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Effect of supplementation of sea buckthorn leaf meal on egg production performances of coloured breeder birds during winter season

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ABSTRACT

The present experiment was conducted to study the effect of sea buckthorn leaf meal (SBTLM) supplementation on hen house and hen day egg production in ninety coloured Chabro adult breeder hens and 18 viable cocks in 1:5 sex ratio were randomly distributed into three dietary treatment groups: Control, standard basal breeder diet (BIS, 2007); basal+0.5% and basal+1.0% SBTLM. The average egg production during 9th week onward till the entire period of experimentation were significantly higher ($p<0.01$) in both SBTLM supplemented groups (basal diet+0.5% SBTLM and basal diet+1.0% SBTLM) as compared to control group (basal diet). However, it was also observed that from 3rd week to 5th week of experimentation, the weekly hen house egg production were significantly higher ($p<0.05$) in both the SBTLM supplemented groups than the control group. The overall egg production up to the 12th week of experimentation were significantly higher ($p<0.01$) in both the SBTLM supplemented groups as compared to control group. During the experimental study period, there was no mortality in any treatment group. Hence, the hen day egg production per week and phase wise hen day egg production per week was equal to the hen house egg production per week egg production.

Key words: Breeder, Chabro and SBTLM, Coloured chicken

Poultry meat and eggs are the cheapest and best source of quality animal protein[17]. Impressive growth has been achieved in commercial poultry farming but the rural poultry sector remains unchanged. Due to limited feed resources and changing agro-climatic conditions of our country, backyard poultry happens to be best viable alternative to ensure nutritional security and agricultural sustainability by utilizing locally available resources. The impressive growth

in poultry industry is the result of technological breakthrough in feeding, breeding, management and health care[13]. The World Health Organization estimated that approximately 80% of the earth's inhabitants rely on traditional medicines for their primary health care needs as well as to improve the productive and reproductive performances of poultry. Herbal medicines may serve as safer alternatives as growth promoters due to their suitability and preference, lower cost of production, improved feed efficiency, fast growth, reduced mortality, reduced risk of diseases, minimum health hazards and environmental friendliness. Sea buckthorn (*Hippophae rhamnoides* L.), a unique and valuable plant has gained worldwide attention, mainly for its medicinal and nutritional potential[12] .Sea buckthorn is a thorny, dioecious, wind pollinated, multipurpose temperate bush plant bearing yellow or orange berries with nitrogen fixing

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abilities. It is commonly known as "cold desert gold" due to its various beneficial effects over plant, animal, human & soil health. Sea buckthorn is a small shrub comprising of fruit and leaves that are rich in nutrients and bioactive components such as vitamins[9], amino acids[15], lipids[6], sugars and acids[18], and flavonoids[7]. Studies have shown that the leaves and fruit residues of sea buckthorn could be used to feed poultry and livestock without the accumulation of toxins, and that the feed also had a stimulating effect on growth and performance of poultry and livestock[11,17&19]. The leaves of SBT are very nutritious and can be fed to the livestock and poultry after value addition[18,20&21]. As protein is the most expensive nutrient, by introducing new protein source in breeder diet, we can certainly decrease the cost of production and increase the profit per birds leading to socio-economic up-liftment of poultry farmers during intense summer season.

MATERIALS AND METHODS

Ninety coloured chicken breeder (Chabro) hens and eighteen viable cocks were obtained from the Poultry farm of the U.P. Pandit Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go-Anusandhan Sansthan, Mathura. These birds were randomly distributed into three treatment groups having three replicates of 10 hens and 2 cock each of uniform age, production and in good health condition. The basal/control group was kept on standard breeder diet[2] and other two treatment groups were supplemented with 0.5% and 1.0% sea buckthorn leaf meal (SBTLM). These breeder birds were reared under deep litter system and standard managemental conditions. Throughout the experimental period the birds were offered fixed weighed quantity (110g/day) of feed (adequate in all nutrients) as per BIS (2007) and water *ad lib*.

The meteorological Parameters *viz.* average morning dry bulb temperature (ºC) and wet bulb temperature (ºC) ranged from 11.07 to 16.86 ºC and 9.60 to 16.14 ºC while afternoon dry bulb temperature (ºC) and wet bulb temperature (ºC) ranged from 13.81 to 25.51 ºC and 11.43 to 18.50 ºC. However, during evening hours, dry bulb temperature (ºC) and wet bulb temperature (ºC) ranged from 13.71

to 22.06 and 11.76 to 16.57. The average morning, afternoon and evening Temperature Humidity Index (THI) values ranged from 55.48 to 67.14, 58.77 to 72.29 and 59.15 to 66.42, respectively, up to twelve weeks of experimentation.

RESULTS AND DISCUSSION

Hen House Egg Production (HHEP) and Hen Day Egg Production

The hen house egg production during 1st to 2nd weeks were not differed significantly during the experimentation. The hen house egg production was significantly higher (p<0.05) in both the sea buckthorn leaf meal supplemented groups compared to the control during 3rd week, 4th week, 5th week and 8th week of experimentation (Table 1). However, the hen house egg production in the various treatment groups during 6th week was 78.09, 89.05, and 88.10, in 7th week was 75.09, 87.62 and 86.67, 9th week was 80.48, 90.48 and 89.05, 10th week was 79.05, 91.90 and 89.52, 11th week was 80.48, 90.95 and 88.57 and in 12th week of experimentation was 79.52, 90.95 and 90.48, respectively. The hen house egg production in basal diet + 0.5% SBTLM and basal diet + 1.0% SBTLM breeder diet supplemented groups were significantly higher (p<0.01) compared to the control group during 6th, 7th, 9th, 10th, 11th and 12th week of experimentation. The overall egg production were also significantly higher (p<0.01) in both 0.5% and 1.0% SBTLM supplemented groups (84.56 and 84.28) as compared to control (75.20).

During the experimental study period, there was no mortality in any treatment group. Hence, the hen day egg production per week and phase wise hen day egg production per week was equal to the hen house egg production per week and phase wise egg production per week, respectively.

The increase in hen house egg production could be due to the supplementation of sea buckthorn leaves, rich in nutrients and bioactive components such as vitamins, amino acids, lipids, flavonoides, higher content of essential oils and have as anti oxidant properties. The results obtained in the

present study fall in line with the findings of many researchers[1,3,4,5,8,16,17&20]. On contrary some scientist reported that changes in the level of protein in diet did not affect the rate of egg production and egg mass[10&14].

Table 1. Effect of dietary supplementation of sea buckthorn leaf meal on the average weekly hen house egg production (HHEP) of breeder birds during winter season

Treatments	Week											
	1	2	3	4	5	6	7	8	9	10	11	12
Basal diet	66.67	66.67	70.00[a]	73.33[a]	75.24[a]	78.09[a]	75.09[a]	75.71[a]	80.48[a]	79.05[a]	80.48[a]	79.52[a]
Basal diet+0.5% SBTLM	65.24	71.90	81.90[b]	82.86[b]	84.76[b]	89.05[b]	87.62[b]	87.14[b]	90.48[b]	91.90[b]	90.95[b]	90.95[b]
Basal diet+1.0% SBTLM	65.71	73.81	82.86[b]	84.76[b]	83.81[b]	88.10[b]	86.67[b]	88.10[b]	89.05[b]	89.52[b]	88.57[b]	90.48[b]
SEM	1.20	1.89	2.43	2.19	1.91	1.98	2.16	2.10	1.70	2.18	1.72	1.90
Sig. Level	NS	NS	p<0.05	p<0.05	p<0.05	p<0.01	p<0.01	p<0.05	p<0.01	p<0.01	p<0.01	p<0.01

Means bearing different superscripts within a column differ significantly (p<0.01)

NS: Not significant (p>0.05) SEM: Pooled standard error of means

SBTLM: Sea buckthorn leaf meal

CONCLUSION

The leaves, seeds and fruit residues contains high crude protein, amino acid, calcium and phosphorus, they have advantages as basic materials for feed formulations for poultry. Due to presence of several nutritional and bio active compounds in fruit, leaves, seed oil and cakes of sea buckthorn, it serves as good growth promoter as well as enhance egg productivity. It was found that the supplementation of 0.5 and 1.0% SBTLM had significantly higher (p<0.05) hen house and hen day egg production as compared to control group during the experimentation during winter season.

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Blood biochemical and physical parameters of crossbred barrows reared with different floor space allowances

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ABSTRACT

To compare the effect of different floor space allowances on physiological status of pigs, 36 crossbred (Landrace x *Desi)* barrows were reared with 3 different floor space allowances {n = 4(group size) x 3(replications) = 12 each}. Group T_{IS} (control) had floor space allowance (0.9, 1.35 and 1.8 m^2/pig during weaner, grower and finisher stage) as per Indian Standards (IS: 3916-1966), while $T_{2/3}$ and $T_{1/2}$ treatment groups had 33% and 50% reduced floor space allocation with fixed small (n=4) group size throughout the experiment. Skin lesion score, blood parameters and back fat thickness (BFT) of pigs were estimated. Mean skin lesion score of head and ears (weaner, P<0.05) was lower in T_{IS} group than other groups, and body regions (finisher, P<0.05) was lower in T_{IS} than $T_{1/2}$ group, whereas, lesion score for other body parts and growth stages did not differ among the groups. Plasma cortisol concentration was higher (P<0.05) in $T_{1/2}$ group than other groups (grower) and T_{IS} group (finisher). BFT of pigs did not differ statistically among the groups. It is concluded that suitable floor space allowance in Indian conditions should lie between $T_{2/3}$ and $T_{1/2}$ group for crossbred pigs.

Key words: Back fat thickness, Crossbred barrow, Floor space, Lesions, Welfare

Pig farming has become a profitable enterprise since it possesses many favourable economic traits e.g. high prolificacy, faster growth rate, shorter generation interval, low cost of rearing and high dressing percentage with better feed conversion efficiency[15]. Rearing of pigs in India is predominantly occupied by marginal (52.36%), small (20.9%) and semi-medium (15.42%) farmers[2] who are already constrained by availability of little land. Efficient utilization of floor space without adversely affecting the quality of pigs and products is an important aspect for profitable pork production. Efficient use of indoor floor space enhances economic and management benefits[1&19]. Some studies indicate that there is scope of reduction of floor space for pigs through environment enrichment[5&13]. Hence, this investigation was carried out to assess the effect of reduction in floor space allowance on welfare indicators of pigs.

MATERIALS AND METHODS

Animals, Facilities and Management Conditions

A total of 36 crossbred {Landrace x *Desi* (local Indian)} male piglets, from 14 litters of unrelated sows farrowed contemporarily, were selected randomly taking body weight and age into consideration at ICAR - Indian Veterinary Research Institute (IVRI), India. These piglets were castrated at one month of age, weaned at 6 weeks of age and subsequently

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distributed randomly in to three equal groups {n=12 each (group size=4, replications=3)} on the basis of 3 different floor space allowances. T_{IS} (control) group provided floor space as per Indian Standards[11] specification, while $T_{2/3}$ and $T_{1/2}$ treatment groups with 33% and 50% reduced floor space allocation per pig in comparison to IS. Indian Standards suggests covered floor area of 0.9 and 1.8 m^2/pig for weaner and finisher pigs, respectively. During weaner (6-14 weeks), grower (15-22 weeks) and finisher (23-29 weeks) stages, 3 different floor spaces {T_{IS} group (0.9, 1.35 and 1.8 m^2/pig), $T_{2/3}$ group (0.6, 0.9 and 1.2 m^2/pig) and $T_{1/2}$ group (0.45, 0.68 and 0.9 m^2/pig)} were provided (Table 1).

Table 1. Floor space allowance (m^2/pig) for different treatment groups

Stages	Groups		
	T_{IS}	$T_{2/3}$	$T_{1/2}$
Weaner (6-14 weeks)	0.9	0.6	0.45
Grower (15-22 weeks)	1.35	0.9	0.68
Finisher (23-28 weeks)	1.8	1.2	0.9

Each pen had 2.5 m width and specified floor space was provided by fixing length of the pen using metallic grill gates. Floor was made of concrete with serrations. Animals were fed twice daily in linear feeders with provision of potable water round the clock. Pigs were provided with corn-barley-soybean meal-wheat bran based diet based on formula as per growth stage (Table 2). Management practices related to health and hygiene were followed as per farm's guidelines. Experiment coincided with summer and monsoon months (May-November, 2012). During weaner, grower and finisher stage micro climatic temperature and relative humidity (RH) ranged between 29-41ºC, 48.6-75.3%; 24.5-37ºC, 79-94.9%; and 22-34.5ºC, 75.3-90.3%. Permission of Institutional animal ethics committee was taken before conduct of experiment.

Table 2. Physical composition of ration for pigs

Ingredients	Weaner (Parts/100 kg)	Grower and Finisher (Parts/100 kg)
Crushed Maize	35	35
Barley	-	15
Deoiled Soybean Meal	10	15
Wheat Bran	47	33
Fish Meal	06	-
Mineral Mixture	1.5	1.5
Common Salt	0.5	0.5

Skin Lesion Score and Physiological Parameters

All the experimental animals were examined daily for any incidence of health problem. Each animal was carefully examined for skin lesions at weekly interval. Skin lesions were examined in four body zones i.e. Head & ears, body, legs and tail. Lesions (scratches and wounds) were scored on a 4 point scale of 0–3 i.e. 0 (No apparent lesion or injury), 1 (up to 5 scratches), 2 (5-10 scratches or 1 Abrasion) and 3 (>10 scratches or >1 abrasions or cut) as per modified technique[1].

Blood samples were collected randomly from 5 barrows of each group during grower (18th week) and finisher (24th week) stages for estimation of plasma cortisol, albumin and total protein. Blood samples were collected aseptically from the anterior venacava in sterilized disposable syringes (24 gauge needle) after restraining pigs in dorsal recumbency. Collected blood samples were transferred to heparin coated centrifuge tubes and centrifuged at 3000 rpm for 10

minutes for separation of plasma. Plasma was stored at -20ºC till the estimation of different biochemical parameters. Plasma cortisol concentration was determined by standard technique using commercial radio-immunoassay (RIA) kit (Beckman Coulter) at Nuclear Research Laboratory, IVRI, Izatnagar, India. Total protein in plasma was estimated using biuret method and albumin was estimated using bromocresol green (BCG) method[7].

Back Fat Thickness

Back fat thickness (BFT) of pigs were recorded using ultrasound scanner (Lean-meater series 11, S/N: 40001, Renco Corporation, 8830 7th Avenue North Golden Valley, MN 55427 USA) once during each stage (weaner, grower and finisher) i.e. at 8th, 16th and 28th week of age. Skin was saturated with light mineral oil and good contact between skin and probe was made. Readings were taken at 3 points i.e. first rib, last rib and last lumbar vertebrae at 2.5 inch off the mid line. Average of these 3 readings (mm) was used as mean BFT value.

Statistical Analysis

The data, thus collected during the experimental period, was subjected to the statistical analysis as per the procedures[17] using the Statistical Analysis System (SAS institute Inc., Cary, NC; USA). The mean and standard error values have been presented and data collected for three treatment groups was compared using ANOVA. P value of ≤ 0.05 was considered significant in the analyses.

RESULTS AND DISCUSSION

Skin Lesion Score

Skin lesion scores were measured at weekly interval for body parts i.e. head & ear, body, legs, tail and total lesion score was derived as sum of all. Mean skin lesion score as per stage of the barrows is presented in Table 3. Lesion scores for different parts and total lesion score did not differ for most of the trial period in barrows of different groups. However, mean lesion score of head & ears was significantly ($P<0.05$) higher in $T_{2/3}$ and $T_{1/2}$ groups during weaner stage than T_{IS} group while during finisher stage lesion score of body part was higher ($P<0.05$) in $T_{1/2}$ group than other groups. The adverse health effects with decreasing floor space are of concern from both animal welfare and economic perspectives, and require confirmation[6]. Skin lesion score differed only for head & ear and body region during weaner and finisher stages, respectively and did not differ for rest of the body categories during various stages. It could be due to the fact that animals in $T_{2/3}$ and $T_{1/2}$ groups had lesser free space when compared to T_{IS} group to escape themselves from face to face interactions of their dominant pen mates especially during feeding and group frolicking at weaner stage. During finisher stage too similar results were noted for body region.

Table 3. Mean skin lesion score of barrows with different floor space allowances

Stage	Groups	Head & Ear	Body	Legs	Tail	Total score
Weaner	T_{IS}	0.083±0.043[a]	0.176±0.046	0.157±0.039	0.102±0.027	0.454±0.063
	$T_{2/3}$	0.222±0.043[b]	0.306±0.046	0.176±0.039	0.019±0.027	0.630±0.063
	$T_{1/2}$	0.231±0.043[b]	0.213±0.046	0.185±0.039	0.028±0.027	0.546±0.063
Grower	T_{IS}	0.292±0.049	0.448±0.052	0.177±0.037	0.021±0.018	0.750±0.050
	$T_{2/3}$	0.260±0.049	0.406±0.052	0.167±0.037	0.042±0.018	0.677±0.050
	$T_{1/2}$	0.312±0.049	0.542±0.052	0.125±0.037	0.031±0.018	0.760±0.050
Finisher	T_{IS}	0.306±0.057	0.514±0.060[a]	0.278±0.047	0.000±0.008	0.861±0.049
	$T_{2/3}$	0.222±0.057	0.556±0.060[ab]	0.222±0.047	0.014±0.008	0.861±0.049
	$T_{1/2}$	0.333±0.057	0.722±0.060[b]	0.139±0.047	0.000±0.008	0.889±0.049

Values (Mean ± SE) bearing different superscripts column wise are significantly (p<0.05) different stage-wise

Reduced space allowances lead to increased aggression-related skin lesion scores[1,19&20]. Pigs (75 kg) housed at 0.8 m² per animal had more lesions on the ears (p<0.01), front (p<0.01), middle (p<0.01) and hind-quarters (p<0.01) regions than those housed at 1.6 and 1.2 m² and total scores of lesions on the body were gradually increased (p<0.01) with the increasing stocking density[9]. Lower joint swelling scores and lesions associated with fighting or biting were observed in pens with lesser space[16]. Low floor space allowance also increased the rate of removal of pigs from pens due to injury, poor health, or death[22]. Since agonistic interactions did not differ between the groups for most of the time, skin lesion scores too did not vary much during majority of the period. As space allowance (minimum $k≈0.05$) in this study was not as low as discussed above, overall lesion scores for most of the body parts did not differ significantly among different treatment groups. The values of lesion score were under acceptable limits for reduced floor space groups as compared with other studies[1&19].

Blood Parameters

Blood parameters were determined only for grower and finisher stages (Table 4). Plasma cortisol concentration was significantly (p<0.05) higher in $T_{1/2}$ group than other groups during both grower and finisher stages while albumin and total protein level did not differ among the groups. For the pigs circadian rhythm is characterized by peak amounts of circulating cortisol expressed in the morning with reduced levels during the afternoon and early evening[21]. The study[12] reported plasma cortisol concentration in pigs in the range of 27 to 355 nM/L. Values of plasma cortisol obtained were lower than earlier report available[14] and falls under normal range. However, another study[18] suggested that breed specific variations exist in basal plasma cortisol levels. These results indicate relatively more stress among pigs of $T_{1/2}$ group than T_{IS} group. Plasma concentration of total protein and albumin did not differ significantly between the groups. Total protein and albumin levels were within normal range as per earlier report[8] in pigs.

Table 4. Plasma concentration of physiological parameters in barrows reared with different floor space allowances

Parameter	Groups	Grower (18th week)	Finisher (24th week)
Cortisol (nM/L)	T_{IS}	100.52 ± 15.15[a]	68.66 ± 14.07[a]
	$T_{2/3}$	101.32 ± 21.78[a]	93.66 ± 25.17[ab]
	$T_{1/2}$	157.78 ± 18.28[b,A]	101.69 ± 20.62[b,B]
Total Protein (g/dl)	T_{IS}	6.88 ± 0.66	6.64 ± 0.64
	$T_{2/3}$	5.67 ± 0.62	5.48 ± 0.55
	$T_{1/2}$	6.37 ± 0.38	6.54 ± 0.50
Albumin (g/dl)	T_{IS}	3.73 ± 0.27	4.27 ± 0.37
	$T_{2/3}$	3.08 ± 0.44	4.01 ± 0.22
	$T_{1/2}$	3.72 ± 0.36	3.72 ± 0.31

Values (Mean±SE) with different superscripts column (a,b) & row (A,B) wise are significantly (p<0.05) different

Back Fat Thickness

Back fat thickness of live barrows did not differ (p>0.05) among the groups throughout the experiment (Table 5). In[3] finishing pigs (120 kg LW), back fat increased from 19.4 to 21.4 mm when available space increased as per floor space coefficient from $k = 0.023$ to $k = 0.030$. Whereas, increasing[4] space allowance was related to a decrease in fat depth, which is a highly desirable characteristic for the producer and the abattoir. In contrast, no[10] differences in fat depth in pigs slaughtered at 120 kg LW and reared in restricted or unrestricted conditions ($k = 0.022$ versus $k = 0.038$)

was also reported. Similarly, in present study BFT did not vary for different floor space allowances which could be due to the fact that stocking density (minimum $k≈0.05$) was not high enough even in lowest space allowance group ($T_{1/2}$) to affect BFT.

Table 5. Back fat thickness (mm) of barrows with different floor space allowances

Groups	Weaner (8th week)	Grower (16th week)	Finisher (28th week)	SEM
T_{IS}	13.78	18.11	19.89	1.01
$T_{2/3}$	12.03	19.31	21.56	1.01
$T_{1/2}$	13.64	17.53	20.78	1.01

CONCLUSION

It can be concluded that 33% reduced floor space to IS in pigs didn't affect welfare indicators while 50% reduction led to relatively higher plasma cortisol level and skin lesion score of few body parts unaffecting major ones though values were under acceptable limits.

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Array of existing breeding and health care management practices followed by dairy animal owners of coastal area of south Gujarat

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ABSTRACT

A field survey was conducted to collect the information on array of existing breeding and health care practices followed by dairy animal owners of coastal area of South Gujarat. Perusal of data revealed that the majority of respondents (98.7%) relied on behavioral signs of heat as a method of heat detection. They preferred artificial insemination process (86%) for breeding their animals. For majority of indigenous cattle & buffalo calving interval was more than 15 months (86.7%) and 16-18 months (56.7%), respectively. Majority of respondents (88.7%) were following the vaccination programme against F.M.D. & H.S. for their animals. About 71% of the respondent followed the practices (dusting, spraying, injectable drugs) to control ecto-parasites. The animal shed was clean and dry for about 85.3 % of the respondents. Except few overall dairy animal owners were following more scientific and organized herd management practices in the coastal area of South Gujarat.

Key words: Breeding, Dairy Animals, Healthcare, Management Practices

For the majority of Indian rural masses dairy husbandry has been an important means of providing livelihood and nutritional security[17]. Understanding prevailing management practices followed by farmers is of paramount importance to identify the strengths and weaknesses of the rearing systems and to formulate suitable intervention policies[5]. Overall profitability from dairy enterprise depends on reproductive efficiency of the herd and adoption of recommended breeding management practices ensure better health of animals that leads to increased productivity of animals[11]. Animal health is also an important criterion which affects the productivity of an animal and has direct relationship with economic outcome of the dairy enterprise. Hence, knowledge about livestock health practices followed by the farmers like deworming, vaccination, timely treatments etc is crucial to categorize and workout appropriate management strategies to ensure adequate health of animals which promotes their productivity[16]. Therefore, present investigation was undertaken to study existing breeding and health care management practices followed by the dairy animal owners of Navsari taluka of Navsari district of South Gujarat, India.

MATERIALS AND METHODS

In order to achieve the objective of the study, a field survey was conducted to collect the information on existing breeding and healthcare practices followed by dairy animal owners of Navsari, taluka of Navsari district of South Gujarat. The Navsari district is situated at 20.9467° N (latitude) and 72.9520° E (longitude) in the South Eastern part of Gujarat state. Navsari district is spread over five talukas Navsari, Jalalpore, Gandevi, Vansadaand Chikhli. Out of these talukas, 15 villages of Navsari taluka having functional primary milk producer's co-operative societies were selected randomly. Selected villages were Bhulaphaliya, Navatalab, Satem, Singod, Supa, Oncchi, Nagdhara, Sarpore, Chandravasan, Mogar, Wada, kasbapar, Kurel, Ugat and Ansundar.

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Ten dairy animal owners from each selected villages were randomly selected which constituted a total of 150 respondents. The selected respondents were interviewed and the desired information was collected. While selecting respondents due care was taken to ensure that they were evenly distributed in the village and truly represented animal management practices prevailing in the area. The required information on dairy animal breeding methods and health care practices followed were collected with the help of a questionnaire. The selected farmers were interviewed and the preferred information was collected with the help of pre-designed and pretested questionnaire. All the responses recorded in the interview schedule were tabulated in the master sheet and comparison was made to find out level adoption of various aspects of breeding and health care management practices among the respondents of the study area on the basis of percentage.

RESULTS AND DISCUSSION

Perusal of data revealed that the majority of respondents (98.7%) relied on behavioral signs of heat as a method of heat detection. Among various behavioural signs of heat they relied mostly on mucus discharge and bellowing as surest signs of heat (Table 1). Similar findings were reported by[2,10&13]. They preferred artificial insemination process (86%) for breeding their animals. Higher proportion for use of AI by dairy animal owners may be due to the availability of good infrastructure facilities, for the preservation and timely AI services with satisfactory results provided by AI workers in villages. Similar findings were reported by[2,8&10]. About 55.3 % of respondents allowed their female animals for breeding through A.I. or N.S immediately after heat detection and remaining 44.7 % of respondents allowed their animals after 12-18 hrs of heat detection. This is in contrast with the findings of[12] where they found that majority of farmers were breeding their animals after 12-18 hrs of heat detection. Majority of them (56%) responded that animals were bred mainly 5 months postpartum. Similar findings were reported by[5]. In more than 50 % of the cases they rendered services of either veterinarian or livestock inspectors for pregnancy diagnosis. For majority of indigenous cattle & buffalo calving interval was more than 15 months (86.7%) and 16-18 months (56.7%), respectively (Table 1). Similar findings were reported by[2,10&13].

Table 1. Breeding management practices adopted by the dairy animal owners of coastal area of South Gujarat

Parameters	Breeding practice followed	Percent of dairy animal owners
Methods of heat detection	(a) Symptoms	98.7 (148)
	(b) Symptoms and Teaser	1.3 (2)
Symptoms of heat detection	(a) Mucus discharge	0.7 (1)
	(b) Mucus Discharge and Bellowing	95.3 (143)
	(c) Mucus Discharge and Bellowing and Frequent urination+ mounting	4.0 (6)
Breeding of female animals	(a) Artificial insemination	86.0 (129)
	(b) Natural service	6.7 (10)
	(c) Both A.I. & natural service	7.3 (11)
Insemination or mating of female after heat detection	(a) Immediately after heat	55.3 (83)
	(b) Within 12-18 hrs.	44.7 (67)
Breeding after calving	(a) 2-3 months	5.3 (8)
	(b) 3-5 months	38.7 (58)
	(c) After 5 months	56.0 (84)
Pregnancy diagnosis	(a) Own judgment	48.7 (73)
	(b) Qualified veterinarian	26.7 (40)
	(c) Livestock inspectors	24.0 (36)

Calving interval		
	(a) 12 - 13 months	6.0 (9)
Crossbred cow	(b) 13 - 15 months	46.7 (70)
	(c) more than 15 months	47.3 (71)
	(a) 12 - 13 months	2.0 (3)
Indigenous cow	(b) 13 - 15 months	11.3 (17)
	(c) More than 15 months	86.7 (130)
	(a) 12 - 15 months	24.0 (36)
Buffalo	(b) 16 - 18 months	56.7 (85)
	(c) More than 18 months	19.3 (29)

Figure in parentheses indicates number of respondents.

Majority of respondents (88.7%) were following the vaccination programme against F.M.D. & H.S. for their animals (Table 2). It shows higher level of awareness of dairy animal owners of the Navsari taluka about vaccination. Findings of this study are in agreement with the findings of[4,6&12]. Majority of respondents were practicing deworming for milch animal (72%) and calves (72%) regularly. Similar findings were reported by[12,13&15]. Practice of navel disinfection of calf after birth was not followed by 92.7% of the respondents. Several workers reported similar findings[7]. About 71% of the respondent followed the practices (dusting, spraying, injectable drugs) to control ecto-parasites as shown in Table 2. Similar findings were reported by[3,8&12]. The animal shed was clean and dry for about 85.3 % of the respondents. Similar findings were reported for dairy animals in north Gujarat[2].

Table 2. Healthcare management practices adopted by the dairy animal owners of coastal area of South Gujarat

Parameters	Healthcare practice followed	Percent of dairy animal owners
Vaccination against F.M.D. & H.S.	Yes	88.7 (133)
	No	11.3 (17)
Deworming of milch animal	Regular	72.0 (108)
	Occasional	16.7 (25)
	Not practiced	11.3 (17)
Deworming of calves	Regular	72.0 (108)
	Occasional	16.7 (25)
	Not practiced	11.3 (17)
Navel disinfection of calf after birth	Yes	7.3 (11)
	No	92.7 (139)
Practices to control ecto - parasites	Yes	71.3 (107)
	No	28.7 (43)
Sanitary condition of shed	Clean (dry)	85.3 (128)
	Dirty (wet)	14.7 (22)

Figure in parentheses indicates number of respondents.

CONCLUSION

A field study was conducted to identify array of existing breeding and health care management practices followed by dairy animal owners of coastal area of South Gujarat. About 98.7% relied on behavioral signs of heat as a method of heat detection and they preferred artificial insemination process (86%) for breeding their animals. For majority of indigenous cattle & buffalo calving interval was more than 15 months (86.7%) and 16-18 months (56.7%), respectively. Majority of respondents (88.7%) were following the vaccination programme against F.M.D. & H.S. for their animals. Most of the respondent (71%)

followed the practices (dusting, spraying, injectable drugs) to control ecto-parasites. It was observed that overall dairy animal owners were following more scientific and organized herd management practices in the coastal area of South Gujarat.

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Feed intake and nutrient utilization in Sirohi, Marwari and Kutchi breeds of goat under intensive system of feeding management

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ABSTRACT

Comparative feed intake and nutrient utilization were studied in adult bucks of Sirohi, Marwari and Kutchi breeds. The bucks were provided *Cajanus cajan* straw *ad libitum* as basal roughage, concentrate mixture 400 g/buck/day and green grass (*Cenchrus ciliaris*) one kg /buck/day as a supplement. The intake of DM, OM and CP were significantly less in *Marwari* bucks, whereas these values were similar between *Sirohi* and *Kutchi*. Total water intake /kg DM intake was similar in all the three breeds. Significantly ($p<0.05$) less water loss through faeces was observed in Marwari than Kutchi and Sirohi. The digestibility coefficient of different feed nutrients did not differ significantly among the breeds. However, Marwari bucks performed better in term of nutrients digestibility as compared to Sirohi and Kutchi. Despite wide variation in the morphological characteristics, negligible variation in voluntary feed intake and nutrient utilization were observed between the breeds, which confirm that all the three breeds were well adapted to the intensive system of feeding and management.

Key words: Goat breeds, India, Intensive system of feeding management, Nutrient intake, Nutrients' digestibility

Goat rearing in India is mainly dependent on grazing. However, most of the grazing lands have encroached for crop production and very little lands are left for livestock grazing. The problem is further accentuated due to the lack of efforts to regenerate the vegetation, leading to overstocking and degradation of available grazing lands[7]. Under the preview of environmental cordiality, goat farming posed serious criticism and suggestions made for improvement in management and production efficiency. The majority of goats in future have to be fed and maintained primarily under the intensive system of management to economize the production efficiency. Studies on feeding management showed that the animals of Sirohi breeds performed better in terms of growth, nutrient utilization and adaptability than Kutchi and Barbari under intensive system of management[9]. There is a need to propagate only the better productive and adoptive breeds most suited to the farmers' situation so that productivity can be increased without causing damage to the already deteriorated and fast shrinking grazing lands. Information on comparative feed intake and nutrient utilization in goat breeds of semi-arid tropics of India is scanty. Therefore, the present experiment was conducted to compare the voluntary feed intake and nutrients utilization in Sirohi, Marwari and Kutchi breed of goats under the intensive system of feeding and management.

