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ORIGINAL ARTICLE

Post artificial insemination conception rate of a Brahman bull in selected areas of Bangladesh

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Abstract

Background: To fulfill the increasing protein demand in Bangladesh, the government has started a programme to inspire the farmers for rearing Brahman as a beef breed. The objectives of the present investigation were to assess the performance of frozen semen of Brahman bulls with respect to conception rate and its associated influencing factors in Bangladesh.

Methods: Data on AI performance, different factors and rate of conception were collected from 150 inseminated cows and heifers of Sadar upazila under Mymensingh district. The cows were inseminated by trained technician using frozen semen of a Brahman bull reared in Research Animal Farm of Department of Surgery and Obstetrics, Bangladesh Agricultural University, Mymensingh.

Results: The overall conception rate was 55.3%. The conception rate in Holstein Friesian cross (68.9%) was significantly higher than that of Local (46%) cows ($P<0.05$). The conception rate in cows with BCS 2.5 – 3.0 was higher (60.7%) than that of BCS 2.0 and 3.5 -4.0 (42.0 and 41.7%, respectively) ($P>0.05$). Cows received insemination at parity 1-2 showed the highest conception rate (60.0%) and cows received insemination at parity 3-7 showed the lowest conception rate (47.0%) ($P>0.05$). Cows received insemination at 2 - <4 years age showed the highest conception rate (58.7%) and cows received insemination at 8 – 11 years age showed the lowest conception rate (41.2%) ($P>0.05$). AI done in cows yielding 6 -10 litres milk showed the highest conception rate (76.9%) and the lowest conception rate (42.5%) was found in cows yielding 1 - 2 litres milk ($P<0.05$). Cows inseminated at 19-24 hours interval between oestrus to AI had the highest conception rate (66.0%) and the lowest (38.1%) was in cows inseminated at ≤12 hours interval ($P<0.05$). The conception rate was the highest (69.2%) when insemination was done in Spring and the lowest (38.5%) was in rainy season ($P>0.05$).

Conclusions: The overall conception rate was within acceptable level but further studies using more population of cows and semen donors are needed to confirm this result.

Key words: Artificial insemination, Brahman bulls, conception rate, frozen semen

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Introduction

The economy of Bangladesh is mostly depends on agriculture. At present its population is increasing day by day. On the other hand, its land area is not increasing rather than decreasing. For this reason, dairying is an important sector for employment generation, rural advancement and poverty reduction. The major constraints of profitable dairying is poor conception rate (CR) or pregnancy rate (PR), high number of services per conception, prolonged calving to first service interval, prolonged days open and poor heat detection (Shamsuddin *et al.,* 2001; Paul *et al.,* 2011). Moreover, the productivity of native cattle is low because of poor genetics (Alam *et al.,* 2001), poor nutrition (Ghos *et al.,* 1993), week herd health veterinary services and marketing access (Shamsuddin *et al.,* 1997). With increasing human population, the demand of beef as animal protein is increasing day by day in Bangladesh. There is no specific beef breed of cattle in Bangladesh although there is presence of limited population of crossbred dairy cattle. Brahman is one of the most popular breeds of cattle intended for meat production and is widely used in Argentina, Brazil, Paraguay, United States, Panama, Colombia and Australia among many other places. The Brahman or Brahma is a breed of zebu cattle (*Bos indicus*) that was first bred in United States from cattle breeds imported from India (Morris *et al.,* 1978). Considering weather, agro-climatic condition, heat tolerance, disease and parasite resistance, grazing ability, calving ease, mothering ability and management, Brahman breed is considered to be the most suitable and compatible beef breed in tropical and sub-tropical regions (Antonio *et al.,* 2006). Recently, the Government of Bangladesh has introduced Brahman as beef breed to boost meat production through cross breeding of local cows by AI (Haque *et al.,* 2013). Accordingly, the Brahman cattle are getting popularity in Bangladesh due to their high meat producing potentiality. However, there is limited study regarding evaluation of conception rate of semen of Brahman bulls routinely used in Bangladesh (Fatematuzzohora *et al.,* 2016). Economy of dairy farming largely depends on a good conception rate after AI. It is likely that the post AI conception rate in any AI programme may be influenced by many factors such as semen donor, BCS, time interval between estrus and AI, parity, breed, milk yield and age of heifers / cows. The season of insemination might also be the important factor to get maximum conception rate in cows (Miah *et al.,* 2004). Moreover, the conception rate and other fertility indices after AI are influenced by health status of bull, semen collection, processing, preservation, transportation, proper heat detection, AI at right time, insemination in sound uterine environment and keeping of AI record. Further, Paul *et al.* (2011) reported that the efficiency of AI technician play the vital role for pregnancy rates of cows. Therefore, it is rationale to evaluate the performance of frozen semen of Brahman bull with respect to conception rate and to determine the influencing factors for conception to obtain satisfactory post-AI conception in Bangladesh.

