

## Inactive and locomotive behaviour of pregnant dairy heifers under loose housing system

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Inactive and locomotive behaviour play important role in managing pregnant animals under intensive production system because, the gravid uterus continuously put pressure on abdomen particularly towards advance pregnancy. As a result, animals prefer more resting and less walking. Verma and Tripathy (1980), Singh *et al.* (1985) and Odyuo *et al.* (1995) in buffaloes and Das (2001) in sheep studied the resting behaviour. But, little information on the changes that took place in the resting and locomotive behaviours of pregnant dairy heifers was found in the published literature. Therefore, the study was undertaken to know the inactive and locomotive behavioural pattern in crossbred heifers during last three months of pregnancy under loose housing system.

Behavioural parameters were observed in 30 crossbred (Jersey × Holstein-Friesian × Hariana) heifers during their last term of pregnancy (27th to 40th week). The animals were selected as per their date of pregnancy from the Institute's Cattle and Buffalo farm and they were kept under loose housing system where each animal was provided 8 m<sup>2</sup> covered area and 16 m<sup>2</sup> opened area. They were offered green fodder (maize, oat and barseem) *ad lib.* along with concentrate mixture. The concentrate mixture was supplied at 09: 00 h and green fodders at 11: 00, 14: 00 and 16: 00 h in the manger constructed under covered area.

For the convenience of observation, 30 heifers were divided into 3 groups of 10 each. The animals of a particular group also had of different days of conception, but the difference between the earliest and latest conception date within the group was less than 30 days. The ongoing activities of 10 heifers in the 3 groups were recorded once in a week during the last 14 consecutive weeks of pregnancy. In each observation session, instantaneous point sample (Tyler 1979)

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of ongoing activities of all the 10 pregnant animals in a group was recorded every 60 sec for 24 consecutive hours. The recording was started from 06:00 h to next day's 06:00 h; 06:00 to 06:59 h is denoted as first of observation and 05:00 to 05:59 h (next day) is designated as 24th h of observation. Four observers recorded observations of the animals without disturbing them.

Time spent on roaming, loafing, sitting and sleeping were recorded in the study. Roaming refers to and fro movement of the animal within the paddock. Loafing (standing idle) was defined as stationary standing for an extended period with occasional limb shifting and position changes. When animals were not doing any activity except to remain idle in sitting/lying posture was considered as sitting (lying idle). Sleeping was seen as evident somnolence with closed eyes either in recumbence or extended recumbence posture. The usual sleep position (REM sleep) was flat on the side with legs extended, minor leg movement, twitching of ears and facial muscles may occur. The sign of light sleep with eye closure but occasional head movement (drowsing) was also considered as sleeping in this study. Fraser and Broom (1990) pointed out that during light sleep (SWS sleep) animals lie on the sternum with the head turned around to the flank and are supported on the ground or on hind leg. The following information was generated for each of the 4 behaviours:

- (i) Bout length- It is uninterrupted period of time (>1 min) during which an animal was engaged in one particular behaviour. Any interruption lasting <1 min within a bout was ignored.
- (ii) Behaviour duration- It is the sum of all bout durations of a behaviour in 1 day (24 h).
- (iii) Inter-bout length- The period of time between 2 consecutive bouts of a behaviour.
- (iv) Frequencies of bouts and inter-bouts- The number of bout and inter-bout episodes recorded over 24 h were grouped on the basis of episode duration, viz. 1 to 15 min, 16 to 30 min, 31 to 60 min, 61 to 120 min and >120 min.
- (v) Pattern of behaviours- Line graph was prepared to study

the pattern of inactive and locomotive behaviours during 24 h. While preparing the line graph, time spent on inactive and locomotive behaviours was recorded every hour.

Data related to time spent on the different behavioural activities (viz. roaming, loafing, sitting and sleeping) were subjected to ‘Friedman 2-way analysis of variance by ranks’ to see the gradual changes in the 4 activities observed during the last trimester of pregnancy (27th to 40th week of pregnancy). In this test, ‘matching’ was achieved by using each animal as its own control.

Time spent on different inactive and locomotive activities by the pregnant heifers is presented in Table 1. Although there was a trend of decreasing roaming activity with the advancement of pregnancy but the time spent roaming did not vary much (19 to 41 min d<sup>-1</sup>) in the different weeks of pregnancy. Earlier studies depicted that non-pregnant cattle and buffaloes generally spent about 1 h d<sup>-1</sup> in roaming. Higher time spent on idle roaming was noted by Jana *et al.* (1988) in crossbreed cows (54 min), by Odyuo *et al.* (1995) in dry buffaloes (56 min) and by Raut (1999) in lactating buffaloes (1.31 h). The present study showed that heifers in their late pregnancy spent about 30 min d<sup>-1</sup>, which was about 50% of time spent by non-pregnant cattle and buffaloes. Hourly pattern of roaming over 24 h is depicted in Fig. 1. Peak roaming activity was observed during pre-dawn period (04: 00 to 06: 00 h).