MATERIALS AND METHODS

The experiment was conducted at the Central Institute for Research on Goats, Makhdoom, Uttar Pradesh, India during the hot humid season. The maximum ambient temperature during experimental period ranged from 32.57 to 35.03 ^{0}C with mean of 34.96^{0}C and the minimum ambient temperature ranged from 20.37 to 23.57^{0}C with mean of of 22.19^{0}C. The relative humidity during the experimental period ranged from 50.42 to 80.71% with mean sun shine hour of 7.05. Eighteen healthy adult bucks of Sirohi, Marwari and Kutchi breeds were divided into three treatments based on body

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weight and were maintained in groups (six in each breed) in a semi-open shed, and allowed one month for adaptation to the conditions before the experiment began. Water was made available *ad libitum* to all the groups. Animals were maintained throughout the experimental period on standard diet[10]. Pelleted concentrate mixture (groundnut cake 25 %, maize 35 %, til cake 10 %, molasses 7 %, mineral mixture 2 % and iodized salt 1 %) was offered 400 g /buck/day in the morning and they consumed it completely within 15-20 minutes. Then, pigeon pea straw (*Cajanas cajan*) was offered *ad libitum* as basal roughage. The green grass (*Cenchrus ciliaris*) @1 kg/buck/day was offered in the afternoon daily. Refusals were recorded in the next morning daily. Practically there was no refusal of concentrate mixture and green grass. Animals were weighed at fortnightly intervals before feeding and watering for three consecutive days.

Animals were subjected to experimental feeding for 60 days. On completion of the feeding trial, the bucks were transferred to metabolism crates for nutrient digestibility and nitrogen balance studies. The bucks were accustomed to the cages for 5 days followed by a collection period of 7 days. Representative samples of offered feed, excreta and refusals were taken daily for seven days and pooled on an individual basis for chemical analysis. The feed and faeces samples were analyzed for crude protein (CP), crude fibre (CF) ether extract (EE), total ash and nitrogen free extract (NFE)[2]. Total water intake was calculated by adding free water intake and water ingested through the feed. The metabolic water production was worked out by using the factors 0.62, 0.42 and 1.10 for digestible carbohydrates, digestible protein and digestible fat, respectively[14]. The insensible water loss was calculated[3.] The data were subjected to analysis of variance for a completely randomized design[13]. Differences between the treatments were compared using the critical difference.

RESULTS AND DISCUSSION

The organic matter (OM), CP, CF, EE and NFE content of green grass was 86.53, 10.34, 25.11, 1.96 and 49.10 %, respectively (Table 1). The corresponding values for pigeon pea straw were 86.93, 10.83, 23.78, 2.66 and 49.66 % respectively. The feed resources offered to the bucks were of medium quality[10] and were sufficient to meet the nutrient requirements of adult bucks. The average daily DM intake was 3.35, 3.06 and 3.43 % of BW in group II, III, and I, respectively (Table 2). The total DM intake % of BW and DM intake (g /kg W$^{-0.75}$) was significant (p<0.05). The data on DM intake in the present experiment was in accordance with those reported by earlier worker[8] in *Sirohi*, *Marwari* and *Kutchi* kids under two feeding systems. However, other workers, [9,4] did not find any significant difference in DM intake in Sirohi, Kutchi and Barbari breeds of goat under the intensive system of management. It was evident from the findings[12] that despite variation in the grazing preference between the goat breeds within a pasture ecosystem, there was no significant difference in DM intake and nutrients digestibility of phytomass derived by Jamunapari and Barbari goats. The DM consumption of goats through various feeds varies widely depending upon breed, feed and physiological functions involved[1&11] . The average daily free water intake was 8.47, 7.78 and 8.81 % of BW in group I, II and III. The total water intake and water intake per kg DM intake did not differ significantly between the breeds. The environmental conditions prevailing during the present study may not have been sufficient to induce a significant change in the water intake in adopted animals.

Table 1. Chemical composition of feedstuffs (% on DM basis)

Particulars	Pegeon pea straw (*Cajanus cajan*)	Green grass (*Cenchrus ciliaris*)	Concentrate mixture
Organic matter	86.93	86.53	92.81
Crude protein	10.83	10.34	21.00
Crude fibre	23.78	25.11	9.62
Ether extract	2.66	1.96	3.25
Nitrogen free extract	49.66	49.10	58.94
Total ash	13.07	13.47	7.19

Table 2. Nutrient intake and plane of nutrition of bucks during metabolism trial period

Particulars	Groups		
	Sirohi	**Marwari**	**Kutchi**
Av. BW, kg	37.79 ± 0.34	37.75 ± 1.32	34.42 ± 1.22
Kg, W $^{-0.75}$	15.24 ± 0.10	15.23 ± 0.40	14.20 ± 0.38
DM intake, g/day			
Concentrate	363.18 ± 1.76	363.18 ± 1.76	363.18 ± 1.76
Green grass	116.46 ± 2.84	116.19 ± 2.56	115.63 ± 2.80
Pegion pea straw*	784.86^a ± 24.87	676.96^b ± 19.67	703.86^b ± 21.96
Total DM intake*	1264.50^a ± 17	1156.33^b ± 28	1182.67^b ± 51
DM intake, % B. weight*	3.35^a ± 0.04	3.06^b ± 0.07	3.43^a ± 0.10
DM intake, g W $^{-0.75}$ *	82.99^a ± 0.75	76.05^b ± 1.30	83.20^a ± 2.50
OM intake, g kgW $^{-0.75}$*	73.77^a± 0.66	67.81^b ± 1.15	74.13^a± 2.12
CP intake, g W $^{-0.75}$ *	11.45 ^{a} ± 0.08	10.75 ^{b} ± 0.20	11.69 ^{a} ± 0.24
DCP intake, g W$^{-0.75}$	6.97 ± 0.10	6.99 ± 0.12	7.26 ± 0.39
TDN intake, gW$^{-0.75}$	52.26 ± 0.90	50.67 ± 1.06	53.89 ± 1.99
Water intake, ml day $^{-1}$	3194 ± 186	2930 ± 147	3030 ± 202
Water intake, ml kg W $^{-0.75}$	209.60 ± 12.25	192.74 ± 9.05	213.17 ± 2.59
Water intake, % B. weight	8.47 ± 0.49	7.79 ± 0.39	8.81 ± 0.52
Water intake, kg DM intake $^{-1}$	2.53 ± 0.14	2.53 ± 0.09	2.57 ± 0.15

*ab means with different superscripts in a row differ significantly (p<0.05)

The digestibility coefficients of various nutrients such as DM, OM, CP, CF, EE and NFE did not differ significantly among the breeds (Table 3). However, higher digestibility coefficients of various nutrients in Marwari animals were recorded in comparison with Kutchi and Sirohi, which indicated that Marwari has utilized the nutrients more efficiently. The digestibility values were close to the values reported for local Bundelkhandi goats fed on green Napier grass (*P. purpureum*)[6], however, no significant differences in digestibility coefficients of various nutrients in *Barbari*, Jamunapari and Marwari animals fed on berseem silage and concentrate mixture was observed[4&12]. The digestibility coefficients of present experiment were contrary to the findings of previous study [9] who reported significantly higher digestibility of CP, CF and NFE in Sirohi as compared to Kutchi and Barbari*,* which explicit more genetic potential and adaptability of Sirohi breed than Kutchi and Barbari.

Table 3. Nutrient digestibility, nitrogen balance and nutritive value of feeds in adult bucks

Particulars	Groups		
	Sirohi	**Marwari**	**Kutchi**
Nutrient digestibility (%)			
DM	63.22 ± 0.68	67.06 ± 1.06	65.05 ± 2.28
OM	67.41 ± 0.55	70.64 + 0.86	68.94 ± 1.95
CP	60.91 ± 0.47	65.04 ± 1.00	61.94 ± 2.82
CF	65.93 ± 5.09	63.47 ± 1.46	61.01 ± 2.89
EE	67.80 ± 1.52	70.91 ± 0.80	67.30 ± 1.47
NFE	71.64 ± 0.59	75.20 ± 0.79	74.18 ± 2.22

Nitrogen balance (g/day)			
Nitrogen intake	27.92 $\pm$ 0.10	26.13 $\pm$ 0.47	26.57 $\pm$ 0.84
Faecal N *	10.75[a] $\pm$ 0.09	9.08 [b] $\pm$ 0.31	9.35[b] $\pm$ 0.46
Urinary N	13.15 $\pm$ 0.12	13.02 $\pm$ 0.26	12.92 $\pm$ 0.54
Nitrogen balance	4.02 $\pm$ 0.09	4.03 $\pm$ 0.18	4.30 $\pm$ 0.16
Nutritive value, per cent			
DCP (% DM basis)[*]	8.40[a] $\pm$ 0.06	9.19 [b] $\pm$ 0.14	8.70[a] $\pm$ 0.31
TDN (% DM basis)	62.86 $\pm$ 0.59	66.62 $\pm$ 0.81	64.85 $\pm$ 1.93

*a,b means with different superscripts in a row differ significantly (p<0.05).

Nitrogen intake in group I, II and III was 27.92, 26.13 and 26.57 g/day and animals in the entire three groups lost 38.50, 34.75 and 35.19 % nitrogen of total intake through faeces and 47.1, 49.83 and 48.63 % through urine making the total loss of nitrogen 85.60, 84.58 and 83.82 % of the total intake, respectively. The animals of all the three groups were in positive nitrogen balance. Nitrogen retention as % of intake was 14.40, 15.42 and 16.18 percent, respectively in group I, II and III and did not differ (P>0.05) among the groups. Similar findings of N retention were reported by earlier worker [4] in Barbari, Jamunapari and Marwari goats maintained under intensive feeding system. Significantly (p<0.05) higher DCP values were observed in Marwari than *Kutchi* and *Sirohi*. However, TDN values did not differ significantly among the breeds. Significant differences in DCP and TDN intake was recorded among the breeds[4]. Daily intake of DM, CP, DCP and TDN in terms of metabolic body size was more in Kutchi than *Sirohi* and *Marwari*. The average requirement of DM, DCP and TDN for maintenance of 35 kg adult goat recommended by ICAR[3] was 70, 3.0, and 30 g/kgW0.75. This indicated that the intake of DM, DCP and TDN were more than maintenance requirements of adult male goats[10&11].

The average intake of free water ranged from 2.224 L/day in group II to 2.462 L/day in group I and did not differ significantly (p>0.05) among the groups (Table 4). This is in contrast to the previous findings[1], who reported that water intake differed significantly among the various breeds. However, the intake of water as % of BW and per unit metabolic body size was more in *Kutchi* than *Sirohi* and *Marwari* breeds. Significantly higher intake of water in *Kutchi* than *Sirohi* and *Barbari* was recorded[9]. Similarly, significantly higher mean water intake per unit body weight in *Kutchi* was recorded compared to *Marwari* animals[5]. The free water intake is influenced by various factors like the type of diet, feed intake, the water content of forage consumed, quality of water, and ambient temperature. *Maradi* goats drank less water and produced drier faeces than the *Yankasa* sheep, indicating a better water conservation mechanism[1]. Significantly (p<0.05) less water loss through faeces was observed in *Marwari* animals than *Kutchi* and *Sirohi*, however, metabolic water production as % of water intake was similar among all the three breeds, which ranged from 13.61 to 14.23 %. The metabolic water production values reported for goats[1] were 9.34 per cent of the total water intake. Significantly higher intake of free water in *Kutchi* than *Sirohi* and *Barbari* goats was reported[9] that *Kutchi* animals may be less adjusted to the intensive system of management. The lack of differences among breeds in the present study might be due to the fact that the environmental conditions prevailing during the present study were probably not sufficient to induce a significant change in the water intake and digestibility of nutrients in adopted animals.

Table 4. Average water balance (ml/day) in adult bucks during the metabolism trial period

Particulars	Groups		
	Sirohi	**Marwari**	**Kutchi**
Water drunk	2461.91[a] + 185.52	2224.05[b] + 142.94	2324.05[b] + 179.55
Feed water intake	732.04 + 26.10	706.01 + 34.89	706.07 + 26.06
Metabolic body water	434.60 + 12.45	416.89 + 13.69	428.40 + 21.47
Total water intake	3628.55 + 183.50	3346.95 + 143.90	3458.52 + 193.84
Water loss through faeces*	515.03[a] + 32.61	365.34[b] + 24.81	430.67[a] + 50.88
Water loss through urine	734.52 + 121.86	527.39 + 114.92	679.29 + 53.13
Insensible losses and sweating	2379.00 + 176.52	2454.23 + 186.47	2348.57 + 149.26
Metabolic water production % of water intake	13.61 + 0.91	14.23 + 0.87	14.14 + 0.81

*a,b means with different superscripts in a row differ significantly ($p < 0.05$).

CONCLUSION

The results of present experiments showed that despite wide variation in the morphological characteristics, negligible variation in voluntary feed intake and nutrient utilization were observed between the breeds, which confirms that all the three breeds were well adapted to the intensive system of feeding and management.

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Effect of dietary supplementation of *Moringa oleifera* leaf meal on production economics of Vanaraja laying hens

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ABSTRACT

An experiment was conducted to study the effect of dietary supplementation of *Moringa oleifera* leaf meal (MLM) on production economics of Vanaraja laying hens. One hundred twenty (120), Vanaraja laying hens of 24 weeks of age were selected at random and divided into four groups of 30 each with three replicates of 10 in each group in a complete randomized design. Four experimental diets were fed to birds in which T_1 (control-antibiotic powder – oxytetracycline @ 50g/ quintal) and in rest of the 3 treatment groups T_2, T_3 and T_4, the birds were fed with MLM at levels of 0.25, 0.5 and 1.0% of feed, respectively. The feed consumption per bird (kg), cost of feed per egg produced, egg production per bird, cost of feed per egg produced (Rs) for the experimental duration of 25-36 weeks was calculated. There was no significant difference ($p > 0.05$) between the treatment groups in terms of production economic parameters during the entire period of experiment. All the birds gained body weight during the experimental period indicating that there was a positive energy balance. From the present study, it is concluded that MLM up to 1% level in the diet of Vanaraja laying hens was at par with the antibiotic supplementation without affecting the production economics.

Key words: Egg quality, Moringa leaf meal, Production performance, Vanaraja

The contribution of chicken to the poultry sector accounts for 95% of the total egg production and the rest is contributed by ducks and others in India[1]. The feed cost accounts for 65-70% of total cost of production in broilers and 75-80% for layers[2]. The rural areas, where majority of the Indian population subsists, are getting access only to 25% of the total poultry products, as commercial poultry farming is limited to urban and semi urban areas. Chicken population in rural areas enhanced marginally from 63 million to 75 million during the last 40 years[3]. Adapting poultry farming in rural areas is a potential tool to increase the availability of poultry products and economic status of the rural people. Vanaraja is a dual-purpose chicken variety developed by the ICAR- Directorate of Poultry Research, Hyderabad, India, aimed at rural communities where it can be reared in backyard on natural, scavenged food with minimal supplementation. Use of antibiotics, as a feed supplement in the poultry ration is a common practice in India. Hence, unsafe drug residues tend to accumulate in various concentrations in the edible parts of antibiotic fed birds[4]. Ingestion of tissues and organs (meat, offals, eggs, etc.) containing drug remnants above safe maximum residual levels leads to numerous health hazards and vulnerabilities[5] directly as initiation of hypersensitive or allergic reactions, cutaneous eruptions, dermatitis, alteration of intestinal microflora etc., indirectly as carcinogens, teratogens, development of antibiotic resistances among microbial strains, and often leads to drug toxicity in human beings[6]. Thus, it's high time to replace the antibiotics with phytobiotics which will

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provide the same beneficial effects without any harmful effects and MLM is an ideal candidate for the same [7]. Moringa is cheaply found in both the rural as well as urban areas. Thus owing to its medicinal properties and availability, Moringa is an ideal candidate to replace antibiotics in the poultry ration. The present experiment was conducted to study the effect of dietary supplementation of *Moringa oleifera* leaf meal (MLM) on production economics of Vanaraja laying hens for a period of 12 weeks.

MATERIALS AND METHODS

Stock, Diets and Husbandry

One hundred twenty (120), Vanaraja laying hens of 24 weeks of age were selected at random and divided into four groups of 30 each with three replicates of 10 in each group in a complete randomized design. Experiment was conducted for a period of 12 weeks. These birds were placed in 12 pens having floor space of 18 sq. ft. each. Rice husk was used as litter material. Moringa leaf meal was prepared by sun drying, followed by grinding the leaves. In control group T_1, the birds were fed with antibiotic powder – oxytetracycline (OTC) @ 50g/ quintal and in rest of the 3 treatment groups T_2, T_3 and T_4, the birds were fed with Moringa leaf meal (MLM) at levels of 0.25, 0.5 and 1.0% of feed, respectively (Table 1). A measured quantity of feed was given on daily basis. The birds were given restricted amount of 125g of feed per bird for first six weeks, followed by 130g of feed for next six weeks. Standard management practices were followed and clean drinking water was made available *ad lib.* throughout the experiment.

Table 1. Ingredient and nutrient composition of experimental diets (% air dry basis)

Ingredients	Cost (Rs)/kg	Parts per quintal			
		T_1	T_2	T_3	T_4
Yellow Maize	16.00	58.46	58.26	58.01	57.51
Soyabean meal	42.00	20.7	20.7	20.7	20.7
Deoiled rice bran	12.00	10.2	10.2	10.2	10.2
Shell grit	4.00	8.7	8.7	8.7	8.7
Dicalcium phosphate	35.50	1.15	1.15	1.15	1.15
DL - methionine	350.00	0.08	0.08	0.08	0.08
Common salt	7.00	0.4	0.4	0.4	0.4
Vitamin B complex	200.00	0.02	0.02	0.02	0.02
Vitamin ABDK	200.00	0.02	0.02	0.02	0.02
Mineral mixture*	70.00	0.12	0.12	0.12	0.12
Choline	80	0.05	0.05	0.05	0.05
Toxin Binder	200.00	0.05	0.05	0.05	0.05
Oxytetracycline	1000.00	0.05	-	-	-
MLM	--------	-	0.25	0.5	1
TOTAL		100	100	100	100
Nutrient composition (Calculate value)					
ME(kcal/kg)		2601	2608	2615	2622
CP (%)		15.99	15.96	16.02	16.08
Lysine (%)		0.79	0.79	0.80	0.80
Methionine (%)		0.31	0.33	0.34	0.34
Calcium (%)		3.23	3.24	3.25	3.24
Phosphorous (%)		0.35	0.35	0.35	0.35

*TraceMin CB (Venky's India Private Limited, Pune). Composition: Each 1 kg Trace Min CB contains Manganese: 90g, Zinc: 80 g, Iron: 90.0g, Copper: 15.0g, Iodine: 2.0g, Selenium: 300mg.

Economics

The effect of providing different dietary supplementation with the antibiotic powder and various concentration of MLM levels on the cost of feed per egg produced during the experimental period was calculated. Cost of ingredients in local market was taken into account for calculation of feed cost (Table 1). The feed cost per bird and for egg produced was calculated basing on the feed cost (Table 2) and quantity of feed consumed during the experimental period.

Table 2. Cost of experimental diet with Moringa leaf meal

Treatment No.	Treatments	Feed (Rs)/kg
T_1	Diet with 50 g/quintal OTC	21.14
T_2	Diet with 0.25% MLM	20.61
T_3	Diet with 0.5% MLM	20.57
T_4	Diet with 1.0% MLM	20.49

OTC-Oxytetracycline. MLM-Moringa leaf meal

Statistical Analysis

The data obtained from the experiment were statistically analyzed according to[7]. The data were subjected to analysis of variance (ANOVA) and Duncan Multiple Range (DMR) Test [8] to test the difference between treatments means, wherever necessary.

RESULTS AND DISCUSSION

The cost of feed per egg produced of Vanaraja laying hens during the dietary supplementation of MLM is presented in Table 3. Considering the composition of four rations the cost per kg feed was Rs 21.14 (T_1), Rs 20.61 (T_2), Rs 20.57 (T_3) and Rs 20.49 (T_4) during entire experimental period. During 25 to 30 weeks of age the feed consumption per bird was 5.25 kg in each treatment group. The cost of feed consumed per bird was Rs 110.99, Rs 108.20, Rs 107.99, and Rs 107.57 in different treatment groups T_1, T_2, T_3 and T_4, respectively. The egg production per bird and the cost of feed per egg did not show any significant difference (p>0.05) between the different treatment groups. During 31 to 36 weeks of age the feed consumption per bird was 5.46 kg in each treatment group. The cost of feed consumed per bird was Rs 115.42, Rs 112.53, Rs 112.31, and Rs 111.88 in different treatment groups T_1, T_2, T_3 and T_4, respectively. The egg production per bird and the cost of feed per egg produced did not show any significant difference (p>0.05) between the different treatment groups. During 25 to 36 weeks of age the feed consumption per bird was 10.71 kg in each treatment group. The cost of feed consumed per bird was Rs 226.41, Rs 220.73, Rs 220.30, and Rs 219.45 in different treatment groups T_1, T_2, T_3 and T_4, respectively. The egg production per bird showed no significant difference (p>0.05) between the different treatment groups. The cost of feed per egg produced was lowest in T_4 (Rs. 4.91) followed by T_2 (Rs. 5.16), T_1 (Rs. 5.07) and T_3 (Rs. 5.35) in increasing order.

In the present study, the cost of feed/egg produced did not vary significantly between the different dietary groups. Thus, the results of the present study suggested that MLM can be included in the diet of Vanaraja laying hens up to 1% level. Similar to the findings of the present study, [9] reported similar feed cost/dozen of eggs by dietary inclusion of MLM up to 2% in the diet of Vanaraja laying hens. In contrast to the findings of the present study [10] reported increase in feed cost/kg egg produced due to addition of MLM in layer ration. This could be due to the higher levels of MLM compared to the present study, where a lower level of MLM was used in the diet.

Table 3. Cost of feed/egg produced (Rs.) of Vanaraja laying hens during different laying period for the dietary supplementation of Moringa leaf meal

Particulars	Treatments				SEM	P value
	50g/ quintal OTC (T_1)	0.25% MLM (T_2)	0.5% MLM (T_3)	1% MLM (T_4)		
Cost of feed (Rs/kg)	21.14	20.61	20.57	20.49	-	
25-30 Weeks period (Phase I)						
Feed consumption per bird (kg)	5.25	5.25	5.25	5.25		
Cost of feed consumed per bird (Rs)	110.99	108.20	107.99	107.57		
Egg production per bird (No.)	19.57	19.53	17.87	19.97	0.589	0.663
Cost of feed per egg produced (Rs)	5.67	5.54	6.04	5.39	0.115	0.240
31-36 weeks period (Phase II)						
Feed consumption per bird (kg)	5.46	5.46	5.46	5.46		
Cost of feed consumed per bird (Rs)	115.42	112.53	112.31	111.88		
Egg production per bird (No.)	25.13	23.23	23.30	24.70	0.90	0.875
Cost of feed per egg produced (Rs)	4.59	4.84	4.82	4.53	0.112	0.320
25-36 weeks period (Overall)						
Feed consumption per bird (kg)	10.71	10.71	10.71	10.71		
Cost of feed consumed per bird (Rs)	226.41	220.73	220.30	219.45		
Egg production per bird (No.)	44.7	42.76	41.17	44.67	1.73	0.820
Cost of feed per egg produced (Rs)	5.07	5.16	5.35	4.91	0.111	0.101

SEM – Standard Error of Mean.   MLM-Moringa leaf meal

CONCLUSION

From the present study, it is concluded that MLM up to 1% level in the diet of Vanaraja laying hens was at par with the antibiotic supplementation and is beneficial in terms of nutrient composition of egg and cost economics of egg production.

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Estimation of repeatability of performance traits of Kankrej cattle

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ABSTRACT

Data of 294 Kankraj cows maintained at Livestock Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat and spread over a period of 20 years (1996 to 2015) was collected to study the repeatability parameters of different traits. The repeatability estimates of 305 days milk yield, total milk yield, lactation length, service period, dry period and gestation period was calculated and found that it was 0.49 ± 0.03, 0.50 ± 0.03, 0.24 ± 0.02, 0.22 ± 0.05, 0.48 ± 0.04 and 0.29 ± 0.09, respectively. Higher estimate of repeatability of total milk yield indicates that the permanent environmental fractions of variance was high. Therefore, the first lactation of cows in the herd will able to predict accurately the subsequent lactation yield and thus lifetime production. Further, more efficient selection can be done after completion of first lactation of the dams.

Key words: Kankrej cattle, Production traits, Repeatability estimate

The rural economy mainly depends on agriculture and allied sector, where animal husbandry and dairy sector plays an important role through supplementing the income of rural households, particularly, the landless, small and marginal farmers.

A sustainable dairy sector requires the maintenance of high yielding cows and buffaloes to satisfy the demand and supply of milk for the populations. The selection of best cows and bulls is based on the lactation performance, fertility, growth rate, and temperament. Therefore, evaluation of performance traits is must to develop a sustainable breeding programme. It is important to estimate the variance components and genetic parameters of performance traits. Repeatability is a proportion of an individual's superiority or inferiority for a particular trait that is expected to be expressed over time of its lifespan. In the present investigation, repeatability of different performance traits of Kankrej cattle reared under semi-arid climatic condition of north Gujarat was estimated.

MATERIALS AND METHODS

The present study was conducted to evaluate the repeatability of different production and reproduction traits of 294 Kankrej cattle having 944 records maintained at Livestock Research Station, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar, Gujarat. Livestock Research Station of Sardarkrushinagar Dantiwada Agricultural University is located in the north Gujarat at an altitude of 136 meters above the mean sea level. It lies at latitude of 24.35º North and longitude of 72.59º East latitude. The climate of the farm is semi-arid in nature. Uniform management practices were followed on the farm. All animals were housed under loose housing system with adequate sheds for shelter against sun, rain and extreme winter. Animals at the farm were stall fed with dry roughages, green fodder and concentrate. The animals having lactation length less than 100 days, incomplete lactation due to sale or death during lactation, abortion and still birth etc. were considered as abnormal lactation and not included in the study. The data pertaining to Kankrej cows spread over a period of 20 years

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from 1996 to 2015 were included in the study. The data were classified into 4 groups with duration of 5 years. Each year was delineated into 3 seasons with a duration of 4 months each (S1: winter from Nov. to Feb, summer from March to June and monsoon from July to Oct.). The traits considered in the study were 305 days milk yield (305DMY), total milk yield (TMY), lactation length (LL), service period (SP), dry period (DP) and gestation period (GP). The repeatability estimates of the different traits were calculated as ratios of sum of additive genetic variance (σ^2_a) and permanent environmental variance (σ^2_{pe}) to the total phenotypic variance (σ^2_p).

$$r = \frac{(\sigma^2_a + \sigma^2_{pe})}{\sigma^2_p}$$

Where, r = Repeatability

σ^2_a = Additive genetic variance

σ^2_p = Phenotypic variance

σ^2_{pe} = permanent environmental variance

RESULTS AND DISCUSSION

The data pertaining to 294 lactating Kankrej cows were analysed to estimate the repeatability of different traits. The estimated are present in Table 1.

Table 1. Estimation of repeatability of Kankrej cattle

Sr. No.	Traits	Repeatability (r)
1	305 days milk yield	0.49 ± 0.03
2	Total milk yield	0.50 ± 0.03
3	Lactation length	0.24 ± 0.02
4	Service period	0.22 ± 0.05
5	Dry period	0.48 ± 0.04
6	Gestation period	0.29 ± 0.09

The repeatability of 305 DMY was found as 0.49±0.03. Similar estimates were of repeatability for this trait were also observed by other workers[2&5] for HF cattle and Kankrej cattle, respectively. However, higher value of repeatability of 305 DMY was reported as 0.70 ± 0.03 for exotic cattle[3]. The repeatability of TMY was as 0.50±0.03 which is in close agreement with the results of other workers[9] while studying for Kankrej cattle. However, lower value was also reported by other researcher[6].

The repeatability of LL was 0.24 ± 0.02 in Kankrej cows. These findings of the study revealed that repeatability of LL was closely supported by different researchers[5,9&10]. The lower estimate of the trait was observed by other worker[7] while studying HF cattle. The estimate of repeatability for SP was observed as 0.22 ± 0.05 which is in close agreement with the reports other reports[5,10&11] conducted in crossbred cattle and Kankrej cattle. Lower estimate was reported by other workers[1]. The repeatability (r) of DP was calculated and observed that it was 0.48±

0.04. Similar estimate was reported by other worker[11] while studying crossbred cattle. The repeatability of GP was 0.29 ± 0.09. The repeatability valueof GP is in agreement with the values reported for Japanese Black cow[8]. The lower value of repeatability was reported for Friesian cattle[4].

CONCLUSION

Higher estimate of repeatability of total milk yield indicates that the permanent environmental fractions of variance was high. Therefore, the first lactation of cows in the herd will able to predict accurately the subsequent lactation yield and thus lifetime production. Further, more efficient selection can be done after completion of first lactation of the dams. Selection of high productive animals and procurement of male calves born from such elite dams must be retained on the farm, for future breeding plan, which will give better result. Further it is also suggested that traits like 305 DMY, SP, DP and GP shall be taken into consideration for selection of animals for future breeding plan.

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Study of shelter management of cattle under field conditions in and around greater Guwahati of Assam

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ABSTRACT

The study was under taken for assessment of shelter management of dairy cows in and around the greater Guwahati city of Assam. Total 173 numbers of farmers were randomly selected from the specified areas and divided into two categories *viz.* farmers having crossbred cattle (F1) and farmers with only local cattle (F2). The crossbred cattle were reared in intensive and local cattle were in semi-intensive system of feeding. The long axis of sheds was 35.84, 26.59, 23.70 and 13.87 percent in the north-south, east-west, north-west and south-west orientations, respectively. Thatched roofs were 75.72 percent followed by 19.65 and 4.62 percent corrugated G.I. and asbestos sheeted, respectively. There was highly significant (p<0.01) difference between F1 and F2 farmers in respect of prevailing roofing materials. The highest 58.96 percent of the cattle sheds were made of earthen floor followed by 37.57 and 3.47 percent brick bedded and concrete, respectively. There was highly significant (p<0.01) difference between the categories of farmer in respect of types of floor. The average floor space (excluding manger) per cow was 1.90±0.04 and 2.05±0.03 sq. meters in case of F1 and F2 types of farmers, respectively. There was highly significant (p<0.01) difference between the farmers for average floor space. The average height at eaves was 1.65±0.04 and 1.70±0.04 meters in F1 and F2, respectively. The gutter and manger was used by F1 farmers only. The width and length per cow of common manger was 1.25±0.02 and 1.00±0.01 meter, respectively. The manger was made of bamboo and woods (91.18%) and concrete (8.82%). The average depth and width of gutter was 0.15±0.003 and 0.35±0.004 meter, respectively. The gutters (88.24%) were made of brick.

Key words: Cattle, Field condition, Management, Shelter.

Provision of health sustaining comfortable environment is a principal function of cattle housing[10]. Adequate housing or shelter management is essential for well being and welfare of any kind of livestock. It keeps the livestock comfort and healthy, thereby increases the production and reproduction performance. Without proper housing it is not possible to exploit the genetic potential of an animal. Under field condition the dairy cows are mostly reared without keeping much attention towards the kind of shelter provided to them. There was very scanty informations regarding shelter management of dairy cows. Therefore, the present study was an attempt to assess the housing management of dairy cows under field condition of Assam.

