

## Reproductive Potentials of Gayal (*Bos frontalis*) under Semi-intensive Management

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**ABSTRACT :** The assessment of reproductive potentials of female gayal under semi-intensive management was conducted with 18 animals in Bandarban hilly area of Bangladesh. Age at first estrous (days), age at first conception (days), length of estrous cycle (days), number of service per conception (natural), gestation period (days), age at first calving (days), and calving interval (natural service) (days) of gayal were  $598.2 \pm 168.44$ ,  $723 \pm 169.94$ ,  $21.86 \pm 2.93$ , 1.41,  $296.05 \pm 3.87$ ,  $1014.42 \pm 260.32$  and  $465 \pm 80.48$  respectively. Daily milk yield and lactation length of gayal were  $304.98 \pm 30.46$  ml/day and  $116.67 \pm 8.08$  days. Gayal male calves had higher birth weight (19.67 kg) than female calves (15.58 kg) in first lactation. Birth weight increases in second and third lactation than first lactation in both male and female calves. Highest conception rate observed in winter season and 70.60% successful conception occur when service was given within 21-30 h of estrous. Maximum number of female gayal use to come in estrous in winter and calved in monsoon and autumn. Cervicitis and irregular heat were the most reproductive problems followed by metritis, case of abortion, anestrus and repeat breeding. From this study it was observed that the reproductive performance of gayal is very close with the domestic cattle. It may use as beef cattle for the hilly regions of Bangladesh. (*Asian-Aust. J. Anim. Sci.* 2003, Vol 16, No. 3 : 331-334)

**Key Words :** Gayal, Reproduction, Estrous, Service and Lactation

### INTRODUCTION

The gayal is a semi domestic cattle which is very much related to the Indian bison or gaur is available in south eastern hilly district of Bangladesh, north eastern part of India, some hilly areas of Myanmar and Bhutan where the altitude is above 1,500 meter. The animal is reported to be a very hardy and capable to adjust in any adverse environmental conditions. Some investigators believed that this animal was domesticated from gaur (Sinoons and Simoons, 1968) but others thought it is a gaur-cattle or gaur-bentang hybrid (Tint, 1993). In Myanmar and Bhutan it is called Mithan. In nature average body weight of mature male gayal is 600-700 kg and female 400-500 kg. The gayal cow produce very negligible amount of milk and found to be much nutrient concentration than cow which can only nourish their baby calves (Islam et al., 1993). This animal is highly susceptible to foot and mouth disease (FMD) and fascioliasis (Huque and Giasuddin, 1998). Huque et al. (2001) reported 24% gayal calf mortality under semi-intensive management.

The gayal belongs to the family Bovidae, tribe-Bovini, group Bovina, genus *Bos* and species- *Bos frontalis*. In nature they found as feral animal. They like to live in shady and humid environment and browse mostly tree leaves or grasses on the hill slopes, tops and valleys of above 1,000 meter high from sea level in day time. During winter

they came down to the hill foot paddy and grass fields because of insufficient feed on hills. Their morphology is different from domestic cattle. They have a bony dorsal ridge on the shoulder and white stocking on all four legs. Their body size is much bigger than indigenous cattle of Bangladesh. They have prominent beef type characters and mainly used as sacrifice animal in religious festivals and often considered as costly animal.

In Bangladesh some tribal family rear gayal with native cattle and their cross offspring after natural mating called "Tang gaur", which was sometime found in local market. In India, gayal cattle hybrids produce more milk than gayal. In Bhutan, the livestock breeders produce profitable hybrid offspring called "Jatsha" by crossing gayal bull with Siri cows (*Bos taurus*) collected from India (NRC, 1983). The gayal is one of the most important animal genetic resources in Bangladesh. Bangladesh Livestock Research Institute has undertaken a gayal conservation and improvement program to develop beef type cattle for Bangladesh and to utilize the vast unused hilly areas. Therefore the present research work was undertaken to know the reproductive performance and disease incidence of gayal in semi intensive management.

### MATERIALS AND METHODS

#### Location and agro-ecological climate

The experiment was conducted at Bangladesh Livestock Research Institute, Regional Station, Naikhongchari, Bandarban hilly district, Bangladesh, conveying the period from 1991-1998. The station is located southeastern hilly parts of Bangladesh and about 20 meter above the sea level. The land type is highland with strong acidic (pH 4.5-4.9)

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loamy soil. The rainfall and humidity varies from 255 to 1,093 mm and 85 to 95% respectively during the wet and hot period (June to October). Mean annual temperature is about 26.1°C but ranges from 11.2°C to 32.3°C.

### The experimental animals

Total 18 gayals out of which 13 females and 5 males were collected from the deep forest areas of Bandarban hill tracts of Bangladesh and rear in semi-intensive management to identify their productive, reproductive potentials and reproductive disorders. The animals were selected on the basis of their physical structure and physiological characters.