Considering the above mentioned facts and circumstances, this study was designed to determine the conception rate of frozen semen of a Brahman bull at Sadar upazila under Mymensingh district and to evaluate the factors influencing the conception rates of cows inseminated with frozen semen of a Brahma bull.

Materials and Methods

Study area

The investigation was conducted in Research Animal Farm (RAF), Department of Surgery and Obstetrics, Bangladesh Agricultural University, Mymensingh. A total of 150 cows were inseminated using frozen semen of a Brahman cross (50% with nondescript local) bull of RAF.

Data collection

Insemination related data were collected from the register of RAF used to keep records. The information which was not recorded in the register was collected from the farmers by mobile phone call and recorded accordingly. The cow related data were collected on Breeds, BCS, parity, age and milk yield. Moreover, data were

collected on season of AI, time and date of estrus and insemination of cows.

Management of cows

The cows were reared in farmer's house by traditional system which is commonly practiced in small holding farms. As per information collected from the farmers over mobile phone conversation, some cows had zero grazing with occasional semi-zero and tethering systems. Most cows were fed on straw and, cut and carry grass obtained from various places. Common supplements were rich polish, wheat bran and oil cake but their supply to animals was low, irregular and restricted mostly to milking cows. All cows were milked by hand milking keeping calves at feet of mother. Most of the local cows milked once daily in the morning. Cross breed cows were milked twice daily at 8 hours interval. In most cases, calves were allowed to suckle freely at day time. Some calves were allowed to suckle only during milking time after 3 months of age. No suckling during milking was only practised if calf was sold or died.

Determination of breeds of cows

The inseminator recorded the breeds of cows by observing the phenotypic characteristics. Three breeds of inseminated cows were nondescript local, Friesian cross with local and Sahiwal cross with local.

Determination of BCS of cows

The inseminator recorded the BCS of inseminated cows by eye estimation on the basis of bony prominence and deposition of sub cutaneous fat. The BCS was measured by using 1-5 scales with 0.5 fractions. The inseminated cows were divided into 3 BCS groups such as 2.0, 2.5-3.0 and 3.5-5.0.

Determination of parity of cows

The inseminator recorded the parity of cows by interviewing the farmers. The parity of cows ranged from 0 to 7. The cows were divided into 3 parity groups such as 0, 1-2 and 3-7.

Determination of age of cows

The age of inseminated cows was determined by the inseminator by observation of teeth eruption and also by interviewing the farmers. The age of inseminated cows ranged from 2 to 11 years. The inseminated cows were divided into 3 age groups such as 2-<4, 4-<8 and 8 to 11 years.

Determination of milk yield of cows

The inseminator recorded the amount of milk yield by interviewing the farmers at the day of insemination. The milk yield of cows ranged from 0 (heifer and dry) to 10 litres. The inseminated cows were divided into 4 milk yield groups such as 0, 1-2, 3-5 and 6-10 litres.

Determination of season of AI in cows

The season was recorded by the investigator from the date of insemination of cows recorded in register. The inseminated cows/heifers was divided into 4 groups such as Summer (May-July), Rainy (August-October), Winter (November-February) and Spring (March-April).

Determination of interval between estrus to AI

The inseminator recorded the time of estrus by interviewing the farmers and recorded the time of insemination. The interval between estrus and AI was determined by calculating the time difference between AI and estrus. The cows were divided into 3 interval groups such as ≤12, 13-18 and 19-24 hours.

