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RESEARCH ARTICLE

EFFECTIVENESS OF ARTIFICIAL INSEMINATION IN BUFFALO AT COASTAL REGION OF BANGLADESH

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ABSTRACT

The aim of the present study was to determine the effectiveness of artificial insemination in Buffalo at Coastal Region during October, 2018 to November, 2020 under Promoting Agricultural Commercialization and Enterprises (PACE) Project. A total of 176 cyclic buffaloes for artificial insemination and 594 cyclic buffalo for natural service were included in this study. The animals were inseminated artificially under four different times, i.e. inseminated i) between 6-12 hours after showing first sign of estrous, ii) between 13-18 hours after showing first sign of estrous, iii) between 19-24 hours after seeing first sign of estrous and iv) between 25-36 hours after showing first sign of estrous. The pregnancies (positive or negative) were confirmed by rectal palpation after 60 days of artificial insemination (AI). In case of Artificial insemination the pregnant animals were 29.55% and in case of natural service pregnant animals were 61.28%. The highest pregnancy rate (47.73%) was observed in insemination between 19-24 hours after seeing first sign of estrous and the lowest pregnancy rate (15.91%) was observed in insemination between 25-36 hours after seeing first sign of estrous. In case of artificial insemination calf mortality was lower (3.85%) than that of natural services. The birth weight of calf was higher in case of Artificial insemination than natural services. The findings of the study suggest that, with the expansion of AI programs in buffalo it was envisioned that the technique used in cattle required modifications in order to achieve the best results in buffalo at Coastal region of Bangladesh.

Key words: Effectiveness, Artificial Insemination, Buffalo, Coastal Region.

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INTRODUCTION

Bangladesh is a south Asian country where the economy is based primarily on agriculture and livestock is an essential component of the rural economy and 10 million people are directly related with this sector for their income generation in Bangladesh. Among different livestock species, the number of buffaloes in Bangladesh is 1.497million (BER-2020). Bhola is a buffalo concentrated area in Bangladesh. Available grazing land and favorable geographical environment make buffalo rearing a popular business in this area. At present the total buffalo population in Bhola is 90,827. In Bhola, normally two methods known as Bathan and are household rearing used for buffalo rearing. In average, 80-100 buffaloes are usually reared in Bathan and most of the families 'rear 2-3 buffaloes all year long according to the tradition in this area. They do not know how to rear buffalo in a scientific method. Though total milk production of Bangladesh is about 6.96 Lakh Metric Ton in 2018 out of which about 3 to 4% is produced by the buffalo in spite of the number buffalo growth rate are increasing during last 10 years (DLS, 2018).

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Presently, it is increasing the number of consumer of buffalo milk because of its white color, high fat content and flavor. As a result there is a high demand for buffalo milk in the country, but milk yield per dairy buffalo is very low which is 600-1000 liter per 250- 270 days lactation period (Faruque *et al.*, 1990). AI was first introduced in cattle in 1930's (Foote, 2002). Series of classical experiments on ovulation and insemination timings addressed this issue in dairy cattle. Minimum number of cows returned to estrus when bred artificially 12 hours after the beginning of standing estrus (Trimberger, 1948) that laid the foundation for AM-PM rule, i.e., a cow detected in standing heat in the morning should be bred artificially in the evening and vice versa. This method ensures sufficient time for sperm to capacitate and reach the proper site of fertilization in the oviduct (Yanagimachi, 1981; Bedford, 1983). Owing to the anatomical and physiological similarities, a natural consequence was the adoption of AI methods in water buffalo from cattle protocols. Consequently, without gaining basic knowledge of timing of ovulation, AM-PM rule was adopted in the buffalo (Drost, 2007). This practice resulted in reduced number of pregnancies leading to less adaptability of AI by the farmer community (Anzar *et al.*, 2003).

Paradoxically, whether or not, this AM-PM rule holds true in water buffalo has not yet been systemically investigated. Therefore, the present studies were undertaken to effectiveness of artificial insemination in Buffalo and to improve the livelihood of farmers and ensure high level of food security through buffalo production.

METHODS AND MATERIALS

Study area: The study was conducted at 13 branches of Grameen Jano Unnayon Sangstha (GJUS) in Bhola district (Bhola Sadar, Lalmohon, Charfassion, Borhanuddin, Daulatkhan upazila) during October, 2018 to November, 2020 under Promoting Agricultural Commercialization and Enterprises (PACE) Project.