### Feeding and health management

The animals were allowed to browse for about 8 h daily and were supplied with 1 kg concentrate mixture per 100 kg body weight daily. No vaccines were used for the prevention of diseases. Necessary treatments were provided against specific diseases according to the suggestions of scientist working in the respective field. Reproductive problems were identified by the same group of scientists on the basis of clinical history, signs and finally laboratory test.

### Reproductive characteristics

To study the reproductive characteristics the animals were closely observed and their age at first estrous, weight at first estrous age at first calving, calving interval, estrus cycle and postpartum estrus etc were recorded in a herd book.

The gestation period were calculated from the date of effective natural service to the date of parturition in day. The sires were always kept in their stall and every morning and evening a teased bull was used to detect the start and end of estrous. Immediately after birth newborn calves were weighted to record birth weight. Gayals were not habituated to milking. In this experiment three third lactating gayal were selected to observe their milk production performance. For this study the calves were completely confined in stall with sufficient feed but other calves were allowed to browse with their mother.

## RESULTS AND DISCUSSION

Table 1 shows the productive and reproductive characteristics of female gayal. The results varied considerably between animal to animal in all traits.

### Age of first estrous and first conception:

The average age at first estrous and age of first conception were 598.2±168.4 and 723.9±169.9 days respectively. Islam et al. (1993) recorded 527.9 and 644.8 days in gayal, which was lower than this study, but their number of observation was only two. Majid et al. (1995)

**Table 1.** Reproductive traits of female gayal under semi-intensive management

Sl. No.	Traits	Mean±SD
1.	Age at first estrous (days)	598.2±168.4 (10)
2.	Age at first conception (days)	723±169.9 (6)
3.	Weight at first estrous (kg)	247.8±35.1 (13)
4.	Length of estrous cycle (days)	21.9±2.9 (22)
5.	Duration of heat (hours)	45.4±12.2 (52)
6.	Service per conception:	
	i) Natural	1.4 (8)
	ii) Artificial	5.0 (4)
7.	Gestation period (days)	
	i) Gayal×Gayal	296.1±3.9 (19)
	ii) Gayal×Cattle	281.7±1.2 (3)
8.	Age at first calving (days)	1,014.4±260.3 (7)
9.	Postpartum estrous (days)	96.2±24.0 (11)
10.	Days open	172±83.5 (5)
11.	Calving interval (days)	
	i) Natural service	465±80.5 (7)
	ii) Artificial insemination	838±158.5 (4)
12.	Optimum time for service after showing sign of heat (h)	21-30

Figure in the parentheses indicate the number of observation.

reported 977.9 and 659.3 days of age at first conception in native and Friesian cows respectively which was higher than this study.

### Weight at first estrous

The average body weight at first estrous in gayal was found 247.8±35.1 kg. The weight ranges from 205 kg to 330 kg.

### Length of estrous cycle and duration of heat

The average length of estrous cycle in gayal was 21.9±2.9 days and average duration of heat was found 45.4±12.2 h. Similar findings were reported from Majid et al. (1995) in Friesian cows in length of estrous cycle. But duration of heat was found longer in gayal than Friesian and local cows.

### Number of services per conception

Average number of services required for a successful pregnancy in natural and artificial insemination were 1.4 and 5 respectively. Khan (1990) reported 1.57 for Pabna cows where as Majid et al. (1995) recorded 1.9 in Sahiwal cows, which was similar with the natural service for conception of this animal. But for a successful pregnancy by artificial insemination in gayal, number of services required was higher than those reports. Improper heat detection, lack of knowledge of the inseminator about reproductive organs of the gayal, concentration of spermatozoa per dose or incorrect insemination may be the causes of more services (artificial insemination) for a conception in this animals.

### Gestation period

Average gestation period between gayal and gayal mating was  $296.1 \pm 3.9$  days and gayal and cattle mating was  $281.7 \pm 1.2$  days. Scheurmann, (1975) reported the gestation period of gayal 293 to 303 days which was similar with our study but disagree with Islam et al. (1993) who reported 283 days in gayal and gayal mating. The rearing system of Islam et al. (1993) was extensive where male and female gayal was graze at a time in the forest. So actual data collection for gestation period may be confused and their number of observation was only two. Majid et al. (1995) reported 270.62 days of gestation period in Friesian cows, which was also lower than present study. From this study it was observed that a longer gestation period was needed in gayal and gayal cross offspring but similar gestation period in gayal and cattle cross offspring. So it is clear gayal fetus needs longer time for maturation than the cattle fetus.

### Age at first calving, postpartum estrous and days open

The average age at first calving, postpartum estrous and days open were  $1.014.4 \pm 266.3$  days,  $96.2 \pm 24.1$  days and  $172 \pm 83.5$  days respectively. More or less similar observation was reported by Majid et al. (1995), where age at first calving 940 and 1,269.3 days, postpartum estrous 108.4 and 120.1 days and days open 126.9 and 165.7 in Friesian and local cows respectively.