Estrus detection and AI in cows

Estrus was detected by the owner of the cows on the basis of clinical manifestation of estrus sign. The cows were inseminated aseptically by recto-vaginal method by single trained inseminator of RAF. The semen in 0.25 ml French straws was processed by following standard protocol of RAF and stored in cryocan at -196°C. The semen straws were thawed in warm water at 35-38°C for 12 seconds before insemination.

Determination of non-return to estrus

All inseminated cows/heifers were checked by the farmers and in some cases by the inseminator for presence or absence of estrus signs at 20-22 days post AI. The cows which returned to estrus at 20-22 days post AI were regarded as

conception failure and recorded. The cows which were non-returned to estrus at 20-22 days post AI were examined for pregnancy diagnosis.

Pregnancy diagnosis

All the cows/heifers under this study were subjected to pregnancy diagnosis by the inseminator per rectum after 60-90 days post AI by visiting owner's house. The results of the pregnancy diagnosis were recorded to determine the conception rate. The pregnancy was confirmed by observing the asymmetry of the horn, palpation of the fetus and slipping of fetal membrane.

Conception rate calculation

The conception rate (CR) was estimated from the proportion of pregnancies confirmed by per rectal examination of the genital tract among the total number of cows/heifers inseminated artificially multiplied by 100.

Analysis of data

All the findings of the study were recorded and the data were analyzed statistically. The data generated from this experiment were entered in Microsoft Excel worksheet, organized and processed for further analysis. The data were analyzed by Pearson Chi-Square Tests using SPSS software. The variation in pregnancy rates was considered significant when the P value was less than 0.05.

Results

A total of 150 cows were inseminated with frozen semen of a Brahman bull reared in RAF, Bangladesh Agricultural University, Mymensingh and 83 cows conceived. The overall conception rate of cows was 55.3%.

Effects of breeds of inseminated cows on conception rate

Effects of breeds of inseminated cows on conception rate of a Brahman bull are presented in Table 1. The conception rate in Local, Holstein-Friesian cross and Sahiwal cross breed cows was 46.0, 68.9 and 66.7%, respectively. However, the difference in conception rate between local and Holstein-Friesian cross cows was significant (P<0.05).

Table 1. Effects of breeds of inseminated cows on conception rate of a Brahman bull

Breeds	No. of cows inseminated	No. of cows conceived	Conception rate (%)
Local	87	40	46.0[a]
Holstein-Friesian cross	45	31	68.9[b]
Sahiwal cross	18	12	66.7[ab]

[a,b] Percentage values with superscripts within same column differ significantly from each other (p<0.05).

Effects of BCS of inseminated cows on conception rate

Effects of BCS of inseminated cows on conception rate of a Brahman bull are presented in Table 2. The conception rate in cows with BCS 2.0, 2.5-3.0 and 3.5-4.0 was 42.0, 60.7 and 41.7%, respectively. However, the difference in conception rate did not vary significantly among different BCS of cows (P>0.05).

Table 2. Effects of BCS of inseminated cows on conception rate of a Brahman bull

BCS	No. of cows inseminated	No. of cows conceived	Conception rate (%)
2.0	31	13	42.0
2.5-3.0	107	65	60.7
3.5-4.0	12	5	41.7

Percentage values within same column did not vary significantly from each other (p>0.05).

Effects of parity of inseminated cows on conception rate

Effects of parity of inseminated cows on conception rate of a Brahman bull are presented in Table 3. The conception rate in cows with parity 0, 1-2 and 3-7 was 58.7, 60.0 and 47.0%, respectively. However, the difference in

conception rate did not vary significantly among different parity of cows (p>0.05).

Table 3. Effects of parity of inseminated cows on conception of a Brahman bull

Parity	No. of cows inseminated	No. of cows conceived	Conception rate (%)
0	46	27	58.7
1-2	55	33	60.0
3-7	49	23	47.0

Percentage values within same column did not vary significantly from each other (p>0.05).

Effects of age of inseminated cows on conception rate

Effects of age of inseminated cows on conception rate of a Brahman bull are presented in Table 4. The conception rate in cows with age 2-<4, 4-<8 and 8-11 years was 58.7, 56.3 and 41.2%, respectively. However, the difference in conception rate did not vary significantly among different age of cows (p>0.05).