MATERIALS AND METHODS

The present study was an assessment of the housing management of dairy cattle followed by the farmers in and around the greater Guwahati of Kamrup district of Assam. Study was carried out on 173 farmers' households having milch cows. Farmers were divided into two groups *viz.* farmers having crossbred cows (F1) and farmers having only local cows (F2). Direct observation and measurement were done for various components *viz.* Orientation of roof, type of roofing materials, type of floor, type of manger and type of gutter and results were expressed in percentage. Height of roof,

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floor space, width and depth of gutters and width and length of mangers were measured in meter. Chi-square test and t-test were used to see the significant difference between the farmers' groups.

RESULTS AND DISCUSSION

From the study it was revealed that the crossbred cows were housed in intensive system and that of local cows were in semi-intensive system. Animals were kept together irrespective of different age groups.

Perusal of Table 1 revealed that maximum number of sheds had their long axis in North-South orientation with 38.24 and 34.28 percent in F1 and F2 categories of farmers, respectively and overall

average of 35.84 percent. There was non-significant difference between F1 and F2 categories of farmers with regards to the orientation of cattle shed. The floors of shed with this orientation were found to be drier and cleaner than the other types of orientation due to maximum duration exposure of sun light inside the shed. Previous worker[2] also suggested such orientation of cow shed to have maximum benefit of sunlight. The floors of shed having any other types of orientation were comparatively more damp and wet; cows in such sheds are more prone to infectious diseases. Moist, soiled environments favor the growth and persistence of gram-negative bacilli and fungi are also present in dust and proliferate in moist and fibrous material[1].

Table 1. Orientation of long axis of cow shed according to the categories of farmers under field condition

Categories of farmer	North-South	East-West	North-West	South-West
F1	38.24 (26)	20.59 (14)	29.41(20)	11.76 (8)
F2	34.28 (36)	30.48 (32)	20.00 (21)	15.24 (16)
Total	35.84 (62)	26.59 (46)	23.70 (41)	13.87 (24)
Chi-square value	3.60[NS]			

Figures in the parenthesis indicate number of observation; [NS]Non-significant ($p > 0.05$)

Evaluation of Table 2 revealed that maximum numbers of sheds had thatched roof with 85.30 and 69.52 percent in F1 and F2 categories of farmer, respectively, with overall average of 75.72 percent. There was highly significant ($p < 0.01$) difference of prevailing roofing materials between F1 and F2 farmers. The materials for thatched roof were easily available at cheap rate in the locality and it was

economically affordable for the farmers. Moreover, thatched roof were an excellent insulator during severe heat as well as cold seasons. However, with thatched roof problem of fire hazard and dust particles cannot be ignored. The present observation was in conformity with the author[4]. Most of the cow sheds had double sloped, which might be due to heavy rainfall area.

Table 2. Roofing materials of cow shed according to the categories of farmers under field condition

Categories of farmer	Thatched	C.G.I.	Asbestos
F1	85.30 (58)	2.94 (2)	11.76 (8)
F2	69.52 (73)	30.48 (32)	Nil
Total	75.72 (131)	19.65 (34)	4.62 (8)
Chi-square value	83.41**		

Figures in the parenthesis indicate number of observation.; **Highly significant ($p < 0.01$)

Evaluation of Table 3 revealed that maximum numbers of cow sheds of F1 farmers had brick bedded floor (88.24%) and in case of F2 farmers, maximum numbers of cow sheds had earthen floor

(95.24%). There was highly significant ($p < 0.01$) difference of floor materials between the two categories of farmers. Only 8.82 percent of cow sheds of F1 category had concrete floor and F2

farmers did not have concrete floor. In contrast to the present finding, previous author[3] reported that the cattle farmers mostly used wooden planks for construction of floors of shed. Wooden planks were not available for construction of floor in the present study due to prohibition of felling of trees in the forest. All the concrete floors under this investigation were even with grooved surface and slight ingredients towards the gutters without any pot holes or undulation which were frequently observed in the earthen as well as in brick bedded floors causing unhygienic condition in the cow shed.

Table 3. Floor types of cow shed according to the categories of farmers under field condition

Categories of farmer	Brick bedded	Concrete	Earthen
F1	88.24 (60)	8.82 (6)	2.94 (2)
F2	4.76 (5)	Nil	95.24 (100)
Total	37.57 (65)	3.47 (6)	58.96 (102)
Chi-square value		16.01**	

Figures in the parenthesis indicate number of observation.; **Highly significant (p<0.01)

The cows were mostly arranged in head to head system with a rectangular common manger of 1.25±0.02 meter width and 1.00±0.01 meter length per cow in case of F1 farmers. The present findings were supported by the finding of the previous author[7]. The overstocking of the animals might be due to ignorance of the farmers. Maximum number of mangers (91.18%) was made with the combination of bamboo and woods which were rectangular shaped. The maximum (88.24%) gutter had brick on the bottom and sides. The average depth of gutter was 0.15±0.003 meter and width was 0.35±0.004 meter in F1 farmers The F2 farmers did not use gutter and manger in the cattle shed.

The average height of roof at eaves was 1.65±0.0.04 and 1.70±0.04 meters in F1 and F2 categories of farmer, respectively (Table 4) and it did not differ significantly (p>0.05). The height of roof was less than the recommendation of the authors [5&6]. The less height of roof in the present study might be due to heavy rainfall in the area. The average floor space (excluding manger) per cow was 1.90±0.04 and 2.05±0.03 sq. meters in case of F1 and F2 types of farmer, respectively (Table 4). There was highly significant (p<0.01) difference of floor space between farmers. This observation of floor space was almost similar to the earlier report[8]. However, floor space was less than the recommendation of the previous workers[9]. Stocking density was more in crossbred cow's (F1) shed than that of local cow's shed (F2) as because there was no manger and gutter inside the sheds of local cow. The local cows were mostly grazed in the open field during the day time. They did not use gutter and manger, as earthen floor was used and hardly stall feeding was done.

Table 4. Average floor space and height at eaves in cow shed according to the categories of farmers under field condition

Categories of farmer	Floor space/cow (sq. m.)	Height at Eaves (meter)
F1	1.90± 0.04	1.65±0.04
F2	2.05± 0.03	1.70±0.04
t-value	2.72**	0.79[NS]

** Highly significant (p<0.01), [NS]Non-significant (p>0.05)

The cow shed under report had no fixed side walls. The farmers used to fit gunny sacks and hessian clothes around the sheds during heavy rains and cold windy days as well as in severe winter season to save the cows from cold draft. In this way the cows were not fully protected during inclement weathers, so improvement of shelter facilities are needed for increasing milk production. As per the

previous authors[9], ideal cattle shed can at best have half walls of 3 to 4 feet high all around.

CONCLUSION

The present study revealed that the shelter management of cross bred dairy cows was better than those of local cows under field condition. However, it is essential to provide scientific training and suggestions to the farmers for construction of a suitable shed for the dairy cows to optimize their productivity.

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Information searching and seeking behaviour of the farmers for cattle disease management: A case study of rural Bangladesh

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ABSTRACT

Livestock sector, especially cattle, is a large contributor to the national economy and a vital nutrition source for millions of people in Bangladesh. Majority of the rural farmers are involved in the homestead cattle rearing along with their main crop cultivation and many of them are using commercial cattle rearing as their main occupation. While rearing cattle, it is usual for them to encounter different cattle diseases and they, to their best of the abilities, look for information to manage those diseases. This study, thus, was undertaken to explore the information search and seeking behavior of the cattle farmers for cattle disease management. The study was based on Wilson's nested model of information behavior. It was carried out in Madargonj and Sharishabari sub-district of Jamalpur district of Bangladesh. One hundred farmers were interviewed using a semi-structured questionnaire. Appropriate scales were used to measure the concerned variables. Descriptive analysis was done to see the outcome of the study. It was observed that farmers faced low to moderate disease infestation in their cattle and worm infestation being the most frequent one. They, besides, search for information from less to a moderate degree. Farmers tend to approach local sources like experienced farmers, neighbours and friends, large local farmers etc. for information. They seek other information sources only when something is beyond the capabilities of local sources like vaccination or medicine prescription for disease management. The lack of field-level livestock extension worker seems to be one of the major factors that break the information flow between farmers and Government agencies. The lack of Government campaigns related to livestock extension is also contributing for not influencing farmers to look for specialized and professional information sources. Government agencies and other relevant organizations working in livestock extension field should take initiatives to reach to the farmers and spread the importance to look for diversified sources to have professional and authentic cattle health-related information. Besides, it seems to be a timely need to recruit more field-level livestock extension workers in Bangladesh so that farmers can easily access better professional opinion on cattle disease management.

Key words: Economy, Extension workers, Information, Local, Vaccination

Bangladesh, a country full of natural food resources, depends largely on its crop and livestock production for its growing economy. Especially livestock, as an expanding industrial sector, plays an important role in the national economy of Bangladesh with a direct contribution of 12% to agricultural GDP and 3% to national economy[8] as observed in last livestock-related national survey in 2012. More than 75 per cent of people rely on livestock to some extent for their livelihood[30]. It shows the importance of livestock as a high valued income source of the people. Despite this, if we consider the production of meat, egg and milk with the current requirement of the people in Bangladesh, it is inadequate and the deficit is 85.9, 77.4 and 73.1% respectively[11&26]. Among the three major products of the livestock sector, milk totally and the majority of meat demand depends on the cattle sector. The average weight of local cattle ranges from 125 to 150 kg for cows and from 200 to 250 kg for bulls that fall 25-35% short of an average weight of all-purpose cattle in India. In

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case of milk also, yields are extremely low, 200-250 litters during 10 month lactation period in contrast to 800 litters for Pakistan, 500 litters for India and 700 litters for all Asia[31]. This indicates that meat and milk production can be improved in Bangladesh. The previous data suggest that meat, egg and milk are inadequate to meet the current requirement of Bangladeshi people and the deficits are 85.9, 77.4 and 73.1% respectively[31]. Among the causes of this deficit, diseases are one of the most significant limiting factors hindering our expected output[20&31]. Geo-climatic condition and management practices for animals of Bangladesh are favorable for the occurrence of diseases[24&25]. However, the question remains, why are the farmers in Bangladesh facing cattle disease to a considerable extent every year? One major limiting factor might be- not getting proper information about management practices.

Generally, rural areas in developing countries have less access to information[6&22] and even more concerning is that farmers do not consider agriculture as an area that requires them to search for information[16&18]. They limit themselves to fewer information sources[2] and mostly unauthentic local sources (Such as neighbors, progressive farmers etc.) for getting any information[32]. Farmers have their preferred information sources to get the desired information[33] and most of the time their traditional mindset makes them stick to those sources for specific information. This lack of information not only makes their cattle vulnerable to disease attack but also makes the farmers less participative to development programs[23]. So, it needs to be explored what Bangladeshi cattle farmers do with the information sources and how they utilize the sources to manage the disease of their cattle. To understand this point, farmers seeking and searching behavior pattern would an appropriate target area. Though seeking and searching, in many common cases, are used to elaborate the same feeling, in reality, the two words are contrasting. Seeking is more focused to find something and searching is focused more on the place where we should look for. This study is undertaken to understand both, what farmers are looking for i.e. seeking and where they are looking i.e. searching. Therefore, the present study was considered to encompass two specific objectives: i) to explore the infestation of cattle diseases in the study area and ii) to determine the extent of use of information sources by the cattle farmers to manage diseases. This study will support ways to disseminate information properly, considering the behavior of farmers. Further, it will also be helpful to the farmers to understand the appropriate line of information used to improve their present economic situation, managing the cattle diseases correctly and timely.

MATERIALS AND METHODS

Study Area

The study was conducted in one village of Madargonj and Sharisabari sub-district under Jamalpur district in Bangladesh. The village (*Ghoshpara*) was purposively selected for being high intensive cattle-rearing area. As per the information given by the Department of Livestock Services (DLS) office of the sub-district, most of the household of the village are involved in cattle rearing. The village is very near to River *Jamuna* and has plenty of grazing land in *char areas of Jamuna* river[7], making it a suitable place for rearing cattle.

Population and Sampling

Cattle rearing farmers of study area having at least more than 2 cattle were considered as the population of the study. The total numbers of the farmers rearing cattle in the study area were 168. Using the simple random method, 100 farmers were selected (60% of the population) as a sample of the study assuming that this sample may be representing the cattle rearing farmers of the study area.

Data Collection Technique

Data were collected through the pre-tested questionnaire by face-to-face interview procedure. The interviews lasted one to two hours and were conducted with proper consent from the responding farmers. The interviews focused on the documentation of farmers seeking and searching behavior through some semi-structured questions. The data were collected based on the recalling of

experience by the farmers. Ten year time period or as much as possible for the farmers was considered for recall. The main target was to explore the experience perspectives of the farmers. Data from the interviews were coded and analyzed using the SPSS software package.

Methodological Background

Information seeking and searching behavior have several models explaining the information seekers interest, context and other intervening environmental factors contributing to it. Different authors tried to explain human behavior from different perspectives and paid most attention to the processes undertaken by people when they approach a system (a library, a database) for information[12]. Wilson, in his modified model (1999), pointed out that information search behaviour is a subset of information-seeking behaviour and that information-seeking behaviour is in turn only a subset of all possible information behaviour (Fig. 1). Also, the four-stage process starts with problem identification and ends with problem-solving. The existence of modes of information behaviour, other than information seeking, is implied[12&29].
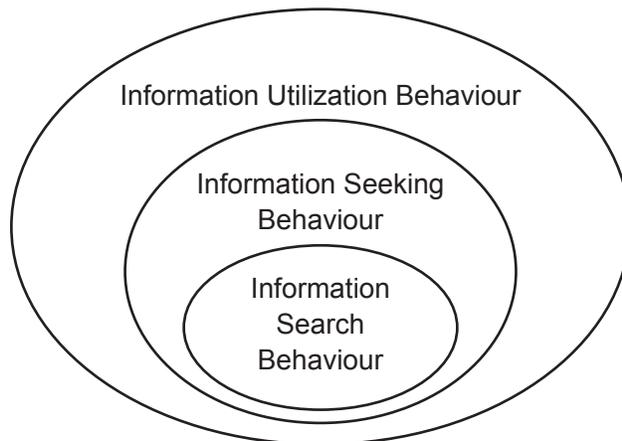
Fig. 1. The nested model of information behaviour[34]

Keeping in mind Wilson's 1999 nested model this paper tries to explore the information search and information-seeking behavior of the farmers in searching cattle disease information. Based on the model, the overall disease infestation was explored to see the need for information seeking. Also, information source utilization and information-seeking behavior were explored.

Measurement of Variables

Use of information sources by the farmers in receiving information on cattle disease management was the focus variable of the study. The extent of use of information source was measured with a four-point rating scale. The scales for categorizing farmers, based on their information source use, were- Not at all (0 times/month), seldom (1 time/month), occasional (2-3 times/month) and frequent (≥ 4 times/month), having a coded score of 0, 1, 2, and 3 respectively. Fourteen issues related to cattle rearing and management were considered to measure the extent of information source use. So, the total possible score could range from 0 to 42, where '0' indicated non-user and '42' indicates the highest user of information sources in receiving information on cattle rearing and management. According to the observed score, the farmers were categorized into three groups considering equal score in each group i.e. low user group (up to score 14), moderate user group (score 15 to 28) and high user group (score above 28). Additionally, the sources used to get that particular information were explored. The sources considered here were those used in the explanatory variable-'contact with information source'. The extent of disease infestation in cattle is explained elaborately to see the rate and frequency of different cattle disease attack in the study area. It will help to identify the need for information to manage the diseases. Sixteen common diseases of cattle were selected consulting with the Upazila livestock Officer and Veterinary surgeon of *Madargonj* sub-district of *Jamalpur.* Cattle farmers were asked to judge the extent of infestation based on four options. The options were frequent, occasional, seldom and not at all weighing 3, 2, 1, and 0 respectively. So the overall score could range from 0 to 48 for each respondents' cattle. Simple descriptive analysis is done to see the output of the study.

RESULTS AND DISCUSSION

The Extent of Cattle Disease in the Study Area

The extent of cattle disease infestation in the study area was measured based on the information given by the farmers. The results showed a mean value of 1.32 with a standard deviation of 0.468. The results indicated in Table 1 explained that the majority of the cattle farmers (68 per cent) felt that their cattle had a low infestation of diseases and rest

thirty-two per cent fell into the moderate category. While none of the farmers was categorized into high category. The study area is a very well-known cattle-rearing area. The farmers are very experienced in cattle rearing. They are expected to manage their cattle in a better way, leading to low to moderate disease infestation. It is noteworthy that farmers try to respond very quickly if any disease started to arise in the area and control its widespread.

Table 1. Distribution of respondents according to their experience of the extent of disease infestation in their cattle (N=100)

Categories (Score)	Percentage	Mean	SD
Low (≤16)	68		
Medium (>16-32)	32	1.32	0.468
High (>32)	00		
Total	100		

To get a clear view on diseases that the farmers of the study area are dealing with, they were asked in the interview to respond to their experience of cattle disease infestation in the last 10 years (or as far they can remember). The results of the overall disease infestation experience of the farmers, as shown in Table 2, outlines the main diseases that farmers have to deal while rearing their cattle. Farmers felt that their cattle are infested mostly by the worms which are intestinal parasites we can see in Table 2. Lice, an external parasite, are ranked second for causing the major infestation to the cattle in the study area. These parasites are a worldwide problem in cattle

rearing and cause a huge loss in production[13&19]. In general, if we consider the scenario of Bangladesh, these parasites are responsible for a lowered general health condition, retarded growth rate, diminishing the working efficiency, decrease milk and meat production resulting in enormous economic losses[3, 4&28]. According to Islam in his work, worm infestation in cattle is highest in most of Bangladesh (34.2%)[17]. Flatulence and Foot and mouth (FMD) disease were ranked 3rd and 4th respectively. The least infestation of cattle is caused by Inflammation and Thileriosis in the study area which is quite similar to the overall scenario of Bangladesh[1].

Table 2. Rank order of different disease infestation on cattle according to the respondents' response (N=100)

Disease	The extent of Infestation (Percentage)				EIS	Rank Order
	Frequent	Occasional	Seldom	Not at all		
Anthrax	6	14	17	63	63	9
Black Quarter	2	13	19	66	51	11
Hemorrhagic septicemia	5	30	18	47	93	7
Foot and Mouth Disease	28	42	16	14	184	4
PPR	6	7	1	86	33	12
Rabies	2	3	20	75	32	14
Mastitis	7	37	13	43	108	6
Flatulence	40	30	14	16	194	3
Pneumonia	24	40	7	29	159	5
Worm infestations	57	28	11	4	238	1
Ketosis	3	6	11	80	32	13

Inflammation	3	4	10	83	27	15
Abortion	5	10	18	67	53	10
Shigellosis	7	25	9	59	80	8
Lice infestations	47	29	15	9	214	2
Thileriosis	1	2	11	86	18	16

EIS: Extent of infestation score.; The extent of searching and seeking of information sources by the cattle farmers

The possible score of the extent of search of information sources could range from 0 to 42. The observed information use score ranged from 6 to 36 with a mean of 16.66 and standard deviation of 0.669. Based on the possible score, the farmers were classified into the three categories as shown in the following Table 3.

Table 3. Distribution of the respondents according to the extent of use of information source (N=100)

Categories (Score)	Percentage
Low (≤14)	45
Medium (>14-28)	44
High (>28)	11
Total	100

Data furnished in Table 3 indicate that majority (89%) of the respondents fell into low to medium category for information searching regarding cattle disease management. This type of information searching is also supported by Miah[21] and Sakib[27] in their study. Besides, they face low to medium disease infestation, as shown in table 1, and that might be another reason for not searching too much information. There can be other reasons working behind their low to the moderate preference of information searching. Normally, in rural areas of Bangladesh, farmers tend to be less communicative and they try not to use different information sources easily. Rural farmers try to search for those sources that are cost-effective, easy to access and convenient to them[15]. Therefore, they remain with the sources that are close to them and they do not need to pay any money for the information. Besides there is no provision for field level

extension workers in the organogram of Government organization Department of Livestock Service[10]. This makes it further difficult as farmers do not know what to search for sometimes. It is one big factor that obstructs the information linkage between farmers and government agencies. Because local field extension officers or workers work closely with the farmers and act as a bridge to spread information from top-level to farmers. They also can act as a medium to take farmers feedback to the top level. The effectiveness of Sub-Assistant Extension Officers of Department of Agricultural Extension (DAE)[9] make it more evident for the need of livestock extension workers.

To measure the extent of preferences of the respondents and their level of those preferences, the cumulative preference score is shown in Fig. 2.
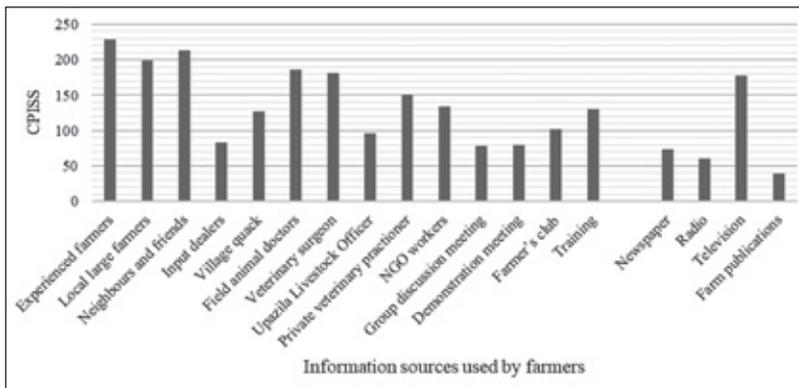
CPISS: Computed Preference of Information Source Score

Fig. 2. Overall preference of information sources by the cattle farmers based on Computed Preference of Information Source Score

From Fig. 2, it is observed that farmers opt to local information sources more while seeking for information. This might be due to the fact that these sources are easily available in the time of emergency need[21] and the cost of getting information is zero to very less. Some farmers in the study area own more than a hundred cows and have immense experience in cattle rearing. So, they can easily share their experience with other farmers need any information. The low cost highly influences the searching for an information source. Therefore, in addition to experienced farmers, cattle farmers, in general, opt to local large farmers, and neighbors and friends for getting any information related to cattle rearing. Since all these sources are easily available in the locality, they need not pay for getting information in the majority of the cases. Lack of field level extension activities makes it harder for the farmers to get easy excess to experts and they tend to go to the local close sources. However, in some cases, farmers face serious problems like complex diseases that cannot be solved by these local resources. Farmers, in those cases, choose to contact field animal doctors and veterinary surgeons for getting information and solutions. Veterinary surgeons and field animal doctors are expert people in disease management and farmers go to them as their cattle are a highly-priced resource to them. Most of the farmers have less schooling[14]. So those written materials like leaflet, farm publications and newspaper are least preferable to them for getting information and using this information. Besides radio which is also rarely used as a medium after the rapid emergence of television in the rural areas.

To see the most searched information regarding cattle disease management two Graphs are prepared and presented in Fig. 3 and Fig. 4.
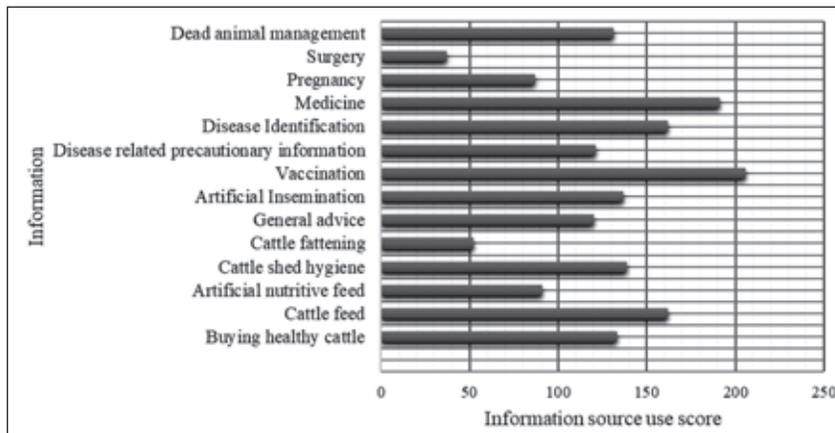

Fig. 3. Information sought by the respondents on cattle disease management
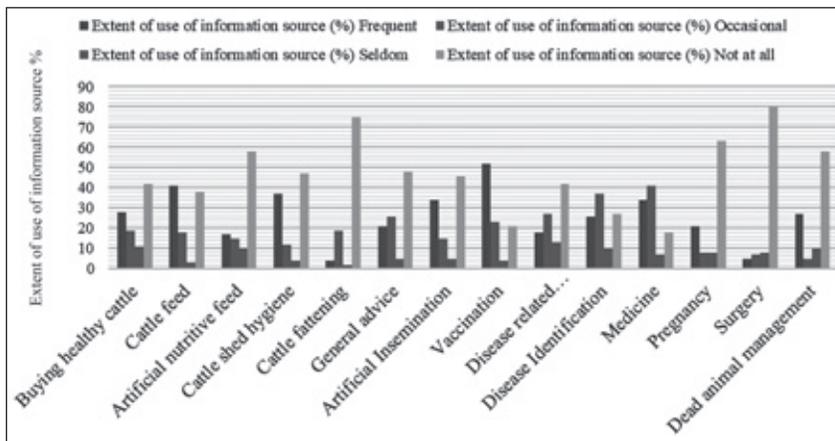

Fig. 4. A graph showing the frequency of seeking information

From Fig. 3 we can see that farmers seek more for vaccination and medicine-related information. Vaccination is a much-anticipated program run by the government every year through different Government organizations and NGOs. People are much aware of the need for vaccines and know its' pros and cons. So the farmers are eager to give their cattle the necessary vaccines to protect them from any unwanted diseases. If you see the trend of the information search in Fig. 6 we can see that vaccination information is followed by medicine-related information, disease identification and cattle feed related information. In the last ten years from 2008-09 to 2017-18, the total cattle in Bangladesh increases to 22.9 million to 24.8 million and the number of commercial farm increases also[10]. The commercial farmers are very much concerned about their cattle as they grow them for selling their products. So, maintaining the cattle health for better production is their prime concern and it clearly showed in the information-seeking behaviour. They tend to search for information that is related to productivity. If the opposite side is explored, it can be seen that the cost is also a factor that they keep in mind. They look for such information that requires less cost to implement like surgery will require more money and they are unwilling to do so. That's why they seek less information.

If we closely observe Fig. 4 we can see that either the cattle farmers seek information more frequently or not at all for any information. This might be because some categories of farmers do not seek any kind of information and some seek a lot of information. This change in pattern might be due to the external or internal factors of the farmers. The more experienced farmers tend to be less proactive and try to solve the problem from their own experience. They tend to rely on their instinct and experience on facing the same problem earlier[5&21]. Sometimes social participation makes them more interested to seek for information from external sources. When they meet with peer farmers and hear their behaviour on seeking information that might influence them to seek information from more expert sources[5].

CONCLUSION AND RECOMMENDATION

Cattle are a key nutritional and income source for millions of Bangladeshi farmers. The commercial rearing of cattle is increasing day by day. Without accurate information, it is hard to get the exact way of treating or managing cattle. But, in this study, it can be seen that farmers information searching tendency is not high. Most of them belong to low search category though they have a prevalence of disease attack in their cattle. They rely on local information sources rather than going to experts. They are only seeking information mostly related to those activities that are publicized well like vaccination. The lack of livestock extension workers and services in the field level is a big obstacle for information flow from the upper level to ground level. There also may be a gap of policies or programs from the Government and other working organization in spreading different important information like pregnancy issues, surgery, dead animal management etc. as these are vital info but farmers ignored to search for the most of the time. It is also visible that some farmers are not interested in seeking information at all and rely on their instinct to manage things. This might cause trouble for the animals. Thus, it is recommended that more awareness-building programs should be arranged by Government livestock-related organizations and NGOs to make farmers concern about the health of their reared animals.

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Milking management practices followed by dairy farmers in tribal areas of Valsad district of Gujarat

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ABSTRACT

A field survey was conducted in Valsad district of Gujarat to ascertain the milking management practices followed by dairy animal owners and data were collected from randomly selected 240 dairy animal farmers through personal interview with the help of structured interview schedule. The present study revealed that all the respondents milked their animals twice a day at same place and practiced washing of teats and udder of animals as well as their hands before milking. About 96.2 and 81.7% respondents were adopted wet hand milking and knuckling method of hand milking, respectively. Only 27.9% of respondents followed stripping at the end of milking and all the respondents didn't wipe the udder and teats just after milking. Majority (72%) of respondents change the milker for their milking animals. About 44.2% of respondents allowed calves for suckling before milking and 80% of respondents washed their milking utensils by simply tap water. Majority (90.8%) of respondents did not follow teat dipping after milking and none of the respondents followed testing for mastitis in their dairy animals. Only 38.82% respondents adopted practice of drying off their dairy animals for less than two months before calving. Majority (99.6%) of respondents didn't follow sealing of teat canal at the end of lactation. Majority (98.3%) of respondents sold their milk to village dairy co-operative society.

Key words: Dairy animals, Milking, Management, Practices, Tribal area

Dairy farming plays a key role in generating income, employment and improving household nutrition. Dairy animals have a complementary, supplementary and sustainable relationship with crops in a mixed farming system. India has about 192.52 million cattle and 109.85 million buffaloes which accounts for 35.93 and 20.5% of the cattle and buffalo population of the India, respectively[1]. India is the highest milk producer country in the world with an estimated quantity of 165.4 million tones in the year 2016-17[3]. The livestock population in Gujarat

has 27.03 millions including 9.98 million cattle and 10.38 million buffaloes. Gujarat contributes about 13.56 million tons of milk to the total milk pool of India and per capita availability is 564 g/day[2]. However productivity per milking animal is poor i.e. wet average (kg/day) in indigenous cows, crossbred cows and buffalo as 1.98, 6.75 and 4.5, respectively[8]. The low production of Indian dairy animal is mainly due to lack of awareness and low adoption regarding improved dairy husbandry techniques by dairy farmers. Gujarat is leading state in production and marketing of milk in India on dairy co-operative system basis. Good milking techniques increase the productivity of animals, support to keep udder and teats in better condition and play important role in production of clean milk[18]. Keeping these facts in mind, the present study was planned to collect information on milking management practices followed by dairy farmers of Valsad district of Gujarat.

Part of M.V.Sc. thesis

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MATERIALS AND METHODS

A field survey was conducted in Valsad district of South Gujarat during September, 2017 to January, 2018. Valsad district possess six talukas namely- Valsad, Dharampur, Vapi, Pardi, Umargaon and Kaparada. This district covers 3008 square kilometers and has 434 villages. Dairy farming is the second leading economic activity after agriculture. There are 416 milk co-operative societies and 428 milk collection centers in Valsad. Out of six talukas in the district, two talukas were randomly selected. From each selected taluka, twelve villages having functional primary milk producer's co-operative societies and ten dairy animal owners from each village were randomly selected using a multi stage random sampling technique with the help of Talati cum Mantri/village dairy cooperatives which constituted a total of 240 respondents. For selecting dairy farmers due care was taken to ensure that they were evenly distributed in the village and truly represented milking management practices prevailing in the area. The selected dairy farmers were single interviewed and the desired information was collected regarding milking management practices with the help of pre-designed and pre-tested questionnaire. Data were tabulated and analyzed as per standard statistical tools to draw meaningful inferences[20].

RESULTS AND DISCUSSION

Data in Table 1 showed that all the respondents followed two times milking and selling milk to primary village milk producers' co-operative society at morning and evening. The present results are similar with the earlier results[5,16&19]. Regularly wash the udder and teats of milking animals before milking was adopted by all of the respondents in study areas which helped for clean milk production. Present results are in agreement with the earlier results[5,9,16&19]. All the respondents developed habit of washing hand before milking which is similar with earlier results of authors[16&19]. Majority (96.2%) of the respondents had habit of wet hand milking and only 3.8% respondents had habit of dry hand milking. The present results are in accordance with[5&16]. However, present result was contrary to the result of author[12] that 53.33% of respondents had habit of dry hand milking. The practice of dry hand milking is better than wet hand milking and the dairy farmers of surveyed area still need to increase their mindfulness for adopting this practice.