Animal selection and management: Buffalo (n = 176), 4-6 years of age and 350-450 kg of body weight were maintained as untied under semi covered having free access to water, fed on 30–40 kg of seasonal fodder and 1–2 kg of concentrate feed to each buffalo daily. Buffalo were kept under optimal sanitary conditions. They were vaccinated and dewormed. The routine screening has been carried out and buffalo without any clinical and reproductive abnormalities were enrolled in this study. For the genital tract evaluation, buffalo were screened by rectal palpation). All buffalo included in the experiment came into estrus spontaneously.

Estrus detection and time of insemination: Heat was detected twice daily for 60 minutes periods from 7:00 to 8:00 AM and from 6:00 to 7:30 PM for 30 minutes, with close observation. Behavioral and external heat signs were taken into account for heat detection. Standing heat was considered in a buffalo when it did not move away for 5-7 seconds with the teaser bull being mounted on her.

Time of insemination; In this research, we inseminated the animals under four different times, i.e. inseminated i) between 0-6 hours after seeing first sign of estrous, ii) between 6-12 hours after seeing first sign of estrous, iii) between 12-18 hours after seeing first sign of estrous and v) between 18-24 hours after seeing first sign of estrous.

Pregnancy diagnosis: All cows were diagnosed for pregnancy 60 days after the last insemination by rectal palpation.

Statistical analysis: The data generated from this study were entered in Microsoft Excel Worksheet and descriptive statistics were performed. The pregnancy rates in different experiments were expressed as percentage (%). The data were analyzed by using SPSS software version 17. The variation in pregnancy rates was considered significant when the P value was less than 0.05.

RESULT AND DISCUSSION

To know the effectiveness of artificial insemination in buffalo, we inseminated (artificially) a total of 176 cyclic buffaloes under four different times by trained and skilled inseminator and observed final pregnancy (positive or negative) following pregnancy diagnosis. After 60 days of insemination, we confirmed pregnant buffalo by rectal palpation with skilled veterinarian.

In this study 176 and 594 numbers of cyclic buffalo were given artificial insemination(AI) and natural service with bull respectively, we found pregnancy rate of buffalo cow were 29.55% in artificial insemination and 61.28% in natural service. Conception rates of artificial insemination in buffalo is low due to poor estrus detection (Cruz, 1998)Also reported low efficiency of artificial insemination in water buffalo has been more related to the human factors such as inability to properly detect estrus, improper handling of semen and management and nutrition of inseminated animals. Although failure of timed ovulation in synchronized buffaloes has been suggested as an important cause of poor fertility (Hattab *et al.,* 2000), yet it has not been fully studied.

The total pregnant animals in this study were 40% (Hamid 2018), this result is almost similar with our study. Higher conceptions were reported when AI was performed at later stage of estrus in buffalo under field conditions but without precise confirmation of ovulation (Srivastava *et al*., 1998). Timing of ovulation is directly associated with proper time of insemination for the success of AI (Nalbandov and Casida, 1942). The results of timing of insemination with respect to beginning of standing estrus on pregnancy per AI in buffalo are presented in the Table 02. Maximum pregnancy rate 47.73% (8/44) was achieved in buffalo inseminated at 19-24 h after the onset of standing heat. This was followed by 36.36% (18/44) in those buffalo which were inseminated at 13-18 h after the beginning of standing estrus. Although, numerically there was a nine percent point difference between these two groups yet it was statistically non-significant. About 18.18% (8/44) buffalo became pregnant when they were inseminated 6-12 h after the onset of standing heat. This pregnancy per AI was significantly ($P < 0.05$) lower than those obtained at 24 h group but not ($P > 0.05$) from 12 h group. Fewer buffalo, became pregnant i.e., only 15.91% (7/44) when inseminated at 36 hours after the beginning of standing heat. Comparison of pregnancy per AI between various groups using chai square test (χ^2) revealed that its occurrence was higher in buffalo inseminated at 19-24 h as compared to those inseminated at 6-12 h, 13-18h and 25-36h. Similarly, higher pregnancy rate (50%) was observed in smaller number of buffalo in field conditions when they were inseminated late i.e., around 23-26 h after the beginning of heat signs (Srivastava *et al*., 1998).

