < 0.05$) higher in winter (37.53 ± 1.00) followed by monsoon (27.03 ± 1.00) and summer (13.65 ± 0.70). In winter, it was higher due to increase metabolism, required for heat generation in the body.

Chickamune *et al*. (1986) and Vazhapilly *et al*. (1990) also observed effects of climatic changes on concentrations of thyroid hormones. These results differ with the results reported by Muller and Both (1995).They found similar levels of T-4 in unsheltered, sheltered dry lot and barned cows.

Cortisol

The level of Cortisol in serum has been used as stress indicator.

The overall cortisol concentration (ng/ml) for T_1 (RCC shed) was 1.41 ± 0.5. The corresponding values for T_2 (Thatched roof shed) and T_3 (Under tree) were 12.57 ± 0.5 and 12.11 ± 0.6, respectively. In summer season, the average serum Cortisol concentration (ng/ml) for T_1, T_2 and T_3 was 10.50 ± 0.40, 11.89 ± 0.20 and 10.60 ± 0.60, respectively.

In monsoon season, the average serum Cortisol concentration for T_1, T_2 and T_3 was 11.84 ± 0.80, 12.73 ± 0.50 and 12.81 ± 0.70, respectively, while corresponding values in winter season for T_1, T_2 and T_3 were 11.89 ± 0.20, 13.10 ± 0.90 and 12.51 ± 0.40, respectively.

Conclusion

It can be concluded that all three housing systems provided sufficient shelter against weather stress as far as hormone levels are concerned during experimental period.

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Production Performance, Nutrient Utilization and Economics of Lactating Kankrej Cows Fed Probiotics

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Abstract

An on-farm trial of 90 days was conducted in Kushkal village, Palanpur taluka of Banaskantha district of Gujarat to study effects of Probiotics supplementation on production performance, nutrient utilization and economics of lactating kankrej cows. Fourteen lactating Kankrej cows were divided in to two dietary treatments T1 (control) and T2 (probiotics). The results revealed that supplementing Probiotics to lactating Kankrej cows significantly improved fat percent, 4% FCM, DM intake, CP and TDN intake while milk production, DCP intake and return as percent of feed cost were increased but remained statistically similar as compared to control.

Keywords: DCP; FCM; TDN; Probiotics; Lactose; Kankrej.

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Introduction

The use of Probiotics culture in large and small ruminants has been appreciated for the improvement in feed intake and nutrient utilization (Nocek and Kautz, 2006). Probiotics has potential to improve the milk production in dairy cows, increase milk fat, milk protein and lactose content in milk (Williams 1989, Adams *et al.* 1995). Hence present study was carried out to study the effects of probiotics supplementation on production performance, nutrient utilization and economics of lactating kankrej cows.

Material and Methods

An on-farm trial of 15 days preliminary feeding and 90 days experimental period was conducted in village Kushkal, Palanpur taluka of Banaskantha district during October to December 2011. Fourteen lactating Kankrej cows of uniform body weight, milk yield and with 2nd and/or 3rd lactation number in the initial stages of lactation were selected for the experiment to observe the effect of probiotics supplementation. Seven healthy animals, each allotted to two dietary treatments in completely randomized design. Two dietary treatments i) T1 (control concentrate mixture + Green fodder + Dry fodder) and ii) T2 (T1+15 g/d/animal probiotics containing *Saccharomyces cerevisiae*; 1.5 x 10^8 cfu/g and bacteria, *Lactobacillus sporogens*; 5 x10^7cfu/g) were given. Milk yield of morning and evening was recorded daily and was compiled for six periods of 15 days each. At the end of experiment, digestion trial of 7 days was undertaken. The samples of feeds and fodder were analysed for proximate constituents by AOAC (1999) method. The milk fat percent and 4% FCM were recorded by procedure described by ISI (1961).

Results and Discussion

The results are represented in Table 1. Average daily milk production, average fortnightly yield of whole milk and whole milk production for 90 days were statistically (P>0.05) similar. The average daily milk fat

Table 1: Effects of Probiotics on production performance, nutrient utilization and economics of lactating Kankrej cows

Parameters	T1	T2	P value
Milk yield kg/d	8.56±0.57	9.11±0.53	NS
Fat%	4.61±0.16[a]	5.59±0.21[b]	(P<0.05)
4%FCM	9.32±0.59 [a]	10.82±0.55 [b]	(P<0.05)
DM Intake (kg/d)	10.03±0.04[a]	10.27±0.04[b]	(P<0.01)
CP intake(g/d)	1012.03±1.53[a]	1057.91±9.40[b]	(P<0.01)
DCP intake(g/d)	576.43±35.88	665.75±39.63	NS
TDN Intake(g/d)	6135.39±254.17[a]	6919.64±262.35[b]	(P<0.05)
Digestibility (%)			
DM	65.27±1.88[a]	70.89±1.76[b]	(P<0.05)
CP	56.91±3.41	62.85±3.42	NS
CF	36.52±3.73	43.53±4.80	NS
EE	46.92±2.78[a]	59.78±3.47[b]	(P<0.05)
NFE	69.75±1.82	74.50±1.52	NS
Return as Percent of feed cost (%)	236.80±15.62	265.62±12.70	NS

percent and 4% FCM of T2 were significantly (P<0.05) higher than T1 group. Similarly, fortnightly 4% FCM and cumulative FCM of T2 were significantly (P<0.01) higher than T1 group. However, total FCM production of treatment groups was statistically (P>0.05) similar. Average daily DM, CP and TDN intake of T2 group was significantly higher than T1 while DCP intake and return as percent of feed cost remained statistically similar in both groups. The average digestibility coefficient of CP, CF and NFE were statistically (P>0.05) similar except DM and EE (P<0.05). Findings of present study corroborate with Gomez-Alarcon et al. (1991) and Putnam et al. (1997) while contrasting results found by Doreau and Jouany (1998) and Dutta and Kundu (2008).