Data in Table 1 observed that majority (81.7%) of the respondents followed knuckling method, whereas 11.7 percent respondents practiced full hand milking and 5.8% stripping method of milking. However, 0.8% of the respondents used milking machine in surveyed area. Present results are in agreement with the earlier results[5,11,16&19]. The results are contrary to the earlier finding[4&9] reported that 62.5 and 73.33% of the farmers were followed full hand milking method in their study, respectively. This might be due to lack of knowledge of farmers regarding full hand milking and farmers of surveyed areas still needed to adopt full hand milking by educating that knuckling is an incorrect method of milking which may cause teat injury and mastitis in long term.

It was revealed that 27.9% of the respondents followed stripping at the end of milking, while 72.1% of respondents didn't follow this practice. The present results are contradictory with the earlier findings[10&16] that more than 86 percent of the respondents were followed stripping at the end of milking. It might be due to the fact that farmers of these areas were more aware about beneficial effects of stripping at the end of each milking. Majority (72.1%) of the respondents change the milker while, 27.9% did not change the milker. Highly significant (p<0.01) different was observed with respect to milker replace between the two talukas of Valsad district. Similar findings were reported by earlier findings[13&16]. The respondents change the milker from time to time because some milch animals will give milk to a particular person if milker is not change. All the respondents didn't follow practice to wipe the udder and teats of animals just after milking. The present results are similar with the earlier results[9,16&19]. Wipe the udder and teats after milking might be helped to minimize the occurrences of mastitis as milk is a very good media for the growth of bacteria.

Data presented in Table 1 indicated that 44.2% of the respondents allowed calves for suckling before milking, whereas 32.5 and 14.6% of the

respondents allowed calves for suckling after milking and suckling both before and after milking, respectively. However, 8.8% of the respondents didn't follow this practice. Calf allowed to suckle was highly significant (p<0.01) difference observed between the two talukas. The values observed in the present study are lower than the earlier result[7] where more than 91% of the respondents allowed the calves to suckle before milking. However,[10&16] observed that fairly high percent of farmers allowed the calves to suckle before and after milking.

Perusal of data in the Table 1 revealed that 62.08% of the respondents' offered concentrate feed and teat manipulation, while 10 and 4.17% of the respondents used oxytocin injection and dummy calf if the animals did not let down milk after the death of calf, respectively. It was also observed that 23.75% of the respondents did not follow this practice. The present results are similar with the earlier results[4,16&19]. All of the respondents milked their dairy animals at the same place. The present finding values are higher than the earlier finding values of[7,10,16&19]. However, present findings are contrary to the earlier results[9&15] observed that majority of the respondents milked their animals at separate and dry place. About 99.2% of the respondents used open mouth bucket for collection of milk during milking which is similar with the earlier results[10&16].

Data presented in Table 1 revealed that 38.8 and 61.2%of respondents adopted practice to drying off their dairy animals for less than two months and more than two months before calving, respectively. Practice of drying off dairy animals observed highly significant (p<0.01) different between the taluka. It might be due to lack of knowledge of respondents regarding proper time to drying of animals. The present findings are supported with the earlier finding[17]. However, the results are contradictory to the earlier result recorded[5] that 90.28 and 9.72% respondents adopted practice of drying off their dairy animals for less than two months and two months / more time before calving, respectively.

Data in Table 1 showed that 90.8% of the respondents did not follow teat dipping after milking, whereas only 9.2% of the respondents followed teat dipping after milking. These farmers follow weaning method of calf rearing in study areas which is in accordance with the earlier results[17&19]. This modern practice has yet not reached to the farmers in rural area. Adoption of this practice seems to be very low. Majority (80%) of the respondents washed their milking utensils by simply tap water and 20% of the respondents washed their milking utensils by hot water. The present findings are well supported by the earlier results[10,12&14].

Majority (98.75%) of respondents disposed off their milk through village primary milk co-operative society, while very few respondents (1.25%) disposed their milk through private milk vendors. The study area has well developed network of Valsad district dairy co–operative union (Vasundhara dairy). Present results are in accordance with the earlier results[17&19]. However, the present results are contrary to the earlier results recorded by[7] in Rajasthan. This showed that in Gujarat the network of dairy co-operative is better, which has reached to the interior parts in tribal belt.

None of the respondents followed testing for mastitis diagnosis in their dairy animals which is similar to the earlier results[17&18] in tribal and coastal areas of Navsari district of South Gujarat. However, the results are contrary with the earlier finding[6] who reported that 44% of the respondents followed practices to detect mastitis in Ludhiana district of Punjab. The test is standard qualitative and easy to follow by farmers but this technique had not reached at farmers' level in rural areas. It might be due to the lack of awareness about the detection of subclinical form of mastitis among the farmers of Valsad district. Zero level adoption of testing for mastitis diagnosis practice is suggestive of probably absence of efforts in communication and training in study areas. Majority of the respondents (99.6%) didn't follow sealing of teat canal at the end of lactation, while remaining 0.4% of respondents followed sealing of teat canal at the end of lactation in their dairy animals. Teat sealing at the end of lactation is important practice to maintain good udder health of animals but it seems that the awareness level of the farmers in Valsad district was poor. Present findings are encouraging than earlier results[10&16].

Table 1. Milking management practices followed by dairy farmers

Practices/Taluka	Dharmpur (n=120)		Pardi (n=120)		Overall (n=240)		Chi Square Value
	n	%	n	%	n	%	
Frequency of milking							
Once	00	0.00	00	0.00	00	0.00	NA
Twice	120	100.00	120	100.00	240	100.00	
Splashing of water on teat/udder before milking							
Yes	120	100.00	120	100.00	240	100.00	NA
No	00	0.00	00	0.00	00	0.00	
Washing of hand before milking							
Yes	120	100.00	120	100.00	240	100.00	NA
No	00	0.00	00	0.00	00	0.00	
Milking habit							
Dry hand	06	5.00	03	2.70	09	3.80	1.03[NS]
Wet hand	114	95.00	117	97.50	231	96.20	
Milking method							
Machine	01	0.80	01	0.80	02	0.80	
Full hand	16	13.30	12	10.00	28	11.70	1.04[NS]
Knuckling	95	79.20	101	84.20	196	81.70	
Stripping	08	6.70	06	5.00	14	5.80	
Stripping at the end of milking							
Yes	36	30.00	31	25.80	67	27.90	0.51[NS]
No	84	70.00	89	74.20	173	72.10	
Milker replace							
Yes	107	89.20	66	55.00	173	72.10	34.80**
No	13	10.80	54	45.00	67	27.90	
Wipe the udder and teats just after milking							
Yes	00	0.00	00	0.00	00	0.00	NA
No	120	100.00	120	100.00	240	100.00	
Calf is allowed to suckle							
Before milking	46	38.30	60	50.00	106	44.20	
After milking	51	42.50	27	22.50	78	32.50	12.74**
Both times	12	10.00	23	19.20	35	14.60	
Not allowed	11	9.20	10	8.30	21	8.80	
If the cow do not let down milk after the death of calf then practice followed							
Offer concentrate feed and teat manipulation	70	58.30	79	65.80	149	62.08	
Apply oxtyocin injection	08	6.70	16	13.30	24	10.00	7.77*
Dummy calf	07	5.80	03	2.50	10	4.17	
None	35	29.20	22	18.30	57	23.75	

Place of milking							
Milking at the same place	120	100.00	120	100.00	240	100.00	NA
Milking at separate and dry place	00	0.00	00	0.00	00	0.00	
Type of milking pail							
Open mouth bucket	119	99.20	119	99.20	238	99.20	0.00 NS
Scientific milking pail	01	0.80	01	0.80	02	0.80	
Drying period							
>2 months	62	51.70	85	70.80	147	61.20	9.29**
<2 months	58	48.30	35	29.20	93	38.80	
Teat dipping followed							
Yes	09	7.50	13	10.80	22	9.20	0.80 NS
No	111	92.50	107	89.20	218	90.80	
Cleaning of milking utensils							
Hot water	16	13.30	32	27.70	48	20.00	6.67*
Tap water	104	86.70	88	73.30	192	80.00	
Disposal of Milk							
Co-operative society	120	100.00	117	96.70	237	98.30	3.04 NS
Vendors	00	0.00	03	2.50	03	1.20	
Test for mastitis diagnosis							
Yes	00	0.00	00	0.00	00	0.00	NA
No	120	100.00	120	100.00	240	100.00	
Sealing of teat canal at the end of lactation							
Yes	01	0.80	00	0.00	01	0.40	1.00 NS
No	119	99.20	120	100.00	239	99.60	

n- Frequency,*Significant at 5 per cent level (p≤0.05), **Significant at 1 per cent level (p≤0.01),NA-Not applicable

CONCLUSION

It can be concluded that majority of respondents followed wet hand with knuckling method of milking. All the respondents didn't wipe the udder and teats just after milking and less than half of the respondents allowed calves for suckling before milking. All the respondents milked their dairy animals at the same place. Majority of the respondents adopted practice to drying off their dairy animals for more than two months before calving. Most of respondents don't practice teat dipping procedure after milking. None of respondents followed testing for mastitis control in their dairy animals and very few respondents adopted sealing of teat canal at the end of lactation of dairy animals. So, much scope to improve the adoption of scientific milking practices among dairy farmers in study areas through organizing awareness camps, kisan ghosthi, demonstration and exposer visits by various government organizations and NGOs.

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Effect of water restriction and rehydration on body weight, feed and nutrient intake in indigenous hoggets

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ABSTRACT

The present experiment was conducted with objective to study effect of water restriction (WR) and rehydration on body weight, feed and nutrient intake in indigenous hoggets under intensive production system during summer season. Eighteen farm born unshorn Patanwadi and Marwari breeds of hoggets were selected and randomly divided in three treatment groups on the basis of body weight (25 - 30 kg) comprising of six in each group, viz., T_1: Control (*ad.lib*.water), T_2: (WR$_1$-20% water restriction), T_3: (WR$_2$-40% water restriction) for 28 days of water restriction and 4 days of rehydration. The body weight (kg), dry matter (g/d, % and g/kg $W^{0.75}$), digestible crude protein (g/d, % and g/kg $W^{0.75}$) and total digestible nutrient (g/d, % and g/kg $W^{0.75}$) intake of experimental animals were comparable among treatment groups. The body weight, dry matter and nutrient intake of experimental animals recovered significantly after 2nd day of rehydration. The results indicated that the Patanwadi and Marwari hoggets can withstand up to 40% water restriction during summer season under intensive production system.

Key words: Body weight, Feed and nutrient intake, Water restriction

Small ruminants are an integral part of farming systems in the arid and semi arid regions of the world. The arid and semi arid regions of the country are characterized by fluctuating precipitation, water scarcity and unpredictable weather. Irregular rainfall of these areas leads to limited availability of water. Along with water accessibility, feed and other resources will be markedly affected by climate change.

There is a close relationship between the quantities of feed and water consumed by ruminants. The increase or decrease in feed intake causes a concurrent change in water intake. In open range livestock select high quality forage to maintain a relatively similar basal diet quality from season to season and intake significantly reduces in extremely dry seasons when forage biomass and its quality are low. In the changing scenario of climate change, thermal stress along with feed and water scarcity are the major predisposing factors for the low productivity of small ruminants under hot environment [8]. Looking at the current situation of weather uncertainty and depleting water resources, the study on water restriction and rehydration is very important. Therefore, the present study was conducted to assess the effect of water restriction and rehydration on body weight, feed and nutrient intake in indigenous hoggets under intensive production system during hot season.

MATERIALS AND METHODS

The present experiment was conducted at Livestock Farm Complex, College of Veterinary Science and Animal Husbandry, Anand Agricultural University, Anand. Eighteen Patanwadi and Marwari hoggets (25-30 kg) were selected as experimental animals and randomly divided in to three treatment groups on the basis of body weight each comprising

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of six animals, *viz.,* T_1: Control Group (no water restriction. *ad. lib.* water), T_2: (WR_1- 20% water restriction), T_3: (WR_2- 40% water restriction). The duration of experiment was 32 days *i.e.* 28 days of water restriction and 4 days of rehydration phase. During the rehydration phase *ad lib* water was provided to animals under T_2 group and T_3 group also. Experiment was conducted under intensive production system during summer season (May – June, Average temperature range was 35-41° C). THI during the experiment was 73.31±2.21 and 34.64±1.45 at 7:30 am and 2:30 pm, respectively. The water intake of experimental animals was assessed individually by offering *ad.lib* water of known quantity using measuring cylinder during the adaptation period of 15 days prior to actual experiment to decide the quantum of water required by the individual animal. After knowing the quantum water required by the individual animal, water was offered to the individual animal as per the treatment during experiment. Average water consumption of experimental animal irrespective of treatment was 2.7 litres/animal/day during adaptation period. The animals of control group (T_1) were offered measured quantity of water with *ad lib* water intake at 9.00 am, 2.00 pm and 4.00 pm, while in T_2: (WR_1- 20% water restriction) and T_3: (WR_2- 40% water restriction) 2094.17±152.69 and 1673.33±127.59 litre/animal/day water, respectively was given keeping it in front of animal until drink it. During rehydration phase of 4 days, all animals of the groups were offered *ad lib* water but of measured quantity and leftover were also measured to calculate actual amount of water intake.

The experimental animals were maintained on ICAR feeding standard[4]. Measured quantity of wheat straw was given to animals of all groups on *ad lib* basis throughout the day in three instalments *i.e.*, 9.00 a.m., 2.00 p.m. and 6.00 p.m. as per consumption. Leftover of wheat straw was measured on next day morning to calculate actual intake. AMUL® dan was provided @ 250 gm to each animal at 8:30 am during the experiment while green fodder was not provided as it can also become source of water for animal. The experimental data of dehydration was analysed by two factorial completely randomized designs by individual analyses[9] and rehydration data was analysed by one way ANOVA.

RESULTS AND DISCUSSION

Body Weight (kg)

The body weight (kg) of Patanwadi and Marwari hoggets reared on different water restriction and rehydration are presented in Table 1. The average body weight of hoggets at the beginning of experiment was 26.53±2.32, 26.77±1.69 and 27.12±1.79 kg in control (T_1), 20% (T_2) and 40% (T_3) water restriction groups, respectively. The corresponding value during the period of dehydration was 26.98 ± 0.25, 26.57 ± 0.10 and 25.40 ± 0.55 kg in control, 20% (T_2) and 40% (T_3) water restriction, respectively. While on the final day of dehydration the body weight of experimental animals was 27.63 ± 2.32, 26.48 ± 1.60 and 24.50 ± 1.36 kg in control (T_1), 20% (T_2) and 40% (T_3) water restriction groups, respectively.

Table 1. Average body weight (kg) of experimental animals during dehydration and rehydration phase of experiment

Phases of experiment	T_1 (Control)	T_2 (20%)	T_3 (40%)
Beginning of experiment	26.53 ± 2.32	26.77 ± 1.69	27.12 ± 1.79
During the period of dehydration	26.98 ± 0.25	26.57 ± 0.10	25.40 ± 0.55
Final day of dehydration	27.63 ± 2.32	26.48 ± 1.60	24.50 ± 1.36
2nd day of rehydration	27.65 ± 2.23	29.28 ± 1.62	28.77 ± 1.71
4th day of rehydration	27.50 ± 2.29	28.77 ± 1.58	28.47 ± 1.75

Irrespective of periods, mean body weight of hoggets at the end of dehydration phase did not differ significantly among treatment groups. It was observed that water restriction leads to loss in body weight as compared to feed restriction alone[1&5] although, the difference was not always statistically significant. Similarly, mean body weight of hoggets did not differ significantly among treatment groups

during rehydration phase (Table 1). The experimental animals maintained at 20% (T_2) and 40% (T_3) water restriction recovered their body weight on 2nd day of rehydration. The mean body weight of hoggets after 4th day of rehydration did not differ from 2nd day of rehydration. It indicated that experimental animals recovered their body weight within 48 hrs of rehydration even after 40% water restriction during summer season.

Dry Matter and Nutrient Intake

Average daily dry matter intake (g/d, %, g/kg $W^{0.75}$) was not significantly influenced by the level of water restriction during hot dry season (Table 2). Averaged daily DMI (g/d, %, g/kg $W^{0.75}$) declined non-significantly in the hoggets maintained at 40% water restriction (640.56±18.18, 2.55±0.05, 56.86±1.01) as compared to control group (697.70±24.90,

2.61±0.05, 59.13±1.05). The sheep consumed significantly higher DMI (g/d, %, g/kg $W^{0.75}$) during hot dry season (16.32%) as compared to hot humid season which is accordance with present findings[6]. The daily feed intake reduced by 40% and 25% due to water restriction in Barmer goats and Marwari sheep, respectively[2&7]. The daily dry matter intake (g/d) of indigenous hoggets reduced to the tune of 7.6% and 5.28% significantly ($P < 0.05$) in 40% water restriction group as compared to animals of 0% and 20% of water restriction, respectively[3] and 16.32% in sheep and goats under 50% water restriction as compared to control group[6]. The DMI (g/d, %, g/kg $W^{0.75}$) recovered significantly ($p<0.05$) in T_2 (833.40±35.95, 3.02±0.13, 69.04±2.47) and T_3 (795.30±44.09, 3.00±0.1, 68.00±2.5) on 2nd day of rehydration where as at par with 4th day of rehydration (Table 3).

Table 2. Average dry matter and nutrient intakes of animal during dehydration phase of experiment

Particulars	T_1 (Control)	T_2 (20%)	T_3 (40%)	Average
Dry Matter Intake (DMI)				
g/d	697.70 ± 24.90	692.27 ± 10.94	640.56 ± 18.18	676.85 ± 11.18
%	2.61 ± 0.05	2.64 ± 0.08	2.55 ± 0.05	2.60 ± 0.03
g/kg $W^{0.75}$	59.13 ± 1.05	59.85 ± 1.41	56.86 ± 1.01	58.61 ± 0.68
Digestible Crude Protein Intake (DCPI)				
g/d	1.22 ± 0.05	1.21 ± 0.04	1.27 ± 0.04	1.23 ± 0.03
%	0.12 ± 0.01	0.12 ± 0.00	0.13 ± 0.00	0.12 ± 0.00
g/kg $W^{0.75}$	2.73 ± 0.09	2.73 ± 0.05	2.83 ± 0.06	2.76 ± 0.04
Total Digestible Nutrient Intake (TDNI)				
g/d	386.35 ± 12.45	383.64 ± 5.47	357.78 ± 9.09	375.92 ± 5.59
%	1.45 ± 0.03	1.47 ± 0.04	1.42 ± 0.03	1.45 ± 0.02
g/kg $W^{0.75}$	32.89 ± 0.53	33.17 ± 0.76	31.79 ± 0.51	32.59 ± 0.35

Table 3. Average Dry Matter Intake (DMI) of animal during rehydration phase of experiment

Treatments	Final day of dehydration	Rehydration phase	
		2nd day	4th day
Dry matter intake (g/d)			
1 (Control)	697.80 ± 51.41	771.45 ± 54.50	713.85 ± 48.62
2 (20% WR)	647.70[A] ± 22.81	833.40[B] ± 35.95	787.80[B]± 29.31
3 (40% WR)	586.65[A] ± 50.40	795.30[B]± 44.09	778.80[B] ± 70.52
Dry matter intake (%)			
1 (Control)	2.57 ± 0.13	2.82 ± 0.12	2.62 ± 0.13
2 (20% WR)	2.48[A] ± 0.11	3.02[B] ± 0.13	2.75[A] ± 0.16
3 (40% WR)	2.33[A] ± 0.18	3.00[B] ± 0.13	2.71[A] ± 0.13

Dry matter intake (g/kg $W^{0.75}$)			
1 (Control)	58.38 ± 2.61	64.26 ± 2.38	59.71 ± 2.58
2 (20% WR)	55.94^A ± 1.90	69.04^B ± 2.47	63.54^B ± 3.00
3 (40% WR)	51.66^A ± 3.92	68.00^B ± 2.59	62.64^B ± 3.50

Means with dissimilar superscripts (A and B) in a row differed significantly (p<0.05)

The digestible crude protein (g/d, %, g/kg $W^{0.75}$) and total digestible nutrient (g/d, %, g/kg $W^{0.75}$) intake were not influenced either by level of water restriction and period of experiment (Table 2). It may be due to body weight of experimental animals. DCPI (g/d, %, g/kg $W^{0.75}$) was marginally increased under water restriction group but TDNI (g/d, %, g/kg $W^{0.75}$) declined in 40% water restricted group. DCPI (% and g/kg $w^{0.75}$) did not influence by water restriction and season of the experiment which is accordance with present findings [3&6]. The DCPI and TDNI (g/d) neither influenced by treatment nor by period in combination or independently. The DCPI (g/d, %, g/kg $W^{0.75}$) did not influence by the rehydration (Table 4). The TDNI (g/d, %, g/kg $W^{0.75}$) recovered significantly (P < 0.05) in T_2 (454.20±17.98, 1.64±0.07, 37.64±1.30) and T_3 (435.83±22.04, 1.64±0.07, 37.23±1.31) on 2nd day of rehydration where as it was at par with 4th day of rehydration (Table 4).

Table 4. Average nutrient intakes of animals during rehydration phase of experiment

Treatment	Final day of dehydration	Rehydration phase	
		2nd day	4th day
Digestible Crude Protein Intake (g/d)			
1 (Control)	1.19 ± 0.11	1.18± 0.11	1.19 ± 0.11
2 (20% WR)	1.22 ± 0.08	1.30 ± 0.07	1.25 ± 0.07
3 (40% WR)	1.31 ± 0.08	1.32 ± 0.07	1.33 ± 0.07
Digestible Crude Protein Intake (%)			
1 (Control)	0.12 ± 0.01	0.12 ± 0.01	0.12 ± 0.01
2 (20% WR)	0.12 ± 0.01	0.11 ± 0.01	0.11 ± 0.01
3 (40% WR)	0.13 ± 0.01	0.12 ± 0.01	0.11 ± 0.01
Digestible Crude Protein Intake (g/kg $W^{0.75}$)			
1 (Control)	2.69 ± 0.18	2.68 ± 0.18	2.68 ± 0.18
2 (20% WR)	2.74 ± 0.13	2.63 ± 0.12	2.55 ± 0.11
3 (40% WR)	2.89 ± 0.13	2.72 ± 0.12	2.58 ± 0.12
Total Digestible Nutrient Intake (g/d)			
1 (Control)	386.40 ± 25.71	423.23 ± 27.25	394.43 ± 24.31
2 (20% WR)	361.35^A ± 11.41	454.20^B ± 17.98	431.40^B ± 14.66
3 (40% WR)	321.83^A ± 25.20	435.83^B ± 22.04	426.90^B ± 35.26
Total Digestible Nutrient Intake (%)			
1 (Control)	1.42 ± 0.07	1.55 ± 0.07	1.45 ± 0.07
2 (20% WR)	1.38^A ± 0.07	1.64^B ± 0.07	1.51^{AB} ± 0.09
3 (40% WR)	1.32^A ± 0.09	1.64^B ± 0.07	1.49^{AB} ± 0.06
Total Digestible Nutrient Intake (g/kg $W^{0.75}$)			
1 (Control)	32.29 ± 1.34	35.32 ± 1.21	33.05 ± 1.34
2 (20% WR)	31.23^A ± 1.06	37.64^B ± 1.30	34.80^{AB} ± 1.60
3 (40% WR)	29.27^A ± 1.98	37.23^B ± 1.31	34.39^B ± 1.68

Means with dissimilar superscripts (A and B) in a row differed significantly (p<0.05)

CONCLUSION

It may be concluded from the present experiment that Patanwadi and Marwari hoggets can withstand water restriction up to 40% during summer season under intensive production system.

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Prevailing feeding and breeding management practices at commercial dairy farms in urban and peri-urban areas of Navsari district of Gujarat

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ABSTRACT

A field survey was carried out in Navsari district of South Gujarat to examine feeding and breeding management practices adopted by commercial dairy farmers. For this purpose 20 dairy farms each in urban and peri urban area were selected randomly. The required information was collected through personal interview schedule. The observed data revealed that majority (92.5%) of the respondents had adopted stall feeding and used to cultivate green fodder. Only 25% farmers were feeding concentrate to young calves and 40% were feeding concentrate to heifers. Majority (80%) of the farmers was practicing chaffing of green fodder and 82.5% used readymade concentrate feed. Only 20% farmers provided additional concentrate to pregnant and lactating animals whereas, 75% followed special feeding after calving. Only 42.5% respondents were practicing mineral mixture feeding, among them 45% were urban and 40% were peri urban farmers. The data was non significant among both regions. More than half the respondents (55%) were breeding their animals by artificial insemination method,. Majority of the farmers were followed pregnancy diagnosis (62.5%) and treatment of anoestrus /repeaters breeders but no respondents were keeping breeding records.

Key words: Breeding**,** Commercial dairy farm, Feeding, Management, Peri-urban, Practices, Urban areas

Urban dairy production system has smallholder to highly specialized, state or businessmen owned farms, which are mainly around major cities of the country. Nowadays a number of smallholder and commercial dairy farms are emerging mainly in the urban and peri-urban areas. Valsad district cooperative milk producers union limited is federation milk union (Vasudhara dairy) in Navsari and its surrounded area. Over and above procurement of milk, dairy works on various projects like artificial insemination, manufacturing and sale of concentrate at no profit no loss basis, insurance, fertility improvement camp, vaccination and mastitis control program. The Vasudhara dairy is also promoting activity for feed and fodder management like selling chaffing machines and seeds of fodder crops. These dairy farmers do not possess grazing land; hence, dairy farmers have to purchase most of the feeding resources. The costly feed resources are forcing the farmers for their judicious use which might lead to special feeding management practices. So, the prevailing breeding as well as feeding practices were observed in this case study.

MATERIALS AND METHODS

A field survey was conducted to analyze prevailing feeding and breeding management practices at commercial dairy farms in Navsari district of south Gujarat. The area which falls within 8 km radius to Navsari was considered as urban area whereas, the areas falling within 16 km radius minus urban area was considered as peri-urban area. From urban and peri urban areas 6 villages were selected randomly. Twenty dairy farmers each from urban

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and peri urban areas who possessed 20 Adult Unit of either cattle or buffalo were selected randomly to make a total of 40 commercial dairy farms for the study. The selected dairy farmers were interviewed solo and the desired information was collected regarding feeding and breeding management practices with the help of pre-designed and pre-tested questionnaire. During the study period data was collected which scrutinized and tabulated into frequency, percentages; arithmetic mean standard error and analysis of variance following the methods suggested by [13].

RESULTS AND DISCUSSION

The milk production of animals is low mainly due to lack of proper knowledge for balanced feeding. Breeding of dairy animals is also very important way to improve herd productivity generation by generation. Farmer feeds their animal with roughages and concentrates but, they do not have knowledge about the quality and quantity of feed to be fed to the animal.They also don't t follow proper managemental practices which lead to dairy business non- profitable.. The dairy animal owners must have a thorough understanding of the feeding practices. The data regarding the feeding practices followed by the dairy animal owners are presented in Table 1 and Table 2 whereas the analysis of prevailing breeding management practices is depicted in Table 3.

Feeding Management Practices

Data in Table 1 revealed that majority (92.5%) of respondents followed stall feeding system, while only 7.5% of the respondents followed stall feeding as well as grazing system for their animals. These finding are in line with[12] and not supported by [5,7,8&14] who revealed that majority (85.83%) of the farmers adopted stall feeding with grazing and 14.67% of the respondents adopted only stall feeding. All the above quoted studies mostly focused on dairy farmers of rural region having ample grazing scope but grazing land is less available in urban and peri urban area. Table 1 indicated that 97.5% animal owners adopted individual feeding system for their animals and only 2.5% animal owner adopted group feeding. The result is in agreement with the earlier

findings[5] who found that 92% of the farmers followed individual feeding system to their buffaloes and 12.08% of the respondents practiced group feeding which is contradictory to earlier finding[8]. Individual feeding of animals provides an opportunity to feed the milch animals according to their production level and also to save docile animals being harassed by vicious animals during feeding. Majority (92.5%) of the dairy animal owners fed their animals twice in a day followed by one time (7.5%). Similar finding was reported by[12] and[9]. It might be due to the farmers were keeping their animals in tied condition. Majority of the respondents (60%) were practiced cultivation of green fodder crops in their fields, while remaining 40% of the respondents didn't followed this. These findings are in close conformity with[7&8] who observed that 65.83% of the farmers cultivate green fodders whereas 34.17% of the farmers did not cultivate. Detailed study of data revealed that majority (77.5%) of the farmers did not mix green and dry fodder and remaining farmers (22.5%) of the farms mix green and dry fodder. The present result was contrary to the finding of[6] who found that majority (85.83%) farmers fed green and dry both type fodder in combination followed by 9.75% only green and 5% only dry. They did not aware about mixing of green and dry fodder. Only 2.5% respondents fed concentrate with roughage to their animals, while 97.5% respondents fed concentrate without roughage (Table 1). The present study is in agreement with the reports of workers[4] who said that majority 99.95% of the farmers fed concentrate alone and not in agreement with [7] who said that majority (86.67%) of the respondents was offered concentrates with roughages and 13.33% without roughage. Data in Table 1 observed that majority (85) of the respondents fed concentrates to their animals on the basis of their milk production, while, 15% of the respondents did not fed concentrates on the basis of their milk production. These finding are more or less in agreement with [1&12] who told that 75% of the farmers were providing concentrate feed which depend on the milk yield, the farmers have belief that milk production depends on the amount of concentrate feed. Data from Table 1 revealed that majority (68.5%) of the respondents fed 2.1-3.0 kg concentrates followed by 1-2 kg concentrates (20%)

and 3-5 kg concentrates (12.5%) to a lactating cow per day a finding in agreement with the reports of [5] who found that 78.75% of the respondents fed 2-3 kg concentrates, 13.33% of the respondents fed that 3- 5 kg concentrates and 7.92% of the respondents only 1-2 kg concentrates to their animal. Findings is not agreement with one study [8] as they revealed 50% of the farmers fed concentrate 1 kg per liter followed by 3-5 kg (31.25%) and 2-3 kg (18.75%). It is observed that majority of the respondents (75%) did not feed concentrates to their young calves, while 25% of the respondents fed concentrates to their young calves. The results are slightly higher than [12] who told that (64%) of respondents did not feed concentrates to their young calves and 36% respondents fed concentrate to young calves. However, this is not supported by [5&8] who found that 82.50% of the buffalo keepers were feeding concentrate to young calves and 17.50% of the respondents did not feed concentrated to the calves. It is showed that 60% of the respondents did not feed concentrates to their heifers, while 40% of the respondents fed concentrate to their heifers (Table 1). These results are supported by[12] who found that 54% respondents fed concentrates to their heifers and 46% respondents did not feed concentrates to their heifers. On the contrary,[5&87] observed that 82.08% of the respondents fed concentrated to their heifers and 17.92% of the respondents did not fed.

