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Original Research

Effect of Microclimate Alteration Devices and Feed Additive on Stress Related Behavioural Traits in Murrah Buffaloes

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Abstract

The present study was carried out in twenty-four lactating Murrah buffaloes housed in four different groups (six in each group) viz. foggers (T1), fans (T2), fans and feed additive (T3) and control group (C) under loose housing system. Stress related behavioural traits of Murrah buffaloes were studied, of which, the mean feeding time was more in T2 group followed by T3, T1 and C groups of buffaloes while the mean rumination time was more in T1 group followed by T3, T2 and C groups of buffaloes. The mean resting time was more in C group of Murrah buffaloes followed by T3, T2 and T1 groups whereas the mean drinking time was more in C group followed by T2, T3 and T1 groups of buffaloes.

Keywords: Buffaloes, Foggers, Fans, Feed Additive, Stress Behavioural Traits

Introduction

Global warming resulting in increase of mean global surface temperature is posing a serious challenge to livestock rearing in tropical conditions, especially to buffaloes with poor heat dissipation capacity. Current climate models indicated an increase in temperature by 0.2°C per decade and predicted that the increase in global average surface temperature would be between 1.8°C to 4.0°C by 2100 (IPCC, 2007). Heat is lost from the body by radiation, conduction, convection, evaporation of water from skin and respiratory passages and excretion of faeces and urine. Respiratory cooling and evaporation from body surface are negatively correlated with the temperature and relative humidity in the air. To the changing climate, homeotherms generally adapt compensatory (thermoregulatory) mechanisms directed at maintaining or restoring thermal balance (West, 1999) and this adaptability results in changes in physiological, haematological, biochemical, hormonal, behavioural, production and reproduction aspects.

During hot temperature, buffaloes spend less time on feeding (Portugal *et al.,* 2000 and Redbo *et al.,* 2001) and rumination thereby resting time increased (Vijay, 2005). Due to heat stress drinking time was more in buffaloes housed without foggers when compared to those housed under foggers (Sandeep Reddy, 2014). Thus, altering the microclimate at high temperature by providing water shower/mister, foggers, sprinklers and fans, etc in sheds are used to improve welfare, milk production and reproductive efficiency in bovines (Thatcher *et al*., 1974; Huang *et al*., 1986; Igono *et al*., 1987; Aii *et al*., 1988; West, 2003; Chauhan, 2004; Anjali and Singh, 2005, 2006; Mader *et al.,* 2006, Ambulkar *et al.,* 2011).

Materials and Methods

The study was conducted in twenty-four lactating Murrah buffaloes available at Livestock Research Station, Mamnoor, Warangal district, Telangana for a period of 90 days during summer. The research station is situated 290 meters above the mean sea level on 17.9 ^{0}N Latitude and 79.59 ^{0}E Longitude. The average annual rainfall is around 550 mm. The climate of the area is tropical. The average temperature ranges from 15-46°C and relative humidity ranges from 38% to 59%.

All the selected buffaloes in Livestock Research Station, Mamnoor were housed under loose housing system (Gable roofing RCC shed with covered area concrete floor and open area with gravel floor) distributed randomly into four groups consisting six animals in each group. The first study group was housed in shed provided with foggers operating daily during hot hours of the day i.e, 12.00 noon to 3.00 pm (T1), the second group was provided with ceiling fans (air circulating devices) to alter microclimate of buffaloes (T2), the third test group was housed in shed with ceiling fans along with supplementation of feed additive in the form of Chromium supplement and yeast culture as an anti-stress agent @ 500g/tonne of feed (T3) and the control group of buffaloes was housed under loose housing system (C) without any of the above..

The buffaloes were fed with green fodder, dry fodder and concentrates at the rate of 40 kg, 6 kg and 6-6.5 kg per day respectively (chopped Hybrid Napier Co-4 and jowar straw). They had free access to fresh and clean water all the time. All types of veterinary aid measures for all the animals were followed as per farm schedule. Behavioural recording was done by direct visual observation in buffaloes present in all the four groups for 8h (480 minutes) a day (4h immediately after each feeding) over a week period. The following activities were recorded during the study:

Eating: Time spent by an animal in ingesting feed.

Rumination: Time spent by an animal in regurgitating, masticating and then swallowing the feed which has been previously ingested into the rumen.

Drinking: Time spent by an animal in taking water into mouth and swallowing.

Resting: Time spent by an animal not involved in any major activities except to remain idle either in standing or in sitting/lying posture.

Statistical analysis of data was carried out according to the procedures suggested by Snedecor and Cochran (1994) (Analysis of variance was utilized to test the significance of various treatments).

Results and Discussions

The behavioural traits of Murrah buffaloes studied mainly were feeding, rumination, resting and drinking for 8h/day over a week period which has been presented in Table 1 and no other specific stress related behavioural traits were noticed during the study period.