These results clearly indicate that the interval from onset of standing heat-ovulation is significantly (at least about eight hours) more in buffalo than cow. This late occurrence of ovulation would, therefore, require delayed insemination in buffalo, compared to cow, to acquire better results of AI. Lower pregnancy rate in AI of buffalo when inseminated at 0 and 36 h after onset of standing heat, are most likely due to mismatching of the sperm and ova at the site of fertilization. At early insemination (0 h) sufficient viable sperm might still not be available for fertilization. In case of much delayed insemination (36 h), the sperms have to undergo capacitation first which takes almost 8 hours (Hunter and Wilmut, 1983) and perhaps by that time ova after ovulation might have become aged. Major observation of the present studies indicates that the timing of insemination in buffalo, for optimum fertility differs from the cow. The AM-PM rule i.e. interval between onset of standing estrus and AI, which was classically developed in dairy cows in United States during late forties, was implemented, without any systematic experimental study, in buffalo. Resultantly, the fertility remained generally low in buffalo (Andrabi *et al*., 2001).

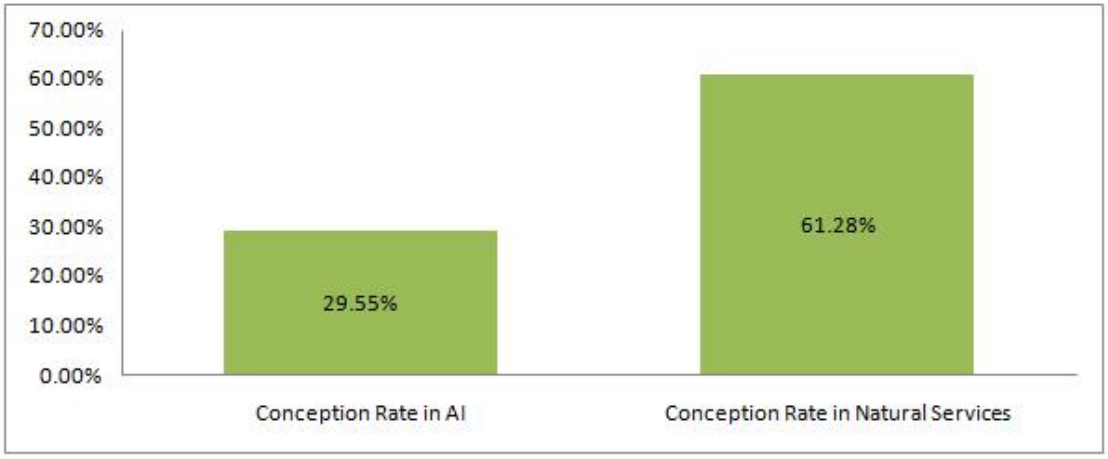

Table 1: Pregnancy rate of buffalo in Artificial insemination and Natural Services

Table 02. Timing of Artificial insemination in buffalo cow

Insemination time	No of animals	Conception rate	P value	χ^2 value
6-12h after showing heat	44	18.18%		
13-18h after showing heat	44	36.36%*		
19-24h after showing heat	44	47.73%*	0.002	14.63
25-36 after showing heat	44	15.91%		

* indicates significant at 5% level.

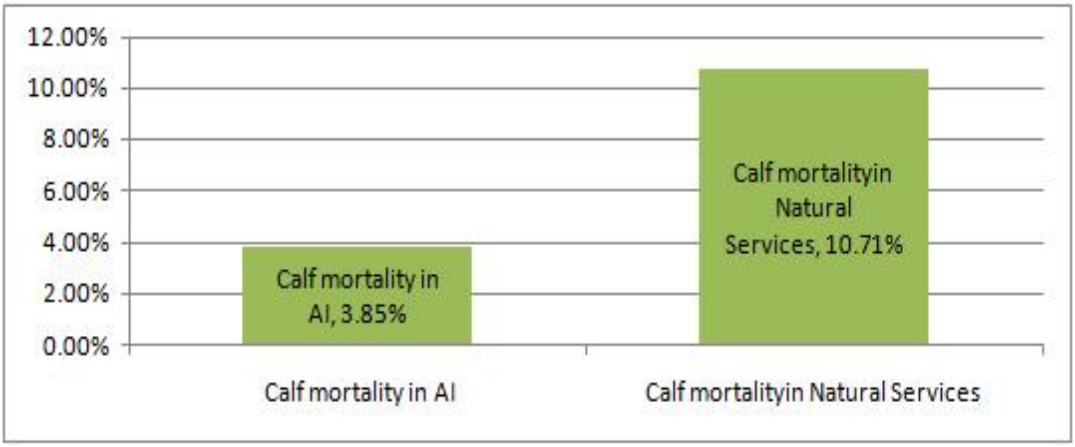

Table 3. Comparison of calf mortality in between the calf from AI and natural services