Table 1. Distribution of the dairy animal owners according to feeding system and frequency

Sr. No.	Practices	Urban		Peri urban		Over all		Chi square	
		n	%	n	%	n	%	Value	p
1	**Feeding system**								
	Stall feeding	20	100	17	85	37	92.5	3.243	0.072
	Stall feeding +Grazing	0	0	3	15	3	7.5		
2	**Feeding of animals**								
	Individual	20	100	19	95	39	97.5	1.026	0.311
	Group feeding	0	0	1	5	1	2.5		
3	**Feeding frequency**								
	Once	0	0	3	15	3	7.5	3.243	0.072
	Twice	20	100	17	85	37	92.5		
4	**Cultivation of green fodder**								
	Yes	12	60	12	60	24	60	0.00	1.00
	No	8	40	8	40	16	40		
5	**Mixing of green and dry fodder**								
	Yes	5	25	4	20	9	22.5	0.143	0.705
	No	15	75	16	80	31	77.5		
6	**Mode of concentrate feeding**								
	With roughage	0	0	1	5	1	2.5	1.026	0.311
	Without roughage	20	100	19	95	39	97.5		
7	**Concentrate feeding based on milk production**								
	Yes	18	90	16	80	34	85	0.784	0.376
	No	2	10	4	20	6	15		
8	**Quantity of concentrate fed to the lactating animal per day**								
	1–2 kg	2	10	6	30	8	20		
	2.1–3.0 kg	16	80	11	55	27	68.5	3.126	0.210
	3.1–5.0 kg	2	10	3	15	5	12.5		

9	Concentrate feeding to young calves								
	Yes	6	30	4	20	10	25	0.533	0.465
	No	14	70	16	80	30	75		
10	Concentrate feeding to heifers								
	Yes	10	50	6	30	16	40	1.667	0.197
	No	10	50	14	70	22	60		

Availability and Usage of Feeding Resources

The information regarding availability and usage of feeding resources like concentrate, special feeding, mineral mixture usage etc. are given in Table 2.

Majority of the respondents (80%) offered chaffed green, while 20% of the respondents offered the greens as such to their animals (Table 2). Similarly, majority of buffalo owners of Jaipur district of Rajasthan were also feeding chaffed green fodder[8]. Chaffing of fodders before feeding was also followed by majority (81.55%) buffalo owners at Nagpur district of Maharashtra and Jabalpur district of M.P.[10&14]. They all found that majority (60%) of the respondents give to their animal chaffed green fodder which is little lower side than present study. However, present result was contrary to the finding of [5,9&12] who observed that 97.08% practiced to feed green fodder as such, only 2.92% of the farmers offered chaffed green fodders. As all the above said studies were mostly focused on field dairy farmers keeping livestock in mixed farming situation where chaff cutter is not convenient and economical. While in present study majority of respondents had knowledge about the importance of chaffing fodder. Data in Table 2 revealed that majority (82.5%) of the respondents were feeding readymade concentrate and 17.5% of the respondents were used to mixed ingredients along with readymade feed. Present findings are in conformity with the results of [5]. The previous study reveals that 65.84% of the respondent fed readymade concentrate mixture followed by mixture of home prepared and readymade (28.33%) and home prepared (5.83%). Present findings are in controversy with the results of [7,8&14]. All these previous studies reported that majority of the respondents (82.50%) provided homemade concentrate mixture and 17.50% have to purchase concentrate mixture. Data presented in Table 2 revealed that majority (80%) of the respondents did not practice additional allowance of concentrate to their pregnant and lactating animal, while remaining 20% of the respondents follow this practice. The present findings are comparable with the results of [6&10] which reveal that 78.5% of them don't follow the practice of feeding concentrate mixture @ 1 to 1.5 kg to pregnant buffalo. Contrary to the present study many reports[5,8&12] revealed that all the respondents fed concentrates to advanced pregnant buffaloes. From the data it was observed that majority of the respondents (75%) followed special feeding after calving. The chi square value suggested significant difference between the two regions. The present findings are well supported by the findings of [12]. Majority of the respondents had adequate knowledge about the feeding management and care postpartum. They fed energy and protein rich feed mixed with ingredients like Asaliya, Suva, Methi, to prevent stress and to provide sufficient energy for freshening. Table 4.2 showed that 42.5% of the respondents provided mineral supplements to their milch animals, while 57.5% respondents did not provide mineral supplements to their milch animals. These findings are supported by [4&12] and not supported by [5&6]. Mineral mixture supplementation is essential for high producing and lactating animals; however it was not yet more accepted in the study area. It might be due to the lack of awareness of the farmers about the benefits of mineral mixture feeding and unwillingness in use due to additional cost of mineral mixture they have to incur for feeding. Data in Table 2 revealed that half (50%) of the respondents provided water to their animal thrice a day followed by free access (30%) and (20%) were offered wate twice a day. This result is in agreement with [5,7&12]. The importance of water is known practically to all farmers, who provided water to their animals depending upon their resources.

Table 2. Distribution of the dairy animal owners according to feeding practices

Sr. No.	Practices	Urban		Peri urban		Over all		Chi square	
		n	%	n	%	n	%	Value	p
1	**Chaffing of fodder**								
	Yes	16	80	16	80	32	80	0.00	1.00
	No	4	20	4	20	8	20		
2	**Types of concentrate feeding**								
	Ready made	16	80	17	85	31	82.5	0.173	0.677
	Homemade + Ready made	4	20	3	15	7	17.5		
3	**Additional allowance of concentrate fed to pregnant and lactating animal**								
	Yes	5	25	3	15	8	20	0.625	0.429
	No	15	75	17	85	32	80		
4	**Special feeding after calving**								
	Yes	12	60	18	90	30	75	4.800	0.028
	No	8	40	2	10	10	25		
5	**Feeding of mineral mixture**								
	Yes	8	40	9	45	17	42.5	0.102	0.749
	No	12	60	11	55	23	57.5		
6	**Frequency of Watering**								
	2 times	3	15	5	25	8	20		
	3 times	10	50	10	50	20	50	0.833	0.659
	Free access to water	7	35	5	25	12	30		

Breeding practices

The information regarding breeding practices followed by dairy animal owners are presented in Table 3. It is apparent from the table that mostly (52.5%) farmers were detect heat in dairy animals was based on the signs of estrus. Good number of respondents (47.5%) were keeping bulls with females. These findings are in similar line with the results of [1]. They observed that 71% of the animals in the study area showed regular signs of estrus and opposite to [5] show that all of the respondents used these signs of estrus as a method of heat detection.

Table 3. Distribution of the dairy animal owners according to breeding practices followed

Sr. No.	Practices	Urban		Peri urban		Over all		Chi square	
		n	%	n	%	n	%	Value	p
1	**Methods of heat detection**								
	Sign	10	50	11	55	21	52.5	0.100	0.752
	Bull kept with female	10	50	9	45	19	47.5		
2	**Symptoms of heat detection**								
	Mucus discharge	4	20	7	35	11	27.5		
	Mucus Discharge + Bellowing	10	50	10	50	20	50	1.118	0.403
	Low milk yield on the day of heat	6	30	3	15	9	22.5		

3	Method of breeding								
	A.I	11	55	11	55	22	55		
	N.S.	2	10	3	15	5	12.5	0.403	0.871
	A.I +N.S	7	35	6	30	13	32.5		
4	Breeding after calving								
	2nd heat	4	20	3	15	7	17.5		
	3rd heat	10	50	13	65	23	57.5	0.934	0.627
	Other	6	30	4	20	10	25		
5	Pregnancy diagnosis								
	No	10	50	5	25	15	37.5	2.667	0.102
	Yes	10	50	15	75	25	62.5		
6	Treatment of anestrous/repeat breeders								
	Yes	14	70	17	85	31	77.5	1.290	0.256
	No	6	30	3	15	9	22.5		
7	Kept breeding records								
	Yes	0	0	0	0	0	0	--	--
	No	20	100	20	100	40	100		

Half (50%) of the respondents were observed mucus discharge and bellowing as the main signs of estrus, whereas, 27.5% of the respondents observed only mucus discharge as the main sign of the heat detection. Only 22.5% of the respondents observed low milk yield on the day of heat as the main sign of estrus. Present findings are comparable with the experimental results of many scientists [2,5,14&15] who observed that majority (46.66%) of the farmers relied on mucus discharge and bellowing as the signs of heat, whereas, 33.34% of the farmers trusted only on mounting, followed by frequent urination (11.36%) and mucus discharge (8.34%).

More than half (55%) of the respondents used scientific method of artificial insemination (A.I.) while 12.5% of the farmers used natural service as the main method for breeding their dairy animals and only 32.5% of the farmers used artificial insemination together with natural service. Present results are similar to the previous result [1] which suggests that 60% of the farmers followed artificial insemination to bred their animals and 16% of the farmers practiced both artificial insemination and natural service and 22% of the respondents practiced natural service alone [2,5&12]. However, the results are contrary to some findings [6&10]. It was observed that about (37.51%) of farmers used natural service as a breeding method and only 16.66% farmers utilized the facility of artificial insemination to their buffaloes for breeding whereas, 45.83% of the farmers used both methods. A.I. facility in the study area was well developed although, majority of the farmers kept buffalo bull for service, in case of cattle they were using A.I. Data in Table 3 revealed that 17.5 and 57.5% respondents rebred their dairy animal after 2nd heat and 3rd heat, respectively. It is recommended scientifically that cow or buffaloes should bred as early as possible to achieve better reproductive efficiency, however, majority of buffalo owners prefers to bred their buffaloes after minimum 5 months of calving [5&15]. Some studies shown that buffalo owners particularly in south and central Gujarat were preferred early breeding [11&12]. Farmers prefer long lactation in high producer buffalo breeds like Murrah, Jaffrabadi, Mehsani etc. Further, they believe that the daily milk production in buffaloes reduces soon after breeding. However, this myths among farmers is not proved scientifically. More than half (62.5%) of the respondents followed pregnancy diagnosis for their dairy animals. Present finding is similar with [3,12,14&15]. Majority (77.5%) of the respondents followed treatment of anestrous/

repeat breeders in their dairy herds. Present finding are slightly lower than the results of [3,5,11&12]. It was found that none of the respondents were keeping breeding records. These findings are supported by [12] which reveal that 6% of the respondents kept breeding records. The farmers did not care about maintaining the proper record which ultimately lead to poor breeding practices.

CONCLUSION

From the study it can be concluded that majority of the respondents adopted stall feeding system along with individual feeding of animal. Most of the farmers did not mix green and dry fodder. Animals were fed green fodder according to seasonal availability. Majority of the farmers gave chaffed fodder. Most of the farmers given special feed after calving. Further in study it was observed that only some respondents gave mineral mixture to animal. Majority of the respondents were detecting oestrus by mucus and discharge and sign observed by farmers. Most of the farmers adopted A.I. method of breeding along with natural also. Majority of the farmers did not practice pregnancy diagnosis however they followed treatment of anestrous/repeat breeders.

RECOMMENDATION

The commercial farmers in study regions should be aware for concentrate feeding to calves and heifers. Treatment of repeat breeding and pregnancy diagnosis are most important intervening point where farmers and government needs to be think for increase profitability in dairy farms.

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Comparison of herd composition and infrastructure facilities in specialized dairy farms between north and south Gujarat

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ABSTRACT

The present investigation was carried out to compare herd composition (buffaloes, cows, heifers, calves, breeding bull, total herd strength) and infrastructure facilities (assets and implements) of specialized dairy farms in north (n=10) and south (n=10) semi-arid to arid and medium to high rainfall agro-climatic zones respectively. In northern region higher mean average of cross-breed cattle (82.20 vs. 23.25, p=0.01) compared to southern region. Opposite to this in southern region higher mean average of buffalo (85.00 vs. 3.77, p=0.00) compared to northern region. Whereas in southern region slightly higher mean average of total herd strength (111.70 vs. 86.60, p=0.11) compared to northern region. The facility of infrastructure in both region possessed similar proportion of average adult animal shed, individual calf shed, pregnant animal shed, sick animal shed. Store-dutch barn, milking parlour, feed factory, labour house, milk storage room, staff office, tractor, hydraulic trailer, mannual as well as electric chaff cutter, shredder, water pipe router, dung scraper, automatic grooming brush, bulk milk cooler, milking parlour, deep freezer, automatic ghee maker and milk packaging machine. However, Northern region had higher proportion of milking machine (80% vs. 20%, p=0.00) as compare to southern region. Present study indicated that herd composition differed between two regions might be attributed to climatic difference including moisture and rainfall pattern along with marketing pattern.

Key words: Cross breed, Herd composition, Infrastructure facilities, Milking machine, Specialized dairy farm.

Dairy farming in India has become an important sector for employment generation to rural as well as urban farmers. The unique feature of Indian milk production scenario is that 70 million rural families with holdings of 2-4 cattle are engaged in milk production. This is in contrast to specialized dairy farmers in the western world, where a much smaller section of the population is engaged in dairy farming with large cattle holdings. In future the growth in demand will increase at 7.00 percent per annum, pushing the total annual demand of milk upto 170.00 MMT by the year 2020.

Therefore, switchover to an organized dairy industry with technological specializations in every step of the process needs to be emphasized. Large commercial dairy farms should be established near the cities to take advantage of higher prices of milk and milk processing for value addition[2]. Whereas, productivity and success rate of such specialized dairy farms depends on its herd strength along with infrastructure facilities. However, herd strength and breed preference in specialized dairy farms varies from region to region. By focusing this view, the study was carried out to compare the herd strength and infrastructure facilities of the specialized dairy farms in agro-climatic zones of north and south Gujarat.

MATERIALS AND METHODS

Study was conducted at north and south agro-climatic zones of Gujarat during 2018-2019. North Gujarat covers Gandhinagar, Aravalli, Banaskantha,

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Mehsana, Patan and Sabarkantha district; whereas, south Gujarat covers Surat, Navsari, Tapi, Narmada, Bharuch, Valsad and Dangs district. In the present study, 10 dairy farms each from Sabarkantha and Banaskantha district of north agro-climatic region and 10 dairy farms each from Surat, Navsari and Bharuch district were selected randomly. Sabarkantha and Banaskantha district of north Gujarat received on an average 807 and 578 mm rain fall and the climate is semi-arid to dry arid, respectively. Wheras, Surat, Navsari and Bharuch district of south Gujarat receive on an average 1400-1700, 1959 and 985.6 mm rain fall and the climate was medium to heavy warm to extremely humid arid. Information collected was related to herd composition and infrastructure facilities. The data was collected from dairy farm owners by well-organized questionnaire and observation which was scrutinized and tabulated into frequency, percentages; arithmetic mean standard error and analysis of variance following the methods suggested by [5].

RESULTS AND DISCUSSION

Herd Composition of the specialized Dairy Farms of North and South Gujarat

The livestock possessed by dairy farms was classified according to species and classes for two regions. Mean livestock of various classes have been presented and described below. Mean average data regarding herd composition along with chisquare test value and significance between dairy farms of north and south regions have been presented in Table 1.

Table 1. Mean herd strength of dairy farms of north and south Gujarat

Class/Species of Livestock	North		South		Overall		F Value	p Value
	n	Mean±S.E	n	Mean±S.E	n	Mean±S.E		
Buffaloes	9	3.77±1.03	9	85.00±4.64	18	44.38±10.11	291.12	0.00
Buffalo Heifers	9	0.66±0.33	9	18.11±4.00	18	9.38±2.87	18.84	0.00
Buffalo Calves	9	0.44±0.44	9	9.77±0.84	18	5.11±1.22	95.35	0.00
Breeding bull (Buffalo)	9	0.00±0.00	9	0.89±0.11	18	0.44±0.12	36.00	0.00
Herd strength buffalo	9	4.88±1.66	9	113.77±7.39	18	59.33±13.70	206.58	0.00
Cows	10	56.40±7.92	4	11.50±7.02	14	43.57±8.12	11.06	0.00
Heifers	10	11.40±2.45	4	4.50±3.57	14	9.42±2.13	2.34	0.15
Calves	10	13.50±2.54	4	7.00±4.02	14	11.64±2.22	1.86	0.19
Breeding bull (Cattle)	10	0.90±0.27	4	0.25±0.25	14	0.71±0.22	7.38	0.01
Herd strength Cattle	10	82.20±12.04	4	23.25±14.36	14	65.35±11.82	7.67	0.01
Total herd strength	10	86.60±12.20	10	111.70±8.57	20	99.15±7.80	2.83	0.11

Herd Composition and Total Herd Strength

Data in Table 1 showed that the mean average of buffalo and cattle herd strength was statistically not similar in north and south region. Average buffalo possessed were 3.77±1.03 and 85.00±4.64 in north and south region, respectively. Data revealed that farms of north Gujarat were more interested in cattle keeping as compared to south Gujarat. The overall dairy farms were having 9.38±0.84 and 9.42±2.13 buffalo heifers and cattle heifers, respectively. Average of breeding buffalo bull was 1.00±0.00 and cattle were also 1.00±0.00. The results revealed that most of the farms in south region were keeping buffalo breeding bull as they believed in natural service in buffaloes. Further, it was expensive to bred large number of buffaloes by artificial insemination, while in north region some dairy farms also kept breeding bull for their cattle.

Above results indicated that regarding the preference of animal species buffalo was more famous in specialized dairy farms of south Gujarat instead of cross breed cattle because there was a huge demand of milk and value added products from indigenous animals and prices of dairy fat have

doubled in the international market, and since buffalo milk has higher fat content, dairy farm owners were likely to now tilt more towards buffalo rearing. On the other hand, in north Gujarat because of majority of the dairy farms were associate with co-operative sector so for better returns cross breed cattle was more popular because of its high milk yield, less age of first calving and inter calving period.

Possession of Assets

The data collected regarding various assets possession *i.e.* adult animal shed, calf shed, pregnant animal shed, sick animal shed, store-dutch barn, milking parlour, feed factory, labour house, milk storage room and staff office of dairy farms were analyzed and results have been presented in the Table 2. The frequency distribution along with significance of these categorical data in north and south regions has been discussed below.

Table 2. Frequency distribution of dairy farms according to the possession of assets

Sr. No.	Name of assets	North		South		Overall		F Value	p Value
		n	%	n	%	n	%		
1	**Adult animal shed**								
	Yes	10	100	10	100	20	100	0.00	1.00
	No	00	00	00	00	00	00		
2	**Calf shed**								
	Yes	10	100	10	100	20	100	0.00	1.00
	No	00	00	00	00	00	00		
3	**Pregnant animal shed**								
	Yes	2	20	3	30	5	25	0.26	0.60
	No	8	80	7	70	15	75		
4	**Sick animal shed**								
	Yes	6	60	4	40	10	50	0.80	0.37
	No	4	40	6	60	10	50		
5	**Store-Dutch barn**								
	Yes	10	100	10	100	10	100	0.00	1.00
	No	00	00	00	00	00	00		
6	**Milking parlour**								
	Yes	2	20	2	20	4	40	0.00	1.00
	No	8	80	8	80	16	60		
7	**Feed factory**								
	Yes	2	20	0	0	2	10	2.22	0.13
	No	8	80	10	100	18	90		
8	**Labour house**								
	Yes	8	80	10	100	18	90	2.22	0.13
	No	2	20	0	0	2	10		
9	**Milk storage room**								
	Yes	3	30	5	50	8	40	0.83	0.36
	No	7	70	5	50	12	60		
10	**Staff office**								
	Yes	2	20	4	40	6	30	0.95	0.32
	No	8	80	6	60	14	70		

Table 2 revealed that all the dairy farms had adult animal shed, calf shed and store-dutch barn and majority of the dairy farms had sick animal shed while only few dairy farms had pregnant animal shed, sick animal shed, milking parlour, feed factory, milk storage room and staff office this finding was supported by[3] who quoted that the large farms were characterized as specialized modern dairy farms it possessed large open area, store for storing dry fodder and concentrates, chaff cutter shed, residences for the permanent laborers, milking shed equipped with milking machine, manager's office etc. Results indicated that majority of the dairy farms possessed average required assets on their farms however, they had not some advanced and required assets in their farms which might be due to high cost of construction and lack of adequate space for construction.

Infrastructure Facilities

The infrastructure facilities possessed by dairy farms were classified according to assets and implements for two regions. Mean possession of assets and implements in both the regions have been presented and described below.

Possession of Implements

The use of farm implements and machineries has a direct bearing on cost of production and productivity of dairy farm. Farm mechanization helps in effective utilization of livestock as well as agriculture inputs. It increases the speed of completion of livestock and agricultural operations, reducing labour costs and increases the productivity of farm and labour. Besides, it also helps in reducing the drudgery involved in dairy farm operations.

Table 3. Frequency distribution of the dairy farm owners according to possession of implements

Sr. No.	Name of implement	North		South		Over all		Chi Square	p Value
		n	%	n	%	n	%		
1	Tractor	9	90	8	80	17	85	0.39	0.53
2	Hydraulic trailer	7	70	8	80	15	75	0.26	0.60
3	Manual chaff cutter	2	20	1	10	3	15	0.39	0.53
4	Electric chaff cutter	8	80	9	90	17	85	0.39	0.53
5	Shredder	6	60	5	50	11	55	0.20	0.65
6	Water pipe roater	4	40	2	20	6	30	0.95	0.32
7	Dung scraper	2	20	4	40	6	30	0.95	0.32
8	Automatic grooming brush	2	20	1	10	3	15	0.39	0.53
9	Bulk milk cooler	4	40	5	50	9	45	0.20	0.65
10	Milking machine	8	80	2	20	10	50	7.20	0.00*
11	Milking parlour	2	20	2	20	4	20	0.00	1.00
12	Deep freezer	1	10	2	20	3	15	0.39	0.53
13	Automatic ghee maker & milk packaging machine	1	10	2	10	3	15	0.39	0.53

Implements possessed by dairy farms in both regions have been presented in Table 3. The chi-square values revealed that no significant differences between two regions except possession of milking machine. It was indicated that in both the region majority of the dairy farms were aware about the importance for use of some agriculture implements in dairy farms as well as in self-agriculture farming for feeding of their animals. Majority of the dairy farms were using some farming implements like tractor (85%) and hydraulic trailer (75%) for cultivation and dung transportation, chaff cutter electric (85%) and manual (15%) for chafing of fodders. Some (30%) farms were using pipe router for distribution as well as winding up of water pipes in their agriculture farms and half of the dairy farms

(55%) were using shredder for converting farm waste into organic manure. In regards to dairy farm implements it was observed that less than half of the dairy farms (45%) possessed bulk milk cooler and dung scrapper (30%) while, only few dairy farms possessed automatic grooming brush, deep freezer, automatic ghee maker and milk packaging machine (15%). The result indicated that majority of the dairy farms were aware regarding the use of agriculture implements like tractor, hydraulic trailer, chaff cutter, pipe router and shedder. However only few dairy farmers understood the importance of dairy farm implements like bulk milk cooler for preservation of milk, dung scraper for cleaning of dung from floor and automatic grooming brush to eliminates external parasites on the skin and to accelerates blood circulation by massaging capillaries also to ensures animal's psychological comfort, deep freezer for clean milk production, automatic ghee maker and milk packaging machine for very easy making of ghee and packaging of milk in pouch but all the dairy farms (100%) possessed electrical fans and foggers to protect their animals from extreme weather. It was also observed that less than half of the dairy farmers (50%) possessed milking machine. This result was encouraged by [1] who reported that maximum number of dairy farmers (22%) possessed chaff cutter followed by *kudal* and *can peepa* with 17.00 and 14.00%, respectively milking machine, grinder mixing machine, bull nose ring, shovel with 02.00 percent, respectively. In case of non-member of dairy farmers category, majority of the farmers (81%) had *kudal* followed by *can peepa* and chaff-cutter with 14% and 9% of dairy farmers, respectively and[4] who reported that all the large dairy farmers owned tractors, machine milking, generator and pump. One finding[3] showed that around 60% of the large dairy farms had made some arrangement to overcome heat stress in their animals by means of fans and coolers, sprinkles.

CONCLUSION

Specialized dairy farms of north agro-climatic zone were mostly possessed cattle whereas, in south Gujarat region buffaloes were more popular. Majority of the dairy farms were using common implements like tractor and hydraulic trailer, chaff, pipe router and shredder. All the dairy farms had adult animal shed, calf shed and store-dutch barn and majority of the dairy farms had sick animal shed while only few dairy farms had pregnant animal shed, sick animal shed, milking parlour, feed factory, milk storage room and staff office. Many dairy farms possessed bulk milk cooler and dung scrapper while, few of them possessed automatic grooming brush, deep freezer, automatic ghee maker and milk packaging machine.

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Differential pattern of mineralo -physiological attributes in indigenous cows during pre-partum vaginal prolapse

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ABSTRACT

The present study was performed to observe the differential patterns in mineralo -physiological attributes of Sahiwal and Hariana cows during their pre-partum vaginal prolapse. During the experimental period of five months, a total of five Sahiwal and no Hariana cows were found to be suffering from pre-partum vaginal prolapse. The physiological and mineral attributes of prolapsed Sahiwal cows were compared with those of healthy Sahiwal and Hariana cows. In present study, plasma concentration of calcium and phosphorus in Sahiwal cows (6.10±0.64, 3.90±0.37 mg/dl, respectively) was found to be significantly ($p < 0.01$) lower as compared to healthy Sahiwal (10.68± 0.64 and 7.62± 0.37mg/dl, respectively) and healthy Hariana cows (10.20± 0.64 and 7.17± 0.37mg/dl, respectively). Moreover, the plasma concentration of sodium (154.40±2.36 mEq/L) in affected Sahiwal cows was observed to be significantly ($p < 0.01$) elevated than those in healthy Sahiwal (133.40± 2.36mEq/L) and healthy Hariana cows (135.20± 2.36 mEq/L). However, a decrease ($P = 0.07$) in plasma concentration of sodium was only observed in affected Sahiwal cows during different stages of recovery. None of the physiological attributes were found to be affected in prolapsed cows. Thus, hypocalcaemia and hypophosphatamia during advanced stage of pregnancy in Sahiwal cows may be the tentative cause of pre partum vaginal prolapse.

Key words: Hariana cows, Minerals, Prolapse, Sahiwal cows

The productivity of a cow is greatly affected by the poor reproductive efficiency and is greatly controlled by the age at first calving, calving intervals, management practices, pre-partum reproductive disorders, and other various obstetrical problems[24]. Among pre-partum reproductive disorders, vaginal &/or uterine prolapse is considered to be the major problem causing substantial monetary losses to the farmers[21].

The genital prolapses (uterine and vaginal prolapse), in ruminants is an emergence estate and should be treated before leading to unfavourable prognosis[16] .The mean cause of the disorder is relaxation of the pelvic ligaments and surrounding soft tissue structures and/or alterations in the antepartal metabolism of vaginal connective tissue[27]. The other predisposing factors may be increased levels of intra-abdominal pressure[7], alteration in micro- and macro mineral blood concentration[5&4], ovarian cysts that may lead to nymphomania[6]or genetic predisposition[9].

Minerals are essential nutrients that are needed in animal body for the regulation of physiological functions in puerperal period. The deviation in normal blood mineral concentration may cause poor reproductive health of the animal. It was hypothesized in the present study that the occurrence of prepartum vaginal prolapse was due to the deficiency or excess of concentration of certain macro-minerals in blood. Keeping in view these facts, the present research was planned to compare serum macro mineral levels in Sahiwal cows suffering with vaginal prolapse with healthy Sahiwal and Hariana cows.

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MATERIALS AND METHODS

The present experiment was performed in Sahiwal and Hariana cows maintained at District Dairy Demonstration Farm (DDDF) situated within the premises of Instructional Livestock Farm Complex (ILFC) of College of Veterinary Sciences and Animal Husbandry, U.P. Pandit Deen Dayal Upadhayay Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go AnusandhanSansthan (DUVASU), Mathura. Five adult Sahiwal cows suffering from pre-partum vaginal prolapse and five healthy Sahiwal and Hariana cows of similar stage of pregnancy and parity were selected as experimental animals in the present study. The experimental cows were kept in loose housing system as was the normal practice at DDD Farm. These cows were managed as per the normal schedule for other animals of the DDD farm.

The blood samples were collected from jugular veins of Sahiwal cows suffering from pre-partum vaginal prolapse at 0, 12, 24, 36, 48 and 60 hrs after the appearance of clinical signs of prolapse. The blood sample from healthy Sahiwal and healthy Hariana cows were collected on the corresponding day of 0 hrs in affected Sahiwal cows only. The blood samples were collected in heparinized vaccutainer tubes. The data generated for various mineral attributes were subjected to general linear model (GLM) by using univariate analysis of variance procedure of the Statistical Software Package (SPSS for window, V19.0; SPSS Inc., Chicago, II, USA) and significance of difference among various subclasses was examined by using DMRT as modified by Kramer. For this purpose following statistical model was used:

$$Y_{ijk} = \mu + C_i + e_{ijk}$$

where, Y_{ijk} is the blood mineral attributes of ith condition of kth cow; C_i is the effect of ith condition (prolapsed Sahiwal, healthy Sahiwal and Hariana cows) and e_{ijk} is the random error, assumed to be normally and independently distributed with mean zero and constant variance *i.e.* NID $(0, \sigma^2)$.

RESULTS AND DISCUSSION

The results of present study have been presented in Table 1 and are discussed under following sub-heads:

Calcium

The present investigation revealed that the plasma calcium level in Sahiwal cows suffering from pre-partum vaginal prolapse was significantly (p<0.01) lower than healthy Hariana and Sahiwal cows (Table 1). Similar to findings of present investigation, condition of hypocalcemia was observed to be significant (p<0.01) cause of genital prolapse in buffaloes and other animal species[2,15&23] too. Moreover, some contradictory findings to present results were also reported[19]. A mild decline in calcium level of Friesian cows suffering from vaginal prolapse was also reported[1]. Hypocalcemia results in loss of muscular contractions and ultimately leads to uterine prolapse in various animal species[22]. The lower level of blood calcium in experimental Sahiwal cows might be due to increased plasma concentration of cortisol due to pre partum stress which might have resulted immune-suppression and loss of muscular contractions and ultimately caused pre partum vaginal prolapse[8]. The higher incidence of pre partum prolapse in experimental Sahiwal cows reflected that these were more prone to pre partum stress as compared to those of Hariana cows.

Phosphorous

The significantly (p<0.01) lower plasma concentration of phosphorous in Sahiwal cows affected with pre-partum vaginal prolapse, than healthy Hariana and healthy Sahiwal cows. Similarly, a decreased plasma concentration phosphorus was reported by various authors in their respective studies on different species of animals[2,3,14&17]. However, a few studies[12&25] reported a non-significantly lower plasma phosphorus concentration in buffaloes suffering with vaginal prolapse as compared to that of healthy buffaloes.

Magnesium

Plasma concentration for magnesium in Sahiwal cows suffering from pre partum vaginal prolapse did not differ significantly from those for healthy Sahiwal cows and Hariana cows. Thus, the results for plasma concentration of magnesium in present study revealed that it has no relation with the chances of occurring of pre partum vaginal prolapsed and may be supported with the similar findings of various

authors[11&5]. But, some authors[18&2] opined differently and reported a significant (p<0.01) decrease in serum magnesium level of prolapsed animals as compared to the non-prolapsed animals.

Sodium and Potassium

The plasma sodium concentration in pre-partum vaginal prolapsed Sahiwal cows was significantly (p<0.01) higher than the plasma sodium level for healthy Hariana and Sahiwal cows in present study (Table 1). Moreover, plasma potassium concentration for affected cows was not found to be significantly different from those for non-affected cows of either breed. The present result was in agreement with the findings of certain authors[3&20] who reported that the serum potassium concentration in prolapsed and healthy buffaloes did not differ significantly.

Physiological Parameters

The rectal temperature, respiration rate and pulse rate of Sahiwal cows affected with pre partum vaginal prolapse in present study did not differ significantly from healthy Sahiwal and Hariana cows (Table 1). The above findings of present investigation were supported by the findings in Mehsana buffaloes[10], whereas, a weak pulse rate was reported in African goats[26] and slightly elevated rectal temperature and accelerated heart and respiration rate in primiparous Murrah buffaloes[13].

