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NUTRITIONAL STATUS OF ANIMALS IN PERI-URBAN DAIRIES IN PUNJAB STATE OF INDIA

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ABSTRACT

The study was taken up to assess the nutritional status of dairy animals in peri-urban dairies in Punjab State of India. The state Government has established 7 peri-urban dairies; 2 each in Ludhiana and Amritsar and 1 each in Jalandhar, Ferozepur and Hoshiarpur Districts. About 30 dairy houses were selected randomly from each complex. Buffaloes predominated in almost all peri-urban dairies, except in Ferozepur dairy complex (FDC). The animals of FDC had the lowest body weight while animals of Ludhiana downy had highest (478 vs 572 kg) mean weight should be given. The healthy animals of LDC were capable of producing highest ($P<0.05$) milk. As compare to other groups. The area allocated per adult cattle unit was highest in Jalandhar dairy complex (JDC) and lowest in Ludhiana dairy complex (LDC). However, the space allocated was much lower than the recommended area i.e. 11.25 m^2. Wheat bran was the most common feedstuffs used in the rations of lactating animals. Non-conventional feed resources like brewery and starch industry waste played a significant role in peri-urban dairy production system. The diet of the animal was about 86, 64, 79, 58 and 46% deficient in CP in JDC, ADC, FDC, LDC and HDC respectively while the diet was deficient in fat in almost all dairy houses in all dairy complexes except those of HDC, where only 69% of dairy house fed ration were deficit in fat. The NDF content of the complete feed was higher than the recommended level. The milk urea nitrogen (MUN) was lowest ($P<0.05$) in animals of FDC (8.1mg/dl) and highest in animals of HDC (20.8mg/dl). The DM offered was about 24, 14, 64, 83 and 50% less than the requirement in dairy houses of the households of JDC, ADC, FDC, LDC and HDC, respectively. The daily consumption of nutrients was lowest ($P<0.05$) by the animals of LDC and FDC in comparison to animals of other dairy complexes. Only 3.6% of the dairy houses of FDC and 25% of the dairy houses of LDC offered mineral mixture to their animals, while mineral mixture was not offered at all in JDC, ADC and HDC. It was concluded that most of the animals in peri urban dairies were underfed.

Key words: Nutritional status, Dairy animals, Peri urban dairies

INTRODUCTION

In Punjab, 34% of the human population lives in urban areas (Anon. 2007). An ever increasing population because of migration from rural to urban areas has led to increased demand of food in urban area. Also there is little opportunity exists for subsistence production to meet family needs as in the rural area. This is particularly true for milk and milk products. Common solution to this problem is the establishment of peri-urban dairies at outskirts of cities. Punjab state government has established seven peri-urban dairy units; two each in Jalandhar and Ludhiana and one each in Amritser, Ferozepur and Hoshiarpur district. Most of these dairymen feed animals mainly on wheat straw, bought green fodder, and feed which they obtain from the market daily. But optimum productive and reproductive efficiency of livestock could be achieved only if the animals receive the required quantity of feedstuffs providing all nutrients in proper proportion (NRC 2001) and required management in terms of good health and comfortable environment (Noguera and Abreu, 1995; Venkatasubramaniam and Fuizele, 1996). There is a paucity of information regarding nutritional status of animals in newly established peri-urban dairy units of Punjab. The objective of this study was to assess the nutritional status of animals to improve the productive and reproductive pe4rformance by advocating the use of right kind of feed at the right time or by the use of supplements.

MATERIALS AND METHODS

For assessing the nutritional and management practices followed and nutritional status of dairy animals, 30 dairy houses were selected randomly from dairy complex in each district. Information about livestock holdings and feeding practices was collected by filling up a comprehensive questionnaire duly approved by the ICAR. The different categories of animals kept by the farmers were converted into adult cattle units i.e. adult lactating buffalo, cow, bullock or adult male buffalo as 1 unit, heifer as 0.75 units and calves as 0.35 units.