Conclusion

Supplementing Probiotics to lactating Kankrej cows significantly improved fat percent and 4% FCM, CP and TDN intake while daily milk production, DCP intake and return as percent of feed cost were increased but remained statistically similar as compared to control.

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Effect of Seasons on Nutrients Intake and Milkability of Lactating Kankrej Cows

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Abstract

An experiment was conducted on 20 lactating Kankrej cows divided in four groups according to lactation number one to four and initial stage of lactation with almost same production. Highly significant ($P < 0.01$) difference was observed for let down time in cold and dry season (61.54 sec.) as compared to hot and humid season (68.13 sec.), milking time in hot and humid season (245.72 sec) as compared to cold and dry season (260.02 sec.) and milk yield/ milking in cold and dry season (4.300 Kg) as compared to hot and humid season (3.860 Kg) while, significant ($P < 0.05$) difference was observed in milk flow rate in cold and dry season (0.990Kg /minute) as compared to hot and humid season (0.950 Kg / minute).

Keywords: Milkability; Lactation; Cattle.

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Introduction

Milk and milk products are widely accepted source of animal protein. Milk plays a major role in economic significance in cattle and buffaloes. India has emerged as leading milk producing country in the world (FAO, 2002). Milk harvesting is an art and science as well as it is the most important aspects on a dairy farm management (Bhagat *et al.*, 1992). Full co-operation of the milch animal is required for harvesting clean and maximum milk. In flush season higher milk production is seen while reverse trend is observed in lean season. Thus, the present experiment was conducted to find out effect of season on different milking attributes in Kankrej cow.

Materials and methods

The experiment was conducted on twenty lactating Kankrej cows. Animals were divided into four groups according to number of lacatation one to four (L_1 to L_4).The research work was carried out at Livestock Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar. Individual feed and water consumption was recorded by providing measured quantity of roughages, concentrate and water to each cow at fortnightly interval every month. All animals reared under semi-loose housing system and two times (Morning & Evening) milking was done with full hand milking in RCC milking parlour. All the animals were allotted routine feeding and management practices followed at Livestock Research Station. The experiment was conducted for six months. The experimental period was divided in to following seasons.

Hot and Humid season : 1st August - 2003 to 31st October - 2003

Cold and Dry season : 1st November-2003 to 31st January-2004

Let down time and milking time were recorded with use of stop watch in seconds while, milk yield was recorded by electronic weighing balance in Kilogram. Milk flow rate (Kg/minute) was calculated by dividing total milk yield by total milking time per cow at each milking. The data so obtained were analyzed using standard statistical methods (Snedecor and Cochran, 1994).

Results and discussion

Feed intake

The overall average daily feed intake (kg/animal/day) recorded in T_1, T_2 and T_3 were 12.41±0.17, 11.65± 0.19and 10.64±0.14, respectively and was significantly (Pd"0.05) higher in T_1, T_2 and T_3.

Water intake

The overall average water intake recorded under T_1, T_2 and T_3 were 40.0 ± 0.23, 36.28 ± 0.17 and 36.10 ± 0.26 litre / animal / day, respectively and the differences were statistically significant.

Let Down Time

Season-wise let down time is presented in table 1. The average let down time was observed 64.83 ± 3.5 seconds with a range from 51.75 to 86.30 seconds. It was lower than previously reported (73.19 Sec.) by Shiralkar and Dave (1975) in same breed. The difference due to season was highly significant. The let down time was reduced significantly in cold and dry season (61.54 sec.) as compared to hot and humid season (68.13 sec.) This might be due to more stress on animals in hot and humid season.

Milking Time

Milking time according to season is presented in table: 1. The average milking time was observed 252.87 ± 14.01 seconds with a range from 222.74 to 268.87 seconds. milking time was less in hot and humid season (245.72 sec) as compared to cold and dry season (260.02 sec.). The difference due to season was highly significant. The milking time recorded was lower than Gir (390 Sec.), Red Sindhi (390 Sec.)

Table: 1 Milking attributes recorded during different seasons in Kankrej cows

Season	Milking attributes			
	Let down time (Seconds)	Milking time (Seconds)	Milk yield /milking (Kilogram)	Milk flow rate (Kg/Minute)
Hot & Humid	68.13	245.72	3.860	0.950
Cold & Dry	61.54	260.02	4.300	0.990
Average	64.83 ± 3.5	252.87 ± 14.01	4.080 ± 0.41	0.970 ± 0.04
SEM	1.114	4.112	0.113	0.0131
C.D.	3.467 **	14.013 **	0.391**	0.038 *

* P < 0.05, ** P < 0.01

and Crossbred cows (270 Sec.) as reported by Thomas and Anantkrishan (1949). Normally milking time is proportional to milk yield. The Kankrej is a dual purpose breed; it produces less milk than other milch breeds (Gir and Red Sindhi etc.

Milk yield per milking

The overall average milk yield (Kg) per milking in each season was recorded 4.080 ± 0.41 (Table: 1). It was significantly higher in cold and dry season (4.300 Kg) as compared to hot and humid season (245.72). This might be due to more stress on animals in hot and humid season. It was lower than Sahiwal (7.2 Kg), Holstein Friesian (7.5 Kg) and Jersey (6.0 Kg) as reported earlier by Agarwal *et al.,* (1995); Beck *et al.,* (1951) and Blake *et al.,* (1978) respectively. This might be due to the lower yield in Kankrej as dual purpose breed, while earlier observations were taken for milch breeds.

Milk Flow Rate

The overall average milk flow rate was recorded 0.970 ± 0.04 Kg/minute.(Table: 1). It was significantly higher in cold and dry season (0.990Kg / min.) as compared to hot and humid season (0.950 Kg/min.). It was obviously more in cold & dry season due to more milk yield in aforesaid season. It was higher than reported earlier (0.890 Kg/Min.) by Shiralkar and Dave (1971) in same breed. While, it was less than Tharparkar (1.6 Kg/Min.) and Sahiwal (1.6 Kg/ min.) as reported by Sundaresan et al., (1964). Earlier workers (Bhagat *et al.,* 1992) also found significant difference in milk flow rate due to different milkers.