Table 1. Mean and SEM values for various mineral and physiological attributes in healthy Hariana and Sahiwal cows and Sahiwal cows suffering from pre-partum vaginal prolapse

Groups	Calcium (mg/dl)	Phosphorous (mg/dl)	Magnesium (mg/dl)	Sodium (mEq/L)	Potassium (mEq/L)	Rectal Temperature (°C)	Respiration Rate (per minute)	Pulse Rate (per minute)
	Mean ± SEM	Mean ± SEM	Mean ± SEM	Mean ± SEM	Mean ± SEM	Mean ± SEM	Mean ± SEM	Mean ± SEM
Healthy Hariana	10.20[b] ± 0.64	7.17[b] ± 0.37	2.26 ± 0.22	135.20[a] ± 2.36	6.64 ± 0.24	38.64 ± 0.22	14.40 ± 1.18	50.00[a] ± 3.44
Healthy Sahiwal	10.68[b] ± 0.64	7.62[b] ± 0.37	2.04 ± 0.22	133.40[a] ± 2.36	6.48 ± 0.24	38.86 ± 0.22	14.40 ± 1.18	53.20[ab] ± 3.44
Prolapsed Sahiwal	6.10[a] ± 0.64	3.90[a] ± 0.37	2.35 ± 0.22	154.40[b] ± 2.36	6.42 ± 0.24	38.98 ± 0.22	15.60 ± 1.18	62.00[b] ± 3.44

Values with different superscript in the same column differ significantly from each other

CONCLUSION

Based on the present study it could be concluded that hypocalcaemia and hypophosphatamia during advanced stage of pregnancy in Sahiwal cows may be the tentative cause of pre partum vaginal prolapse.

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Factors affecting milk constituents of Gir cows in an organized dairy herd

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ABSTRACT

The present experiment was conducted in an organized herd of lactating Gir cows during April, 2017 and October, 2018. Milk samples were collected from each quarter at monthly interval, checked for sub-clinical mastitis by California Mastitis Test (CMT) as a routine practice and analyzed for milk constituents. Total 1000 milk samples, negative for CMT were purposively included for the study to see the effect of season (winter, summer and rainy), stage of lactation (early, mid and late) and parity (1st, 2nd-3rd and ≥4) on milk constituents and to study association among different milk constituents. The overall milk fat, solid not fat (SNF), protein, lactose and total solid (TS) percent were 4.111±0.020, 8.625±0.028, 3.180±0.011, 4.731±0.015 and 12.737±0.047%, respectively. There was significant ($p≤0.05$) effect of season on all milk constituents (fat, SNF, protein and TS) except milk lactose. The concentrations of milk constituents were significantly ($p≤0.05$) higher during rainy season as compared to winter season. Milk constituents were affected significantly ($p≤0.05$) by the stage of lactation and parity of cows. Milk samples from early stage of lactation comprised of significantly ($p≤0.05$) higher level of milk constituents than mid and late lactation stages. Significantly ($p≤0.05$) higher level of milk constituents were observed in 1st parity cows compared to other parities cows. There was significant ($p≤0.001$) positive correlation among different milk constituents. On the basis of findings it can be concluded that season, stage of lactation and parity affect milk constituents of Gir cows, while the positive association among milk constituents indicated that improvement of one trait could improve the other traits.

Key words: Gir cows, Lactation stage, Milk constituents, Parity, Season

Gir cattle is an excellent dairy breed of India, well known for its milk production performance, good fertility, heat tolerance, easy maintenance, resistance to diseases and longevity as compared to other dairy breeds[2]. The main breeding tract of this breed is found in Saurashtra region of Gujarat state, situated in the western part of India[16]. As per the National Dairy Development Board (NDDB) report, standard lactation yield i.e. 305 days milk yield (305-DMY) of Gir cows ranged from 752.05 kg to 5956.45 kg across different lactations (average

yield is 2573.19 kg per lactation). The overall average milk fat content (5.08%) is also higher in Gir cows[2]. Thus, Gir is one of the important dairy breed owing to better productive performance among the Indian indigenous cattle breeds. Generally, milk price in India is depend upon milk fat content, that's why milk fat content is estimated and recorded in the organized farms and dairy cooperatives on routine basis to improve the cost benefit ratio. Now-a-days owing to advancement of technology and cost effectiveness, milk auto-analyzer is used for recording of other milk constituents like protein, lactose, ash, solid not fat (SNF) etc[18]. These milk constituents play a significant role in maintaining the worth of raw milk, producing better milk products and preserving its nutritive value for food safety[15]. Milk constituents were affected by several factors such as

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environmental, nutritional and physiological factors etc.[18]. Better and uniform managerial practices could minimize the variations of milk components in dairy cows. In a recent study, it was observed that effect of season, stage of lactation and parity plays a significant effect on milk constituents in Gir cows[10]. However, no information regarding udder health status of Gir cows has been reported earlier. Moreover, milk composition is not only influenced by clinical condition of udder infection but also by sub-clinical condition[13&18]. Further, correlation study among different milk constituents could be helpful to the breeders, while selecting cows for improvement of milk constituents. Therefore, the present study was designed to see the effect of season, stage of lactation and parity on milk constituents and their association in healthy Gir cows.

MATERIALS AND METHODS

The present study was conducted at Junagadh Agricultural University, Junagadh (Gujarat), India between April, 2017 and October, 2018 on lactating Gir cows in an organized farm of the University. The organized herd of 175 lactating cows were maintained at Cattle Breeding Farm of the University. The experimental cows were reared under zero grazing semi-intensive loose housing system with pucca flooring. The animals were offered seasonal green fodder (maize and jowar fodders @ 10-12 kg/ adult cow/ day) as well as *ad-lib* quantities of dry fodder depending on availability. In addition to roughage, at milking the cows were fed concentrate mixture (comprised of cottonseed cake, ground maize and Amul dan) to fulfill the nutrient requirement as per Indian Council of Agricultural Research (ICAR) feeding standard[1]. The cows were milked twice a day (4.00 am and 4.00 pm) by hand milking inside the milking parlour. Calves were allowed to suckle for milk let down, prior to milking. The cows were vaccinated for Foot and Mouth Disease, Haemorrhagic Septicaemia and Black Quarters diseases, and dewormed twice a year as per the farm schedule. Similar managerial practices were followed in the herd throughout the year. As a routine practice, quarter wise milk samples were collected at monthly interval from the milking cows which were free from any clinical conditions. Immediately

after collection, the milk samples were checked for sub-clinical mastitis by California Mastitis Test (CMT) and at the same time samples were analyzed for milk constituents such as milk fat, solid not fat (SNF), protein, lactose and total solid (TS) percent using milk analyzer "LACTOSCAN" (New dairy engineering and trading company Pvt. Ltd., Delhi, India). Total 1000 milk samples found negative for CMT were only included in the final study.

The milk samples were categorised into 3 seasons (winter, summer and rainy), 3 lactation stages (early: ≤90 days, mid: 91-180 days and late: ≥180 days) and 3 parity groups (1st, 2nd-3rd and ≥4) for study. The sets of data were analyzed by General Linear Model (GLM) procedure using SPSS 16.0 software package to see the effect of season, stage of lactation and parity on milk constituents such as milk fat, solid not fat (SNF), protein, lactose and total solid (TS) percent. The pair wise mean difference was compared by Tukey post hoc test. The mean difference was considered as significant if p≤0.05. The correlation among different milk constituents were carried out using Pearson's correlation method.

RESULTS AND DISCUSSION

Milk Constituents

The mean value of milk fat, SNF, protein, lactose and TS percent were observed to be 4.111, 8.625, 3.180, 4.731 and 12.737%, respectively (Table 1). The results of milk constituents obtained in this study were comparable with the previous studies conducted on the same breed[9&10]. In contrast to the present findings, some workers reported higher value of milk fat contents in Gir cows[2&12]. The mean TS percent of milk was 12.74%, which is comparatively lower than the previous study conducted on Gir cows[9]. In a similar line, the Gir cows in Brazil produces milk of 4.12% fat, 3.26% protein, 4.63% lactose and 12.93% TS[4]. The variation of milk constituents may be attributed to the genetic potential of a particular animal as well the environmental and managemental factors. Additionally milk yield and parity of the cows may have effect on the milk constituents, as milk yield shows negative correlation with solid components such as milk protein, lactose, total solids and milk

fat[5]. Proper selection of animals, considering milk constituents in addition to milk yield could improve the concentration of different milk constituents in Gir cows.

Seasonal Effect on Milk Constituents

There was significant (p≤0.05) effect of season of sampling on all milk constituents except milk lactose in Gir cows (Table 1). The results are in agreement with[10], who observed significant effect of season on milk constituents such as milk fat, SNF, protein and lactose in Gir cows in the same herd. In contrast, some workers[10] reported lower value of milk constituents in summer season, but in the present study the values remained lower during winter season. Milk lactose is considered as least variable milk constituent owing to its osmotic regulatory property[18]. This may be the reason of non-significant effect of season on this trait in Gir cows during the experimentation. In other indigenous

breeds like Sahiwal, the season had significant effect on milk constituents[8&20] and similar results were observed in Gir cows. In consonance with other studies on Sahiwal cows[8&20], lower milk fat content was observed during winter season in Gir cows. The data revealed that milk SNF content was lower during winter season, which is in consonance with some workers[8]. In a similar line, season had also significant effect on milk constituents of Kankrej cows[11]. In a recent study, it was reported that significant seasonal effect on milk fat, SNF protein and lactose content in Kosali breed[19]. The seasonal effect on milk constituents might be attributed to variation of available feed and fodder offered to the cows during different season. The climatic effect on the physiology may have effect on milk constituents. In addition, owing to better feed availability as well as environment, the cows produce more milk during winter season[19], may result lower milk fat as both traits show negative correlation.

Table 1. Milk fat, solid not fat (SNF), protein, lactose, ash and total solid (TS) per cent of Gir cow

Factors	N	Milk constituents (%)				
		Fat	SNF	Protein	Lactose	TS
Overall	1000	4.111±0.020	8.625±0.028	3.180±0.011	4.731±0.015	12.737±0.047
Season						
Winter	494	4.046ᵃ±0.027	8.517ᵃ±0.038	3.139ᵃ±0.014	4.699±0.020	12.563ᵃ±0.062
Summer	316	4.120ᵃᵇ±0.034	8.693ᵇ±0.047	3.178ᵃᵇ±0.018	4.719±0.025	12.813ᵇ±0.078
Rainy	190	4.168ᵇ±0.043	8.667ᵃᵇ±0.059	3.222ᵇ±0.023	4.774±0.031	12.834ᵇ±0.098
Stage of lactation						
Early	360	4.305ᵇ±0.037	8.871ᵇ±0.051	3.269ᵇ±0.020	4.886ᵇ±0.027	13.176ᵇ±0.084
Mid	348	4.023ᵃ±0.033	8.537ᵃ±0.046	3.126ᵃ±0.018	4.673ᵃ±0.024	12.560ᵃ±0.075
Late	292	4.005ᵃ±0.036	8.469ᵃ±0.050	3.145ᵃ±0.019	4.634ᵃ±0.026	12.474ᵃ±0.082
Parity						
1ˢᵗ	336	4.181ᵇ±0.034	8.780ᵇ±0.047	3.228ᵇ±0.018	4.826ᵇ±0.025	12.961ᵇ±0.077
2ⁿᵈ-3ʳᵈ	382	4.111ᵃᵇ±0.033	8.655ᵇ±0.046	3.159ᵃ±0.017	4.757ᵇ±0.024	12.766ᵇ±0.075
≥4ᵗʰ	282	4.043ᵃ±0.039	8.441ᵃ±0.054	3.153ᵃ±0.021	4.609ᵃ±0.028	12.483ᵃ±0.088

Means with different superscripts (a, b) differ significantly within a column (*p*≤0.05)

Effect of Stage of Lactation on Milk Constituents

Stage of lactation in Gir cows significantly (p≤0.05) affected the milk constituents studied in this study. Similar findings were also observed on milk fat content in Gir cattle during different

seasons[10]. There was significant effect of stage of lactation on milk SNF, protein and lactose content in Gir cows. In contrary, no significant effect was observed in the same breed[10]. However, similar results were observed in Sahiwal cows and Hill cows of Uttarakhand on the milk constituents at different stage of lactation[8,17&20]. In a recent study,

significant effect of stage of lactation on milk protein and lactose was observed in Kosali breed of cows[19]. Concentrations of milk components were observed higher in early lactating cows as compared to the mid and late lactation stage in Gir cows (p≤0.05). Other studies on indigenous dairy, dual and draft cattle in India though cited variation of milk constituents among different lactation stages; the results did not reflect any particular trend[8,10,19&20]. This may be attributed to the prevailing environmental, nutritional and/or managemental conditions in addition to physiological stage of the dairy cows[18]. Further, sub-clinical diseases particularly sub-clinical mastitis in dairy cattle also affects the milk composition[13]. Thus better management could minimize the effect of lactation stage on milk constituents in dairy cows.

Parity Effect on Milk Constituents

Parity had significant (p≤0.05) effect on milk constituents in Gir cows (Table 1). The levels of milk components were comparatively lower in 4th and above parity cows as compared to lower parities (1st-3rd) cows. On the other hand, all milk constituent except milk protein were almost similar in 1st, 2nd and 3rd parity cows. In other findings, similar results were also observed in Gir Cows[10] and other indigenous cows[8&19]. In a similar line, higher value of milk fat and TS contents were observed in primiparous Gir cows[10], Kosali cattle[19]. The milk SNF and lactose content were similar in 1st, 2nd and 3rd parity Gir cows and similar results were also observed in Kosali breed[19]. However, in contrary, non significant effect of parity on milk constituents in Sahiwal cows were observed[20]. Though, parity is not directly associated with milk constituents, it affects lactation yield of cattle[7&19]. The significant effect of parity on alteration of certain milk components might be attributed to variation of milk yield among different parities as milk yield is significantly affected by parity in Gir cows[7]. Further, the variation of certain milk constituents in primiparous cows as compared to pluriparous cows may be due to metabolic difference of cows in different parities[21].

Correlation of Different Milk Constituents

The correlation study revealed highly significant (p≤0.05) and stronger positive correlation among different milk constituents in the Gir cows (Table 2). The results are more or less comparable with other studies on indigenous cattle[8&14] as well as on crossbred cattle[6]. In Sahiwal cows, significant and positive correlation of milk fat with milk TS (0.762-0.885), SNF (0.241-0.630), protein (0.094-0.751) and lactose (0.203-0.646) has been reported[8&14]. The strong and positive correlation of fat with other milk constituents indicated that selection of animals for fat will automatically improve the other traits in Gir cattle. There were positive correlation of milk TS with other milk constituents (fat, SNF, protein and lactose) which are inconsonance with previous studies[8&14]. Such association are obvious as fat, SNF, protein and lactose are component of TS. Similarly, in crossbred cows milk fat, SNF, protein and lactose also show positive and significant association[6].

Table 2. Correlation among milk fat, solid not fat (SNF), protein, lactose and total solid (TS) in Gir cows

Milk constituents	Fat	SNF	Protein	Lactose	TS
Fat	1				
SNF	0.834***	1			
Protein	0.692***	0.796***	1		
Lactose	0.790***	0.894***	0.784***	1	
TS	0.942***	0.971***	0.785***	0.887***	1

*** p≤0.001

CONCLUSION

It can be concluded that season, stage of lactation and parity had significant effect on milk constituents in healthy Gir cows. Milk constituents except lactose percent were observed higher during rainy season than winter season. In early phase of lactation, the

concentrations of milk constituents were higher, which gradually decreased with advancement of stage of lactation. Gir cows in their first parity produced milk comprised of higher percent of milk constituents, but in later parities the concentrations decreased markedly. Better managerial practices could reduce the variation of milk constituents in Gir cows. The positive correlation of milk fat with other constituents indicated that improvement of milk fat under breeding programme could improve the other milk constituents as well as the total solid content of milk in Gir cows.

ACKNOWLEDGEMENT

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Impact of supplementation of lukewarm water during winter on productive performance of dairy cows

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ABSTRACT

The present study was carried out to find the effect of supplementation of lukewarm water during winter season on physiological parameters and production of Sahiwal cows. The present study was carried out with twelve healthy, lactating Sahiwal cows maintained at DDD farm within the premises of LFC of DUVASU, Mathura. These experimental cows were quasi randomly divided into two groups consisting six animals in each. All the cows were kept in conventional (tail-to-tail) system of housing for whole day. Cows of one group i.e. control were offered drinking water stored in water trough located in a corner of the shed at ambient temperature, whereas, the cows of supplemented group were offered lukewarm water at 25°C which was prepared by mixing of partial amount of warm water in cold water. Cows of both the groups were offered weighed amount of ad lib water thrice a day (early morning, afternoon and late evening) in graduated buckets individually. They were also provided weighed amount of ad lib feed. The production profile of control and treatment group were studied during the course of experiment and compared to observe the impact of supplementation of lukewarm water during winter season. A significant difference for total solid % ($p<0.01$) and SNF % ($p<0.01$) in experimental cows among 0, 1st, 2nd, 3rd, 4th and 5th fortnights were observed. But no significant ($p>0.05$) difference was observed in milk fat%, fortnight total milk yield (FTMY), fortnight daily milk yield (FDMY), total milk yield (TMY) and daily milk yield (DMY).

Key words: Lukewarm water, Lactating Sahiwal, Mathura, Productive attributes

Dairy production is traditionally an important source of livelihood for the rural Indians. India is endowed with the largest livestock population in the world. It accounts for about 56.7 percent of the world's buffalo population and 14.7 per cent of the cattle population. The livestock sector alone contributes nearly 25.6% of total value of output in Agriculture, Fishing & Forestry sector. The overall contribution of Livestock Sector in total GDP was nearly 4.11% at current price basis[2]. India contributed about 18.5 per cent to the bulk milk pool of the world during 2015-16 with a total production of 163 million tones and continues to remain the largest milk producer in the world. The per capita availability of milk was around 352 grams per day[3]. Despite of these facts India is still not able to fulfill the increasing demand of rapidly growing population. Thus, there seems a

need to increase milk production from our available dairy animals.

Production performance of a herd depends upon various genetic and non genetic factors. Dairy animals may reflect better performances subjected to a comfort zone. The range of comfort zone may vary depending upon the geographical and/or climatic variations as well as breed and species of the animals. In tropics dairy cows are in the comfort zone when environmental temperature ranges between 5°C and 25°C[9].The zone of comfort for Indian cows is 10-26.7°C[8]. On exposure to the similar type of temperate climatic condition crossbred cows don't reflect the similar performance as is reflected by exotic cows as because crossbred cows are having about 50% tropical cattle blood which are more adapted to warm climate rather than cold climate[6]. The performance of dairy animals is adversely affected during winter season as the ambient temperature falls below the lower critical

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temperature, which in turn significantly lowers down the temperature of normal drinking water[1]. Therefore, if the cattle are being provided with lukewarm water during extreme winter they may face little problem of shifting of most of the metabolic energy of the body in maintenance of their normal body temperature which in turn may improve the production performances of dairy cows.

MATERIALS AND METHODS

Twelve healthy, lactating, cyclic Sahiwal cow were selected for a period of 75 days (1st December 2017 to 15th February 2018). The animals were maintained at District dairy demonstration farm, livestock farm complex of U.P. Pandit Deen Dayal Upadhayay Pashu Chikitsa Vigyan Vishwavidyalaya Evam Go Anusandhan Sansthan (DUVASU), Mathura. The animals selected for the study were quasi randomly divided into two groups, containing six animals in each group i.e. control and treatment. The grouping of animals was done on the basis of milk yield, stage of lactation, parity, body weight etc. All the experimental animals were housed in tie-barn double row tail-to-tail shed for the entire study period where individual feeding, watering and care was given. About 1 week adjustment period was provided for all the cows to habituate drinking water in bucket and to standardize watering practices. *Adlib* drinking water of known quantity was provided to all the experimental cows of both the groups thrice a day, scheduled at early morning, afternoon and late evening. The control group was provided with *adlib* administration of known quantity of normal stored water in water trough overnight. The treatment group was provided with lukewarm water (25ºC). 150 ml of milk sample was collected from each experimental animal on fortnightly interval in sterilized bottles and were immediately used for analysis of its composition. The data observed were subjected to univariate analysis of variance using the general linear model (GLM) procedure of the Statistical Software Package (SPSS for window, V19.0; SPSS Inc., Chicago, II, USA) and significance of difference among various subclasses was examined by using DMRT as modified by Kramer (1957).

RESULTS AND DISCUSSION

Milk Fat (%)

The results for mean squares value for production attributes during experimental period (Table 1) revealed non significant (p>0.05) effect of supplementation of lukewarm water on milk fat % of experimental Sahiwal cows in present study. The effect was also observed to be non significant (p>0.05) on the mean fortnightly milk fat % of experimental cows on 0, 1st, 2nd, 3rd, 4th and 5th. Table 1 also revealed no significant (p>0.05) difference between the milk fat % of Sahiwal cows of control and supplemented group on different fortnights. The overall pool mean of milk fat % of experimental Sahiwal cows in present study was observed to be 4.85±0.09 %, whereas, the mean milk fat % of Sahiwal cows under control and treatment group was observed to be 4.82±0.12 and 4.77±0.12 %, respectively (Table 3).

Total Solids Percentage and Solid Not Fat Percentage

The overall pool mean for total solid and solid not fat of experimental Sahiwal cows in present study was observed to be 14.00±0.12% and 9.147±0.08%, respectively (Table 3). The mean values for total solid of Sahiwal cows under control group (14.04±0.17%) was observed to higher as compared to under supplemented group (13.98±0.17%) but the difference between these two was not significant (p>0.05). Contrary to total solid, the mean solid not fat for Sahiwal cows of supplemented (9.08±0.12%) group was observed to be non significantly lower than for Sahiwal cows of control (9.21±0.12%) group (Table 1 and Table 3).

Fortnight Daily Milk Yield (FDMY)

The results for mean squares value for production attributes during experimental period (Table 1) revealed no significant (p>0.05) effect of supplementation of lukewarm water on FDMY of experimental Sahiwal cows of present study. No significant (p>0.05) difference for the mean FDMY of experimental cows was also observed among 0, 1st, 2nd, 3rd, 4th and 5th fortnights. Table 1

also revealed no significant (p>0.05) difference between the FDMY of Sahiwal cows of control and supplemented group on different fortnights.

Fortnight Total Milk Yield (FTMY)

The results for mean squares value for production attributes during experimental period (Table 1) revealed no significant (p>0.05) effect of supplementation of lukewarm water on FTMY of experimental Sahiwal cows of present study. The effect was also observed to be non significant (p>0.05) on the mean FTMY of experimental cows on different fortnights i.e. 1st, 2nd, 3rd, 4th and 5th. Table 1 also revealed no significant (p>0.05) difference between the FTMY of Sahiwal cows of control and supplemented group on 1st, 2nd, 3rd, 4th and 5th fortnights.

Total Milk Yield and Daily Milk Yield

The mean squares value table for TMY (Table 1) and DMY (Table 4) in present investigation revealed a no significant (p>0.05) effect of supplementation of lukewarm water in experimental Sahiwal cows. The overall pool mean for TMY (Table 3) and DMY (Table 2) of experimental Sahiwal cows in present study was observed to be 410.54±27.84 liter and 5.46±.09 liter/ day respectively. The mean values for TMY and DMY of experimental Sahiwal cows of control and treatment group were observed to be 412.25±39.37 Vs 408.83±39.97 liter and 5.50±0.12 Vs 5.41±0.12 liter/ day, respectively.

Effect of Supplementation of Lukewarm Water On Production Attributes of Sahiwal Cattle

A significant (p<0.05) difference for total solid and solid not fat percent in milk of Sahiwal cows on 0, 1st, 2nd, 3rd, 4th and 5th fortnights was observed in present investigation. It was probably due to the variations in mean and minimum environmental temperatures of the day on different fortnights and on the day of lower environmental temperature the plasma concentration of free fatty acid might have increased which in turn caused an increased uptake of net fatty acid by mammary glands[10]. These results could be supported by the similar findings of [4] who reported that SNF and total solid percentage were significantly higher in milk of cows consuming warm drinking water during winter. Moreover, no significant change in fat percentage of experimental Sahiwal cows of present study was in converse to the findings of [5], who reported that cold exposure increased the milk fat content in ewes significantly (p<0.05). The mean fat, total solid and SNF percentage of Sahiwal cows of supplemented and control group did not reflect any significant difference as a whole or on different fortnights. The mean DMY, FDMY, FTMY and TMY of Sahiwal cows of supplemented and control group did not reflect any significant difference as a whole or on different fortnights. Moreover, the differences for these attributes among different fortnights were also not observed to be significant. These findings were similar to the observations of[7] that increase in the water intake by cows did not influence their milk yield.

Table 1. Mean square values for production (milk composition, FDMY, FTMY and TMY) attributes of Sahiwal cows presenting the effect of supplementation of lukewarm water during winter

Sources	df	Milk Fat (%)	Total solid (%)	SNF (%)	FDMY (kg)
Group	1	0.48	0.06	0.29	0.28
Fortnight	5	0.62	18.34**	16.33**	2.25
Group*fortnight	5	0.10	0.32	0.67	0.51
Error	65	0.52	1.08	0.51	1.83

**p<0.01; FDMY= Fortnightly daily milk yield; SNF= Solid not fat

Cont….

Sources	df	FTMY (liter)	TMY (liter)
Group	1	7	35.02
Fortnight	4	932.11	-
Group*fortnight	4	115.09	-
Error	-	440.74 (df=54)	9301.57 (df=10)

FTMY= Fortnightly total milk yield; TMY= Total milk yield

Table 2. Mean and SEM values for daily water intake during morning, afternoon and evening hours and daily milk yield of Sahiwal cows presenting the effect of supplementation of lukewarm water during winter

Source	Morning water intake (Liter)		Afternoon water intake (Liter)		Evening water intake (Liter)		DMY (Liter)	
	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM
Control	3.49[a]	0.24	8.41	0.31	8.68	0.25	5.51	0.13
Treatment	4.81[b]	0.24	8.80	0.31	8.93	0.25	5.41	0.13
Overall mean	4.15	0.17	8.61	0.22	8.80	0.18	5.46	0.09

Values with different superscript in the same column differ significantly from each other

Table 3. Mean and SEM values for various production attributes of Sahiwal cows presenting the effect of supplementation of lukewarm water during winter

Source Column1 Mean	Milk Fat (%)		Total solid (%)		SNF (%)		FDMY (liter/day)		FTMY (liter)		TMY (liter)	
	SEM	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM	Mean	SEM	
Group												
Control	4.93	0.12	14.04	0.17	9.08	0.12	4.93	0.12	82.45	3.83	412.25	39.37
Treatment	4.77	0.12	13.98	0.17	9.21	0.12	4.77	0.12	81.77	3.83	408.83	39.37
Fortnight												
Control	5.08	0.34	12.13	0.42	7.05	0.29	5.58	0.57	-	-	-	-
0 Treatment	4.55	0.34	12.70	0.42	8.15	0.29	5.83	0.57	-	-	-	-
Mean	4.82	0.21	12.42[a]	0.30	7.60[a]	0.21	5.71	0.39	-	-	-	-
Control	4.65	0.34	12.57	0.42	7.92	0.29	5.67	0.57	100.58	8.82	-	-
1 Treatment	4.62	0.34	12.49	0.42	7.87	0.29	5.42	0.57	91.75	8.82	-	-
Mean	4.63	0.21	12.53[a]	0.30	7.90[a]	0.21	5.54	0.39	96.17	6.06	-	-
Control	5.23	0.34	14.33	0.42	9.09	0.29	5.75	0.57	83.25	8.82	-	-
2 Treatment	5.18	0.34	14.22	0.42	9.04	0.29	5.00	0.57	78.17	8.82	-	-
Mean	5.21	0.21	14.27[b]	0.30	9.07[b]	0.21	5.38	0.39	80.71	6.06	-	-
Control	4.63	0.34	14.65	0.42	9.89	0.29	5.08	0.57	73.50	8.82	-	-
3 Treatment	4.53	0.34	14.40	0.42	9.87	0.29	4.92	0.57	74.00	8.82		-
Mean	4.58	0.21	14.52[bc]	0.30	9.88[c]	0.21	5.00	0.39	73.75	6.06	-	-
Control	4.96	0.34	15.13	0.42	10.16	0.29	5.50	0.57	81.92	8.82	-	-
4 Treatment	4.60	0.34	15.00	0.42	10.10	0.29	5.92	0.57	86.00	8.82	-	-
Mean	4.93	0.21	15.07[bc]	0.30	10.13[c]	0.21	5.71	0.39	83.96	6.06	-	-
Control	5.02	0.34	15.40	0.42	10.38	0.29	4.75	0.57	73.00	8.82	-	-
5 Treatment	4.82	0.34	15.04	0.42	10.22	0.29	4.50	0.57	78.92	8.82	-	-
Mean	4.92	0.21	15.22[c]	0.30	10.31[c]	0.21	4.63	0.39	75.96	6.06	-	-
Overall Mean	4.85	0.09	14.01	0.12	9.15	0.08	5.33	0.16	82.11	2.71	410.54	27.84

Values with different superscripts in the same column differ significantly from each other

Table 4. Mean square values for daily water intake during morning, afternoon and evening hours and daily milk yield of Sahiwal cows presenting effect of supplementation of lukewarm water during winter

Source	df	Morning intake (Liter)	Afternoon intake (Liter)	Evening intake (Liter)	DMY (kg)
Group	1	394.68**	34.54	14.44	2.10
Error	898	26.18	42.89	28.34	7.52

**p<0.01; DMY= Daily milk yield

CONCLUSION

Supplementation of lukewarm water did not reflect a significant (p>0.05) effect either on milk composition attributes viz. milk fat (%), total solid (%) and SNF (%) or on milk yield attributes viz. DMY, FDMY, FTMY and TMY. A significant (p<0.01) difference among the fortnightly mean values of total solid(%) and SNF(%) for experimental Sahiwal cows on 0, 1st, 2nd, 3rd, 4th and 5th fortnights was observed, but no significant difference could be observed for other production attributes on different fortnights. The differences for various production attributes between cows of supplemented and control group at 0, 1st, 2nd, 3rd, 4th and 5th fortnights were also observed to be non significant (p>0.05).

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Effect of temperament on milking behavior and milk yield in Surti buffaloes

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ABSTRACT

Present study was conducted on twenty-three Surti buffaloes maintained at Livestock Research Station under Navsari Agricultural University, Navsari, Gujarat with the objective to study the general temperament and its effect on milking behaviour traits and milk yield. Important milking behavioural traits like total milking time, milk flow rate and milk yield per milking were recorded at the time of each milking. All of these parameters were recorded on day 6 postpartum thereafter at fortnight interval till 90th postpartum. The collected data were compiled, tabulated and analyzed by using SAS 9.2. Perusal of data revealed that during early lactation temperament of primiparous buffaloes found to be restless-nervous type. The temperament score was significantly higher (p<0.05) for primiparous than multiparous animals on day 6 (3.38±0.18 vs 1.87±0.19), 20 (2.50±0.19 vs 1.60±0.16) and 34 (2.13±0.29 vs 1.47±0.16) postpartum. Milking behavior traits like liking time and milk flow rate found to be higher for animals having docile-slight restless temperament and animals having docile-slight restless temperament produced significantly higher (p<0.05) milk yield in 100 days (492.13±42.81 vs 328.57±28.79 kg) than animals with restless and nervous temperament.

Key words: Milking behavior, Milk yield, Surti buffalo, Temperament

Temperament can be defined as the type and the level of reaction of an animal to its surrounding conditions[3]. Temperament depends on physiological and genetic factors as well as experience and learning hence an outcome of interaction between heredity and the life history of the animal. Temperament has been an important criterion during the process of domestication of our livestock species and for many centuries, natural selection for calmer animals has been conducted[2]. Dairy temperament and milk yield are interrelated[12]. It has been observed that the buffaloes with docile temperament are good milk yielder generally tend to have longer lactation period. Temperament of an animal plays vital role in ease of their handling and in improving their productive and reproductive abilities[7]. Further, neonatal mortality is being affected by the temperament of the mother at parturition [5] as it indicates some form of epimeletic behaviour. Moreover, during restraint and handling process calmer animals are less likely to be stressed thus they are less vulnerable to get injured than animals with wild temperament. Thus, study on temperamental behaviour of buffaloes will help in setting the norms for their successful management and may be helpful in selection of better dairy animals. Therefore, the present work was planned to study the general temperament and its effect on milking behaviour traits and milk yield in Surti buffaloes.