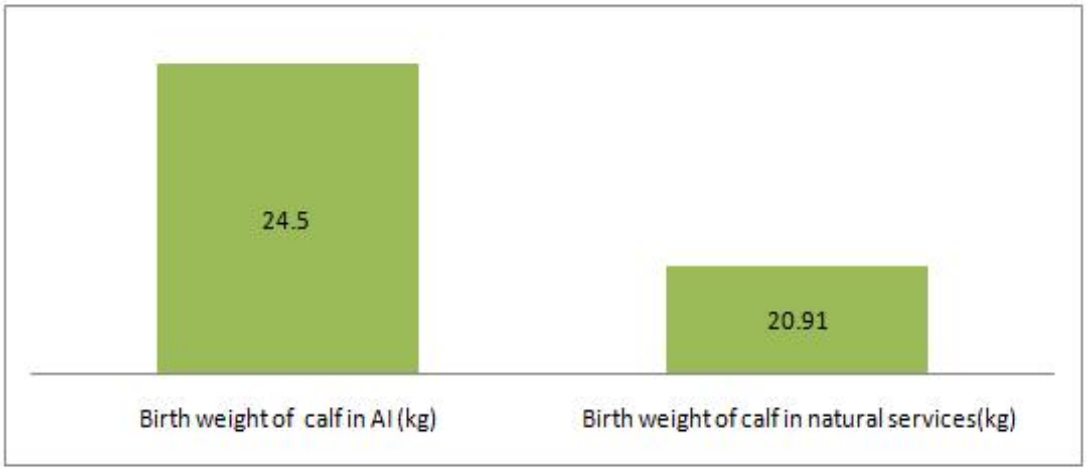

Table 4. Comparison of birth weight of calf in between the calf from AI and natural services

With the evidence of delayed time of ovulation in buffalo as compared to cows and higher fertility (47.73%) with late insemination (19-24 h) in this study, the AM-PM rule appears to be misfit for buffalo and need to be modified. With the expansion of AI programs in buffalo it was envisioned that the technique used in cattle required modifications in order to achieve the best results in buffalo (Cockrill, 1974). The result of the present study indicated that buffalo calf mortality of calf in AI was 3.85% and in natural service 10.71%, higher mortality was reported by around Jabalpur district was 42.11% (Shakya *et al.,* 2017.) According to Afzal *et al.* (1983) the mortality in cattle and buffalo calves ranged from 29.1% to 39.8%. Furthermore, 25% average early calf mortality hardly provides any chance for regular replacement of low production animals. Neonatal calf mortality varies from 8.7 to 64 per cent throughout world. Martin and Wiggins (1973) estimated that 20% calf mortality resulted in reduction of 38% profit of a livestock farm.

Mortality is higher in male 25.5%) than in female(13.9%) neonatal calves (Kaushik *et al.*1980), reason for this higher mortality might be due to serum immunoglobulin, required for the protection from different diseases during neonatal life, absorb less in male (20.69 mg/ml) than female (25.12mg/ml) calves. Table 04 show the birth weight of buffalo calf. In case of AI birth weight of Buffalo calf was 24.5kg and in case of natural service birth weight of buffalo calf was 20.91kg. It is found that the birth weight of buffalo calf is higher in the calf from AI. There is a little difference with Bhatti *et al.* (2009) who reported Birth weights of buffalo calves were 34 and 29.5 kg in male and females, respectively because of breed difference. Also Chaudhry *et al.* (1989) have reported average birth weights of 37.2 and 36.1 kg in male and female calves, respectively, in primiparous buffaloes, during the year 1976-77 to 1986-87.

Conclusion

The maximum pregnancy rate in AI was obtained when buffalo were inseminated 18-24 hours after the beginning of standing estrus. It can be conclude that with the expansion of AI programs in buffalo it was envisioned that the technique used in cattle required modifications in order to achieve the best results in buffalo .This implies that the breeding management needs to be modified in buffalo.

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