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Effect of housing management on reproductive efficiency of buffaloes

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ABSTRACT

Data on 1690 buffaloes were collected randomly through a questionnaire to assess the relationship between degree of housing management (Housing Index) and postpartum reproductive efficiency of buffaloes. Buffaloes were declared anoestrus when they failed to exhibit oestrus till 60 days postpartum. The postpartum acyclic period was defined as the length of period (in days) between day of calving and first appearance of heat signs. The data was analyzed by ANOVA, c^2-test and linear regression. Buffaloes raised under good, medium and poor housing conditions required 55.2 ± 6.19, 87.1 ± 3.52 and 139.5 ± 6.26 days, respectively, to show first oestrus after calving. The proportion of buffaloes remaining anoestrus was 38.6, 54.8 and 71.1%, respectively. There was a significant linear relationship between Housing Index and acyclic period. The data was also analysed after splitting it into two seasons—summer and winter. Housing management significantly affected the postpartum reproductive efficiency of buffaloes during both the seasons.

Key words: Buffalo, Housing management, Reproduction

Buffalo is essentially an animal of tropical and subtropical regions (Cockrill 1985). But for its susceptibility to solar radiations, she is eminently adaptable to hot climates (Sastry *et al*. 1973). There is a marked seasonal variation in the breeding pattern of buffaloes, the reproductive behaviour being drastically suppressed during summer (Singh *et al*. 1989, Patel *et al*. 1996). Thus, housing management especially during summer is of paramount importance for buffalo production and reproduction. Studies on postpartum reproductive efficiency of buffaloes in relation to housing management are scanty. The present investigation was, therefore, planned to assess the relationship between degree of housing comfort and the length of postpartum acyclic period in buffaloes.

MATERIALS AND METHODS

Data on 1690 buffaloes (from 375 dairy units) was collected randomly through a questionnaire from May 2001 to April 2002. Information pertaining to identity and location of the farm, housing management and reproductive status of each animal was collected through personal visits to the farms located in three agro-climatic zones of Punjab, viz. Sub-mountainous Zone (Zone I), Central Plains (Zone III) and Western Plains (Zone IV).

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Buffaloes were declared anoestrus when they failed to exhibit oestrus till 60 days postpartum. This period was selected because majority of buffaloes (85.1%) at University Dairy Farm displayed oestrus within 60 days postpartum, which was later on confirmed through rectal palpation and ultrasonography (Kumar 2001). Moreover, buffaloes showing oestrus within 60 days postpartum would have three chances of conceiving till 120 days postpartum. Since, buffaloes require 2.5 to 3.0 services per conception (Tailor *et al*. 1990, Jain and Tailor 1995), there would be maximum likelihood of these buffaloes getting pregnant during this period, ultimately leading to a calving interval of 13–14 months (an ideal calving interval for buffaloes). At the time of calculating incidence of anoestrus, recently calved animals and those in late gestation were excluded from the data analysis.

The postpartum acyclic period was defined as the length of period (in days) between day of calving and first appearance of heat signs. In some circumstances when the buffalo remained anoestrus for more than one year, the acyclic period was truncated to the time period elapsed between calving and the day of the visit.

The dairy farmers of Punjab follow different housing management practices in different parts of the State. It is difficult to compare these practices with reproductive efficiency of buffaloes. So a Housing Index (HI, Table 1) was developed. It was adopted from Patel and Saiyed (2001) after making certain modifications. For easy interpretation of results, the Housing Index was categorized into three

Table 1. Description of the housing index

Housing component	Score
Direction of shed	East West—2; Other than East West—1
Height of roof	>10 feet—2; < 10 feet—1
Type of roof	Pucca—2; Thatched—1; Asbestos/tin—0
Floor area per animal	>32 Sq. feet—2; < 32 Sq. feet—1
Flooring of the stall	Pucca—2; Tiled—1; *Kutcha*—0
Level of the floor	Sloppy—2: Levelled—1; Uneven—0
Cleanliness of floor	Clean and dry—1; Wet floor—0
Ventilation	Good—2; Fair—1; Poor—0
Tree shade	Available—1; Not available—0
Cooling arrangement in summer and warming in winter	Yes—1; No—0
Provision of bedding	Yes—1; No—0

Total points=18

classes- Class I (Poor housing management, HI 10–12), Class II (Medium type housing management, HI 13–15), Class III (Good housing management, HI 16–18).

The length of acyclic period among different classes of HI was analysed by analysis of variance. Association between categorization of HI and incidence of anoestrus was assessed by c^2-test. Linear trend was analysed by linear regression. All tests were done two-tailed and significance was set at 5% level.

RESULTS AND DISCUSSION

A significant (P<0.05) linear relationship existed between HI and acyclic period. As the degree of comfort (HI) increased, the length of postpartum acyclic period in buffaloes decreased (Table 2).

The first postpartum oestrus interval in buffaloes kept under different housing management conditions has been presented in Table 3. Buffaloes raised under good housing conditions required minimum time (55.2 ± 6.19 days) to show first oestrus after calving while those under medium type of housing management took significantly (P<0.05) longer time (87.1 ± 3.52 days). The first oestrus after calving was maximally delayed (139.5 ± 6.26 days) in buffaloes kept under poor housing conditions.