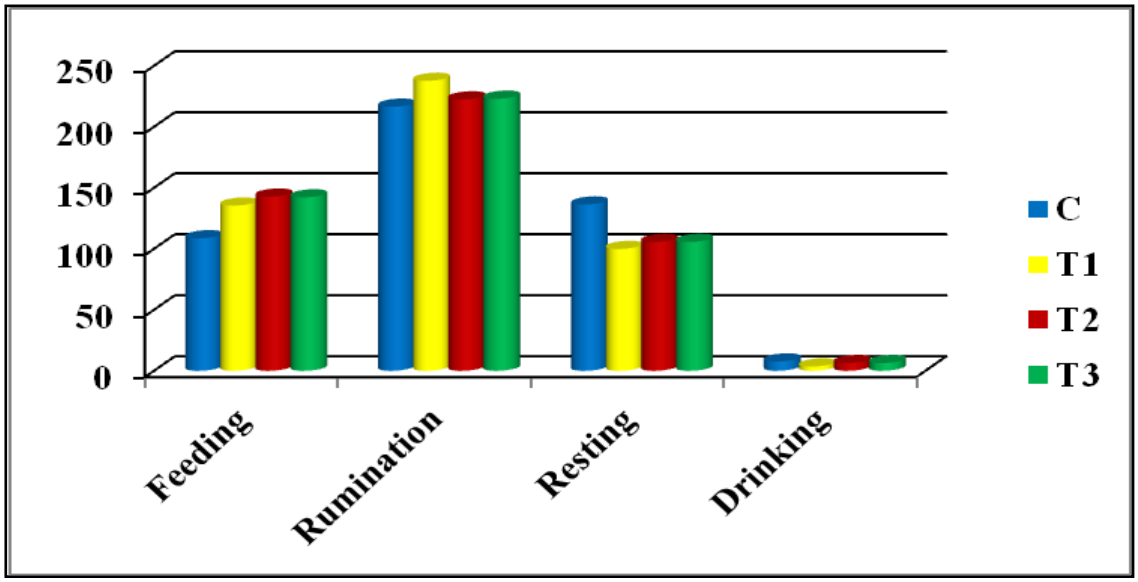
1. Effect on Feeding

Present study revealed that the mean feeding time in C, T1, T2 and T3 groups of Murrah buffaloes were 108.64±0.78, 135.43±0.59, 142.76±0.63 and 142.17±0.62 minutes, respectively and differed significantly (P<0.01). Perusal of Graph 1 has shown that the mean feeding time was more in T2 group followed by T3, T1 and C groups of buffaloes. This might be due to enhanced feed intake in buffaloes housed under fans. Similar results were observed by Vijay (2005). Feeding time in T2 and T3 groups were comparable indicating no additional effect of feed additive on feeding time in buffaloes. In C group of buffaloes least feeding time was recorded, which might be in response to hot temperature as found by Redbo *et al.* (2001). Portugal *et al.* (2000) also reported that feeding behaviour was significantly (P<0.05) affected by temperature and RH during summer.

Table 1: Effect of microclimate alteration devices and feed additive on behavioural traits (time spent in minutes) in Murrah buffaloes during the study period

Experimental groups		Feeding	Rumination	Resting	Drinking
C	Mean± SE	108.64^{a} ± 0.78	216.43^{a}± 0.99	136.29^{c}± 1.07	7.66^{c}± 0.09
T1	Mean± SE	135.43^{b}± 0.59	237.67^{c}± 1.02	99.9^{a}± 0.8	3.51^{a}± 0.07
T2	Mean± SE	142.76^{c}± 0.63	222.45^{b}± 0.74	105.64^{b}± 0.8	6.38^{b}± 0.07
T3	Mean± SE	142.17^{c}± 0.62	223.05^{b}± 0.95	105.69^{b}± 0.7	6.37^{b}± 0.05

Means within a column with different superscripts differ significantly (P<0.01)



Graph 1: Behavioural traits (minutes) in Murrah buffaloes as affected by experimental groups

2. Effect on Rumination

Present study revealed that the mean rumination time was 216.43±0.99, 237.67±1.02, 222.45±0.74 and 223.05±0.95 minutes, respectively in C, T1, T2 and T3 groups of Murrah buffaloes and were significantly (P<0.01) different. Among the groups, mean rumination time was more in T1 group followed by T3, T2 and C groups of buffaloes (Graph 1) might be due effect of foggers which increased the rumination time and similar results were found by Sandeep Reddy (2014) and Antil *et al.* (1990), who reported rumination was more during cooler parts of the day. While, Vijay (2005) observed more rumination time in fans and sprinkling group when compared to fans group and control group of buffaloes. Rumination time in T2 and T3 were comparable indicating no additional effect of feed additive on rumination time in buffaloes. In C group of buffaloes least rumination time was recorded which might

be in response to heat stress.

3. Effect on Resting

The mean resting time of buffaloes during the study in C, T1, T2 and T3 groups were 136.29±1.07, 99.90±0.80, 105.64±0.80 and 105.69±0.70 minutes, respectively which differed significantly (P<0.01). Graph 1 revealed that the mean resting time was significantly more in C group of Murrah buffaloes followed by T3, T2 and T1 groups. The mean resting time was significantly (P<0.01) lower in T1 group of buffaloes, might be due more time spent in feeding and rumination. Resting time was more in C group of buffaloes which may be due to less time spent in feeding and rumination during 8h study per day. This was in accordance with the results given by Vijay (2005). Resting time in T2 and T3 groups were comparable indicating no additional effect of feed additive on resting time in buffaloes.

4. Effect on Drinking

Present study revealed that the mean drinking time was 7.66±0.09, 3.51±0.07, 6.38±0.07 and 6.37±0.05 minutes in C, T1, T2 and T3 groups of Murrah buffaloes which differed significantly (P<0.01). The mean drinking time was more in C group (Graph 1). It might be in response to heat stress followed by T2 and T3 groups which were comparable indicating no additional effect of feed additive on drinking time in buffaloes. Drinking time was less in T1 group suggesting that foggers work well as a managemental tool in relieving heat stress in animals. Similar findings were given by Shearer and Beede (1990), Vijay (2005) and Sandeep Reddy (2014).

Conclusion

The microclimate alteration devices were beneficial in amelioration of heat stress and the Murrah buffaloes were comfortably housed. There was no additional beneficial effect by feed additive in the form of chromium and yeast culture.

Conflict of Interests

There is no conflict of interest.

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