### Daily milk yield, lactational production and lactation length

The daily average milk yield, lactational production and lactation length of gayal was  $305 \pm 30.5$  ml/day,  $35.7 \pm 6.2$  kg/lactation and  $116.7 \pm 8.1$  days respectively. Hossain and Routledge (1982) found highest average 890ml/day milk production in local cows and 286 days of lactational length in Pabna cows. Nahar et al. (1992) found the lactational production was 890 kg in Sahiwal-Local cross ( $F_1$ ) cows in Bangladesh.

### Birth weight

The average birth weight (kg) of male and female calves in first, second and third lactation were  $19.7 \pm 2.1$  and  $15.6 \pm 1.4$ ,  $21.3 \pm 1.5$  and  $19.7 \pm 2.6$  and 23 and  $21.3 \pm 1.8$  respectively (Table 2). Birth weight increases in second and third lactation than first lactation in both male and female. Islam et al. (1993) reported  $19.1 \pm 3.3$  kg birth weight of gayal calves without considering the effect of lactation

which was similar with the present observation. However, higher birth weight reported by Haque et al. (2001) which was  $24.3 \pm 6.9$  in male and  $20.20 \pm 4.08$  in female calves. In this study no significant difference ( $p > 0.05$ ) was found in birth weight of male calves on different lactation, but female calves differ significantly ( $p < 0.01$ ). It is also observed that sex has some effect on birth weight (Table 3). At first lactation, birth weight of male calves differ significantly ( $p < 0.05$ ) from birth weight of female calves.

### Reproductive pattern

Seasonal fluctuation of reproductive pattern of gayal is presented in Table 4. It was observed that highest number of calving (33.3%) occur during monsoon and autumn. It may be due to highest conception rate in winter (December to February) because of availability of green fodder after summer in the period of monsoon, autumn and winter which improve the live weight and health status (Jochle, 1972). It is also observed that there was a decreasing trend of postpartum estrous interval among autumn and monsoon calving (87.3 and 94.2 days) gayals. Whereas summer and winter calving gayals had a long postpartum estrous interval 158.7 and 174.7 days respectively.

### Time for service

Table 5 shows the optimum time for service in female gayal. It was revealed that 70.6% successful conception occur when the service given within 21-30 h (mid-estrous) of heat in natural service, where as 100% successful conception occur when the service was given artificially within 31-40 h of heat. Das et al. (1990-1993) reported higher conception rates in the mid-estrous in indigenous cattle, which is similar with the present study. The duration of heat in gayal was relatively higher ( $45.4 \pm 12.2$  h) than the cattle.

### Reproductive problems

The occurrence of reproductive problems of gayal was showed in Table 6. Irregular heat and cervicitis was found highest (25%) followed by metritis and case of abortion. Before starting artificial insemination cervicitis and metritis was not found in this herd.

## CONCLUSION

In the present study it was observed that the reproductive

**Table 2.** Effect of lactation on birth weight in male and female gayal calves

Trait	1st Lactation	2nd Lactation	3rd Lactation	SED	Level of significance
Birth wt. (kg) (male)	19.7 (3)	21.3 (3)	23.0 (2)	1.8	$p > 0.05$
Birth wt. (kg) (female)	15.6 <sup>a</sup> (6)	19.7 <sup>b</sup> (3)	21.3 <sup>b</sup> (2)	3.4	$p < 0.01$

Values are mean; Figure in the parentheses denotes number of observations; Mean with uncommon superscripts differ significantly.

**Table 3.** Effect of sex on birth weight of gayal calves

Trait	BW (kg) of male (Mean)	BW (kg) of female (Mean)	SED	Level of significance
1 <sup>st</sup> Lactation	19.7	15.6	1.2	p<0.05
2 <sup>nd</sup> Lactation	21.3	19.7	1.7	p>0.05
3 <sup>rd</sup> Lactation	23.0	21.3	1.3	p>0.05

**Table 4.** Seasonal fluctuation of reproductive pattern in female gayal

Trait	Summer	Monsoon	Autumn	Winter
Number calved	3	6	6	3
Calving rate	16.7%	33.3%	33.3%	16.7%
Postpartum estrous interval (days)	158.7±6.5	94.2±10.1	87.3±12.5	174.7±8.8

Summer- March to May, Monsoon-June to August, Autumn- September to November, Winter- December to February.

**Table 5.** Optimum time of service for female gayal

Time	Percent of conception	
	Natural	Artificial
10-20 h	-	-
21-30 h	70.6% (12)	-
31-40 h	29.4% (5)	100% (3)
Total	100% (17)	100% (3)

Figure in the parentheses denotes the number of observation.

**Table 6.** Distribution of reproductive problems of female gayal under semi-intensive management

Problems	No. of cases	Percent of case
Metritis	2	16.7%
Irregular heat	3	25.0%
Anestrus	1	8.3%
Repeat breeder	1	8.3%
Abortion	2	16.7%
Cervicitis	3	25.0%
Total	12	100%

potentials of gayal is very close with domestic cattle. In this regards this animal may become a potential beef cattle for the hilly regions of Bangladesh.

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