

Effect of age, parity and breed on conception rate and number of service per conception in artificially inseminated cows

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Abstract

Context: Age, parity and breed have effect on high conception rate of dairy cows which is very important for success of Dairy farms.

Objectives: To determine the effects of age, parity and breed of the cows on conception rate and number of services per conception in artificially inseminated cows at Bangladesh Agricultural University Veterinary Clinic, Mymensingh, Bangladesh.

Materials and Methods: A total of 133 animals were inseminated during the specified time brought to the BAU Veterinary Clinic using frozen (cryo preserved) semen. The cows were inseminated between 6-20 hrs of onset of heat; data (history) obtained from the owners.

Results: Out of 133 animals 101 animals required 1-2 services and 32 animals required 3 or more services. Out of 133 animals, 79 animals were conceived. Out of 1-2 serviced animals showing conception rate 62.4% and 3 or more serviced animals showing conception rate 50%. The overall conception rate with frozen semen (in native Zebu cows, Holstein Cross and Sahiwal Cross) was 59.3%. A significantly increased conception rate was found in both Parity 2 and 3 ($P \leq 0.02$) and conception rate was 73-75%. Cows with parity 2 and 3 had several times increased conception rate than the nulliparous animals. In different age groups conception rate was the highest in between 3.5-5 years, (77.8%) and cows with age group more than 9 years had significantly decreased ($P \leq 0.001$) conception rate than other age groups. In different breed groups, conception rate was the highest (64%) in native cattle and intermediate (57%) in Friesian cross and the lowest (53%) in Sahiwal cross. The service per conception was the lowest (1.6) in Friesian cross, intermediate (1.8) in Sahiwal cross and the highest (2.3) in local cows. More service was required for heifer than older animals.

Conclusion: Friesian cross and cows with parity 2-3 were the best choice of selection for a dairy farm in respect to age, conception and the lowest service per conception. The lower service per conception is a desirable merit in breeding of animals.

Keywords: cow, conception rate, Zebu, Holstein, Sahiwal

Introduction

Bangladesh has a large population of livestock. However, the dairy industry is not developed like other Asian countries. The country has made great effort to improve the productivity of local breeds through artificial insemination (AI) programme to crossbreed locally adapted cattle breeds with improved exotic dairy breed ones. However, the success of such programme is not satisfactory due to numerous factors, including substandard nutrition, poor husbandry practice and infrastructure status. Thus, dairy producers have challenging complaint about a poor reproductive performance in animals using AI (Lemma and Kebede, 2011). To ensure the success of the AI programme, regular supervision should be taken by evaluating the reproductive performance of the dairy cow under the prevailing management and environmental conditions since dairy cattle are important sources of food and income for smallholders, specially in urban and sub-urban areas of Bangladesh.

Herd profitability is majorly determined by dairy cows reproductive performance (LeBlanc, 2007). Fertility or conception of dairy cows has a great importance to meet today's expectation of dairy man to get one calf per cow per year. Major reproductive performance factors encompass both herd-level management factors (such as methods of husbandry, feeding, estrus detection, semen handling and cow management) and cow-level factors (such as age, BCS, post parturient problem, disease events, milk yield, and genetics) (Lucy, 2001; Hudson *et al.*, 2012). In tropical countries performance of smallholder dairy cattle is affected by various factors such as breed, location

(geographical location), season of calving, suckling status, age, parity, and body condition score (Obese *et al.*, 1999; Masama *et al.*, 2003; Msangi *et al.*, 2005; Lobago *et al.*, 2007). Number of service per conception (NSC) is one of the most important parameters of fertility (Cavestany and Galin, 2001). The major constraints of profitable income from dairy cows is low conception /pregnancy rate to first services, increased number of services per conception, long calving to first service interval, and poor heat detection rate after AI (Alam and Ghosh, 1988; Shamsuddin *et al.*, 2001). Furthermore, the parity, breed and age of the cows inseminated also found to affect the conception rate after AI.

Retrospective research works have been done at institutional large dairy farms to evaluate reproductive performances of dairy cows (Amene *et al.*, 2010, Habtamu *et al.*, 2010; Tadesse *et al.*, 2010). However, none of the studies were done to evaluate the reproductive performance of dairy cows for AI breeding solely. Effects of age, parity and breed of the cows on conception rate and number of services required per conception are poorly documented in respect of Bangladesh despite having a lot of importance for success of dairy farms of our country. Considering the paramount importance, the present study was conducted to estimate the conception rate after AI using frozen semen, effects of age, parity and breed of the cows on conception rate and number of services required per conception in artificially inseminated cows.

Materials and Methods

The study was carried out at Bangladesh Agricultural University veterinary clinic, Mymensingh, Bangladesh. One hundred and

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thirty three animals were inseminated during the specified time brought to clinic using frozen semen. The cows were inseminated between 6-20 hrs of onset of heat; data (history) obtained from the owners. The breeds were indigenous (Zebu) and their crosses with Holstein Friesian and Sahiwal. The semen was collected from Central Cattle Breeding Station (CCBS), Savar, Dhaka. An overview of the data for different variables (breed, age, BCS) of cows were shown in Table 1.