The median value of time spent on loafing varied between 200 to 327 min d<sup>-1</sup> (range from 105 to 503 min). The average time spent on loafing was higher in ninth month of pregnancy (294 min d<sup>-1</sup>) compared to seventh (241 min d<sup>-1</sup>) and eighth (229 min d<sup>-1</sup>) month of gestation. There was significant

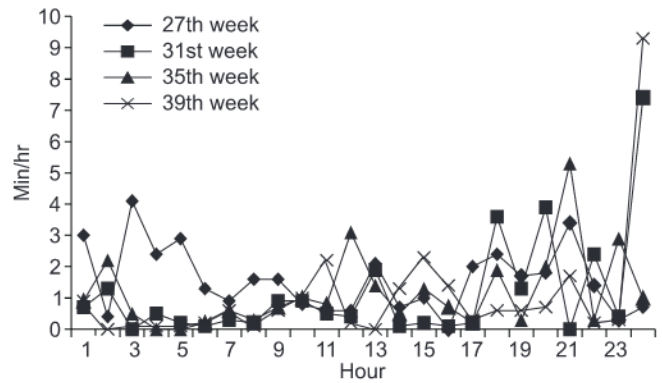


Fig. 1. Daily pattern of time spent roaming (min/h) during last trimester of pregnancy under loose housing system.

difference ( $P < 0.05$ ) in time spent on loafing between last week (40th) and other weeks of pregnancy. In pregnant Black Pied cows, Rusev and Ignatov (1989) noted that animals spent 346 min d<sup>-1</sup> for idle standing during summer. As per the report of Odyuo (1989), idle standing durations in dry and lactating buffaloes were 340.93 and 333.17 min d<sup>-1</sup>, respectively. The report of Yadav and Gupta (1985) envisaged that idle standing time was 447.38 min per day in lactating buffaloes under loose housing system. All the earlier works revealed that non-pregnant cattle and buffalo generally spent more than 6 h d<sup>-1</sup> in idle standing. Present study showed that pregnant animals in the last trimester spent about 4 h d<sup>-1</sup> in idle standing except in the last month of pregnancy (about 5 h d<sup>-1</sup>) when the fetus developed fully and as a result, the belly of the pregnant cows distended highly. Animals with distended belly preferred idle standing than sitting or sleeping. The peaks of the loafing activity were observed between 09: 00 to 11: 00 h

Table 1. Median value and range of time spent (min d<sup>-1</sup>) roaming, loafing, sitting and sleeping by crossbred heifers during last trimester of pregnancy

Pregnancy stage (week)	Roaming		Loafing		Sitting		Sleeping	
	Median	Range	Median	Range	Median	Range	Median	Range
27th	39 <sup>a</sup>	5–85	251 <sup>a</sup>	105–339	121 <sup>a</sup>	101–254	168 <sup>a</sup>	71–218
28th	23 <sup>a</sup>	4–49	200 <sup>a</sup>	146–378	190 <sup>a</sup>	58–337	155 <sup>a</sup>	110–386
29th	21 <sup>a</sup>	3–46	270 <sup>a</sup>	178–400	175 <sup>a</sup>	93–284	172 <sup>a</sup>	111–282
30th	25 <sup>a</sup>	2–57	226 <sup>a</sup>	153–315	181 <sup>a</sup>	116–301	228 <sup>a</sup>	100–398
31st	25 <sup>a</sup>	9–46	256 <sup>a</sup>	153–445	175 <sup>a</sup>	119–353	194 <sup>a</sup>	112–393
32nd	41 <sup>a</sup>	14–65	241 <sup>a</sup>	164–440	200 <sup>b</sup>	114–298	169 <sup>a</sup>	98–286
33rd	33 <sup>a</sup>	12–59	201 <sup>a</sup>	150–307	167 <sup>a</sup>	118–343	177 <sup>a</sup>	91–195
34th	24 <sup>a</sup>	2–61	221 <sup>a</sup>	179–344	185 <sup>a</sup>	92–275	176 <sup>a</sup>	86–278
35th	32 <sup>a</sup>	1–49	253 <sup>a</sup>	121–346	132 <sup>a</sup>	97–240	157 <sup>a</sup>	98–304
36th	22 <sup>a</sup>	7–50	278 <sup>a</sup>	159–380	138 <sup>a</sup>	82–249	175 <sup>a</sup>	127–394
37th	23 <sup>a</sup>	5–53	278 <sup>a</sup>	206–396	204 <sup>b</sup>	124–323	136 <sup>a</sup>	84–291
38th	19 <sup>b</sup>	8–30	315 <sup>a</sup>	200–405	138 <sup>a</sup>	85–196	154 <sup>a</sup>	103–188
39th	26 <sup>a</sup>	8–43	271 <sup>a</sup>	163–482	188 <sup>a</sup>	69–270	156 <sup>a</sup>	36–281
40th	23 <sup>a</sup>	8–47	327 <sup>b</sup>	198–503	138 <sup>a</sup>	69–296	174 <sup>a</sup>	69–264
FR value	18.1		24.7		21.2		12.5	