Conclusion

Milking attributes of lactating Kankrej cows were recorded during different seasons .The difference due to season in all parameters were found highly significant(P<0.01) except in milk flow rate (P< 0.05). This might be due to more availability of green and dry fodders in flush season and vice versa. Also in cold and dry season the animals remain more healthy and comfortable as compared to hot and humid season. There is no menance of wet conditions in house, flies etc also play important role in clean and higher milk production.

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Journal of Animal Feed Science and Technology Vol.1(2013) 31-34

Effects of Probiotics Supplementation on Production Performance and Economics of Feeding of Lactating Kankrej Cows

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Abstract

To study the effects of probiotics supplementation in lactating kankrej cows, a farm trial of 90 days was conducted in Kushkal village, Palanpur taluka of Banaskantha district of North Gujarat. The parameters studied were production performance and economics of feeding. Fourteen lactating Kankrej cows were divided in to two dietary treatments T1 (control) and T2 (probiotics). The results revealed that supplementing probiotics to lactating Kankrej cows significantly improved fat percent, 4% FCM while milk production and return as percent of feed cost were increased but remained statistically similar as compared to control.

Keywords: Probiotics; Supplementation, Productivity; Kankej cow; Economics.

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Introduction

The productivity potential of our livestock has not been fully exploited because of deficit feed resources and under utilization of available technologies to fill the deficiency of nutrients in their ration. For achieving the economic productivity in livestock, it is essential to enhance the feeding value of available feed resources.Successful strategies for increasing the efficiency of utilization of poor quality roughages include pretreatment of crop residues and dietary supplementation and manipulation of rumen ecosystem (Baghel *et al*., 2005). The rumen harbors a dense and complex microbial population responsible for 60-70 % of total digestion therefor, the potential prospective benefits of robiotics are greater with ruminants than with monogastrics (Fuller, 1992).

The use of probiotics culture in large and small ruminants has been appreciated for the improvement in feed intake and nutrient utilization(Nocek and Kautz, 2006). Probiotics has potential to improve the milk production in dairy cows, increase milk fat, milk protein and lactose content in milk (Williams, 1989, Adams *et al.* 1995). Further the large majority of descript cattle belongs to draught and dual-purpose breeds among which Kankrej is a well established dual-purpose breed of cattle, giving sustainability to the marginal farmers and contributing to agriculture based economy of the nation. (Singh, 2006).Hence present study was carried out to study the effects of probiotics supplementation on production performance and economics of lactating Kankrej cows.

Material and methods

An on-farm trial of 15 days preliminary feeding and 90 days experimental period was conducted in village Kushkal, Palanpur taluka of Banaskantha district during October to December 2011. Fourteen lactating Kankrej cows of uniform body weight, milk yield and with 2nd and/or 3rd lactation number in the initial stages of lactation were selected for the experiment to observe the effect of probiotics supplementation. Seven healthy animals, each allotted to two dietary treatments in completely randomized design. Two dietary treatments i) T1 (control concentrate mixture + Green fodder + Dry fodder) and ii) T2 (T1+15 g/d/animal probiotics containing *Saccharomyces cerevisiae*; 1.5 x 10^8 cfu/g and bacteria, *Lactobacillus sporogens*; 5 x10^7cfu/g) were given. All the animals were individually fed and their nutrient requirements were met as per ICAR feeding standards (1998). Milk yield of morning and evening was recorded daily and was compiled for six periods of 15 days each. The milk fat percent and 4% FCM were recorded at fortnight interval by procedure described by ISI (1961). At the end of experiment, digestion trial of 7 days was undertaken.The samples of feeds and fodder were analyzed for proximate constituents by AOAC (1999) method.

Results and discussion

The results are represented in **Table 1**. Average daily milk production**,** average fortnightly yield of whole milk and whole milk production for 90 days of were statistically (P>0.05) similar.In corroboration to finding of present study Bhageri *et al.* (2009) and Schingoethe *et al.* (2004) found no effect of probiotics on milk production. However Dutta and Kundu (2008) observed that probiotics supplementation increased milk production significantly.

The average daily milk fat percent and 4% FCM of T2 were significantly (P<0.05) higher than T1 group. Similarly, fortnightly 4% FCM and cumulative FCM of T2 were significantly (P<0.01) higher than T1 group. However, total FCM production of treatment groups was statistically (P>0.05) similar.The findings of present experiment corroborate with Bhageri *et al.* (2009) while Raeth-Knight *et al.* (2007) reported that probiotics supplementation did not have any adverse effect on milk fat percent and 4% FCM.

Average return as percent of feed cost remained statistically (P>0.05) similar. However, the Kankrej cattle fed with probiotics

Table 1: Effect of Probiotics on production performance and economics of feeding of lactating Kankrej cows

Parameters		T1	T2	P value
Milk yield	Kg/d	**8.56±0.57**	**9.11±0.53**	NS
	Kg/15d	**127.63± 1.37**	**134.83±50.96**	NS
	Kg/90d	**770.33±51.60**	**819.71±47.99**	NS
4%FCM	Kg/d	**9.32±0.59** [a]	**10.82±0.55** [b]	(P<0.05)
	Kg/15d	**139.25±3.07** [a]	**160.71±5.25** [b]	(P<0.01)
	Kg/90d	**838.94±53.27**	**973.91±49.06**	NS
Fat (%)		**4.61±0.16** [a]	**5.59±0.21** [b]	(P<0.05)
Total Selling price (Rs)		**15216.50±977.76** [a]	**18519.26±949.34** [b]	(P<0.05)
Total feed cost (Rs)		**6431.40±40.86** [a]	**6966.00±33.86** [b]	(P<0.05)
Return as Percent of feed cost (%)		**236.80±15.62**	**265.62±12.70**	NS

culture recorded 28.25% higher return over feed cost than the control group.Thus, supplementation of probiotics culture in concentrate mixture has economic advantage in lactating Kankrej cows.