The feed and fodder samples (240-300) were collected from the dairy farm of each farmer. On the spot milk, grab faecal samples from rectum and urine samples were collected from at least 2 lactating animals selected at random from each peri urban dairy. The samples of different feedstuffs offered were dried in a hot air over at 80^{o}C and ground to pass through 1 mm sieve and analyzed for CP, NDF and EE content (AOAC, 1995). The milk samples were preserved with sodium azide tablet. The samples were prepared by centrifuging at 5000 rpm for 15 min. at 4°C to separate the fat layer. The defatted milk was de-proteinized by equal volumes of 3% TCA. Samples were mixed and centrifuged at 15,000 rpm for 20 min. at 4°C. The supernatant was used for the estimation of urea, by using kits (Bayer Diagnostics, India). The urine sample (10 ml) was kept in a vial containing 0.5 ml of 20% H_2SO_4 to keep the pH below 3 and analyzed for allantoin (Young and Conway, 1942), uric acid (Trivedi *et a1.,* 1978) and creatinine by the method of Folin and Wu (1919). Purines absorbed were calculated from the daily urinary PD excreted (IAEA, 1997). The data were analyzed by simple ANOVA (Snedecor and Cochran, 1994) by using the software package SPSS version 12 (SPSS, 1996) and differences in mean were assessed by using Turkey b. The heart girth and body length of animals were measured to calculate body weight of animals.

RESULTS AND DISCUSSION

The LDC had the highest number of adult cattle units (ACU) followed by JDC and ADC (Table 1), while the FDC had the lowest number of ACU. The lactating animals as percent of AUC were highest in JDC followed LDC, ADC and lowest in FDC. Buffaloes predominated in all periurban complexes and the relative proportion of cattle and buffaloes varied between 43:57 (FDC) to 17:83 (JDC). The body measurement revealed that the animals in FDC had lowest (P<0.05) body weight as compared to animals in other dairy complexes. The animals of LDC had excellent health as indicated by highest body weight (572 kg).The animals of LDC followed by HDC had the highest (P<0.05) milk yield as compared to the lowest in ADC, statistically comparable with that of animals in JDC and FDC. The milk urea N (MUN), an indicator of nutritional status of animals, specifically with respect to protein was highest (P<0.05) in LDC and HDC as compared to MUN in animals of other periurban dairy complexes and lowest in FDC. The level of MUN i.e. more than 16 mg/dl also revealed that the animals of LDC and HDC were over fed.

The purine derivative, (a tool to assess the microbial protein synthesized in the rumen) excreted in the urine were highest (P<0.05) in animals of ADC as compared JDC, were but statistically comparable with the animals in other periurban dairy complexes (Table 2). The relative proportion of allantoin and uric acid ranged between 94.5:5.5 (HDC) to 98.4: 1.6 (LDC), confirming the earlier report (Wadhwa *et al*, 2005, 2006). The purines absorbed and microbial N synthesized in the rumen were highest (P<0.05) in animals of ADC as compared with of JDC, but statistically comparable with those of other dairy complexes.

Agro-industrial by-products particularly wheat bran was the most common feedstuff used in the rations of lactating animals. Non-conventional feed resources like moong chunni, brewery and starch industry waste were used extensively in peri-urban dairy production system.

The chemical composition of complete diet was worked out from the composition of different feedstuffs available and the quantity consumed. The CP content of the complete diet (9.4 to 11.4%) fed to animals was less than the recommended content (13-17%). The diet of animals in JDC had lowest (P<0.05) CP and highest (P<0.05) NDF (Table 3) as compared to diet offered to animals in LDC and HDC. The diet offered to animals in group had lowest (P<0.05) EE content as compared to the diet offered in LDC and HDC. The EE content of the diet offered in all periurban complexes was lower than recommended level of 3% (NRC 1989). The complete feed was deficit in fat content by 4 (HDC) to 38% (FDC), whereas the NDF content was 114% (LDC) to 144% (JDC) higher than the recommended (>28%) for dairy animals (NRC, 2001). About 24, 14, 64, 83% and 50% of the dairies of JDC, ADC, FDC, LDC and HDC, respectively offered less DM than required by the animals. Singh *et al* (2008) also found that dairy animals in urban, periurban and rural areas were offered diet deficient in DM, CP and TDN. The roughage to concentrate ratio revealed that the animals of LDC were offered highest (P<0.05) level (40%) of concentrate mixture as compared with HDC, while reverse trend (P<0.05) was observed in level of roughage offered. With in the roughages the relative proportion of green fodder was the highest (P<0.05) in HDC and lowest in LDC and reverse trend (P<0.05) was observed with respect to wheat straw. Bakshi *et al.* (2004) revealed that roughage level in the diet modify rumen microbial population, leading to changes in the secretion of microbial enzyme responsible for digestibility of nutrients which inturn may affect productivity of animals.