Table 4. Effects of age of inseminated cows on conception rate of a Brahman bull

Age group (year)	No. of cows inseminated	No. of cows conceived	Conception rate (%)
2-<4	46	27	58.7
4-<8	87	49	56.3
8-11	17	7	41.2

Percentage values within same column did not vary significantly from each other (p>0.05).

Effects of milk yield of inseminated cows on conception rate

Effects of milk yield of inseminated cows on conception rate of a Brahman bull are presented in Table 5. The conception rate in cows with milk yield 0, 1-2, 3-5 and 6-10 L was 58.7, 42.5, 50.0 and 76.9%, respectively. The variation in conception rate with different milk yield was significant (p<0.05).

Table 5. Effects of milk yield of inseminated cows on conception rate of a Brahman bull

Milk yield (L)	No. of cows inseminated	No. of cows conceived	Conception rate (%)
0	46	27	58.7^{ab}
1-2	40	17	42.5^{b}
3-5	38	19	50.0^{b}
6-10	26	20	76.9^{a}

^{a,b} Percentage values with superscripts within same column varied significantly from each other (P<0.05).

Effects of interval between oestrus to AI on conception rate

Effects of interval between estrus to AI of inseminated cows on conception rate of a Brahman bull are presented in Table 6. The conception rate in cows with ≤12, 13-18 and 19-24 hours interval between estrus to AI was 38.1, 53.2 and 66.0%, respectively. The variation in conception rate with different interval between estrus to AI was significant (p<0.05).

Table 6. Effects of interval between oestrus to AI of inseminated cows on conception rate of a Brahman bull

Interval between estrus to AI (Hours)	No. of cows inseminated	No. of cows conceived	Conception rate (%)
≤12	21	8	38.1[a]
13-18	79	42	53.2[ab]
19-24	50	33	66.0[b]

[a,b] Percentage values with superscripts within same column varied significantly from each other ($p<0.05$).

Effects of season on conception rate

Effects of season of insemination on conception rate of a Brahman bull are presented in Table 7. The conception rate in cows inseminated in summer, rainy, winter and spring was 57.9, 38.5, 53.3 and 69.2%, respectively. However, the difference in conception rate did not vary significantly among different seasons of AI in cows ($P>0.05$).

Table 7. Effects of season of insemination on conception rate of a Brahman bull

Season	No. of cows inseminated	No. of cows conceived	Conception rate (%)
Summer (May-July)	64	37	57.9
Rainy (August-October)	13	5	38.5
Winter (November-February)	60	32	53.3
Spring (March-April)	13	9	69.2

Percentage values within same column did not vary significantly from each other ($p>0.05$).

Discussion

The study was undertaken to determine the conception rate of frozen semen of a Brahman bull at Sadar upazila under Mymensingh district and to evaluate the associated factors like breed, BCS, parity, age, milk yield, interval between estrus to AI and season of insemination which may influence the conception rate.

In the present study, the overall conception rate in cows inseminated with frozen semen of Brahman cross bull was 55.3%. Contrasting to the present finding, higher (71.6%) conception rate was reported by Fatematuzzohora *et al.* (2016) elsewhere. Moreover, similar conception rate was reported when cows were inseminated by other than Brahman semen (Shamsuddin *et al.*, 2001). The difference in conception rate after using Brahman semen may be due to differences in breeds of inseminated cows between two investigations. Earlier study only used non-descript local cows and present study used local, Holstein-Friesian cross and Sahiwal cross cows for insemination.

The conception rate in Holstein Friesian cross cows inseminated with Brahman semen was significantly higher than that of local cows. This result is in agreement with Khatun *et al.* (2014) who inseminated cows with other than Brahman semen and obtained higher conception rate in HF cross than that of local counterpart in Bangladesh. Contrasting to the present finding, higher conception rate was reported in local than HF cows inseminated with semen of different breeds in India (Potdar *et al*., 2016). This difference in conception rates between studies could be due to variations in management of cows, handling of semen and agro-climatic conditions in study areas.