Conclusion

It was concluded that supplementing probiotics to lactating Kankrej cows significantly improved fat percent, 4% FCM while daily milk production and return as percent of feed cost were increased but remained statistically similar as compared to control. Thus supplementation of probiotics to lactating Kankrej cows has economic advantages compared to control.

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Economics of Guar Korma Based Ummb Formulation Using Local Ingredients in Semi - Arid Rajasthan

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Abstract

Economics of guar korma based UMMB was investigated using local ingredients. Ingredients used were molasses, deoiled rice bran, guar korma, urea, mineral mixture , common salt and cement.

Keywords: Urea-molasses-mineral-block; Guar korma; Economics; Milch livestock; Local ingredients.

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Introduction

An experiment was planned and conducted to explore, economics of formulating UMMB based on locally available ingredient of Jaipur region. The multi-nutrient block was formulated on the basis of availability and cost of local ingredients. The principal ingredients are rice bran and molasses. In general, deoiled rice bran which is the major component of the block is available in almost all parts of the country throughout the year. Guar korma is also available in semi-arid region of Rajasthan. Molasses, a by-product from sugar factory is also available in all regions even if it is far away from the factory. Other ingredients like urea, salt, cement and minerals are commercially available. Use of urea as a non-conventional source of non-protein nitrogen for ruminal micro-organisms. **UMMB used as a feed supplement for ruminants.**

Material and Method

Ingredient selected were molasses, deoiled rice bran, guar korma, urea, mineral mixture , common salt and cement. UMMB was prepared with above ingredient in proportion of 50% molasses , 20% deoiled rice bran , 5%g Guar korma, 5% cement , 10% urea , 5% mineral mixture , 5% comman salt (35.73 % CP and 49.40% TDN) .

All the ingredients were weighed separately in an electrical balance before mixing. Liquid molasses was heated up to boiling temperature for 2-3 minutes for killing the micro-organism and easy mixing of ingredients with urea and for setting. Molasses was weighed again as the moisture was lost. Urea was broken down to ensure proper mixing and to avoid toxicity problem then urea was added to the molasses and is thoroughly mixed. Then, mineral mixture, Guar korma, DORB and salt were added and mixed continuously. Water and cement were added in the ratio of 2:4 to make which is then added to molasses mixture and thoroughly stirred to obtain a consistent paste and prepared UMMB using hydraulic pressure by UMMB machine at 1000 psi.

Result

Taking in to account, cost of ration, electricity and labour, cost of UMMB formulation comes around 17 Rs. per kg. It is concluded that UMMB can be prepared economically using guar korma and local ingredients to maintain milch livestock during scarcity period.

Conclusion

The cost of the UMMB normally would be less than the other concentrate meal, and the use of urea obviously as an economical replacement for a part of protein in a ration.

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Economics of TMR Formulation (Complete Feed Block) for Tharparkar Cattle

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Abstract

Economics of TMR(complete feed block) was computed for Tharparker cattle utilizing local ingredients. Total formulation cost was around Rs. 6.05 / kg**.**

Keywords: Total mixed ration (feed block); Economics, maintenance; Local ingredients.

Corresponding author: Sandeep Meel, Department of Animal Nutrition PGIVER, Rajasthan University of Veterinary and Animal Sciences, Jaipur.

Introduction

An experiment was planned and conducted to explore, economics of TMR (feed block) formulation based on locally available ingredient of semi-arid region of Rajasthan for Tharparkar cattle using various local ingredients. Total mixed ration (TMR) is a revolutionary concept in the feeding and delivering the nutrients to the bovines. TMR is the best way for balancing the feed for the animals and improve the nutrient utilization, resulting in optimum productive and reproductive performance of the animals.

Material and method

Ingredient selected were barley, Deoiled rice bran, Til cake, Chaula churi, mineral mixture , common salt and wheat straw. Nutrient requirements were estimated for body weight measurement of Tharparkar cattle at Durgapura Farm by Shefferd's formula. The body weight was around 364 kg and maintenance requirement was 0.288 kg DCP and 2.81 kg TDN. To meet out this requirement, feed block was prepared, with above ingredient in proportion of 75% roughages and 25% concentrate, using hydraulic pressure at 4000 psi by complete feed block machine.

Result

Taking in to account, cost of ration, electricity and labor, cost of total mixed ration (feed block) formulation comes around 6.05 Rs. per kg. With DCP content of 14.3 percent which are very much economical and comparable to the commercial feeds available in the market.

Conclusion

It is concluded that economic feed blocks can be prepared using local ingredient to maintain livestock particularly during scarcity period.

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Nutrition of Canine and Feline Geriatrics

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Abstract

Greying of the muzzle, stiffness in movement, changes in posture, reduced responsiveness to outside stimuli are external signs of increasing age.The ageing process is complex and we haveyet to discover its secret. The person who does - and can find a way to delay it - stands to make a fortune! In humans, the mean life-expectancy can be predicted based upon sex, race, socio-economic and other factors. For example, in western society women live longer than men and smokers have a reduced life expectancy. Factors affecting the life expectancy of cats and dogs have not been fully determined and within breed and across-breed comparisons have not been made though it is generally accepted that large and giant breeds of dog have a shorter life expectancy than small breeds.

Insufficient work has been done on the nutritional requirements of older cats and dogs or on the effects of nutrition on age-related changes, and so the first two premises are controversial. However, the role of certain nutrients in some common diseases of old animals is well documented and many of these diseases are often slow and insidious in their onset and progression, and so dietary manipulation may be beneficial. Old dogs and cats have nutritional requirements for energy, protein, fat, minerals and vitamins.

