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Study on Modified Housing Management Practices on Physiological and Psychological Responses of Buffaloes in Hot Humid Climate of Bundelkhand

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Abstract

The present study was carried out to investigate the effect of modified housing on physiological and psychological responses of 16 lactating buffaloes during hot humid climate of Bundelkhand, India. Various parameters viz. feeding, drinking, rumination, lying and standing time, temperature, respiration rate and pulse rate were recorded. It is observed that animals resting period, water intake capacity, feeding time and rumination were significantly higher in modified housing (G2) as compared to existing loose shed (G1). Respiration and pulse rate were significantly lower in G2 as compared to G1. It was concluded that the buffaloes kept in modified house were more comfortable and had improved physiological reactions and psychological responses during hot-humid season as compared to buffaloes housed in other shed.

Key words**: **Psychological and physiological response, buffaloes, Lying time, modifications.

Introduction

Housing is one of the important factors that affect the production, reproduction performance and behavioral expression of buffaloes. Slight modification in housing will protect the animal from stress of heat during adverse climatic condition. Heat stress lowers dry matter intake, rapid respiration rate, high skin and rectal temperature, and their behaviour of livestock. The performance of the animals is impaired when they are exposed to extremes of climatic conditions. Environmental conditions especially housing managemental practices also affect the behaviour (feeding, rumination rate, resting etc.) of dairy animals in a varying range, which could be used to study the effectiveness of housing system in a particular agro-climatic region. Change in shelter significantly improves the animal activity and reduces the temperature and respiration rate within the physiological limit[7]. Environmental factors particularly housing system may be modified for the improvement of animal production and reproduction. Loose housing system gives optimum space and *ad lib.* feeds and fodder to the animals. Dairy animals changed their behavioural and physiological responses when they are exposed to discomforting of their lying surface.

So, there is a need to develop different types of suitable housing systems for various agro-climatic regions of the country. Keeping in view these facts the present study was carried out to study and observe the effect of modified shelter managemental interventions on production and reproduction performance of buffaloes in Chhatarpur district of Bundelkhand region.

Materials and Methods

The present investigation was conducted on Lactating healthy buffaloes (16) were randomly distributed in two experimental groups of 8 each on the basis of more or less the similarity in parity and stage of lactation. The study was

conducted at Nowgong, Chhatarpur district under JNKVV- Krishi Vigyan Kendra for a period of three months (July to September 2022) during hot humid climate. In group 1, animals were tie with rope under the tree shades and in group 2, animals were housed under modified shed under loose housing system, which consist of covered floor area made up of brick paved and kuchha open floor area, elevated feeding manger and asbestos roof at a height of 12 feet and width to 20 feet. It consisted of feeding manger and sand bedding in open paddock to alleviate the heat stress. Animals in these systems of housing were provided *ad lib.* green fodder sorghum as per availability in the season and concentrate mixture (65% TDN and 18% CP) as per NRC requirement. Behavioural observation was recorded manually. The maximum and minimum temperature recorded by using dry and wet bulb thermometer and data on microclimatic variables were recorded. The observations recorded in present experiment were time taken for fodder eating, standing rumination, lying rumination. Physiological parameters such as rectal temperature, respiration rate and pulse rate were recorded at weekly interval as per standard protocol. *Statistical analysis:* The data recorded were analysed by One Way Analysis of Variance (ANOVA) and means between groups were compared using Duncan's multiple range test.

Results and Discussion

Microclimatic variable: The mean maximum temperature was significantly ($P<0.05$) lower in shed (group 2) as compared to loose shed (group 1). The maximum temperature was reduced to the extent of around 3ºC in the group[1,6]. Use of sprinkler and cooling jacket in combination with force ventilation helped to ameliorate the thermal stress in murrah buffalo under loose housing system during hot humid season[11,12].