The intake of DM, CP, DCP and TDN (Fig. 1) was about 22%, 18%, 15% and 21%, 5, 8%, 11% and 7% less than the one required by dairy animals, in LDC and FDC, respectively. Intake of all the nutrients (33%-41%) was higher (P<0.05) in ADC in comparison to that in JDC and HDC.

The importance of mineral in regulating biological systems, growth, production and reproduction is well documented (McDowell 1985).Only 3.6% of the dairy houses of Ferozepur and 25% of the dairy houses of

LDC, offered mineral mixture to their animals (Table 3), while none of the dairy farmer of ADC and HDC used mineral mixture. Mastitis was frequently observed on 68% to 86% of dairy houses in different dairy complexes. Highest number of cases of abortions (12% of dairy animals) was observed in ADC where as the cases of abortions (3.3-3.5%) were lowest in LDC and FDC.

General observations: In the commercial peri-urban dairy complexes, the conditions were very unhygienic representing poor cleanliness, stripping of milk or flakes on floor and heaps of dung on ground was the common scene. The number of animals per unit area was very high and animals were unable to move or sit and had no option but to stand. The dairy farmers rarely let lose the animals for exercise. The poor living conditions could be responsible for high incidence of mastitis in milking herd. In all the commercial dairy complexes, the banned hormone oxytocin used extensively, at higher doses (6-10 ml or even more), for let down of milk and same needle was used for all animals. Perhaps this is the one of possible reason for high incidence of abortions (1-20%) at most of the dairy farms. Mismanagement and negligence are the key factors responsible for spread of diseases and very high calf mortality. The sick animals were usually given self treatment or were examined by so called doctors (quacks). The animals were rarely dewormed and occasionally vaccinated.

Table 1. Livestock inventory, Body weight and milk production in peri urban dairies

Parameter	JDC (n=29)	ADC (n=28)	FDC (n=28)	LDC (n=24)	HDC (n=25)
Livestock inventory					
ACU's / dairy house	98.2	94.5	20.6	136.3	42.0
Lactating animals/ dairy house	85.0	69.3	10.9	115.3	24.4
Lactating animals, % ACUs	86.6	73.3	52.6	84.6	58.2
Area allocated/ACU, m^2	6.50	6.12	5.96	5.09	5.21
% area less than required	42	46	47	55	54
Species wise distribution					
Cattle	17.2	28.6	42.9	25.0	26.9
Buffalo	82.8	71.4	57.1	75.0	73.1
C: B	1:4.8	1:2.5	1:1.3	1:3.0	1:2.7
Body weight, milk yield and MUN					
Body weight, kg	544.9^{ab}	553.2^{b}	478.1^{a}	571.8^{b}	537.5^{ab}
Milk yield, kg/d	6.50^{a}	5.96^{a}	6.66^{a}	9.65^{b}	8.27^{b}
MUN, mg/dl	12.8^{ab}	13.7^{b}	8.1^{a}	19.6^{c}	20.8^{c}

Table 2. Urinary excretion of purine derivatives and microbial protein synthesis in animals