Keywords: Geriatric; Conception; Growth; Reproduction; Stiffness.

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There is no specific definition of a geriatric animal, though we all recognise external signs of increasing age such as greying of the muzzle, stiffness in movement, changes in posture, reduced responsiveness to outside stimuli, and so on. There are many problems about defining life-stages based on chronological age in cats and dogs because breeds have differing rates of ageing, lead different lifestyles and have different life expectancies. There is a simplified classification scheme (Table 1.1) based upon functionality rather than chronological age which can be applied at any time to any individual. There are many theories about the ageing process including the concept that all living creatures are genetically programmed to age - a 'biological clock' theory. Most higher living organisms have a relatively brief life consisting of the following basic life stages: conception, growth, reproduction and death. Only a few species (including humans and domesticated pets) pass through a post-reproductive senescent stage known as 'old age'. In the wild, most animals have predators that prevent the frail and infirm from surviving.

The ageing process is complex and we have yet to discover its secret. The person who does - and can find a way to delay it - stands to make a fortune! In humans, the mean life-expectancy can be predicted based upon sex, race, socio-economic and other factors. For example, in Western society women live longer than men and smokers have a reduced life expectancy. Factors affecting the life expectancy of cats and dogs have not been fully determined and within breed and across-breed comparisons have not been made though it is generally accepted that large and giant breeds of dog have a shorter life expectancy than small breeds.

Table 1.1 Proposed description for age stages of cats and dogs.

Age stage Description

1. (Fetal) Conception to birth - from fertilisation through embryological development to birth
2 (Growth) Growth - from birth until skeletal growth is completed
3. (Adulthood) Young adulthood - active reproductive phase. Until age-related changes
4. (Ageing) Advanced adulthood - obvious external signs of ageing and/or evidence of age-related changes affecting the function of at least one major organ system
5. (Senile) Age-related loss of central nervous system function leading to cognitive impairment and/or loss of control over at least one major organ system

Ageing changes

We can make several observations about ageing changes:

1. they are progressive
2. they are irreversible
3. multiple organ systems are involved
4. physiological mechanisms ultimately become impaired
5. variable expression is shown between individuals.

Ageing changes that may occur in tissues include:

- atrophy
- fatty infiltration
- fibrosis
- delayed ability to repair
- reduced number of active cells
- reduced rate of activity
- reduced organ function.

The pigment lipofuscin is deposited in body tissues in increasing amounts with increasing age, indeed it has been called 'the pigment of ageing'. In the dog lipofuscin is deposited at five times the rate that it is in humans.

Ageing changes proceed at varying rates in different organ systems of the body, and may be present in varying degrees of severity between individuals of the same age. Typically, older animals lose sensitivity of their major senses, e.g. vision, hearing, taste and smell, and all organ systems may be affected to some

degree by age-related changes. Geriatric screening is helpful in determining whether or not organ function is impaired, particularly before elective procedures such as minor surgery. Some organ systems are more likely to be affected than others, for example with increasing age teeth are likely to demonstrate: dental calculus accumulation ?gingival hyperplasia ?periodontitis ?gum atrophy and retraction ?enamel wear ?ulcerative lesions ?tooth loss.By the time they are 7-8 years of age 95% of dogs are said to be affected by periodontal disease.

The occurrence of obesity increases with age probably due to:

1. reduced lean body mass (hence reduced basal energy requirement
2. reduced exercise
3. over nutrition.

Obesity can have serious effects on other body systems, e.g. cardiovascular and skeletal systems, and may have a role in the cause of some diseases, e.g. diabetes mellitus.

Manipulation of dietary intake in older animals is necessary when there is either:

(1) frank clinical disease present

(2) subclinical disease present

(3) the nutritional requirements of the individual have changed.

Commercial pet foods have been formulated specifically for old dogs and in the future it is likely that foods will be developed for older cats as well. The justification for such products is based upon several premises:

(1) That older animals have different nutritional requirements from younger adults.

(2) That it is desirable to reduce the dietary intake of certain nutrients because they may be risk factors for the development, onset or progression of age-related changes.

(3) That it is desirable to reduce the dietary intake of certain nutrients because they may be risk factors for the development, onset or progression of disease processes.

(4) That it is desirable to increase the dietary intake of certain nutrients because of an increased requirement in older animals due to ageing changes in various organ systems.

(5) That it is desirable to increase the dietary intake of certain nutrients because of increased requirements due to the likely presence of subclinical disease.

(6) That many owners feed their animals a ration that greatly exceeds their nutritional needs.

Insufficient work has been done on the nutritional requirements of older cats and dogs or on the effects of nutrition on age-related changes, and so the first two premises are controversial. However, the role of certain nutrients in some common diseases of old animals is well documented and many of these diseases are often slow and insidious in their onset and progression, and so dietary manipulation may be beneficial. Good examples are endocardiosis in dogs and chronic renal failure in both cats and dogs .

It is true that many owners feed rations that grossly exceed the nutritional needs of their animal so reducing dietary intake to meet requirements may be beneficial, will help reduce the likelihood of obesity occurring and is unlikely to be harmful.

Age-related changes that may affect nutrition

Age-related changes that may occur and affect nutrition include:

- reduced appetite
- reduced sense of taste
- reduced sense of smell
- reduced secretions - saliva, gastrointestinal secretions (including enrymes)
- reduced absorption?
- reduced transportation?
- reduced utilisation - liver

- reduced ability to excrete waste products - liver disease, renal disease increased requirement for nutrients - zinc?
- shift in body weight distribution from lean body mass to fat.

Energy

For any individual, energy requirements may stay the same, increase or decrease with advancing age. There are few studies looking at the energy needs of large numbers of old cats and dogs.

With advancing age a fall in basal metabolic rate has been recorded in humans and experimental animals. This is thought to be due to a change in the ratio between lean body mass and fat, there being an increasing tendency to lay down body fat with advancing age.