MATERIAL AND METHODS

Present study was conducted on twenty-three Surti buffaloes maintained at Livestock Research Station under Navsari Agricultural University, Navsari, Gujarat. These animals were maintained under loose housing and group management system. All management practices were uniform

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to all animals. They were hand-milked twice daily. Milking temperament was studied as per the technique suggested by [13] with slight modification. Temperament score 1: docile, 2: slight restless, 3: restless, 4: nervous and 5: Aggressive type of animals. Animals were observed for temperament score during morning and evening milking time. However, experimental animals were categorized into only two groups based on their milking temperament, as there was no animal found in aggressive category. Further, due to statistical convenience docile and slightly restless animals were merged and placed into single category i.e. Group-I included animals with docile to slightly restless temperament and Group-II included animals with restless and nervous temperament. Important milking behavioural traits like total milking time (MLT), milk flow rate (MFR) and milk yield per milking were recorded at the time of each milking. All of these parameters were recorded on day 6 postpartum thereafter at fortnight interval till 90th postpartum. The collected data were compiled, tabulated and analyzed by using SAS 9.2. Statistical analysis of other parameters was carried out by using fixed least square model LSML package[3]. Significant differences between means were tested by one-way ANOVA.

RESULTS AND DISCUSSION

Perusal of data revealed that the temperament of primiparous Surti buffaloes were restless-nervous type till 28 days postpartum thereafter it was docile-slight restless type. However, temperament of multiparous Surti buffaloes was docile-slight restless type throughout the study period.

Further, we observed that there was significant difference (p<0.05) in the temperament score of both the group of animals till 34th day postpartum thereafter though the temperament score of primiparous buffaloes were higher than multiparous but it was statistically non-significant (Table 1). Similar findings were reported by other workers as they reported significant differences in the milking temperament between primiparous cows and multiparous cows[1] and restless and slightly restless temperament was more frequent in primiparous animals while docile temperament was more frequent among buffaloes under second, third and fourth lactations[9].

Table 1. General temperament (LSM±SE) of Surti buffaloes

Group	Temperament Score on the day						
	6	20	34	48	62	76	90
Primiparous	3.38±0.18ᵃ (8)	2.50±0.19 ᵃ (8)	2.13±0.29 ᵃ (8)	2.00±0.27 (8)	1.88±0.29 (8)	1.63±0.26 (8)	1.63±0.26 (8)
Multiparous	1.87±0.19ᵇ (15)	1.60±0.16 ᵇ (15)	1.47±0.16 ᵇ (15)	1.47±0.13 (15)	1.60±0.13 (15)	1.80±0.14 (15)	1.80±0.14 (15)
Overall	2.39±0.21 (23)	1.91±0.15 (23)	1.70±0.16 (23)	1.65±0.13 (23)	1.70±0.13 (23)	1.74±0.13 (23)	1.74±0.13 (23)

Means showing different superscripts in lower case letters in a column differ significantly (p<0.05).
Figures in parentheses show the number of animals used to derive mean

Least square's mean of temperament score of group-II animals were significantly higher than Group-I animals on the day these animals were included in the study. We observed that the milking time was higher for Group-II animals than the Group-I animals throughout the experiment period however it was only significantly higher on the 90th day postpartum (Table 2). This result was in consonance with reports of other workers[10, 5].

Milk flow rate (ml/sec) was significantly higher (p<0.05) for Group-I animals than the Group-II animals at most of the stages of the study period (Table 3). Our finding is in agreement with the findings of other worker who found that temperament score had significant effect on total milking time and milk flow rate[8]. Cumulative 100-day milk yield and daily milk yield was significantly higher (p<0.05) for Group-I animals than the Group-II animals at all stages of the study (Table 4).

Table 2. Effect of temperament on milking time (seconds) in Surti buffaloes

Temperament score group	Temperament Score	Milking time (seconds) on the day						
		6	20	34	48	62	76	90
Group-I	1.58±0.14[a] (12)	303.75±30.26 (12)	384.75±41.81 (12)	417.83±35.91 (12)	443.08±22.26 (12)	443.83±36.19 (12)	439.08±19.22 (12)	465.17±22.70[a] (12)
Group-II	3.27±0.14[b] (11)	247.55±26.54 (11)	353.00±18.70 (11)	359.55±21.25 (11)	374.82±27.06 (11)	399.18±27.74 (11)	397.55±27.21 (11)	368.18±14.56[b] (11)
Overall	2.39±0.20 (23)	276.87±20.69 (23)	369.57±23.31 (23)	389.96±21.75 (23)	410.43±18.46 (23)	422.48±23.06 (23)	419.22±16.64 (23)	418.78±16.95 (23)

Means showing different superscripts in lower case letters in a column differ significantly (p<0.05).
Figures in parentheses show the number of animals used to derive mean

Table 3. Effect of temperament on milk flow rate (ml/sec) in Surti buffaloes

Temperament score group	Milk flow rate (ml/sec) on the day						
	6	20	34	48	62	76	90
Group-I	10.90±0.43 (12)	12.73±0.70[a] (12)	12.97±0.65 (12)	12.98±0.61 [a] (12)	12.45±0.41 [a*] (12)	12.67±0.51 [a] (12)	12.48±0.51 [a*] (12)
Group-II	9.26±0.89 (11)	10.03±0.66[b] (11)	11.34±0.49 (11)	10.83±0.47 [b] (11)	11.14±0.45 [b] (11)	10.40±0.47 [b] (11)	10.94±0.53 [b] (11)
Overall	10.11±0.50 (23)	11.44±0.55 (23)	12.19±0.44 (23)	11.95±0.44 (23)	11.82±0.32 (23)	11.58±0.42 (23)	11.75±0.39 (23)

Means showing different superscripts in lower case letters in a column differ significantly (p<0.05).
Figures in parentheses show the number of animals used to derive mean

Table 4. Effect of temperament on milk yield in 100 days and milk yield at different intervals in Surti buffaloes

Temperament score group	Milk yield on the day							
	6	20	34	48	62	76	90	MY100
Group-I	3.23±0.25[a] (12)	4.99±0.66[a] (12)	5.52±0.63[a] (12)	5.84±0.52[a] (12)	5.59±0.56 (12)	5.63±0.42[a] (12)	5.86±0.45[a] (12)	492.13±42.81[a] (12)
Group-II	2.03±0.21[b] (11)	3.30±0.40[b] (11)	3.75±0.36[b] (11)	4.02±0.45[b] (11)	4.40±0.42 (11)	4.22±0.46[b] (11)	3.88±0.36[b] (11)	328.57±28.79[b] (11)
Overall	2.66±0.21 (23)	4.18±0.43 (23)	4.67±0.41 (23)	4.97±0.39 (23)	5.02±0.37 (23)	4.96±0.33 (23)	4.91±0.35 (23)	413.90±31.01 (23)

Means showing different superscripts in lower case letters in a column differ significantly (p<0.05).
Figures in parentheses show the number of animals used to derive mean

Dairy temperament of Holstein cows significantly correlated with 100-day milk yield and milk flow (r =0.24) and (0.23 respectively)[11] and in Holstein-Friesian cows that temperament was highly correlated with milking rate (r =0.83) and with average daily milk yield (r =0.992)[7].

CONCLUSION

From the findings it may be concluded that during early lactation temperament of primiparous buffaloes found to be restless-nervous. Milking behavior traits found to be higher for animals having docile-slight restless temperament and animals having docile-slight restless temperament produced more daily and milk yield in 100 days.

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Calf rearing practices followed by dairy farmers in Valsad district of Gujarat

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ABSTRACT

A field survey was conducted to ascertain the calf rearing practices followed by dairy animals owners in Valsad district of Gujarat. A total of 240 respondents were selected from two randomly selected talukas and interviewed with the help of structured interview schedule. The present study revealed that 97.9% of the respondents attended calving and cleaned the calves soon after parturition. Only 14.20% of respondents followed practice ligation, cutting and disinfection of the naval cord. Majority (67.9%) of the respondents fed colostrum to new born calf within an hour of birth. About 34.2% of the respondents did not followed weaning practice and 35.4% of the respondents allowed calves to suckle their dams till lactation ceased. Only 22.9% of the respondents provided green fodders from two months of age and 27.9% of the respondents provided calf starter to the calves. Majority (72.5%) of respondents practiced castration of male calves and 34.2% of the respondents gave anthelmintic to the calves regularly. Only 16.7% of the respondents provided jacketing as well as bedding in order to protect their calves from cold during winter season. Calf rearing management practices are not being adopted by farmers to certain extent and needs to be improved by organizing training programmes and result demonstration on and off campus extension activities of SAUs, KVK's and government agencies working in the study area.

Gujarat has around 5.23% and 9.55% of cattle and buffalo population of the country, respectively[1]. Gujarat shared about 7.72% of total milk produced in India during the 2018-19 with 626 gm/day per capita availability above the national average[1&2]. Calves play an important role in the development of the dairy sector of the country, as the future of the dairy herd solely depends upon the successful raising of young calves. Calf-care and management is not only essential for sustenance of the dairy industry but also essential for preserving and maintaining good quality germplasm. Important aspects in the calf rearing are the health management and proper nutrition. Calves for the future dairy herd require proper management with constant attention. Poor calf management practices may leads to higher mortality, poor growth rate, delayed maturity and poor productivity which leads to economic losses to the dairy farmers[7]. Therefore, the present study was undertaken to ascertain the calf rearing practices followed by dairy farmers in tribal areas of Valsad district of Gujarat.

MATERIALS AND METHODS

Study was conducted in Valsad district of South Gujarat during September, 2017 to January, 2018. The district covers 3008 square kilometers, has six talukas namely- Valsad, Dharampur, Vapi, Pardi, Umargaon and Kaparada and 434 villages. Dairy farming is an important prime economic activity after agriculture in Valsad district. There are 416 milk co-operative societies and 428 milk collection center in district. Out of six talukas in the district,

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two talukas were randomly selected. From each selected taluka, twelve villages having functional primary milk producer's co-operative societies were selected at random. Ten dairy animal owners from each village were randomly selected using a multi stage random sampling technique with the help of Talati cum Mantri/ village dairy cooperatives which constituted a total of 240 respondents. While selecting respondents due care was taken to ensure that they were evenly distributed in the village and truly represented animal management practices prevailing in the area. The selected dairy animal owners were single interviewed and the desired information was collected regarding calf rearing practices with the help of interview schedule. The data were scrutinized and tabulated into frequency, percentages; arithmetic mean standard error and analysis of variance as per the methods suggested by[19] to draw meaningful inferences.

RESULTS AND DISCUSSION

The data regarding calf rearing practices followed by the dairy animal owners are presented in Table 1 and revealed that 97.90% of respondents attended calving and took care of the calves after parturition, while only 2.10% of the respondents didn't follow this practice. Present findings were similar to the findings of earlier authors[14&17]. However, author [8] reported that all the respondents attended calving and took care of the calves after parturition. Majority (97.9%) of the respondents cleaned the calves soon after calving which is similar with earlier findings were reported by authors[8,11,14&17]. It was observed that 85.80% of respondents did not practice ligation, cutting and disinfection of the naval cord and it was left to fall off itself naturally, whereas remaining 14.20% of respondents followed these practices. The low percentage of dairy farmers following these practices was probably due to lack of awareness. Present findings were supported with the earlier results recorded by authors[7,8,12&20]. However, the present result was contrary to the earlier results of author[6,9,10&11] who observed that 37.00 to 85.56% of the respondents followed these practices in their study areas.

Majority (97.10%) of the respondents followed practice of colostrum feeding to new born calves, while only 2.90 % of the respondent didn't fed colostrum to their calves. Significant differences in time of colostrum feeding after birth was observed which differ between different talukas. Present results were similar to the earlier results reported by authors [5,6,13&17]. Further, the data revealed that scientific recommendation of feeding colostrum to newborn calves within one hour of birth was being practiced by 67.90% of the total respondents which might be due to the awareness regarding importance of timely colostrum feeding. These findings were similar to earlier findings of authors[17&20]. However, present findings were contradictory with the earlier finding of author[8] who found that 87.92% of the respondents fed the colostrum to new born calf after drop of the placenta. The new born calves were allowed for suckling colostrum as *ad- lib*., one quarter and half quarter by 70.80, 22.50 and 6.70% of the respondents, respectively, which was similar to earlier results reported by author[8]. Majority (50.40%) of the respondents followed weaning practices at the age of three months, while 0.80, 2.90 and 11.70% of the respondents followed weaning practices at the age of two months, one month and 0-3 days, respectively and remaining 34.20% of respondents didn't follow weaning practice. Weaning age of calves was found highly significant (p<0.01) difference between Dharampur and Pardi taluka of Valsad district. It might be due to the fact that farmers were acquainted with the advantages of weaning. These findings were supported by earlier findings of author[4]. However, they are contradictory to the results of author[8] who found that 11.25% of the respondents followed weaning practices in their study areas. Majority (55.4%) of the respondents allowed the calves to suckle only one teat, while remaining 44.6% of the respondents allowed suckling of two teats of their dams for an average 6 minutes which was similar with earlier findings of author[5]. However, the present result was contrary to author[13] who found that all the respondents allowed the caves to suckle one teat of their dams. The number of teat allowed for suckling of calf was highly significant (p<0.01) between the two talukas.

Data in Table 1 showed that 35.40% of the respondents allowed calves to suckle their dams till lactation ceased, whereas 64.60% of respondents didn't follow this practice. Milk fed to their calves till the end of lactation was highly significant (p<0.01) between the two talukas. The present findings are encouraging than those reported by earlier authors[9&17]. Majority (77.5%) of respondents provided water to their calves twice a day followed by 22.10 and 0.40% of the respondents provided water to their calves *ad libitum* and once in a day, respectively which is similar with earlier result of author[17].

Only 27.90% of the respondents provided calf starter, while remaining 72.10% of the respondents did not provide calf starter to their calves. Highly significant difference was found in between the two talukas. This might be due to lack of knowledge among the respondents of the two taluka. The present findings were encouraging than the earlier results reported by author[17] who observed that 2.67% of the respondents provided calf starter to their young calves. It was revealed that 41.20% of the respondents provided green fodders from one months followed by 35.80 and 22.90% of the respondents provided green fodders from three and two month after birth, respectively. Incorporation of fodder in the ration of calves which hastens the development of rumen function at early age. This finding is supported by the earlier findings of author[18]. It was observed that 27.50% of respondents practiced castration of male calves, while 72.50% of respondents didn't follow this practice. Castration of male calves was found significant (p<0.05) difference between the talukas. These findings are supported by the earlier findings of author[10,11&12] who found that 20, 19.5 and 22.5% of the respondents did castration of male calf. However, these findings are higher than that of author[8&9] who found that 0.42 and 7.25% of the respondents followed castration of male calves in their study areas, respectively.

Data in Table 1 indicate that 34.20% of the respondents gave anthelmintic to the calves regularly, whereas 56.70% of the respondents gave anthelmintic to the calves occasionally. Only 9.20% of the respondents did not gave anthelmintic to control the endoparasites in the calves. The present findings are supported to the earlier results recorded by authors[16&17]. However, present results are contrary with the results of author[8] who found that 90.63% of the respondents did not followed the deworming of calf in their study areas. Deworming of calves were found significant (p<0.05) difference between the talukas. Majority (79.2%) of the respondents sold their calves followed by 14.60, 5.80 and 0.40% respondents were disposed of their male calves to goshala / panjrapole, kept for working purpose and community bull, respectively which is lower than the earlier result of author[3] revealed that more than 90.00% of respondent disposed their male calf by selling. Only 16.70% of the respondents provided jacketing as well as bedding in order to protect their calves from cold during winter season, while majority (83.3%) of the respondents didn't follow these practice which is similar to the earlier findings of author[15] but, encouraging than the earlier finding of authors[8&12].

Table 1. Calf rearing practices followed by dairy farmers

Practices/Taluka	Dharmpur		Pardi		Overall		Chi square value
	n	%	n	%	n	%	
Attended calving and took care of the calves after parturition							
Yes	117	97.50	118	98.30	235	97.90	0.20
No	03	2.50	02	1.70	05	02.10	
Cleaning of calf after calving							
Yes	117	97.50	118	98.30	235	97.90	0.20
No	03	2.50	02	1.70	05	02.10	
Practiced ligation/ cutting and disinfection of the navel cord							
Yes	22	18.30	12	10.00	34	14.20	3.43
No	98	81.70	108	90.00	206	85.80	

Feeding of colostrum to new born calf							
Yes	117	97.50	116	96.70	233	97.10	0.15
No	03	2.50	04	3.30	07	2.90	
Time of colostrum feeding after birth							
Within one hour	68	56.70	95	79.20	163	67.90	17.74**
After one hour	05	4.20	07	5.80	12	05.00	
After fall of placenta	47	39.20	18	15.00	65	27.10	
Rate of colostrum feeding							
Ad lib suckling	81	67.50	89	74.20	170	70.80	1.29
One quarter	30	25.00	24	20.00	54	22.50	
Half quarter	09	7.50	07	5.80	16	06.70	
Weaning calves at the age of							
None	21	17.50	61	54.20	82	34.20	34.22**
3 months	80	66.70	41	34.20	121	50.40	
2 months	02	1.70	00	00	02	0.80	
1 month	03	2.50	04	3.30	07	2.90	
0-3 days	14	11.70	14	11.70	28	11.70	
Number of teats allowed for suckling							
One teat	46	38.30	87	72.7	133	55.40	28.35**
Two teats	74	61.70	33	27.5	107	44.60	
Fed milk to their calf till lactation ceased							
Yes	23	19.20	62	51.70	85	35.40	27.71**
No	97	80.80	58	48.30	155	64.60	
Water provided to the calf/ day							
Once	01	0.80	0.00	00	01	0.40	1.02
Twice	93	77.50	93	77.50	186	77.50	
Ad-lib	26	21.70	27	22.50	53	22.10	
Calf starter supplied							
Yes	23	19.20	44	36.70	67	27.90	9.13**
No	97	80.80	76	63.30	173	72.10	
Started giving green fodder after attaining age of							
1 month	73	60.80	26	21.7	99	41.20	67.25**
2 months	34	28.30	21	17.5	55	22.90	
3 months	13	10.80	73	60.8	86	35.80	
Castration of male calves							
No	40	33.30	26	21.70	66	27.50	4.09*
Yes	80	66.70	94	78.30	174	72.50	
Deworming of calves							
Regular	38	31.70	44	36.70	82	34.20	6.86*
Occasional	76	63.30	60	50.00	136	56.70	
Not practiced	06	5.00	16	13.30	22	9.20	

Disposal of male calves							
Sold	100	83.30	90	75.00	190	79.20	3.21
Kept for work purpose	06	05.00	08	6.7	14	5.80	
Community bull	00	00.00	01	0.8	01	0.40	
Goshala/Panjrapole	14	11.70	21	17.5	35	14.60	
Provided jacketing as well as bedding on litter during winter							
Yes	28	23.30	12	10.00	40	16.70	7.68*
No	92	76.70	108	90.00	200	83.30	

n- Frequency, **Significant at 1 % level (p<0.01) *Significant at 5 % level (p<0.05)

CONCLUSION

It can be concluded that some of the calf rearing management practices are not being adopted by farmers to certain extent and needs to be improved by organizing training programmes and result demonstration on and off campus extension activities of SAUs, KVK's and government agencies working in the study area.

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Effect of false ceiling on microclimatic variables of crossbred cattle during rainy season

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ABSTRACT

The present study was conducted to find out the effect of false ceiling materials on microclimatic variables of crossbred (*Vrindavani*) cattle shed during rainy season. Twenty four crossbred cattle were randomly distributed equally into three groups (8 in each) on the basis of their average milk yield, parity and body weight. Control group (T_0) animals were kept under asbestos roof without any ceiling insulation, while modified shed had false ceiling of Expanded Polyethylene (EPE) sheet (T_1) and paddy straw thatch (T_2) under asbestos roof. The average maximum temperature was significantly ($p<0.05$) lower in T_2 ($33.50\pm0.16°C$) and T_1 ($33.67\pm0.17°C$) in comparison to T_0 ($35.12\pm0.21°C$). The average relative humidity (RH) % at 2:00 PM was significantly ($p<0.05$) higher in T_1 (75.72 ± 0.77) and T_2 (75.98 ± 0.75) than T_0 (73.28 ± 0.82). The overall THI at 2:00 PM and overall average temperature humidity index (THI) was significantly ($p<0.05$) lower in T_2 (85.69 ± 0.16 and 83.61 ± 0.20) and T_1 (85.84 ± 0.16 and 83.73 ± 0.20) as compared to T_0 (87.32 ± 0.20 and 84.67 ± 0.24). The findings of the present study revealed that false ceiling installed underneath the asbestos roof might have blocked emitted radiation considerably. Thus utilization of paddy straw thatch and EPE sheet as false ceiling under asbestos roof may help in providing relatively comfortable microclimate to the animals in comparison to simple asbestos roof shed. Ceiling insulation could observe complementary effect in reducing heat stress in dairy animals when utilized with other heat amelioration measures.

Key words: Asbestos roof, Crossbred cattle and Rainy season, False ceiling, Microclimate.

India is an agricultural country as it's more than two third of population lives in rural areas and earns their livelihood from agriculture and allied sector. Livestock keeping is an integral part of Indian agriculture, which not only helps in providing nutritional security to rural people, but also opens up employment opportunity to the masses. Today our nation is boasting to be the leading milk producer in the world with total milk production 187.75 million metric tonnes during 2018-19, ensuring 394 gram per / day per capita availability of milk. Contribution of buffaloes, exotic/crossbred cows and indigenous cows in total milk production of the country is 49%, 27% and 21%, respectively[3]. In tropical countries like India, high ambient temperature coupled with high humidity induces heat stress in dairy animals in general and in crossbred cattle in particular due to their exotic inheritance. Heat stress reduces the feed intake, milk production and reproduction performances of dairy animals[6&7]. Production losses arises out of excessive heat load in dairy animals could be minimized by adopting heat stress amelioration measures like selection of heat stress tolerant breed, housing modification, microclimate alteration, feeding strategies etc[4].

Animal gains heat from environment through conduction, convection and radiation that may be either direct solar radiation or reflected radiation from surrounding structures; and by providing a simple shade over an animal cuts the radiant heat load on the animal by about 45% [5]. Roofing material and housing design have a major role in reducing radiant heat load inside animal shed[1]. Each roofing material possesses some merits as well as drawbacks. Owing to certain merits like relatively cheaper, durable, fire resistant and easy to install,

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asbestos sheet, tin sheet and GI sheets are quite popular roofing materials in India. The major drawback with these roofing materials is radiative heat emitted from underside of sheet during sunny days, which induces heat stress in animals kept underneath. Such emitted radiation can be minimized by placing insulation material below or above the asbestos or metal sheet roof[14]. In order to ameliorate heat stress in dairy animals, certain roof modifications like false ceiling insulation, fitting of solar panel, reflective roof paints, agro-net cover, wet gunny bags cover, mud plastering, thatch material placed above asbestos roof and green roofing could be considered[15]. By placing false ceiling of paddy straw thatch under asbestos sheet has created comfortable microclimate to the crossbred dairy animals besides being cheap, economic and profitable in long run [11&16]. Therefore, keeping these points in consideration, present investigation was carried out to study the effect of false ceiling on microclimatic variables of crossbred cattle shed during rainy season.

MATERIALS AND METHODS

The present investigation was carried out on crossbred cattle (*Vrindavani*) maintained at Cattle and Buffalo farm, ICAR- Indian Veterinary Research Institute, Izatnagar, Bareilly. The institute is located at the latitude 28.22° N, longitude 79.22° E and an altitude of 169 meters above mean sea level. Ambient temperature of the place reaches up to 45°C during summer months (April-June), while mercury dips below 5°C during winter months (December-February). Relative humidity (RH %) values ranges from 15 % to 90 %. Rain fall is mainly experienced during rainy season (July-September) with average annual rainfall ranges from 90 cm to 120 cm.

In order to evaluate the effect of different false ceiling materials on different microclimate parameters of crossbred cattle shed during rainy season (1 July to 30 September, 2019), 24 crossbred (*Vrindavani*) cattle were randomly distributed into three different groups (8 in each) on the basis of their average milk yield, parity and body weight. Control group (T_0) animals were kept under asbestos roof, while animals of treatment groups were kept under asbestos roof having false ceiling of expanded polyethylene (EPE) sheet (T_1) and paddy straw thatch (T_2) material. Thickness of EPE sheet and thatch was 2 inch and 4 inch, respectively. Crossbred cattle were kept under loose housing system, where floor under covered area was made up of cement-concrete, while in open area, brick on edge. These crossbred cattle were fed and managed as per the standard feeding and management practices followed at the institute farm.

For microclimate data recording, maximum and minimum thermometer (for maximum and minimum temperature) and dry and wet bulb thermometer were hanged at equal height inside all three sheds. The minimum and maximum temperature was recorded daily in the morning and in the evening, respectively. Relative humidity (RH) % was estimated by psychometric chart using dry and wet bulb reading taken at 09:00 AM and 2:00 PM daily. Temperature humidity index (THI) values inside different sheds were calculated by using the following formula[13].

THI=0.72 (wet bulb temperature + dry bulb temperature) + 40.6

Statistical analysis of parameters was carried out by General Linear Model using JMP 9.0 software. The multiple comparisons between groups at different time intervals for various parameters were done by using Tukey's test at 5% level of significance.

RESULTS AND DISCUSSION

Minimum and maximum temperature: The overall average minimum and maximum temperature inside all the experimental sheds is presented in Table 1. The overall minimum temperature under T_0, T_1 and T_2 was 25.70±0.17°C, 25.71±0.16 °C and 25.63±0.16 °C, respectively.

The overall maximum temperature inside T_1 (33.67±0.17°C) and T_2 (33.50±0.16°C) was significantly (p<0.05) lower than T_0 (35.12±0.21°C). Similarly, the overall average temperature inside T_1 (29.70±0.32°C) and T_2 (29.56±0.31°C) was significantly (p<0.05) lower in comparison to T_0 (30.40±0.37°C). There was significant (p<0.05) difference observed between minimum and maximum temperature within a period across different groups during all fortnights (Fig. 1).The overall maximum temperature and overall average temperature inside treatment sheds having false ceiling of EPE sheet and paddy straw thatch material was significantly (p<0.05) lower as compared to control shed, which might be due to efficient blocking of emitted radiations from heated asbestos sheet by false ceiling material. Higher values of maximum temperature inside control shed may cause excessive heat load in animals kept under it, while placing false ceiling under asbestos roof may help in reducing heat stress among inmates present underneath. Few workers[9] observed significantly (p<0.05) lower average maximum temperature under thatch roof (31.77±0.26 °C) and agro-net shading roof (32.20±0.24°C) in comparison to asbestos with canvass shading roof (33.61±0.26°C) in crossbred calves during rainy season,[17] also reported significantly (p<0.05) lower overall maximum temperature under modified shed (30.72±0.72 °C) than asbestos shed (33.03±0.87°C) of crossbred cattle during rainy season. Similar findings were also observed by[12] who recorded significantly (p<0.05) lower overall maximum temperature under polycarbonate roof (34.94±0.32°C) than that of corrugated cemented sheet roof (35.75±0.15 °C) in crossbred calves during rainy season.

Relative Humidity: The overall RH (%) during entire period of experiment is presented in Table 1. The overall RH (%) at 2:00 PM was significantly (p<0.05) higher for T_1 (75.72±0.77) and T_2 (75.98±0.75) in comparison to T_0 (73.28±0.82). The RH (%) at 9:00 AM was also higher inside T_1 and T_2 sheds

than that of T_0, but difference was non-significant. During rainy season, higher values of RH (%) were observed at 9:00 AM, which later decreased by 2:00 PM irrespective of control and treatment groups fortnightly (Fig. 2). The overall average RH (%) was significantly (p<0.05) higher for T_2 (79.19±0.54) and T_1 (78.99±0.55) than T_0 (77.46±0.60). Lower values of relative humidity (%) across different periods inside control shed can be correlated with higher ambient temperature inside it in comparison to sheds having false ceiling of EPE sheet and paddy straw thatch. Moreover, changes in RH (%) values from morning to afternoon could be due to rise in ambient temperature as a routine phenomenon,[9] found significantly (p<0.05) higher overall RH (%) under thatch roof (87.67±0.29) in comparison to asbestos sheet covered with canvass cloth (79.78±0.46) in crossbred calves during rainy season,[2] also recorded significantly (p<0.05) higher overall RH (%) under thatch roof (84.52±0.96) than that of asbestos roof (77.11±1.70) and GI sheet roof (75.62±1.13) in buffalo calves shed during rainy season.

Temperature Humidity Index (THI): The overall average values of THI during entire experiment are given in Table 1. The overall THI at 9:00 AM under T_0, T_1 and T_2 was 82.03±0.20, 81.62±0.18 and 81.53±0.17, respectively. Although THI value at 9:00 AM was higher for T_1 and T_2 in comparison to T_0, but difference was non-significant. The overall THI at 2:00 PM and overall average THI was significantly (p<0.05) lower in T_1 (85.84±0.16 and 83.73±0.20) and T_2 (85.69±0.16 and 83.61±0.20) than T_0 (87.32±0.20 and 84.67±0.24). Irrespective of different sheds, THI recorded at 9:00 AM was significantly lower than that of at 2:00 PM across all fortnights of rainy season (Fig. 3), which can be correlated to ambient temperature variation from morning to afternoon. Since, higher THI values insides different experimental sheds indicated towards stressful condition throughout the rainy season. Nevertheless, lower values of THI under modified roof fitted with false ceiling of EPE sheet and paddy straw thatch in comparison to

control shed indicated comparatively comfortable microclimate. The present findings are comparable with work done by[2,8,10,12&18] who reported higher THI in asbestos roof shed in comparison to thatch over asbestos sheet, thatch, agro-net and polycarbonate sheet roofing shed during rainy season.

Table 1. Effect of false ceiling on microclimate of shed during rainy season

Microclimate variables		Asbestos sheet shed (T$_0$)	EPE sheet false ceiling shed (T$_1$)	Thatch false ceiling shed (T$_2$)
Ambient Temperature (°C)	Minimum	25.70±0.17^A	25.71±0.16^A	25.63±0.16^A
	Maximum	35.12±0.21^{aB}	33.67±0.17^{bB}	33.50±0.16^{bB}
	Average	30.40±0.37^a	29.70±0.32^b	29.56±0.31^b
RH (%)	**9:00 AM**	**81.63±0.62^A**	**82.26±0.61^A**	**82.40±0.61^A**
	2:00 PM	73.28±0.82^{aB}	75.72±0.77^{bB}	75.98±0.75^{bB}
	Average	77.46±0.60^a	78.99±0.55^b	79.19±0.54^b
THI	**9:00 AM**	**82.03±0.20^A**	**81.62±0.18^A**	**81.53±0.17^A**
	2:00 PM	87.32±0.20^{aB}	85.84±0.16^{bB}	85.69±0.16^{bB}
	Average	84.67±0.24^a	83.73±0.20^b	83.61±0.20^b

Means bearing different superscript (a, b) differ significantly ($p<0.05$) within a row and (A, B) between 9:00 AM and 2:00 PM of IST differ significantly ($p<0.05$) within the treatments.

CONCLUSION

From the present study, it could be concluded that use of false ceiling material under asbestos roof helps in blocking emitted radiations underneath and thus helps in creating relatively comfortable microclimate during rainy season in comparison to asbestos roof shed. Being economical and easily available in rural areas, use of paddy straw as false ceiling under asbestos and metal sheet roofs can help in heat stress amelioration in dairy animals. Besides heat stress mitigation, utilization of paddy straw as false ceiling may help in reducing air pollution arises out of paddy straw stubbles burning in the agricultural fields.