Table 1. Description of demographic variables of cows inseminated artificially

Variable	Category level	No. of observation
Breed	Local	58
	Friesian Cross	56
	Sahiwal Cross	19
Age (year)	2.5 -3	19
	3.5-5	36
	6	32
	7-8	30
	>9	16
BCS	1.5-2	49
	2.5-3	73
	3.5	11

Techniques of AI with frozen semen: The methodology of artificial insemination is followed as described by Khan (2008).

Sterilization of instruments and hygienic measures: The instruments were washed with tap water and then rinsed in alcohol. After that the instruments were again rinsed several times in distilled water. New plastic gloves, new sheath were used. After loading the AI guns were kept uncontaminated and did not allow contacting with any dirty materials. The vulva of the animal was wiped as clean as possible. The lips of the vulva were parted and introduced the point of the gun as clean as possible. Always it was ensured that kit box and its contents were cleaned and it contained new gloves, insemination gun, sheath, thaw box, and thermometer.

Thawing of the semen and loading of the AI gun: It was checked and adjusted the water temperature in the thawing flask to within a range of 35°C-38°C. Thawing of semen above 40°C might cause it to over heat and cook. It was ensured that the water was deep enough to cover only about 4/5th of the straw. During selection of straw the canister was lifted to the top of the frost line in the neck of the tank. The frost line was about 50 mm below the top of the neck. By using fingers the straw was removed from the thawing flask and dried it with a paper towel. The straw was held by the manufacturers end after drying was completed. The name of the bull printed on the straw was checked. It was prepared to cut off the laboratory end of the straw by a clean scissors. A sheath was selected and placed it over the barrel of the gun. The sheath was pushed through the center hole of the locking ring and twisted it down on the conical seat of the gun. The seal between the sheath and the gun was secured and then pressed the plunger of the gun until the semen just visible at the end of the gun.

Inseminating procedure: Plastic disposable glove was always used when inseminating. A small quantity of lubricant was used. A cone was formed with the gloved fingers and inserted hand into the rectum. The gun was inserted cleanly between the lips of the vulva into vagina. The gun was pushed gently through the vagina until it reached the surface of the cervix which had a grating feel about it. A forward pressure was maintained on the gun and manipulated the cervix so that the gun passes through cervix canal. The semen was begun to express at this position ensuring that most of the semen is expressed in the body of the uterus. The gun was removed slowly from the cervix and vagina because rapid withdrawal of the gun can suck semen back through the cervix into the vagina.

Confirmation of pregnancy: Pregnancy was confirmed by rectal palpation as described by Arthur (1964). All the animals under this study were subjected to pregnancy diagnosis per rectum after 60-90 days post AI, some by visiting owner's house and some at the BAU Vet. Clinics where animals are brought by the owners. The results of the pregnancy diagnosis were recorded to find out the conception rate. The pregnancy was confirmed by observing the asymmetry of the horn, palpation of the fetus and slipping of the fetal membrane.

Recording and 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. Descriptive statistics and multiple logistic regression analysis were done to find the relationship between age, parity, BCS and conception rate.

Conception rates (CR) were estimated from the proportion of pregnancies confirmed by the rectal palpation of the genital tract at day 60-90 of post insemination among the total number of cows /heifer inseminated artificially with frozen semen in a specified period of time. Banerjee (2004) estimated conception rate and service per conception by using the following formulae.

$$\text{Conception rate (CR)} = \frac{\text{No. of cows / heifer pregnant}}{\text{No. of cows / heifer inseminated}} \times 100$$

$$\text{Service per conception} = \frac{\text{Total number of service}}{\text{Total number of cow conceived}}$$

Results and Discussion

Conception rate: Conception rate refers to the percent of cows diagnosed pregnant out of total number of cows inseminated. The conception rates of cows of our study are shown in Table 2. A total 79 cows were conceived among 133 animals. The overall conception rate in artificially inseminated cows in this study was 59.3% which is in agreement with Bhatnagar *et al.* (1978) and Tomar (1981). This rate was, however, higher than those reported by Nair (1975), Prokash and Saini (1987), Shamsuddin *et al.* (1987) and Qureshi (1979). Bach (1983) reported that the highest (79%) and the lowest (61.8%) conception rate may be obtained when cows were inseminated at strong or weak

oestrus signs respectively. Insemination with increased proportion of abnormal spermatozoa beyond the normal limit may induce lower fertility (Larson, 1988). Other factors which may increase or decrease the conception rate may be of sexual health status of the female reproductive organs, proper maintenance of the liquid nitrogen level in the container and faulty technique of using frozen semen in AI practice.