Table 2. Linear trends in postpartum acyclic period of buffaloes in relation to housing index

Level of the HI	No. of buffaloes (n)	Acyclic period (days) (mean ± SE)
10	64	175.8 ± 16.9
11	152	133.2 ± 10.1
12	279	136.1 ± 8.83
13	431	104.9 ± 5.66
14	379	80.6 ± 5.17
15	152	50.0 ± 7.68
16	70	51.0 ± 10.9
18	163	57.0 ± 7.53

P for linear trend <0.05.

Table 3. Effect of housing management on postpartum acyclic period in buffaloes

Levels of the HI	No. of buffaloes (n)	Anoestrous buffaloes (%)	Length acyclic period of (days) (mean ± SE)
Class I (HI 10–12)	498	71.1	139.5 ± 6.26^a
Class II (HI 13–15)	959	54.8	87.1 ± 3.52^b
Class III (HI 16–18)	233	38.6	55.2 ± 6.19^c

Means with different superscripts differ significantly (P<0.05).

More than 70% of buffaloes under poor housing conditions failed to show oestrus within 60 days postpartum whereas only 38.6% buffaloes under good housing management remained anoestrus. These results clearly indicate association of housing management with anoestrus in buffaloes (c^2 = 74.4, P<0.05).

Owing to thick and black skin, and fewer hair follicles, buffaloes feel uncomfortable in the sun. Thus, provision of shade (prevention from solar radiation) and wallowing (heat dissipating tool) are the 2 most important components of the HI during summer.

Data related to HI was also analyzed after splitting it into two seasons, i.e. summer (April to July) and winter (November to February). During hot summer conditions, buffaloes kept under good housing conditions required only 86.4 ± 14.8 days to exhibit first oestrus against 133.8 ± 7.02 days required by buffaloes kept under poor housing conditions (Table 4). The proportion of buffaloes showing oestrus till 60 days postpartum was also significantly (P < 0.05) higher in good-housed buffaloes (50.0 vs. 29.7% under poor housing conditions). Buffaloes mainly depend on insensible heat loss, such as panting because of low rate of sweating (Das *et al*. 1997, Aggarwal and Upadhyay 1998). Evaporative losses from pulmonary surfaces increase many fold as the air temperature exceeds 30°C (Chikamune 1986, Aggarwal and Upadhyay 1998). When the ambient conditions turn too harsh (when air temperature exceeds 40°C), the regulatory mechanisms become inadequate even after increasing the pulmonary frequency 5–6 times. During such conditions, the buffalo depends on sensible heat loss, i.e. wallowing, which increases both heat conductivity as well as evaporative heat loss (Srivastava *et al*. 1978, Koga *et al*. 1999, Perera 2000).

In the present investigation, it was observed that buffaloes that wallowed in the running canal water had minimal incidence of anoestrus during hot summer. Provision of cooler sheds significantly improved conception rate in buffaloes (Roy *et al*. 1968). Mehta (1976) also reported encouraging results of wallowing in terms of number of animals showing oestrus, postpartum oestrous interval and regularity of oestrous cycle. If let loose, a buffalo always preferred to cool off in a wallow rather than seeking shade.

Table 4. Effect of housing management on acyclic period of buffaloes during summer and winter

Season	Classes of HI	No of buffaloes (n)	Anoestrous buffaloes (%)	Length of acyclic period (days) mean ± SE
Summer	Class I	340	70.3	133.8 ± 7.02[a]
	Class II	297	58.6	107.6 ± 7.61[b]
	Class III	52	50.0	86.4 ± 14.8[c]
Winter	Class I	158	72.8	151.6 ± 12.7[a]
	Class II	662	53.0	77.9 ± 3.73[b]
	Class III	181	35.3	46.2 ± 6.60[c]

Means bearing different superscripts differ significantly (P<0.05) within each season.

Similarly, buffaloes kept under tree shade also experienced similar type of comfort but the response in terms of oestrus frequency, postpartum oestrous interval and intensity of oestrous signs was not as good as those who wallowed (only subjective observations). Bharadwaj *et al*. (1992) also reported that buffaloes tied under tree shade felt most comfortable and had the maximum voluntary dry matter intake. This is because of low heat tolerance coefficient of buffaloes under exposure to direct sun radiations (Daghash *et al*. 1999).

These results clearly indicate that provision of tree shade and/or wallowing especially in the running water significantly reduces thermal stress in buffaloes leading to exhibition of oestrus even during hot summer months.

Exposure to extreme cold conditions is also detrimental to buffalo's reproductive efficiency. Around 65% of buffaloes showed oestrus under good housing conditions in winter as against 27.2% buffaloes under poor housing conditions. Duration of acyclic period was 46.2 ± 6.60 and 151.6 ± 12.7 days in buffaloes kept under good and poor housing conditions, respectively (Table 4). Good housing management conditions during winter significantly (P<0.05) improved the proportion of oestrus and reduced the postpartum acyclic period. Previous studies also indicated that frequency of oestrus was significantly correlated with mean minimum temperature during winter. The correlated coefficient was of the order of 0.74 to 0.85 (Kodagali *et al*. 1973, Patel *et al*. 1996).

Thus, housing management during both the seasons significantly affect the postpartum reproductive efficiency of buffaloes.

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