INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2004/06–5–797–801
http://www.ijab.org

Factors Influencing Conception Rate of Local and Crossbred Cows in Bangladesh

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ABSTRACT

An experiment was conducted for a period of 1.5 years at District Artificial Insemination Centre, Sylhet, Bangladesh to evaluate the effects of genetic and environmental factors on conception rate with 983 cows of seven genotypes. The experimental animals were within zero to 5th parity and they were inseminated artificially through using the semen from different bulls of four genotypes. The overall feeding and management of the animals was almost similarly kept by the farmers. From this study, it was observed that conception rate of the cows were significantly affected by time of insemination ($P<0.01$), season of insemination ($P<0.05$) and their interaction (time of insemination × season of insemination). On the contrary, there were no significant ($P>0.05$) effects on conception rate by genotypes of cows, genotypes of bulls, parity of cows and interaction effect of cows genotypes and bull genotypes. The highest conception rate was observed in the cows which were Indigenous local cows (46.14%) of second parity, and which were inseminated by Local × Holstein Friesian bull (44.43%) at 11-14 h after onset of estrus (60.26%) in spring season (53.07%). It was concluded that the factors, time of insemination and season of insemination might be the most important factors to get maximum conception rate of the cows. So, it may be suggested for the farmers that to achieve the desire rate of conception, they should inseminated their cows in Spring season and during the time 11–14 h after onset of estrus.

Key Words: Cow; Conception rate; Artificial Insemination

INTRODUCTION

Poverty alleviation is one of the most important challenges of the twenty century in Bangladesh. Agricultural development is the main key to alleviate poverty from the country. Livestock is the most important agricultural component which alone contributes about 6.5% of total GDP (DLS, 1998). In spite of, the cattle population in Bangladesh is considerably high (23.04 million, FAO, 1998) but the productivity is not satisfactory in terms of milk and calf crop production, probably due to lack of appropriate breeding policy, feed scarcity, disease problem etc.

In Bangladesh, artificial insemination (AI) was introduced as an effective breeding program beginning of 1960 with the objective of upgrading indigenous local cows. In 1960, Central Cattle Breeding Farm, Dhaka was established with the major objectives of fundamental research in livestock and to evolve one or two cattle breeds suitable for the country. Latter, a cross breeding program was planned for upgrading the local cattle with the infusion of *Bos taurus* blood. AI program always demands to keep records of non-return rate, conception rate, service per conception and calving rate in order to properly evaluate the reproductive efficiency of cows, skill-ness of the inseminators, fertility and semen quality of bulls. However, an effective reproductive recording system must provide the cattle owner with the key information required to make reproductive management decision. Ideally, optimum economic fertility could be achieved with a pregnancy rate of 80% after the first insemination, a maximum of 1.3 services per conception and an average interval of 85 days between parturition and conception (Morrow, 1980).

Conception rate is directly associated with the production attribute and responsible for monitoring life time productivity of the individual animal. Conception is the first pre-requisite of an animal entering into the productive life. In our situation, around the year a large number of animals remain barren or unproductive having exposed many times for natural mating or artificial insemination and become a burden for the farmers. Conception rate determines directly to the total profitability of farm enterprises. Thus, to achieve the maximum profitability, it is very important to increase the conception rate up to maximum level. On the contrary, there are many genetic and non-genetic factors, *viz.* genotypes of cow, genotype of bull, age and parity of cow, semen quality, season etc., have direct influence on increasing conception rate.

Considering these, the present study was planned with the aim to evaluate the effects of genetic, environmental and their interactions affecting conception rate in cattle and to recommend an optimum approach for achieving maximum conception rate in cattle.