Table 1 Temperature and thermal humidity index

Parameter	(G1) Shed	(G2) Shed
Maximum Temperature	42.03a ± 0.82	39.72b ± 0.73
Minimum Temperature	31.78 ± 1.21	28.52 ± 1.19
Thermal heat Index	81.65a ± 1.10	77.12b ± 1.01

a, b mean with different superscripts in a row differ significantly ($P<0.05$).

Low temperature in hot humid climate in the present findings may be due to increased height and width of the roof as well as cooling system by using fans. Improper air ventilation and housing system reduce milk production up to 25% in summer in dairy animals[2]. The mean THI value was significantly lower ($P<0.01$) in group 2 as compared to group 1 (Table 1). The average THI values in present findings were higher than normal (THI=72) value in both types of sheds. The THI values in dairy classified as mild stress (THI=72 to 79), moderate stress (THI=80 to 89) and severe stress (THI=90 to 99), respectively[9]. Hence the overall mean THI value obtained in modified shed were under mild stress[4,5,11]. This might be due to lower relative humidity by using forced ventilation, resulting into better replacement of humid air by fresh air.

Feeding and rumination behaviour: Time spent on feeding and total rumination were significantly ($P<0.01$) higher in group 2 as compared to group 1, which reflects the feeding behaviour (Table 2). Animals on sand bedding, spent more time on feeding,

rumination and lying compared to concrete floor, supported to present finding[8]. Change in housing and bedding material such as sand give more comfort for resting and rumination of dairy animals.

Table 2 Feeding behaviour

Behavioural parameter	Existing shed (G1) Mean ± SE	Modified shed (G2) Mean ± SE
Eating time (min/day)	323.58a ± 4.31	339.57b ± 3.70
Sitting rumination (min/day)	299.35a ± 5.37	342.43b ± 5.57
Standing rumination (min/day)	99.51a ± 3.30	82.32b ± 3.31

Lying and standing behaviour: Buffaloes spent significantly (P<0.01) higher lying time in group 2 as compared to group 1, whereas standing time was significantly (P<0.01) lower in group 2 (Table 3). The proportion of mean daily lying time was higher in group 2 as compared to group 1. It can be observed that housing modification provides the most comfortable environment. Increased lying time in cows provided with sand bedding material, which increase comfort due to evaporative cooling and softness[8]. Increase in ambient temperature beyond the limit can be evident from increase in standing time[10].

Table 3 Lying and standing behaviour

Behavioural parameter	**Existing shed (G1) Mean ± SE**	**Modified shed (G2) Mean ± SE**
Lying time (min/day)	525.23a ± 5.76	592.59b ± 5.42
Standing time (min/day)	568.25a ± 8.69	518.21b ± 9.41
Frequency of lying bouts (number/day)	9.36 ± 0.79	8.2 ± 0.61

Physiological responses: The average respiration and pulse rate per minute were significantly (P<0.01) lower in G2 group as compared to G1 group (Table 4). Rectal temperature and skin temperature were non-significant between groups. Pulse rate decreased in dairy animals kept under shower inside the shed[1]. Other researchers who observed that mattress bedding was more comfortable as compared to concrete flooring in terms of physiological responses[3].

Table 4 Physiological parameters

Behavioural parameter	**Existing shed (G1) Mean ± SE**	**Modified shed (G2) Mean ± SE**
Rectal temperature (ºF)	101.62 ± 0.19	101.20 ± 0.21
Skin temperature (ºF)	98.78 ± 0.87	96.25 ± 0.96
Respiration rate (number/day)	42.00 ± 1.85	37.00 ± 1.58
Pulse rate (number/min)	81.00 ±1.18	77.00 ± 1.23

Conclusion

The present findings concluded that buffaloes housed under modified shed were more comfortable and had improved physiological reactions and behavioural pattern during the hot humid season. Animals give more time on eating under modified house as compared to existing loose housing, which shows more

comfortness and normal behaviour. Thus present study indicated that sand bedding with proper ventilation ameliorate stress in hot summers with normal physiological parameters.

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