Parameter	JDC	ADC	FDC	LDC	HDC	PSE
ALL, mM/d	51.1^{a}	102.8^{b}	59.3^{a-b}	74.7^{ab}	77.2^{ab}	5.36
UA, mM/d	0.79	2.23	1.47	0.93	1.40	0.22
PD, mM/d	51.9^{a}	105.1^{b}	61.2^{ab}	75.6^{ab}	75.6^{ab}	5.4
CRT, mM/d	145.6^{b}	151.9^{b}	97.2^{a}	167.5^{b}	188.7^{b}	6.12
Purines absorbed, g	189.9^{a}	412.7^{b}	170.8^{a}	306.9^{ab}	405.5^{b}	24.71
Microbial-N, g	138.1^{a}	300.1^{b}	124.1^{a}	223.1^{ab}	294.8^{b}	17.96
Allantoin %	98.1	97.5	95.1	98.4	94.5	0.85
Uric acid %	1.9	2.5	4.9	1.6	5.5	3.79

Figures with different superscripts in a row differ significantly, P<0.05
ALL-Allantoin; UA-Uric acid; PD- Purine derivatives; CRT- Creatinine

Table 3. Nutrients in complete feed and nutrients intake by animals

Parameter	JDC	ADC	FDC	LDC	HDC	PSE
DM consumed by animals, kg/d/A						
DMI	13.4^{b}	14.4^{b}	10.0^{a}	10.0^{a}	12.4^{b}	0.30
Green Fodder	7.33^{b}	7.26^{b}	4.51^{a}	2.83^{a}	9.58^{c}	0.47
Straw	2.64^{b}	3.01^{b}	2.94^{b}	3.05^{b}	0.03^{a}	0.18
Concentrate	3.30^{ab}	4.56^{c}	2.47^{a}	4.09^{bc}	3.37^{ab}	0.15
Concentrate : Roughage						
Concentrate	24.8^{a}	31.1^{a}	28.4^{a}	39.8^{b}	24.5^{a}	1.00
Roughage	75.2^{b}	68.9^{b}	71.6^{b}	60.2^{a}	75.5^{b}	1.00
Green fodder	74.4^{b}	71.1^{b}	51.0^{a}	46.0^{a}	99.6^{c}	2.50
Straw	25.6^{b}	28.9^{b}	49.0^{c}	54.0^{c}	0.37^{a}	2.50
Chemical composition, % DM basis						
CP	9.4^{a}	10.8^{ab}	10.1^{ab}	11.3^{b}	11.4^{b}	0.21
NDF	68.4^{c}	63.1^{ab}	66.5^{bc}	59.8^{a}	65.2^{bc}	0.56
EE	2.09^{ab}	2.05^{ab}	1.85^{a}	2.21^{b}	2.88^{c}	0.05
Nutrients consumed, kg/animal/d						
CP	1.26^{ab}	1.56^{c}	1.02^{a}	1.16^{ab}	1.40^{bc}	0.04
DCP	0.84^{ab}	1.0^{ab}	0.63^{a}	0.80^{ab}	1.22^{b}	0.06
TDN	7.5^{b}	8.8^{b}	5.7^{a}	6.1^{a}	7.6^{b}	0.19
NDF	9.1^{b}	9.1^{b}	6.6^{a}	5.9^{a}	8.1^{b}	0.21
Mineral supplements offered and reproductive problems, % of animals						
Mineral Mixture	0.0	0.0	3.6	25.0	0.0	-
Salt	31.0	46.4	25.0	83.3	34.6	-
Abortions	10.1	12.4	3.5	3.3	6.6	-
Mastitis*	69.0	85.7	67.9	79.2	69.2	-

Figures with different superscripts in a row differ significantly, P<0.05
**Percentage of dairy houses*