MATERIALS AND METHODS

The experiment was conducted at District Artificial Insemination Center, Sylhet, Bangladesh for a period of January 2001 to June 2003 with 734 cows and 249 heifers of seven different genotypes. The animals were of 3 to 12 years aged and within zero to fifth parity. The age and parity were recorded according to their own statement and also using by dental formulae. Most of the animals were indigenous Zebu type and besides these the crossbreds Local × Holstein Friesian (F_1), Local × Holstein Friesian (F_2), Local × Sindhi, Local × Shahiwal, Local × Sindhi × Holstein Friesian and Local × Shahiwal × Holstein Friesian were available under the experiment. The overall feeding and management of the animals was almost similar and these are kept by the farmers with stall feeding and grazing. The animals were fed mainly rice straw as a staple feed with seasonal green grass depending on the availability. Wheat bran, oil cake, rice polish etc. were supplied as concentrate feed to the cows on optional basis.

The care and management of the bulls with proper housing, treatment and nourishment were maintained to get better quality of semen in Central Cattle Breeding Station (CCBS), Dhaka, Bangladesh; from there required semen were delivered to the different artificial insemination (AI) center to upgrade the indigenous local cows through artificial insemination. In CCBS, the semen was collected from the different genotypes (Holstein Friesian, Local × Holstein Friesian, Local × Shahiwal & Shahiwal × Holstein Friesian) of the bulls twice in a week by means of artificial vagina (AV) and collected semen was examined routinely (Settergren, 1983) for a) Volume and microscopic examination and b) Motility of spermatozoa; showing at least 65% motility. P^H of the collected semen were examined; ranged from 6.5 to 6.7. Sperm concentration of each ejaculate was measured by Direct Cell Count method (Elliot, 1978). After necessary examination, semen was processed Salisbury *et al.* (1978). The diluted semen was packed as a straw (0.25 mL) and preserved in liquid nitrogen (-196°C) and then delivered to different AI centers.

When the farmers brought their animals to the AI center, the reproductive status and estrus condition of the animals were checked and determined by observing the clinical signs and if it is necessary, by using vaginal speculum for examining the condition of cervix. Artificial insemination was done after a variable period of signs of estrus, ranging from 8 h to 24 h, by trained AI technician with thawed semen straw.

To determine the first service per conception rate, the pregnancy diagnosis was done between 60 to 90 days after insemination by rectal palpation (Ball, 1980) at the farmer's house. Then first service conception rate for particular group was determined by the number of heifers or cows given first service multiplied by 100.

$$Conception\ rate\% = \frac{nuimber\ of\ pregant\ cows}{Total\ numberof\ cowsinse\min ated} \times 100$$

To determine the conception rate of the animals, the parameters (genotype of cows, parity of cows, genotype of bulls, time of insemination during estrus, season of insemination and their interaction) were studied and data on the various variable were analyzed under the least squares procedure by the computer programs (Harvey, 1990; SAS, 1990).

RESULTS AND DISCUSSION

To evaluate the effect of genetic, environmental factors and their interaction on conception rate in cows, the results of the study are discussed below.

Effect of genotypes of the cows. The highest (46.14%) conception rate (CR) was observed in indigenous local cows and lowest (35.39%) in Local and Holstein Friesian (F_2), but there was no significant ($P>0.05$) difference in conception rate among the different genotypes of cows (Fig. 1). Gosh (1995) found almost similar results that had no significant difference in first service CR for different genotypes of cows (HF × L=50.00%, SL × L=43.75% & J × L=43.75%). Gwazdauskas *et al.* (1975) also reported that they found no significant difference in CR due to genotypic variation of cows. But Rao *et al.* (1992) observed higher CR of indigenous cows than other genotypic groups. Besides this, Marongiu *et al.* (2002) reported that CR was significantly ($P<0.01$) higher in Sarda cows (95%) than Charolasis × Sarda cows (57%). In practices, it is difficult to find out the effect of cow's genotype on their fertility. Environmental and management conditions those might have more influence on fertility.

