Indian J. Anim. Prod. Mgmt. Vol. 30(3-4) 29-32 (2014)

EFFECT OF FOGGERS ON MICROCLIMATIC CHANGES AND PHYSIOLOGICAL RESPONSES OF MEHSANA BUFFALOES IN SUMMER SEASON

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Received : 01.08.2014 ***Accepted : 29.09.2014***

ABSTRACT

The trial was conducted during hot dry season when the average maximum temperature was 38.54°C (36.60 to 40.20°C) and relative humidity was 53.45% (46.00 to 60.00%) at Livestock Research Station, S.D.A.U, Sardarkrushinagar. The average dry bulb temperature decreased by 0.19°C and relative humidity increased by 2 - 2.5 % due to cooling effects of foggers at afternoon hours in experimental shed. The animals were divided into two groups of six each. Buffaloes of Group I were kept under loose housing without foggers (control), while buffaloes of group II were kept under loose housing with foggers (experimental). The foggers were operated daily during hot hours from 12:00 to 15:00 p.m. in experimental shed. The fogger cooling system was automatically controlled by an electronic timer and run for 3 min after an interval of every 2 min (36 min/hour) from 12:00 to 15:00 hours. The mean values of physiological responses for rectal temperature, respiration rate and pulse rate of both the groups were not different during morning but varied ($P<0.01$) in the afternoon. Water cooling through foggers played important role in body comfort of animal which is evident from the lower rectal temperature, respiration rate and pulse rate of Mehsana buffaloes in experimental shed by 0.55°F, 4.56 counts/minute and 5.62 beats/ minute, respectively at the peak hot period of afternoon hours.

Key words: Physiological Responses, Microclimatic Changes, Fogger, Buffalo

Buffaloes are prone to physical distress when exposed to heat stress as compared to other farm animals. The scarcely distributed sweat glands and dark body color render buffaloes with poor heat tolerance capacity[5]. At high ambient temperature, buffaloes dissipate excess heat effectively through wallowing[4]. Heat stress leads to increase rectal temperature and subsequent decrease in feed and energy intake and the average effects on reproduction, production and milk composition[2]. An environmental modification is important tools for ameliorating of heat stress. Water is an effective cooling agent either through wetting of the animals or by sprinkling over the body surface as water evaporation indirectly makes evaporative cooling of the air.

MATERIALS AND METHODS

The trial was conducted on twelve early lactating Mehsana buffaloes for a period of three months (April-2012 to June-2012) at Livestock Research Station, Sardarkrushinagar. The animals were divided into two groups of six each. Buffaloes of Group I were kept under loose housing without foggers (control), while buffaloes of group II were kept under loose housing with foggers (experimental). The foggers were operated daily during hot hours from 12:00 to 15:00 p.m. in

experimental shed. The fogger cooling system was automatically controlled by an electronic timer and run for 3 min after an interval of every 2 min (36 min/hour) from 12:00 to 15:00 hours. The physiological responses viz. rectal temperature, respiration rate and pulse rate of buffaloes of both groups were recorded at weekly interval in morning at 08:30 hour and in afternoon at 14:30 hour. Daily data on climatic variables viz. maximum temperature, minimum temperature, relative humidity at outside environment were collected from Meteorological department of Agriculture College, SDAU, Sardarkrushinagar.

The microclimatic variables at animal level were recorded once in the morning at 08:30 hour and again in the afternoon at 14:30 hour in both sheds viz. Maximum and Minimum temperature (°C) were recorded by using the Maximum-Minimum thermometer and for relative humidity (%) recording the dry bulb and wet bulb temperature reading with the help of Dry and Wet bulb thermometer which is pre-installed in both sheds during the experimental period. The psychometric tables were used to derive the relative humidity in percentage using the wet and dry bulb readings. The statistical analysis of the experimental data was carried out by using the two-sample 't' test with equal variances[9].