Table 2. Conception rate in different age group of cow

Age group (Years)	No. inseminated	No. conceived	Conception rate (%)	
			Overall	Within group
2.5-3	19	11	8.2	57.9
3.5-5	36	28	21.1	77.8
6	32	21	15.8	65.6
7-8	30	14	10.5	46.7
>9	16	5	3.7*	31.3
Total	133	79	59.3	-

*p-value ≤ 0.001

Table 3. Conception rate in different parity of cow

Parity	No. inseminated	No. conceived	Conception rate (%)	
			Overall	Within group
0	19	11	8.27	57.9
1	21	13	9.77	61.9
2	19	14	10.52	73.7*
3	28	21	15.79	75.0*
4	17	9	6.76	52.9
5	15	6	4.51	40.0
6	8	3	2.25	37.5
7	6	2	1.50	33.3
Total	133	79	59.3	-

*p-value ≤ 0.02

Effects of age, parity and breed of the cows on conception rate:

The effects of age on the fertility of cows and bulls are difficult to assess, since they are complicated by so many other factors. Environmental factors such as season of the year, management practices and nutritional status frequently affect one age group more markedly than other. In present observation, among the age group, the highest conception rate was in between 3.5-5 years, about 77.8% and cows with age group more than 9 years have significantly decreased ($P \leq 0.000$, 95% CI 4.2e⁻¹⁰, 4.29e⁻⁰⁵) conception rate than other age group (Table 2). Our observation is quite similar with Mufti *et al.* (2010) observed that the conception rate of heifers and cows delivered 1, 2, 3 and 4 calves were 64.52, 72.73, 64.86, 60 and 53.33%, respectively in Red Chittagong cows. Schiling and England (1968) studied the effect of age on fertility in beef cows and reported that fertility is highest in cows between 4 and 9 years of age and decline after 10 years of age. A decline in fertility with advancing age, and a decrease in ovulation rate due to lack of gonadotrophin release from the pituitary. A deterioration in the quality of eggs ovulated with subsequent fertilization, resulting in embryonic or fetal loss or uterine failure due to hormonal imbalance or deficiency may occur in advanced age.

Table 4. Conception rate in different breeds of cow

Breed	No. inseminated	No. conceived	Conception rate (%)	
			verall	Within group
Local	58	37	27.8	63.8
Friesian	56	32	24.0	57.1
Sahiwal	19	10	7.5	52.6
Total	133	79	59.3	-

Table 5. Frequency distribution of service and conception

Variable	Category	No. of observation	No. of cow conceived	Conception rate (%)
Service	1-2	101	63	62.4
	3 or more	32	16	50

Table 6. Frequency distribution of services required in different age groups and breeds of cow

Services	No. of cows (age in year)					No. of cows (breeds)		
	2.5-3	3.5-5	6	7-8	>9	Local	Friesian	Sahiwal
1-2	12	26	24	24	12	50	36	15
3 or more	7	10	8	6	4	8	20	4
Total	19	36	32	30	16	58	56	19

A significantly increased conception rate was found in both Parity 2 ($P \leq 0.02$, 95%CI 1.51, 58.3) and Parity 3 ($P \leq 0.02$, 95% CI 1.5, 124.6) in this investigation (Table 3) and conception rate was 73-75%. Cows with parity 2 and 3 had several times increased conception rate than the nulliparous animals. These findings are in agreement with Spalding *et al.* (1975). Barcellos *et al.* (1996) reported a higher conception rate in multiparous cows than that in primiparous cows. Than *et al.* (2001) reported an increased conception rate with advancing parity from parity 2 up to 6, and then declined at parities 7 and 8.

The conception rate in different breeds of cows in this study is presented in Table 4. Conception rate was the highest (64%) in native cattle and intermediate (57%) in Friesian cross and the lowest (53%) in Sahiwal cross. Hence breed influence in conception rate was observed. Shamsuddin *et al.* (1997) also found the different conception rates in different breeds. Grass *et al.* (1982) found that the breed differences in age at puberty.

Service per conception: Service per conception is defined as the average number of natural or artificial services required per conception. Determining the number of services required per conception is a simple and mostly practiced criterion of expressing fertility and analyzing costs. The frequency distribution of service and conception is placed in Table 5. Among 133 cows inseminated 101 required 1-2 services and 32 cows required 3 or more services. Animals with 1-2 service showed conception rate 62.4% and animals with 3 and more services showed conception rate 50%. Service required in different age groups and breeds of cows is shown in Table 6. At 1-2 services a relatively higher conception rate were observed in age group 3.5-5 and 6 years and local breeds. However, this higher conception rate was not statistically different. The service per conception was different in our observation (for Local cows 2.27, for Friesian Cross 1.56 and for Sahiwal Cross 1.79). The observation is in agreement with Tabler *et al.* (1951) and Dunbar and Henderson (1950). They found little genetic variability in

services per conception. However, El-Amin *et al.* (1981) reported that there was no significant difference between the breed groups in the number of services per conception (av.2.6) or gestation length (av. 275.6 days).

Conclusions

From the present study, it may be concluded that the overall conception rate is 59.3% and conception rate was significant increase in both parity 2 and parity 3 than nulliparous, but cows with age group more than 9 years have significantly decreased conception rate than other age groups. Further study is needed with large number of cattle population with proper AI recording system and veterinary herd fertility program and also should consider management and environmental variation. Thus, a sustainable extension service should be established in order to improve the management and efficiency of AI service to bridge the existing gaps and to improve the reproductive performance of dairy cows.

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