Effect of genotypes of bull. In this study, it was observed that there was no significant ($P>0.05$) difference in first service conception rate (CR) among the cows served by different genotypes of the bull (Fig. 2). Irramain and Owasoyo (1980), Hardin *et al.* (1982), Raju and Rao (1982), Bujarbaruah *et al.* (1982) and Djimde and Weniger (1984) also reported that genotypes of bull did not have significant effect on the conception rate of cows. However, Finland Central Association of AI societies (1978) found difference in conception rate of cows for various genotypes of bull. They reported that 60 days non-return rate to first insemination were 66.8% for Ayrshire, 73.4% for Finish, 70.7% for Friesian, 69.2% for Charolias, 67.4% for Hereford and 62.8% for Aberdeen Angus. These values were higher than the present findings, which may be due to improper approach for preservation of semen and detection of right time of heat.

Effect of parity of cows. In this experiment, the first service conception rate was studied from zero to 5th parity. The conception rate (CR) was increased up to 2nd parity and then decreased up to last parity (5th parity). But, it was also observed that the CR in only 5th parity (25.57%) differed significantly ($P<0.05$) with the rest of all the parities. The steady decline of the CR may be clearly observed (Fig. 3). Bhagat and Gokhale (1999) also reported similar results that

Fig. 1. Effects of cows genotype on conception rate

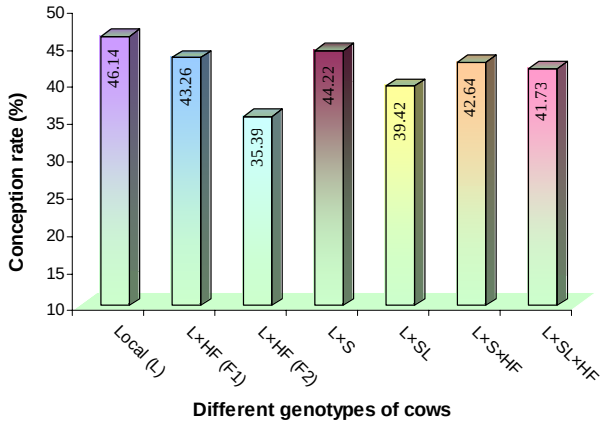


Fig. 2. Effects of bull genotype on conception rate

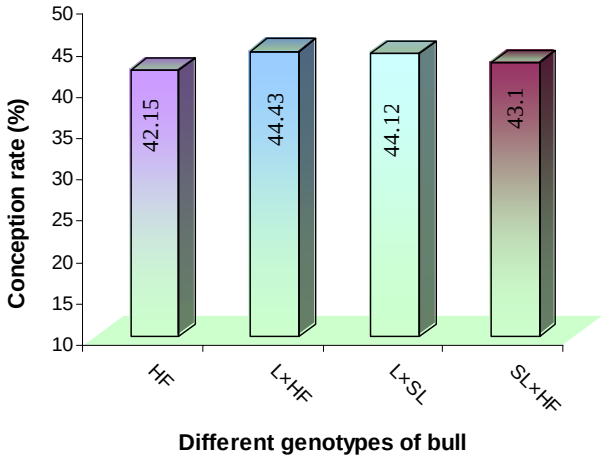


Fig. 3. Effect of parity of cows on conception rate

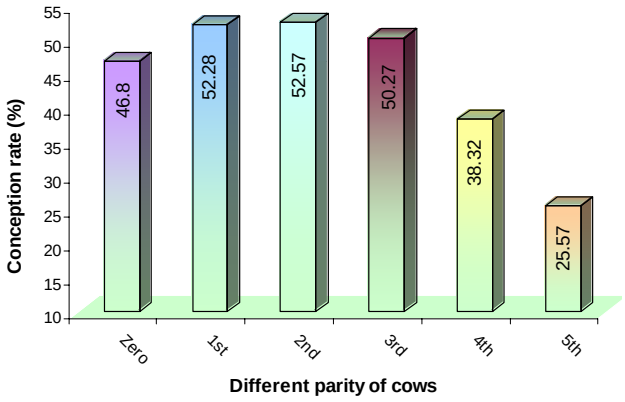
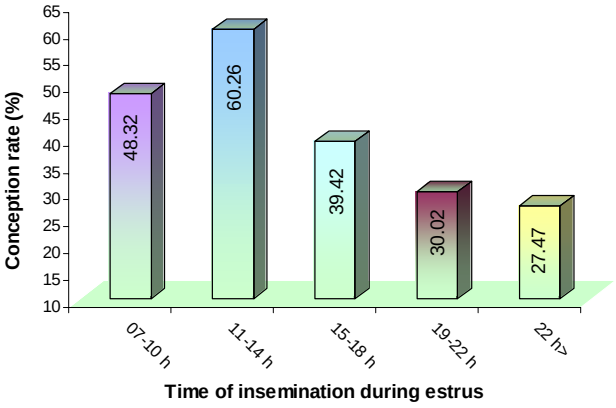