Medians with different superscripts within the same column differ ( $P < 0.05$ ) significantly

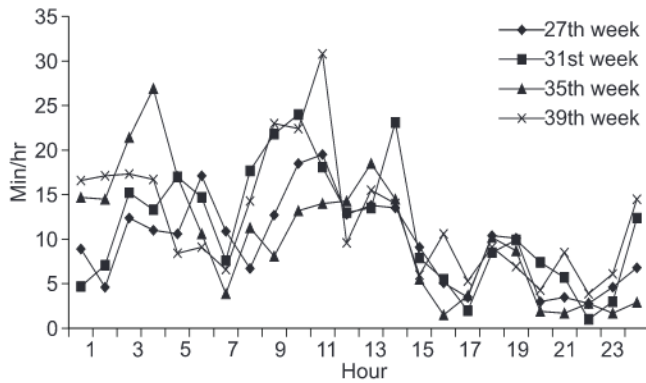


Fig. 2. Daily pattern of time spent loafing (min/hr) during last trimester of pregnancy under loose housing system.

and 14:00 to 16:00 h, while moderate loafing activity between 03:00 to 06:00 h, 19:00 to 20:00 h and 23:00 to 24:00 h (Fig. 2).

The median value of time spent on sitting varied between 121 to 204 min  $d^{-1}$  during the last 14 weeks of pregnancy and weekly differences were not significant except the 32nd and 37th week when the animals spent significantly more time in sitting posture ( $> 200$  min  $d^{-1}$ ). Rusev and Ignatov (1989) observed that Black Pied pregnant cows spent 592 min  $d^{-1}$  for sitting/lying down during summer. Veris and Navratil (1991) reported that advanced pregnant heifers spent less time for lying down and more time for standing. Empel *et al.* (1994) noted similar findings in pregnant cows. More time spent on idle sitting/lying was reported by Kropp *et al.* (1973) in non pregnant heifers (9.7 to 15 h), by Vavak (1981) in dairy cows (10.3 h), by Yadav and Gupta (1985) and Thind and Gill (1986) in lactating buffaloes (10.3 h vs 10.1 h). The highest peak of idle sitting/lying activity was between 19:00 and 22:00 h. However, sitting activity was least between 17:00 to 19:00 h (Fig. 3).

The median time spent on sleeping varied from 155 to 228 min  $d^{-1}$  in 7th month, 157 to 177 min  $d^{-1}$  in 8th month and 136 to 175 min  $d^{-1}$  in 9th month of pregnancy. Jana *et al.* (1988), Odyuo *et al.* (1995) and Raut (1999) reported that non-pregnant cattle and buffalo spent 77 to 112 min  $d^{-1}$  in sleeping activity. Peak sleeping activity was mostly during 05:00 to 08:00 h and 15:00 to 17:00 h and it was least during 12:00 to 14:00 h (Fig. 4).

Short duration ( $< 15$  min) bouts for roaming activity were more frequent (97.2 to 100% of the total bouts) whereas roaming bouts having duration of  $> 15$  min were either very few (range from 1.0 to 5.1% of total bouts) or absent. Roaming bout incidences  $d^{-1}$  were more during eighth month of pregnancy compared to other 2 months. Majority of the roaming bout incidences repeated either after a brief spell of  $< 15$  min (16.4 to 33.6% of the total inter-bouts) or after a long duration of  $> 120$  min (25.6 to 47.4% of the total inter-bouts). About 30 to 45% of the total roaming inter-bout had duration of 16 to 120 min.

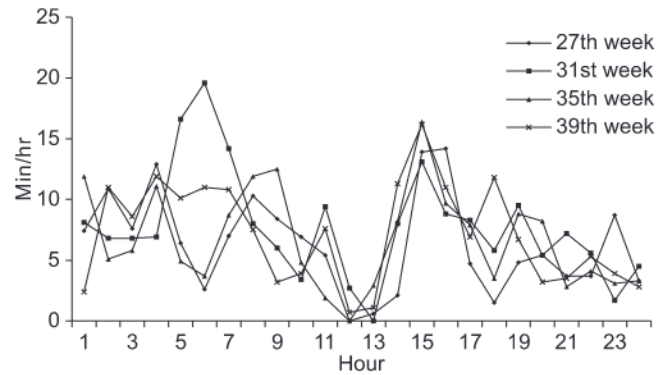


Fig. 3. Daily pattern of time spent sitting (min/h) during last trimester of pregnancy under loose housing system.