RESULTS AND DISCUSSION

Microclimatic changes:

The mean ambient temperature in open environment, under control shed and experimental shed were 31.68, 31.43 and 31.08°C, respectively. The mean relative humidity in open environment, under control shed and experimental shed were 53.54, 54.27 and 55.42 per cent, respectively. The reduction in maximum temperature (°C) and rise in relative humidity % (afternoon) under experimental shed as compared to outside environment and control shed due to evaporative cooling effect of foggers during hot hours of day as depicted in table-1. This indicates that providing water cooling through foggers under loose housing system considerably reduced air temperature and increased relative humidity during hot hours of the day.

Physiological Responses:

The mean morning rectal temperature, respiration rate and pulse rate of Mehsana buffaloes in control and experimental groups were 99.83°F, 24.20 counts per minute, 56.15 per minute and 99.74°F, 23.30 counts per minute, 55.91 per minute, respectively. The mean morning rectal temperature, respiration rate and pulse rate of Mehsana buffaloes was not significantly different from each other because during the morning hours, same microclimate conditions in both sheds during the morning hours. The Mehsana buffaloes maintained under the loose housing with foggers showed significantly ($P<0.01$) lower mean rectal temperature (100.50°F), mean respiration rate (23.00 counts per minute) and mean pulse rate (53.93 per minute) at afternoon than the buffaloes maintained without any cooling system (101.05°F, 27.56 counts per minute and 59.55 per minute). The foggers system tends to reduce the rectal temperature, respiration rate and pulse rate significantly by 0.55°F, 4.56 counts and 5.62 beats per minute at afternoon hours, respectively. The overall mean rectal temperature, respiration rate and pulse rate of Mehsana buffaloes was also significantly different and showed that the buffaloes of experimental group had significantly ($P<0.05$) lower overall mean rectal temperature (100.11°F), respiration rate (23.15 counts per minute) ($P<0.01$) and pulse rate (54.92 beats per minute) ($P<0.01$) than the control group (100.44°F, 25.88 counts per minute and 57.85 per minute). The foggers system had reduced the overall mean rectal temperature, respiration rate and pulse rate significantly by 0.33°F, 2.73 counts per minute and 2.93 beats per minute, respectively ; this suggests that the loose housing with foggers system was helpful in thermoregulation during hot hours. It has a beneficial effect on the body comfort of Mehsana buffaloes during hot hours. This explains the necessity of cooling system during afternoon hours of the day to maintain animals under comfortable conditions. A few research workers[1,3,6,7,8] reported that the splashing, fogging of water and wallowing had highly significant effects on rectal temperature, respiration rate and pulse rate in buffaloes during summer season.

Table 1: Mean environmental variables and micro climatic changes during the experimental period

Attributes	Open Environment (n=77)	Control (n=77)	Experimental (n=77)
Maximum temperature (°C)	38.54	38.21	37.62
Minimum temperature (°C)	24.80	24.66	24.56
Mean temperature (°C)	31.68	31.43	31.08
Relative Humidity (%) (Morning)	72.91	73.62	73.62
Relative Humidity (%) (Afternoon)	33.91	34.92	37.21
Mean Relative Humidity (%)	53.45	54.27	55.42

CONCLUSION

From the present study, it was observed that water cooling through foggers played important role in body comfort of animal which is evident from the lower rectal temperature, respiration rate and pulse rate of buffaloes in experimental shed by 0.55°F, 4.56 counts/minute and 5.62 beats/minute, respectively at the peak hot period of afternoon hours. Provision of water cooling through foggers during hot hours of the day lowered the ambient temperature and increased the relative humidity percent in surrounding air in shed due to evaporative cooling effect of water and buffaloes felt comfort to reduce the heat load. Therefore, it is concluded that the cooling through foggers on buffaloes during summer season, was beneficial in terms of body comfort of the animals.

ACKNOWLEDGEMENTS

Authors sincerely thank the Research Scientist, Livestock Research Station, SD Agricultural University, Sardarkrushinagar, for providing necessary facilities for the research.

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