Fig.4. Effect of time of insemination during estrus on conception rate



CR increased gradually from the 1st parity to the 4th parity and then decreased in the subsequent parities. Xu Fengxum (1997) observed higher CR in 1st, 2nd and 3rd parities than in later parities. Biochard and Manfredi (1994) reported that the CR in 1st parity of cows was highest (54%) and the lowest in 7th parity of cows (38%). So, it may be concluded that the CR in zero to 3rd parity of cows are almost higher than that of subsequent parities.

Effect of time of insemination. Time of insemination during estrus is one of the most important factors influencing conception rate. The first service conception rate in 07–10 h (48.32%), 11–14 h (60.26%) and 15–18 h (39.42%) after onset of estrus of the cows were significantly ($P<0.01$) higher than the cows inseminated at the time of 19–22 (30.02%) and 22 h> (27.47%) of estrus. From the study, the highest conception rate (60.26%) was observed (Fig. 4) when insemination was done between 11–14 h of estrus and lowest conception rate (27.47%) when insemination was done at later than 22 h. Fig. 4 also clearly indicates the CR decreased (after the 14th h of estrus) with the increasing time of insemination during the estrus of cows. Rodriguez and Hernandez (1992) inseminated 100 Holstein and Brown Swiss×Zebu cows on 0-2, 6-8, 12-14, and 18-20 h after the first sign of estrus and found significant variation in conception rate 40%, 52%, 62% and 32% respectively. Das *et al.* (1990) also reported almost similar results, they observed significant ($P<0.01$) variation in conception rate 58.82, 69.69 and 33.70% when the cows were inseminated in early, middle and late estrus, respectively. Thus, the effect of time of insemination on CR as observed in the present study supported the other previous studies. So, it can be concluded on the basis of the above results that the conception rate may be significantly differed due to the time variation of insemination and the appropriate time of insemination is 11-14 h after the on-set of estrus.

Effect of season. In this study, the conception rate was observed (Fig. 5) significantly ($P<0.05$) higher (53.07%) in the cows which were inseminated in spring than the cows were inseminated in summer (37.89%) and winter (39.42%). Alam and Ghosh (1988) reported that conception rate of the cows significantly differed in different seasons.

Fig. 5. Effect of season on conception rate

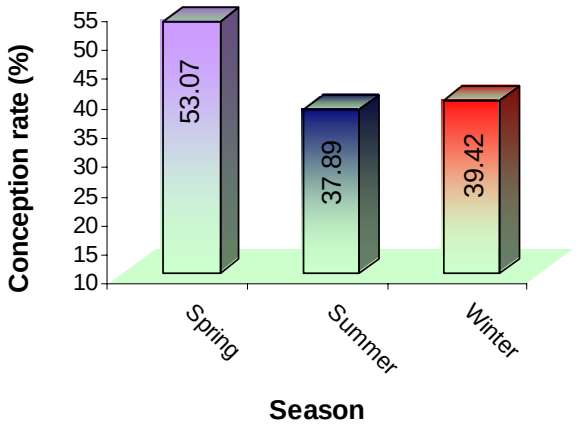
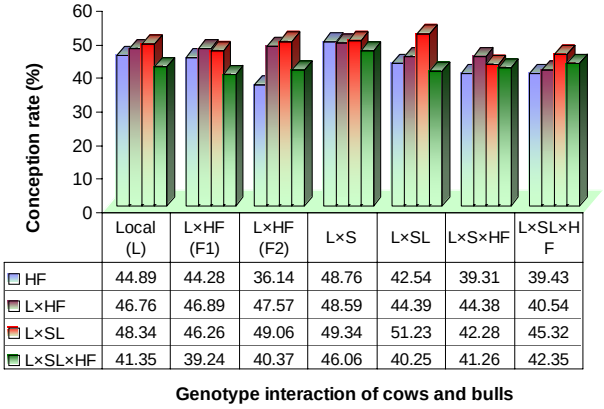