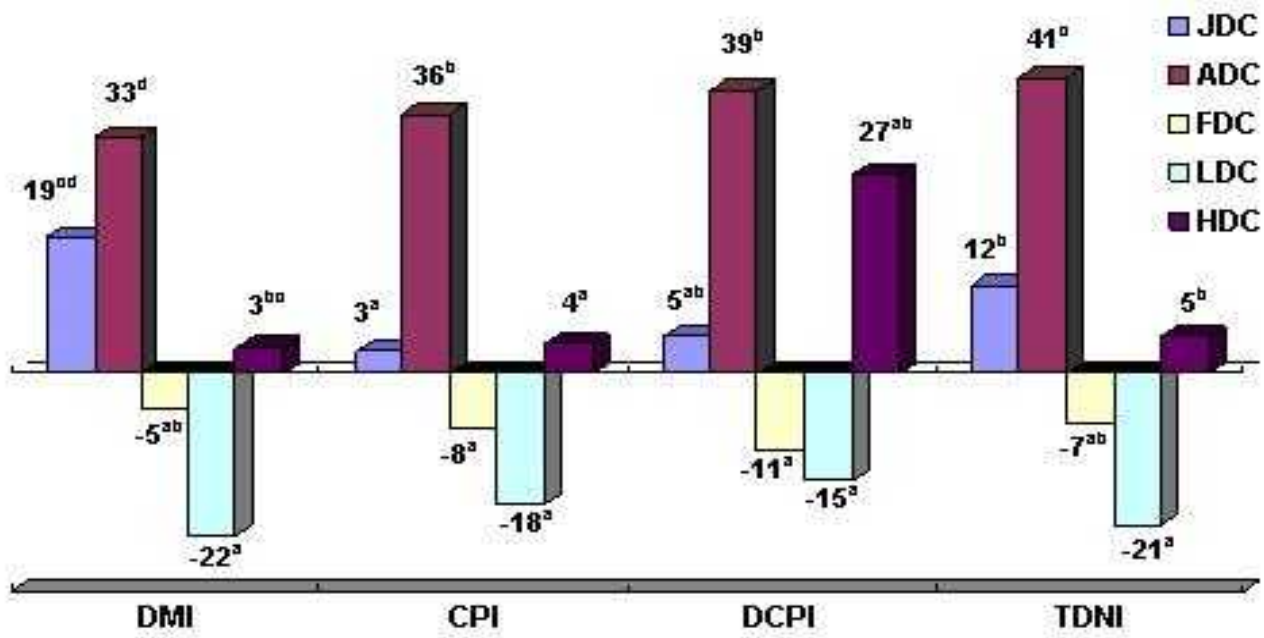

Fig. 1 Nutrient intake (%) in comparison to the requirement of dairy animals in different peri-urban dairies of Punjab

In the commercial farms almost all the animals (sick; mastitis infected and the normal ones) were milked and the mixed milk was sold for human consumption. The sick animals given antibiotic therapy were also milked without taking into consideration of the withdrawal period, necessary to avoid the antibiotic residues in the milk used for human consumption. Moreover the animal which aborted the fetus were offered additional concentrate and once they started milking, the milk was sold to local market from the very first day.

Figures with different superscripts in a parameter differ significantly, $P<0.05$

The farmers were unaware of the nutrient requirements of dairy animals and the animals were offered feed in the manger (group of 10-15 animals) for a limited period and the same manger was used for serving the water. There were no separate mangers for smaller animals. A trend of homemade concentrate prevailed, which was highly imbalanced with respect to protein, carbohydrate and fat content. Most commonly used ingredients were wheat bran, cotton seed cake, gram husk, dried chapattis and brewery waste. Some dairy farmers used only brewery waste or mess waste or chapattis alone as concentrate for feeding to their animals. Some farmers offered 250 ml mustard oil/animal weekly or fortnightly and some of the farmers drenched oil to their animals, just prior to calving. Only a few offered mineral mixture to their animals, while the rest of the lot frequently offered salt (Pakistani namak) or liquid calcium to their animals. All dairy farmers depend upon "Gwalas" to look after their animals. The animal organic waste of commercial peri-urban dairy complexes is disposed off in a stream 'Ganda nalla', from where the water is pumped into the fields for irrigation of forages. The mobile dairy farmers let there animals in this stream for bathing during hot season.

It was concluded that the animals in all periurban dairy complex were underfed with respect to macro and micro nutrients in diet and farmers should be motivated to supplement mineral mixture in the feed to improve productive as well as reproductive efficiency of cattle also. Feeding of balance diet (with respect to energy, protein and minerals) must be advocated under field conditions.

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