There are several possible explanations for this trend:

(1) reduced thyroid hormone activity (secretion or receptor response)

(2) other hormonal effects, e.g. sex hormones, catecholamines.

Similar effects may also be seen in dogs and cats. Certainly there is an increased incidence of obesity in dogs with increasing age (Edney & Smith, 1986).

Energy requirements may also be reduced if an individual is doing less exercise due to changed behavioural patterns or secondary to other problems, e.g. an orthopaedic problem such as degenerative joint disease or osteoarthritis.

Older animals with reduced energy requirements should have their energy intake reduced otherwise obesity may result. Regular weighing of older animals should be recommended to detect any trend towards weight gain.

Obesity should be regarded as a serious problem in older cats and dogs. Obese animals have reduced glucose tolerance and hyperinsulinaemia (Mattheeuws *et al*. 1984a; Mattheeuws *et al*. 1984b) even in the absence of frank evidence of diabetes mellitus. Gross obesity can significantly reduce cardiovascular and respiratory function and also exacerbates numerous other problems such as skin disorders, and orthopaedic problems. Obesity in cats is a risk factor for the development of hepatic lipidosis and in cats and dogs it is a risk factor for the development of diabetes mellitus.

Most major organ system diseases seen in older animals (e.g. cardiac disease, renal disease, hepatic disease and neoplasia) result in catabolism and weight loss.

This is particularly important in cats which, because of their high protein-calorie requirement rapidly break down their own body muscle and other available proteins in the presence of inadequate protein intake or excessive energy utilisation. Almost all chronic diseases in the cat result in significant weight loss or even cachexia.

When energy intake does not meet requirements additional energy should be provided and the selection of energy source (fat, protein or carbohydrates) will depend upon the underlying clinical status of the animal. In cats protein is a major provider of energy because of their obligate carnivorous nature, however fat provides 2.25 times more energy than either protein or carbohydrate and so this will often be the high energy source of choice for both cats and dogs. Carbohydrate will be used when high protein or fat intake is contraindicated in the individual because of the presence of impaired organ function or disease (e.g. renal failure, hyperlipidemia).

Protein

The protein requirements for geriatric cats and dogs have not been determined. In the absence of clinical or subclinical disease minimum protein requirements are probably the same as for adults. It must be remembered that cats are obligate carnivores with higher protein requirements than dogs.

Protein intake should be maintained near to the minimum requirement in situations in which excessive protein intake is considered to be a risk factor for disease progression (e.g. chronic renal failure); or when excessive protein

intake may have a direct clinical effect (e.g. hyperammonaemia in hepatic disease, and uremia). It is controversial whether or not early dietary restriction of protein may prevent the onset of age-related progression of renal failure, though there is good experimental evidence that avoidance of excessive protein intake delays progression once renal damage is present .

It should be noted that no authorities recommend reducing protein intake below the minimum requirement, and that in the presence of chronic renal failure protein requirements may actually increase to twice that recommended for normal adult animals. Avoidance of unnecessary excesses is recommended not restriction below actual requirements. The term low protein' and protein restriction' which are in common use are therefore somewhat misleading.

Geriatric patients benefit from the feeding of high quality protein sources which are:

- highly digestible
- contain high concentrations of essential amino acids.

Protein sources with a high biological value include egg, liver and other animal source ingredients. Cereals have a lower biological value, but feeding a ration containing a mixture of plant and animal source materials can increase the overall biological value of the protein in the food by providing a better balance of amino acids.

Fat (Oils)

The fat requirement for old cats and dogs has not been determined and, in the absence of subclinical or clinical disease, it is likely to be the same as that for younger adults.

Fat is a high energy nutrient and excessive intake is likely to lead to the development of obesity, hence total daily intake should be controlled to maintain a fit healthy body weight.

Essential fatty acids have many important roles to play in the body including cell membrane structure and skin and hair coat condition. Some authorities consider supplementation of a ration with essential fatty acids of possible benefit for old animals, and it is unlikely to be detrimental unless excessive quantities are given in the absence of sufficient antiin the ration (e.g. vitamin E). Fat intake should be carefully controlled in the presence of liver disease, pancreatic disease, hypothyroidism and other causes of hyperlipidemia. Cats and dogs rarely develop coronary artery disease and in these species dietary fat intake does not appear to be a risk factor for the development of cardiovascular disease.

Carbohydrate

As long as the food contains sufficient quantities of gluconeogenic amino acids and fat, there is no dietary requirement for carbohydrate in cat or dog rations. However, in feeding trials carbohydrates in the form of starch are well utilised by both cats and dogs and it is a useful raw ingredient.

Carbohydrates in the form of dietary fibre may be beneficial in maintaining normal gastrointestinal function in geriatric patients because of their effects on motility and the water content of stools. They may decrease the occurrence of constipation in animals predisposed to develop it - though few clinical studies have been performed in the dog or cat. Fibre in the diet also reduces the bioavailability of all energy producing nutrients (i.e. fat, carbohydrate and protein) and so should probably be avoided in animals with compromised gastrointestinal function - particularly those with malabsorption.

Vitamins

Some authors consider that older animals should be provided with increased quantities of vitamins in the ration to overcome reduced ability to digest and/or absorb them from the ration though there is little evidence to support this viewpoint.

Water soluble vitamins are lost from the body in the urine and polyuria such as accompanies

chronic renal failure or diabetes are indications for increasing dietary intake to compensate for urinary losses.

Vitamin intake should probably also be encouraged in the presence of reduced liver function.

Minerals

There is concern about the amounts of some minerals in rations fed to older animals, particularly: Phosphorus, Sodium, Potassium, Zinc andCalcium.

Phosphorus

It is known that phosphorus retention occurs frequently in animals with chronic renal failure. This can result in calcification of various tissues including the kidneys themselves. For this reason high dietary intake of phosphorus should be avoided in older animals.