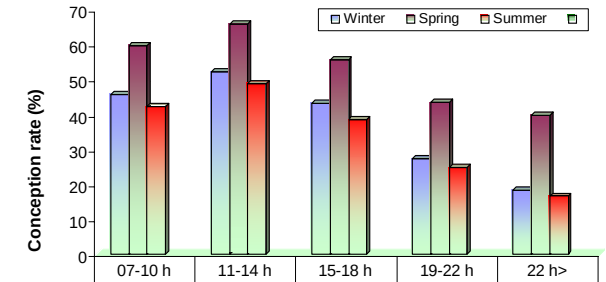
Fig. 6. Effect of genotype interaction of cows and bulls on conception rate



	Local (L)	L×HF (F1)	L×HF (F2)	L×S	L×SL	L×S×HF	L×SL×HF
HF	44.89	44.28	36.14	48.76	42.54	39.31	39.43
L×HF	46.76	46.89	47.57	48.59	44.39	44.38	40.54
L×SL	48.34	46.26	49.06	49.34	51.23	42.28	45.32
L×SL×HF	41.35	39.24	40.37	46.06	40.25	41.26	42.35

Genotype interaction of cows and bulls

Fig. 7. Effect of season and time of insemination on conception rate



	07-10 h	11-14 h	15-18 h	19-22 h	22 h>
Winter	45.7	52.3	43.2	27.3	18.5
Spring	59.6	65.9	55.5	43.4	39.8
Summer	42.4	48.7	38.6	24.8	16.7

Genotype interaction of cows and bulls

The seasonal variations in CR of cattle are not only due to effect of seasons alone but many other factors including influence of bulls (Sexena & Tripathi, 1986) may be involved. Seasonal variation in CR might be due to possible changes in nutrition, environmental temperature, and climate and photo period. The CR of cows markedly reduced when a higher temperature prevails for two days before insemination to 4-6 days after insemination (Gwazdauskas *et al.*, 1975). Higher temperature and relative humidity (Zakari *et al.*, 1981) and poor management affect on fertility of cattle. On the basis of all consideration, it may be concluded that spring is the best season for highest conception rate of cows having suitable ambient temperature and humidity in Bangladesh with satisfactory level of availability of necessary nutrition for feeding of animals.

Effect of the genotype interaction of cows and bulls. The genotype interaction of cow and bull had no significant ($P>0.05$) effect on conception rate of cows (Fig. 6). From the result, it is observed that semen of different genotype of cows had no significant effect on conception rate, probably due to within group variation in Shahiwal bull.

Effect of interaction between time of insemination and season. the interaction of time insemination and season had significant ($P<0.05$) effect on conception rate. The highest conception rate was observed (Fig. 7) in 11-14 h × Spring (65.9%) and the lowest CR in 22 h > × Summer (16.7%). From this result, it can be concluded that the appropriate time of insemination is 11 to 14 h after on set of estrus and season is spring.

Acknowledgement. The authors firstly wish to heartfelt thanks the renowned scientists those who devoted their enjoyable life in the research contribution with factors influencing conception rate. Authors are also grateful to Assistant Director (Animal Production), Scientific Officer and AI technician of District Artificial Insemination Centre, Sylhet, Bangladesh for providing necessary data to prepare the article.

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(Received 12 June 2004; Accepted 10 August 2004)