The BCS of cows did not influence the conception rate in the present investigation when they were insemination by Brahman cross semen. Contrasting to the present result, earlier investigators obtained higher conception rate in cows with good BCS than that of fatty cows in Malaysia (Nordin *et al.,* 2004). They inseminated

Sahiwal x Friesian cows only by using frozen semen from other than Brahman bulls. Moreover, higher conception rate in cows with good BCS than that in cows with poor BCS was reported elsewhere in Bangladesh (Shamsuddin *et al.*, 2001). The difference in conception rate with respect to BCS of inseminated cows may be due to difference in breed of bulls and management of cows between studies. As nutritional status of cows is reflected by BCS, cows with good BCS will stimulate proper secretion of hormones resulting in good conception rate. Accordingly, good nutritional status with better management may help maintaining general health condition of cows resulting in stimulation of endocrine system through the activation of the hypothalamo-pituitary-ovarian axis followed by improved reproductive performance (Morrow, 1980; Fitzpatrick, 1994).

In the present study, conception rate in cows inseminated by Brahman bull semen was not influenced by parity of cows. Similarly, no variation in conception rate with respect to parity of cows was reported in Bangladesh (Howlader *et al*., 2019), India (Potdar *et al*., 2016) and Malaysia (Nordin *et al*., 2004) when conception rate was compared. Contrasting to the present findings, Khatun et al. (2014) reported significant effect of parity on conception rate of cows in Bangladesh. All earlier studies used frozen semen derived from other than Brahman bulls. The differences in conception rates with respect to parities among studies might be due to differences in breeds of cows, breed of semen donor, management and agro-climatic condition of countries where the investigations were performed.

The conception rate in cows inseminated with Brahman semen was not influenced by the age of cows in the present study. Similarly, Howlader *et al*. (2019) did not find significant difference in conception rate with respect to age of inseminated cows. On the contrary, Khatun *et al.* (2014) reported influence of age of cows on conception rate when compared. Donovan (2003) stated that there is a decline in fertility with advancing age due to decrease in ovulation rate caused by lack of gonadotrophin release from the pituitary. Moreover, the older cows might have more chance to get subclinical uterine infection resulting in lower conception rate. However, absence of no influence of age on conception rate in the present study might be due less number of cows evaluated.

The present study indicated that the conception rate in cows was significantly affected by milk yield on the day of insemination. Similarly, conception rate was significantly higher in high yielding cows than that of low yielding counterpart (Nordin *et al.*, 2004). Further, Shamsuddin *et al.* (2001) obtained higher conception rate in high yielding cows than that of low yielding cows. The positive effect of high milk yield on pregnancy rate may be explained by the fact that the high yielding cows received more attention, received balanced diet and were reared under good management (Shamsuddin *et al.*, 2001).

The conception rate in cows was significantly influenced by the time interval between onset of estrus and insemination in the present investigation. On the contrary, Nordin *et al.* (2004) and Howlader *et al.* (2019) did not report any influence of time interval between estrus and insemination on conception rate in cows inseminated with frozen semen of a Brahman bull. The importance of time of insemination for the fertility in cattle has been demonstrated elsewhere (Foote, 1979). The highest fertility was obtained when the inseminations were performed during mid and late oestrus (Dutta *et al.*, 1982; Bach, 1983).

The conception rate was not affected by the seasons of insemination in cows in the present study. Similarly, no effect of seasons of insemination on conception rate was reported in India (Potdar *et al.*, 2016). On the contrary, conception rate was significantly influenced by seasons of insemination in cows and the highest conception rate was recorded in Spring and the lowest conception rate was recorded in Summer (Khatun *et al.*, 2014). Alam and Ghosh (1988) also reported that conception rate of the cows

significantly differed in different seasons of the year. It is likely that spring is the best season for higher conception rate than others due to having suitable ambient temperature and humidity resulting in less stress on animals. Moreover, availability of satisfactory level of green fodder in spring resulting in good BCS may contribute to higher conception rate in cows.

Conclusions

It can be concluded that overall conception rate of cows inseminated with Brahman bull semen at Mymensingh Sadar upazila was 55.3%. The conception rate was influenced by breed, milk yield and interval between oestrus to AI in cows. Further studies with more population of cows and semen donor are needed to confirm this result as low number of cows and only one semen donor were used in this study.

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Conflict of Interest

The authors declare no conflict of interest.

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