Controlling dietary phosphorus intake has been shown to delay the progression of renal failure in several studies .

Sodium

Many older dogs have endocardiosis which, even in compensated patients, results in sodium retention through activation of the renin-angiotensin-aldosterone pathway. Also, hypertension is a common proin chronic renal failure in dogs and excess sodium load may make this worse. In humans clinically normal people with high salt intakes have higher blood pressure, and there is an age-related increase in blood pressure as well. Although primary hypertension is rare in cats and dogs, some dogs are known to have salt-sensitive hypertension and recent studies at the Royal Veterinary College have demonstrated an increase in blood pressure with advancing age in cats and dogs (Bodey 1995 personal communication). In the presence of congestive heart failure sodium intake should be minimised to decrease its effects on preload. While conventional treatof dogs with endocardiosis states that treatment is unnecessary until heart failure is decompensated the author considers early introduction of reduced sodium diets helpful, particularly as the hypothalamic-pituitary-adrenal axis is stimulated early in the disease and switching old dogs from a relatively high sodium content ration to a relatively low sodium content ration can be difficult in some individuals due to acquired taste preference for salt.

Potassium

Potassium is very important as the main intracellular electrolyte in the body and depleted concentrations lead to weakness and neuromuscular abnormalities.

Severe potassium loss can occur in renal disease leading to clinical hypokalaemia, therefore care is needed to avoid a ration with low potassium in such cases.

Zinc

Some authors suggest that older dogs require an increased dietary supply of zinc,presumably due to decreased ability to digest/absorb it. In cancer patients supplementation with zinc can lead to improved appetite and enhanced immune response.

Calcium

High concentrations of calcium in a ration can reduce the bioavailability of other minerals such as copper, zinc and phosphorus so excessive dietary intake should be avoided particularly in rations containing relatively small amounts of trace elements, and in individuals with impaired gastrointestinal function such as malabsorption.

High calcium intake can also stimulate hypercalcitoninism and suppress

parathyroid hormone activity which may be significant and complicate the clinical picture in some cases. Excessive calcium intake should be avoided as this can encourage the

development of nephrocalcinosis and other soft tissue calcification in at-risk individuals.

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Technologies and Practices for Improving Livestock Feeding in India

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Abstract

Marginal farmers constitute the core of the livestock production sector and own over 80 percent of all livestock in India. Ruminant production is based on grazing and crop residues. Small ruminants subsist entirely on open grazing/browsing. Fodder scientists have developed many superior fodder crops like hybrid Napier varieties yielding over 300–400 tonnes of green fodder per hectare annually and giving net income of Rupees 250 000 per hectare. In some villages there are several few 'land surplus' farmers with fully-irrigated land to spare for high-yielding fodder crops. The milk collection centres, dairy and farmer cooperative societies in the village can identify 'land surplus' farmers and enter into mutually-benefiting annual contracts with them for cultivation and daily supply of cut-green fodder. Rotary chaff cutters in farmer households can maximise fodder utilisation. In straw-rich states millions of tonnes of straws are burnt as a means of disposal. This straw could be used for making pellets. Enriched straw pellets from Punjab state could take care of the total needs of ruminant feeds/fodder in the adjoining deficit states. The technology for pulverising, chopping and pelletising straw will have industrial-scale application in all regions.

Keywords: Enriched straw pellets; Fodder on contract; Land surplus farmers.

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Introduction

Marginal farmers constitute the core of the livestock production sector in India. Nearly 80 percent of all large ruminants, including the high-yielding crossbred cows, and over 85 percent of all other livestock are owned by marginal farmers. Ruminant production in India is predominantly based on grazing highly-overgrazed common grazing lands and on crop residues like straws and stovers. Concentrate feeds are used to supplement the dry fodder diets in the case of producing/working large ruminants while small ruminants subsist entirely on open grazing or browsing. Supplementing the dry fodder diets with some green fodder considerably enhances the efficiency of the production system including reducing the emission of greenhouse gases and reducing the dependence on expensive concentrate feeds and lowering production costs. As far as promotion of green fodder production is concerned, India has been trying to persuade the marginal farmers to grow green fodder, but with very limited success.

Application of technology and practice by farmers

Fodder on contract by 'land surplus' farmers

Access to fodder in every village with a milk collection centre (MCC), dairy cooperative society (DCS) or farmer cooperative (FC), would greatly enhance animal production. There are over 100 000 villages in India with some type of organised milk marketing infrastructure (MCC/DCS/FC). Without such access to quality fodder, livestock production in India will not be in a position to meet its burgeoning demand for livestock products. Research efforts of fodder scientists in the country have resulted in the development of high-yielding fodder varieties of grasses and legumes. A number of high-yielding perennial (replanting in 5–6 years) tropical grasses like hybrid Napier varieties yield over 300–400 tonnes of greens per hectare annually. Selling green fodder at Rupee 1 per kg, the fodder-producing farmer would receive daily cash income round the year, totaling up to Rupees 300 000 per hectare annully and net income of Rupees 250 000. One hectare of such fodder crops could sustain the fodder requirements of at least 30 cows or buffalo round the year (@ 20 kg/animal daily) or over 300 small ruminants @ 4 kg per head daily. There are farmers that have surplus, fully-irrigated land to spare for high-yielding, high income cash crops, in almost every village. Such farmers are keen to obtain a higher income from their irrigated land than that obtained from the cultivation of conventional crops. The MCC/DCS/FC could identify the 'land surplus' farmers in the village with irrigated land to spare for cash crops and enter into mutually-benefiting annual contracts with them to cultivate and supply cut-green fodder daily to collection centres for sale to milk suppliers or other small ruminant-farmers. Milk collection centres and dairy cooperative societies sell branded, balanced cattle-feed daily to milk producer members. Similarly the MCC/DCS/FC in each village can sell the cut-green fodder daily in the collection centre, making marketing of green fodders easier. Fodder on contract by 'land surplus' farmers in every village needs only promotional efforts and organised marketing by the MCC/DCS/FC, and requires no cash inputs by the Governments or the Cooperatives. This is eminently practical and demand-driven, and can be universally applied in any village in the country where organised milk marketing exists.