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A study on bottlenecks in adoption of broiler farming in south – western Punjab

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ABSTRACT

A survey work was designed to study the present management status, impact of farm sizes on adoptability of various recommended practices and major bottlenecks faced by broiler farmers in adoption of broiler farms in Mansa and Sangrur districts of Punjab. To undertake this survey work, total 70 broiler farmers were selected for the collection of data. Analysis of data revealed that 60.00% farmers expressed their views regarding the high cost and poor quality of inputs including costs of day-old-chicks, constructional material, feed, medicines and equipments. Out of 70 farmers, 82.85% farmers also complained about non-availability of loan including rigid procedure for supply of loans and 24.28% farmers also complained about high cost of electricity. Overall 48.60% farmers faced the problem of oligopsony marketing structure for purchase of quality-day-old chicks, feed and sale of broilers including high cost of transportation whereas total 72.85% farmers also showed about their lack of knowledge of scientific broiler farming including construction of shed, winter and summer management, feeding and watering. Overall 64.28% farmers faced the problem regarding incidence of diseases including lack of diseases investigation and monitoring facilities whereas 45.71% farmers criticized the non-remunerative prices of broilers. Total 27.14% farmers showed the problem of non-availability and higher costs of labours whereas overall 68.57% farmers were united with various private companies for contract farming.

Key words: Adoption, Bottleneck, Broiler farming, Feeding, Management, Production.

At present, income from agriculture farming alone is hardly efficient to maintain the livelihood of farmers and their families. Moreover, the agricultural production has reached its plateau and there is not much scope of further improvement unless we increase the soil fertility and water resources that are costly inputs. The results of existed animal science enterprise with crop production confirmed that mixed farming system increase productivity and enhance the per capita income and provide employment throughout the year. India has made considerable progress in broiler production in the last three decades. In spite of a spectacular growth in the poultry sector during the past two decades, a huge gap exists between availability and requirement of poultry products. An increase in

per capita consumption by one egg and 50 grams of poultry meat can create employment for about 26,000 persons per year[3]. The present per capita availability of poultry meat is 1.8 kg against the requirement of 11 kg, as per the National Committee on Human Nutrition in India[7]. Therefore, to meet the domestic requirement, there is a need of about six times increase in meat production. Thus, the growth potential of this sector is bright due to regular flow of income throughout the year in the rural economy of the Punjab state. The Indian state of Punjab produced over 112 thousand metric tons of poultry meat in fiscal year 2017. This was a phenomenal increase from 42 thousand metric tons in fiscal year 2008, despite a dip in fiscal year 2013. Today India is the fifth largest producer of broiler meat in the world. Despite this achievement the annual per capita consumption in India is only 1600 grams of poultry meat as against the world average of 5.9 kg of meat. Therefore, we can say poultry farming has

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immense potential to address the burning problems like unemployment, nutritional security and socio-economic upliftment of the people.

However, setting up of these enterprises and securing loans for them is not a planned option. The prospective borrowers set up these enterprises as a means of their livelihood, as they do not have the required background or training. Even, the graduated youths, rural and/or semi urban dwellers who area earning less than Rs. 20,000 per month do not possess the adequate knowledge of preparing a viable plan/project for these enterprises. Yet, bankers extend financial assistance to these untrained persons under compulsion, so as to meet the financial targets. The entire process, though not very scientific, has come to stay as proposals carry some short comings, which include: higher investment in fixed assets, a little or no training, higher borrowings and non-profitability of enterprises.

These lacunae lead to high rate of failures. In view of these facts and providing avenues for self employment and income generation, there is urgent need to sensitize the farmers/farm women, educated youths, rural and/or semi-urban dwellers to establish scientific broiler farming units as a subsidiary occupation amongst the animal science enterprises. In Punjab, broiler farming has emerged as the fastest growing segment of agriculture registering a phenomenal growth in production.

Few people have conducted the survey work for the study of bottlenecks of broiler farming in Punjab. Accordingly, the identification/recognition of non-adoption of recommended technologies is essential to formulate adequate measures to circumvent the crisis befalling the broiler industry. Therefore, the present survey work has been designed to study the present management status in adoption of scientific methods of broiler farming in Punjab.

MATERIALS AND METHODS

The study was conducted in all blocks of two districts, viz. Mansa and Sangrur of the state of Punjab because the authors are working in the Krishi Vigyan Kendra of these two districts and have

conducted regular trainings on poultry farming. Out of each block, a cluster of villages were selected where broiler farming was highly concentrated. In each block, 05 broiler farmers were selected at random who are doing poultry farming from last at least one year. Thus, a total of 70 (14 from Mansa and 39 from Sangrur) farms were selected from the two clusters and from each of the selected farm; the required data have been collected by canvassing a pre-designed and pre-tested schedule. The data collection commenced from the beginning of the December, 2015 and was carried through the end of August, 2018. The frequencies of each response/bottleneck were worked out and expressed in percentage. These farmers are doing broiler farming on small scale i.e. upto 5000 broilers per batch.

Identification, Description and Analysis of Existing Broiler Farming Systems

The farmers purchased their day old chicks from Gurugram, Jind, Jalandhar, Hisar etc. @ approximately Rs. 22-28/ chick. They purchased the feed for broilers from Mansa, Rajpura, Khanna, Dhuri, Lehragagga, Patiala, Jind, Bathinda, Hisar, Dabwali @ approximately Rs. 2700-2800/ quintal for starters and @ approximately Rs. 2500-2600/ quintal for finishers.

A gap was observed in adoption of recommended practices regarding poor quality of day old chicks, balance feeding, deworming, and health care. The farmers also have lack of accurate knowledge to prepare domestic ration and they do not prepare their own domestic feed. Farmers are also facing the difficulty in timely detection of diseases due to lack of knowledge and diseases diagnostic laboratories. Major reasons for low productivity are poor genetic potential of chicks, higher feed conversion ratio, poor management due to lack of knowledge of recommended broiler management practices and birds are infected by numbers of diseases due to harsh climatic conditions.

General Existed Management Practices Adopted by Various Categories of Broiler Farmers

Adoption of technology is the last item of extension approach. If the individual changes his

behaviour, acquire sufficient knowledge and not adopt the technology, it will be a great loss to the extension system. Attempt was also made in the study to assess the adoption level of respondents towards scientific poultry farming. Information in this regard were analyzed and presented in the following table. Overall fifty percent farmers acquired broiler entrepreneurial development training programme before or after starting the broiler farms whereas 17.15% farmers have taken loan from various financial institutions for establishment of broiler farms. The orientation of broiler sheds should be in the direction from East to West length-wise and about 70.00%, broiler farmers established correctly according to their directions.

Table 1. Adoption level of respondents towards scientific poultry farming

Sl. No.	Statements	Frequency	% age
1.	Supplementary feeding	25	35.71
2.	The orientation of broiler sheds	49	70.00
3.	Proper care of disease attack	32	45.71
4.	Maintain prestarter-starter-finisher doses	58	82.86
5.	Feeders and waterers provide	09	12.86
6.	Litter materials provide	36	51.43
7.	Vaccination	33	47.14
8.	Harvesting at proper stage	43	61.42

It is observed from the Table 1 that more than half of the poultry growers maintain the prestarter-starter and finisher dose for better production followed by harvesting at proper stage i. e within 45 days. They provide required amount of litter material and change it time to time for better results. They are also aware about the disease control and vaccination. As per the recommendations, height of roofs of broiler house should be minimum 10 feet whereas height of side walls of house should not be more than 2 feet and rest of the space should be covered with wire netting which offers less resistance to air movement. The farmers do not adopt these recommendations due to lack of accurate knowledge and higher initial costs. Most of the farmers know very well that sprinklers on roof help in reducing the temperature during the hot and dry weather. Fogging is an effective method for reducing the temperature in the house especially when relative humidity is low. Shade is the simplest and relatively inexpensive tool for combating heat. Only 16% farmers are adopting vaccination schedule in broilers to control diseases (Marek's at 1st day, RDV F1 at 5-7th day, IBD Vaccine at 14th day, RDV La Sota at 21st day and IBD Vaccine-Booster at 28th day of age). Most of the farmers are adopting the proper floor space/bird, feeder space/bird and waterer space/bird as per the recommendations (450 cm^2, 3 cm and 1.5 cm up to the age of 18 days and 1000 cm^2, 6-7 cm and 3 cm, respectively at the age from 19 days to 42 days). The broilers farmers don't know about the maximum levels of certain ingredients in a safe water supply for broilers (total dissolved solids =1000 ppm, total alkalinity=400 ppm, pH=8.0, Nitrates=45 ppm, Sulphates=250 ppm, Sodium Chloride-growers=500 ppm). They used fresh water but don't aware about water temperature and feed consumption (water temperature should be 65°F to 70°F and generally at 70°F chickens will consume two litter of water for one kg of feed consumed). Most of the farmers united with private companies through contract farming and having lack of accurate knowledge about proper ventilation, litter management, light management, feed management and water management.

Table 2. Bottlenecks encountered by the broiler farmers in adoption of recommended technologies (in percent)

Sr. No.	Bottlenecks	Existing situation (%)	Number of broiler farms
1.	High cost and poor quality of inputs including costs of day old chicks, constructional material, feed, medicines, equipments, etc.	60.00	42
2.	Non-availability of loan including rigid procedure for supply of loans	82.85	58
3.	High cost of electricity	24.28	17
4.	Marketing structure for procurement of quality-day-old chicks, feed and sale of broilers including high cost of transportation	48.57	34
5.	Adoption of scientific method for feeding, methods for management round the year	72.85	51
6.	Incidence of diseases including lack of diseases investigation and monitoring facilities	64.28	45
7.	Non-remunerative prices of broilers	45.71	32
8.	Lack of availability and higher costs of labours	27.14	18
9.	Contract farming	68.57	48

RESULTS AND DISCUSSION

An in-depth analysis of practices followed under feeding aspect revealed that all the respondents purchased unanalyzed rations. Use of minerals, vitamins, antibiotics, pro-biotics, enzymes etc. for broiler feeding on regular basis was not common practice. The data presented in Table 2 show that overall 60.00% farmers expressed their views regarding the high cost and poor quality of inputs including costs of quality day old chicks, constructional material, feed, medicines and equipments. Total 82.85% farmers also complained about non-availability of loan including rigid procedure for supply of loans. Total 24.28% farmers also complained about high cost of electricity. Total 48.57% farmers faced the problem of oligopsony marketing structure for purchase of quality day old chicks, feed and sale of broilers including high cost of transportation whereas total 72.85% farmers also showed about their lack of knowledge of scientific broiler farming including construction of shed, winter and summer management, feeding and watering. Total 45.71% farmers criticized the non-remunerative prices of broilers, 27.14% farmers faced the problem of non-availability and higher costs of labours whereas 64.28% farmers also faced the problem regarding incidence of diseases including lack of diseases investigation and monitoring facilities at proper time. Overall 68.57% farmers were united with various private companies for contract farming. Similar finding was observed by[1&4].

On the basis of findings it could be concluded that the respondents scored highest in response to lack of accurate knowledge of different recommended management practices, feeding and health aspect. Similar results were also reported by[2,3&5] who observed that maximum bottlenecks were found in management, feeding and health care practices.

CONCLUSION

There was difference in adoption levels between different categories of respondents with regard to procurement of day old chicks, feeding and management practices of broiler rearing. The finding of the study revealed that non-availability of quality day old chicks, high cost of ration, rigid procedure for supply of loans, high cost and poor quality of construction materials, oligopsony marketing structure, incidence of diseases, lack of knowledge of scientific housing/feeding/lighting including temperature maintenance were the main bottlenecks expressed by broiler farmers. To increase the adoption of broiler technologies, emphasis should be given to overcome all these bottlenecks.

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Management interventions in indigenous bull to reduce age at first semen donation

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ABSTRACT

To achieve lifetime more semen productivity, one of the critical aim of breeding centers is to make sexual maturity at early age in bulls. Therefore, a study was planned one group as control (n=5: applied only bull nose ring, handling by Nath (halter), two hour exercise once in a week, different bull handler and semen collection at 08.30 AM) and another group as treatment (n=5: applied halter along with bull nose ring, handling by the halter, managed by same worker, two-hour exercise daily, semen collection at 06.30 AM) to reduce the age at first semen donation through management inputs. Sexual behavior and semen quality data of the two groups were analyzed by T-test. All the bulls (100%) in the treatment group started donating semen by on an average 21.3 months, whereas only 60% bulls in control group donated semen on an average 34.6 months. The results revealed that in the treatment group, the sexual behaviour improved significantly (p<0.01). The semen quality of the bulls of the control group was significantly (p<0.05) better as the compared treatment group. It can be concluded that managemental intervention helps in the reduction of the average age of first semen donation and better expression of sexual behavior.

Key words: Age at first semen donation, Exercise, Management input, Sahiwal bull, Sexual behaviour

Sahiwal is one of the finest and popular milch breeds of India due to its productivity, adaptability, disease resistance, heat tolerance and survivability on poor feed and fodder resources. The breed is gaining popularity in different parts of the country, along with increasing demand for frozen semen of superior genetic merit pure Sahiwal bulls for artificial insemination. Most of the time, literature cited sluggishness and shyness in the reproductive behaviour of indigenous bull[1]. To achieve the optimum target of frozen semen production with better fertility, semen production from a young age is desirable. Management of males from an early age in scientific line and exposure of bulls

at the right time of training for semen collection is very important to maintain good libido and semen production, as it is a learning process, which may be necessary for young bulls before they achieve competence and confidence in their mating ability[2]. Therefore, scientific management and adequate exercise can play an essential role in maintaining good libido, thriftiness and production. Handling of bulls with caring touch and control by skilled and affectionate labour always improves the welfare issues of the bulls and their subsequent production performance. Semen collection in stress-free area, specially during early morning hours along with less human disturbance, further improves the semen production performance of the indigenous bulls. Regular exercise of bulls starting from a young age helps to maintain better vigour of the bull and prevent obesity, lameness and excess growth of feet. Regular exercise is good for health and it is well known irrespective of breed and species; therefore, regular exercise is an essential

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requisite for the management of breeding males. Regular proper exercise helps to maintain healthy neuromusculoskeletal and hooves system, which is essential for mounting and mating to maintain better libido.

Analysis of more than sixteen years data maintained at Artificial Breeding Research Centre of National Dairy Research Institute, Karnal, Haryana, revealed that one of the major reasons of disposal of Sahiwal breeding bulls is poor libido (23%) and average age at first semen donation of Sahiwal bulls was as late as 32 months[3]. There is an urgent need to be addressed to maximize the production of quality germplasm from superior bulls through developing a package of management practices for young bulls. Therefore, the present investigation was undertaken to establish selected management interventions to improve semen productivity in young Sahiwal bulls.

MATERIALS AND METHODS

A total of 10 young Sahiwal breeding bulls maintained at Artificial Breeding Research Centre, ICAR-NDRI, Karnal were selected randomly from the herd and divided into two groups to develop management interventions to improve libido in young Sahiwal bulls. Experimental bulls were housed individually in bullpen (30'×10'). The pens were separated by a wall partition wall that restricted the physical and visual contact of bulls in adjacent pens. Concentrate ration with 21 percent CP and 70 percent TDN was provided to the bulls to the tune of 2.0 to 2.5 kg per bull. Seasonal green fodder (Berseem, Maize and Jowar) and wheat bhusa were supplied throughout the experimental period. Water was available ad lib throughout the day. Vaccination, deworming and other herd-health programme was followed as per the farm schedule, to ensure good health. The experiment was conducted as per the guidelines laid by the Institutional Animal Ethics Committee (IAEC), ICAR-NDRI, Karnal.

In one group five young bulls (average age 27.7 months) were maintained according to existing management practices of farm [application of nose rope /halter, as this type of nylon rope in nostril make the animal handling easy and to tame the ferocious bull by only one person, but this is always a discomfort to the animals, weekly two-hour exercise at morning once a day up to five months, semen collection at 8.00 to 9.00 A.M.], where as in treatment group five young bulls (average age 14.3 months) had given different treatment [application of halter for controlling (this method is used to control the bulls during semen collection. After semen collection only bull nose rings remain and create much less discomfort during the whole day), daily two-hour exercise in long-range at morning up to five months regularly and semen collection at 6.00 to 7.00 A.M.]. In the control group, bulls were introduced at 18 months of age for the training of semen collection under existing management conditions. The bulls in the treatment group were managed, trained and exercised during the entire period of the experiment by the same worker. During the exercise of the young bulls, one person was present to observe that they should not develop homosexuality. Semen was collected once a week two ejaculates from the bulls using sterilized bovine artificial vagina (IMV Model-005417) maintained at 42-45°C, over a male dummy bull. Different dummy bulls were used on different days to minimize sexual refractoriness of the bull exposed to same dummy, to provide uniform stimulus ,and randomize dummy effects. Each bull was assigned to be handled by two experienced handlers who were familiar with the bulls. Bulls were led to a restrained dummy and freely permitted to mount and service an artificial vagina. On the day of semen collection, each bull was taken to the collection yard where two bulls were kept as the dummy. Each animal was sexually stimulated and prepared by 10-minute restraint and two false mounts before semen collection. After collection of the first ejaculate at least 30 minutes, rest was given before the same procedure was initiated to obtain second semen ejaculates from the donor bulls. Sexual behaviour like sexual aggressiveness (SA), reaction time (RT), dismounting time (DT), total time taken in mounts (TTTM), penile erection score (PES), penile protrusion score (PPS), ejaculatory thrust score (ETS), mating ability score (MAS) and sexual behavior score (SBS) were noted at the time of semen collection by using CCTV camera video recording and sexual behaviour scoring was adopted by[4] with some modifications.

Soon after the semen collection, each ejaculate was placed in a water bath at 30°C.

Quality of the semen was assessed for ejaculate volume and microscopic tests such as mass activity (MA), individual progressive motility (IPM), sperm concentration (improved Neubauer's chamber method), non-eosinophilic spermatozoa count (NESC), acrosomal integrity (AI), sperm abnormalities, using DIC phase-contrast microscope (Nikon Eclipse E600, Tokyo, Japan) with Tokoi heat thermal stage. The percentage of membrane intact spermatozoa was evaluated using hypo-osmotic swelling test method. The intact membrane sperms had coiled tail, whereas damaged membrane sperms had a straight tail. A total of 200 sperms per smear were counted using a tally counter to assess live, acrosome intact and membrane intact spermatozoa. The pH of fresh semen was determined immediately after collection with Cyberscan 510 pH meter (Eutech Instrument, Singapore).

Statistical Analysis

T-test was performed to compare sexual behaviour and semen quality (n=88 ejaculates) with respect to management intervention using Sigma Plot 11 software package (Systat Software Inc., San Jose, CA, USA). Prior to the analysis proportionality data (initial progressive motility, non-eosinophilic spermatozoa count, HOST, acrosomal integrity, abnormality, libido score, mating ability score, sexual behaviour score) were transformed using the arcsine transformation [asin(sqrt(value/100))*180/PI] with adjustment to allow for zero values[5].

RESULTS AND DISCUSSION

Effect of Selected Management Intervention on Sexual Behaviour

The least-squares means of overall sexual behaviour of young Sahiwal bulls and sexual behaviour after selected management interventions are presented in Table 1. The young bulls in the treatment group showed better sexual behaviour performance as compared to control group. The treatment group showed significantly (p<0.05) higher values SA, PES, PPS, LS, MAS and SBS than the control group, which indicated the positive effect of treatment. Remaining sexual behavioural traits (RT, TTTM, ETS) were not found to be significant. However, RT and DT of treatment group were lower than the control group.

Table 1. Means (±S.E.) of sexual behaviour parameters of young Sahiwal bulls with selected management interventions

Group	N	SA	RT	DT	TTTM	PES	PPS	ETS	LS	MAS	SBS
Control	33	3.11[A] ±0.09	214.79 ±57.53	4.21[A]± 0.26	219.0 ±57.51	1.69[A] ±0.16	1.05[a] ±0.12	1.37 ±0.17	38.46[A] ±2.84	49.00[A] ±5.50	43.73[A] ±3.96
Treatment	55	3.84[B] ±0.00	133.11 ±18.99	2.76[B]± 0.11	135.87 ±19.00	2.70[B] ±0.07	1.47[b] ±0.06	1.75 ±0.14	54.43[B] ±1.86	75.78[B] ±2.84	65.10[B] ±1.95
Over all	88	3.52 ±0.05	157.18 ±21.73	3.19± 0.12	160.37 ±21.74	2.26 ±0.09	1.28 ±0.68	1.58 ±0.11	47.41 ±1.74	64.02 ±3.08	55.72 ±2.22

N= No. of observations, SA= Sexual Aggressiveness, RT= Reaction Time, DT= Dismounting Time, TTTM= Total time taken in mount, PES= Penile Erection Score, PPS= Penile protrusion Score, ETS= Ejaculatory Thrust Score, LS= Libido Score, MAS= Mating Ability Score, SBS= Sexual Behaviour Score, Means bearing different superscripts within same column differ significantly ([ab]p<0.05, [AB]p<0.01)

The present findings were in accordance with an earlier report of various researchers for sexual aggressiveness[6], reaction time[7], dismounting time and penile erection score[6] penile protrusion score in Sahiwal breeding bulls[8]. However, lower sexual aggressiveness, dismounting time and total time taken in mount and reaction time were reported compared to present findings[6,9&10]. Whereas[11] reported comparatively higher penile protrusion score and ejaculatory thrust score in Sahiwal bulls and libido score and mating ability score in crossbred bulls.

Similar to our observations[19] reported improvement in reaction time after exercise intervention, whereas,

on the contrary[10] reported that there was an increase in reaction time in animals which are given exercise on the same day before semen collection while[19] reported that exercise had no effect on temperament (sexual aggressiveness). Lower DT indicated that bulls quickly dismounted after ejaculation in the treatment group after giving a very good thrust at ejaculation as they are sufficiently sexually stimulated. The results regarding PES, PPS, ETS, MAS and SBS are in consonance with the findings of[10] who reported that exercise had a beneficial effect on penile erection and PPS of bulls. Similar to our result, that exercise had a beneficial impact in libido[10]. The higher sexual aggressiveness, penile erection score, penile protrusion score, libido score, mating ability score, sexual behavior score and lower reaction time as well total time taken in mounts of bulls in the treatment group may be due to higher vigor, vitality and sexual eagerness of younger bulls. Regular exercise prevents excess growth of hooves and maintains a healthy neuro-muscular-skeletal-hoof system and results in better vigor of the young bulls. Bulls in the treatment group have enjoyed the regular exercise in a kaccha long-range under tree sheds and were more active than segregating them the whole day in a cubicle having concrete floor resulted in improvement of libido. On the other side, bulls of treatment group were not in any stress during handling in semen collection area or any other time as halter applied, but bulls of the control group, which were in stress during handling at the time of semen collection may be due to handling by nose rope (halter) at any point of time, as the halter normally passes through

the nasal septum, which is one of the sensitive part of the body and while handling, stretching and rubbing of rope on nasal septum leads of pain and stress to the bulls and bull become frightened to show sexual behaviour optimally. We cannot overlook the fact that semen collection during the early morning provided the desirable environment to come up with better sexual behaviour and semen production performance. Normally there are fewer disturbances during semen collection in the early morning due to the presence of only those persons involved in semen collection as well as no noise of tractor trolley, no phone calls and no talking with persons not involved in semen collection. Generally, bulls are more active during the early morning. In the control group, lesser expression of sexual performance was may be due to less exercise, application of halter, different bull handler and semen collection time.

Effect of Selected Management Intervention on Semen Quality

The least-squares means of overall semen quality of young Sahiwal bulls and semen quality after selected management intervention are presented in Tables 2 and 3. The quality of semen in the treatment group is within the acceptable range of semen quality, but values are lower as compared to the control group. The treatment group showed significantly ($p<0.05$) lower value of IPM, NES, MA, SCON, MSOPE, LSOPE and higher values of total morphological abnormality, head abnormality, mid-piece abnormality, tail abnormality. Remaining semen quality parameters (ejaculate volume, pH, HOST, acrosomal integrity) were non-significant ($p<0.05$).

Table: 2 Means (±S.E.) of semen quality parameters of young Sahiwal bulls with selected management interventions

Group	N	E. volume (ml)	MA (0-5 scale)	IPM (%)	pH	NESC (%)	SCON (10^6/ml)	MSOPE (10^6)	LSOPE (10^6)
Control	33	3.62 ±0.30	3.36[a] ±0.16	79.24[A] ±2.01	6.84± 0.05	89.56[A] ±1.11	1242.27[a] ± 70.38	3757.06[a] ± 409.33	4164.02[a] ± 438.26
Treatment	55	3.43 ±0.22	2.79[b] ±0.10	68.82[B] ±2.06	6.89 ±0.03	81.30[B] ±1.15	1062.91[b] ± 46.93	2793.46[b] ± 274.64	3136.39[b] ± 277.36
Over all	88	3.50 ±0.18	3.00 ±0.09	72.73 ±1.58	6.87 ±0.03	84.40 ±0.93	1130.17 ± 40.30	3154.81 ± 234.25	3521.75 ± 243.27

N= No. of ejaculates, MA= Mass Activity, E. Volume= Ejaculate Volume, IPM= Initial progressive motility, NESC= Non-Eosinophilic Spermatozoa Count, SCON= Sperm Concentration, MSOPE= Motile Sperm Output Per Ejaculate, LSOPE= Live Sperm Output per ejaculate means bearing different superscripts within the same column differ significantly ([ab]$p<0.05$, [AB]$p<0.01$)

Table. 3 Least squares means (±S.E.) of semen quality of young Sahiwal bulls with selected management interventions

Group	N	Sperm morphological abnormalities				HOST (%)	Acrosomal integrity (%)
		Head	Mid-piece	Tail	Total		
Control	33	1.24a±0.09	0.64a±0.16	3.94a±0.21	5.82a±0.36	66.94±2.16	91.90±0.90
Treatment	55	1.64b±0.00	0.98b±0.10	4.64b±0.21	7.27b±0.29	63.78±1.32	90.66±0.74
Overall mean	88	1.49±0.07	0.85±0.08	4.38±0.15	6.73±0.24	64.97±1.16	91.13±0.57

N= No. of ejaculates, HOST= Hypo Osmotic Swelling Test, Means bearing different superscripts within same column differ significantly($^{ab}p<0.05$, $^{AB}p<0.01$)

The present findings in case of ejaculate volume, mass activity, initial progressive motility, NESC, SCON and total abnormality and HOST were in conformity with the reports of previous studies of breeding bulls[12&16]. However comparatively lower values in case of ejaculate volume, mass activity and NESC[9], SCON[13&14], acrosomal integrity[15&16] and higher values in case of ejaculate volume[13,14&16], SCON[12&17], total abnormality[16], HOST[16] in Sahiwal bulls.

The variation of semen quality and sexual behaviour among results of different studies may be due to differences in body weight and age of breeding bulls at the time of the study, geographical location, the genetic makeup of the bull, individual variations, reproductive health status of bulls, experimental plan, the technical skill of the evaluator, management practices, frequency of semen collection and season of study[18].

The better semen qualities of a higher age group of bulls (Control) are in a similar line with the reports available in Sahiwal bulls [13&20]. Similar to our study[21] reported that semen volume, sperm concentration, motility and total motile sperm generally improved significantly (p<0.01) with the age of young bulls. On the other side, [22] reported that the age of bull had a non-significant effect on ejaculate volume and sperm motility at a younger age. In general, the age of the bull at semen collection not only affects the semen quality but also tended to increase with the age of the bull up to 4 to 5 years of age[13]. The higher mass activity in the higher age group of young bulls was probably due to higher sperm concentration and low abnormalities[23]. Similarly, [15&24] reported that ejaculate volume and sperm concentration increased (p<0.05) in mature bulls compared to younger ones may be due to higher scrotal circumference and testicle size of mature bulls, which increases until at least 5 years after puberty[25]. The values of abnormalities in control, as well as treatment group, are within the acceptable range of abnormal sperm. The time from puberty to sexual maturity is variable and various abnormalities are evident during early age of life with a decrease over time with increasing of age. On the other side, older bulls are already sexually matured; their semen production probably was more stabilized than the semen production of growing bulls. The variation in results regarding semen quality with respect to age may be due to calf hood nutrition, which is one of the main factors affect the sertoli cell as well the number of spermatogonia in bull testis, which represent testicle size, sperm-producing ability and semen quality as physiological changes that occur as bulls grow to sexual maturity and it cannot be compared without proper information about the bull management and testicular size.

Semen Donation

The results on the average age at first semen donation and percentage of bull donated semen are presented in Fig. 1. It is interesting to observe that in the treatment group, 100 percent bulls donated semen; whereas, in the control group, only 60 percent bulls donated semen. The average age of first semen donation in the treatment group was 21.3 months, which was 13 months lower as compared to the control group (34.6 months).
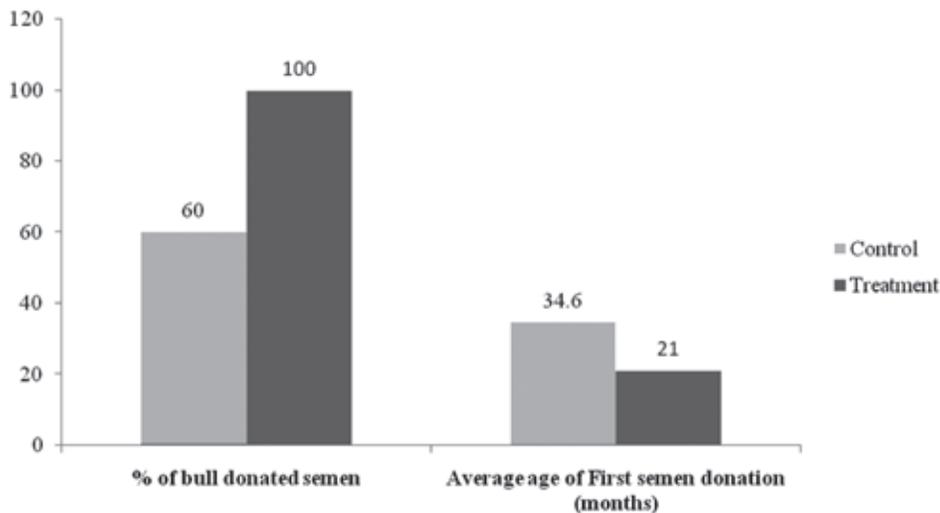
Fig. 1. Percentage of bulls donated semen and the average age of first semen donation of young Sahiwal bulls

In a long term study carried out at Artificial Breeding Research Centre based on 16 years, data[3] reported that average age of first semen donation in Sahiwal bulls was around 32 months, which is similar with our finding regarding control group and if we compare, then treatment group started donating semen 11 months earlier. The early age at first semen donation in Sahiwal bulls depicting the beneficial role of various management interventions like individual care, exercise, timely introduction for the training of young bulls and less exposure to stress conditions during handling. The handler of the bulls should not be changed; which may also impact on the donation of semen, as in our experiment the same handler maintained the bulls from a young age, as bonding between animal and handler may also help the animal in better performance and become stress-free. The young bulls should be managed for grooming, feeding, watering, training and handling during semen collection by the same handlers. On the other side, early age at first semen donation of young bulls may be associated with the introduction of young bulls for training around puberty. It has also been observed that the bulls are not starting semen donation at an appropriate age, either they are not donating semen or coming in semen production at a later stage of productive life.

CONCLUSION

It is concluded that selected managemental interventions like the application of halter for controlling, daily two-hour exercise in long-range at morning regularly till entering in training for semen collection, early morning semen collection and management of young bulls starting from initial age by same bull handler resulted in semen donation of 100% bulls with early age at first semen donation (21.3 months). The importance of the finding of the present investigation lies on the futuristic economic benefit due to less cost involvement in management of the young bulls as well as an increase in the lifetime productivity of the bulls. Therefore, more number of semen doses can be harvested from the bulls started giving quality semen. The managemental interventions helped in the overall improvement of the sexual behavior of young bulls to maintain better libido by keeping the healthy neuro-muscular-skeletal-hoof system and become active. This is quite obvious that the semen quality improves typically with the increase in age of the bulls and indeed observed in our findings also.

CONFLICT OF INTEREST

None of the authors have any conflict of interest.

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