Majority of loafing bout incidences (79 to 88% of total bouts) were completed within 15 min and remaining 10% of total bouts within 30 min. Average number of loafing bout incidence was also highest in ninth month of gestation compared to other 2 months. Short duration ( $< 15$  min) loafing inter-bouts were more frequent (about 40% of total inter-bouts) and indicated that idle standing activity was not performed continuously, rather, the animals preferred to stand for a short period of time and then performed other activities for a brief spell and again, resumed loafing activity.

About 72 to 83% of total sitting bouts had duration of  $< 15$  min and the remaining bouts (15 to 25%) had duration of 16 to 60 min. Average number of bout incidences was lowest in ninth month of pregnancy. Majority of sitting inter-bout had duration of 31 to 60 min. Long duration ( $> 120$  min) inter-bout incidence  $d^{-1}$  was most frequent in 9th month compare to 7th and 8th month of pregnancy.

About 50 to 60% of total sleeping bouts lasted less than 16 min and the remaining 20 to 30% bouts had duration of 16 to 30 min. However, sleeping bouts having duration of more than 60 min were also observed in 10 to 20% of total bouts. Few sleeping bouts (1 to 5%) lasted for more than 2 h. More than 50% of total sleeping inter-bouts repeated after an interval of more than 30 min. The percentage of short

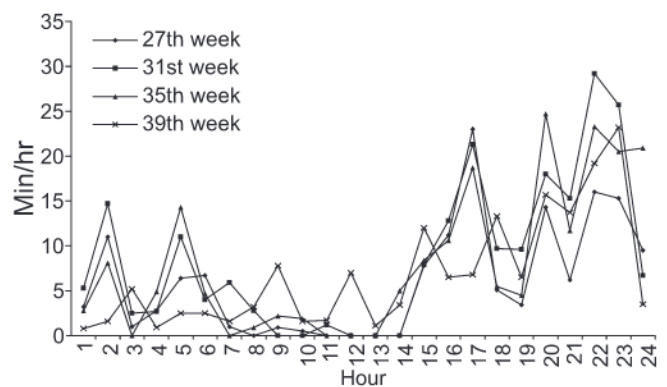


Fig. 4. Daily pattern of time spent (min/h) sleeping during last trimester of pregnancy under loose housing system.

sleeping inter-bouts (1 to 15 min) varied from 16 to 37%. For bout and inter-bout durations of all the four activities, no published report was available to compare the present findings.

During last trimester, pregnant heifers spent 9.1 to 13.4 h per day on different inactive and locomotive behaviours under loose housing system. Loafing (4.6 to 5.5 h per day) was the most frequent form of inactive behaviour followed by sleeping (2.2 to 3.8 h per day) and sitting (2.0 to 3.4 h per day) during the last trimester of gestation. About 0.3 to 0.7 h / day were spent by pregnant animals in roaming activity. Daily time spent on sitting and sleeping decreased gradually as the pregnancy was advanced. Whereas daily time spent on loafing showed an increasing trend. The number of roaming bout incidences per day were more during eighth month of pregnancy compared to other 2 months. For all inactive and locomotive behaviours, short duration (<15 min) bout length was predominant. Majority of inter-bout incidences for roaming and loafing activity had duration of <15 min, but for sitting activity, majority of them were repeated within 30 to 60 min.

#### SUMMARY

The pattern of inactive and locomotive behaviours of pregnant dairy heifers under loose housing system was studied. Inactive (loafing, sitting and sleeping) and locomotive (roaming) behaviour of 30 crossbred heifers were recorded at 60 seconds interval for 24 consecutive hours on 14 occasions (at weekly interval) during their last trimester (27th to 40th wk) of pregnancy. Bout and inter-bout length of these activities were also recorded. Loafing was the most frequent form of inactive behaviour followed by sleeping and sitting. Time spent on sitting and sleeping decreased gradually with the advancement of pregnancy whereas the trend was reverse for loafing. Short duration (<15 min) bout length was predominant in all the 4 activities. Majority of the inter-bout incidences for roaming and loafing activity had duration of <15 min, whereas most of the sitting activities were repeated within 30 to 60 min. This basic information of inactive and locomotive behaviours will help to manage the pregnant dairy heifers better under loose housing system.

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