Promotion of rotary chaff cutters (manual or electric powered) in farmer households can help chop the green fodder into small bits and avoid wastage. Reasonably-priced manual or power-driven rotary chaff cutters are readily available in the market.

Enriched Straw Pellets

India produces some 300 to 400 million tonnes of straws/stovers annually. Farmers all over the country use home-grown dry fodder as the staple diet for their animals. There are straw surplus states that burn millions of tonnes of straws as a means of disposal. Salvaging the straws for animal feed would go

a long way in increasing the availability of ruminant feeds. A survey on the end-use of rice and wheat straws in the state of Punjab showed that less than 10 percent of rice straw and 40 percent of wheat straw produced annually is used as animal feed. The farmers in the states of Haryana, Punjab and Western Uttar Pradesh have largely replaced rice and wheat straws from the diets of dairy animals with high yielding and high quality fodder crops. In Punjab alone nearly 8 million tonnes of rice straw and around 9 million tonnes of wheat straw are burnt annually *in situ* as a means of disposal Millions of tonnes of wheat straw in Gujarat and rice straw in Madhya Pradesh are also burnt annually as farmers do not feed them to their dairy or work animals. Tamil Nadu is a straw surplus state even though rice straw is the staple diet of dairy cows and work animals in the state. Wheat and rice straws left behind by harvesters can be pulverised or chopped and pelletised in feed mills, with or without enrichment (urea, molasses, other supplements), which enhances their utility as ruminant feeds, as they can then be easily stored, transported and utilised as feeds in far-away fibre-deficit areas.

The technology for pulverising, chopping and pelleting straw will have industrial-scale application in all regions of the country where straw is burned for disposal thus making available millions of tonnes of enriched straw pellets as ruminant feed.

There are over 800 animal-feed milling plants of assorted sizes distributed all over Punjab. These minimise the transport of straw across the state for processing. Enriched rice or wheat straw pellets from Punjab can take care of the total needs of ruminant fodder and feed in the drought-ravaged and fibre-deficit state of Rajasthan. Punjab can also market enriched straw pellets to cattle-feed manufacturing plants in North India, as a low-cost ingredient for balanced cattle-feed. Small straw-pelletising plants, if established in the straw-producing areas in Madhya Pradesh or Gujarat can supplement ruminant feeding in straw-deficit

Table 1: Land and Livestock Holding in India in 2003

Category	RHH (Million)	RHH %	AFCB Cattle %	AF Indigenous cattle %	AF Buffalo %	Sheep & Goat %	Pig %	Poult %
Landless	46.09	31.18	0	0	0	0.21	0.15	1.03
Marginal (0.002-1h)	70.89	47.89	78.47	77.40	71.86	85.34	94.79	85.07
Semi medium (2-4 ha)	09.21	06.23	07.09	08.04	09.34	04.04	01.63	03.68
Medium (4-10 ha)	04.33	02.93	08.77	07.42	10.69	04.45	01.04	04.79
Large (=10 ha)	00.81	00.55	00.81	01.75	02.12	02.50	00.48	00.63
Total(Ha)	**147.84**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

RHH- Rural house Holding

AF-Adult Female

AFCB-Adult female Cross Bred

Table 2: Rice and wheat straw production and end - use in Punjab State

Straw type	Quantity			End use & Total		
	(000 tonnes)	Fodder	Manure	Burnt	Sold	Miscelaneous
Rice straw	09.852	06.5	00.9	81.4	04.8	05.8
Wheat straw	18.972	42.6	00.2	48.2	08.1	01.0

areas of Andhra Pradesh and Orissa; and in Tamil Nadu for use in Kerala.

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Standard journal article

[1] Flink H, Tegelberg Å, Thörn M, Lagerlöf F. Effect of oral iron supplementation on unstimulated salivary flow rate: A randomized, double-blind, placebo-controlled trial. J Oral Pathol Med 2006;35:540-7.

[2] Twetman S, Axelsson S, Dahlgren H, Holm AK, Källestål C, Lagerlöf F, et al. Caries-preventive effect of fluoride toothpaste: A systematic review. Acta Odontol Scand 2003;61:347-55.

Article in supplement or special issue

[3] Fleischer W, Reimer K. Povidone iodine antisepsis. State of the art. Dermatology 1997;195 Suppl 2:3-9.

Corporate (collective) author

[4] American Academy of Periodontology. Sonic and ultrasonic scalers in periodontics. J Periodontol 2000;71:1792-801.

Unpublished article

[5] Garoushi S, Lassila LV, Tezvergil A, Vallittu PK. Static and fatigue compression test for particulate filler composite resin with fiber-reinforced composite substructure. Dent Mater 2006.

Personal author(s)

[6] Hosmer D, Lemeshow S. Applied logistic regression, 2nd edn. New York: Wiley-Interscience; 2000.

Chapter in book

[7] Nauntofte B, Tenovuo J, Lagerlöf F. Secretion and composition of saliva. In: Fejerskov O, Kidd EAM, editors. Dental caries: The disease and its clinical management. Oxford: Blackwell Munksgaard; 2003. p. 7-27.

No author given

[8] World Health Organization. Oral health surveys - basic methods, 4th edn. Geneva: World Health Organization; 1997.

Reference from electronic media

[9] National Statistics Online—Trends in suicide by method in England and Wales, 1979-2001. www.statistics.gov.uk/downloads/theme_health/HSQ 20.pdf (accessed Jan 24, 2005): 7-18. Only verified references against the original documents should be cited. Authors are responsible for the accuracy and completeness of their references and for correct text citation. The number of reference should be kept limited to 20 in case of major communications and 10 for short communications.

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