Research Article

Success of estrus synchronization and artificial insemination in cattle among the NGO supported farmers at char area in Bangladesh

Shankar Biswas[1], Jotan Kar[2], Arup Sen[2], Nijaya Mohanto[3], Sabuj Kanti Nath[4]*

[1]Department of Physiology, Biochemistry & Pharmacology, Chittagong Veterinary and Animal Sciences University (CVASU), Chittagong, Khulshi-4225,Bangladesh,
[2]Department of Microbiology and Veterinary Public Health, Chittagong Veterinary and Animal Sciences University (CVASU), Chittagong, Khulshi-4225,Bangladesh,
[3]Department of Pathology and Parasitology, Patuakhali Science and Technology University (PSTU), Bangladesh.
[4]Department of Animal Science and Animal Nutrition, Chittagong Veterinary and Animal Sciences University (CVASU), Chittagong, Khulshi-4225,Bangladesh,
*Corresponding author: *sabujkantinath@gmail.com*

Abstract

An experimental study was performed to synchronize estrus and artificial insemination with its success rate in cattle by the Mahideb Jubo Somaj Kallayan Somity under a project of Artificial Insemination in Dairy and Beef cattle at Ulipur upazila in Kurigram district, Bangladesh during in 2016. The aim of this project was to synchronize estrus of cattle as they give birth between September to November. All the recorded data was collected for this study to use synchronization technology with the concern of the Department of Medicine and Surgery, Chittagong Veterinary and Animal Sciences University, Chittagong. Under the project, 264 cattle were selected for synchronization of estrus. All selected cattle were dewormed, vaccinated against harmful diseases before synchronization treatment. Moreover, they got a dose of prebiotic-probiotic combination and multivitamin before synchronization treatment. Among the selected cattle 244 were heifer and 20 were the cow. The age of heifers was around 2.5-3years and cow's parity was 1.The body condition score was above 3.5. The Ovsynch (First day GnRH-8th day PGF2 -10th day GnRH and estrous with 48hrs) method of estrus synchronization was followed. Injection GnRH (Fertilon®, Synthetic Gonadorelin-100microgram per ml, Dose-5ml/cattle, Marketed by Techno Drugs) at first day and Injection PGF2 (Dinoprost®, Trometamol-5mg per ml, Dose-5ml/cattle, Marketed by Techno Drugs) at day 8th then again injection GnRH at day 10 was used. 177 heifers and 13 cows were responded to synchronized method. Overall conception rate was 54.54 and service per conception rate was 1.38.

Keywords: Estrus synchronization, Ovsynch, Conception rate, Prostaglandin, Gonadotropin.

Introduction

Dairying is nearly always a part of mixed farming systems in Bangladesh. It has a direct impact on income generation, poverty alleviation, and availability of animal protein. Cattle among other livestock species available are the most versatile component in relation to the existing integrated agricultural farming system in Bangladesh. Total cattle population of the country is about 24.5 million, which is about 1.79% of the world and 5.47% of Asian cattle population (FAO, 2004). In the last 10 years, the cattle population has increased by 0.3% in contrast with 0.4% of the world. It has been reported by the Bangladesh Bureau of Statistics (BBS 1999), that 52.0% of male cattle, 62.3% of female cattle and 60.9% of cattle <3 years old are raised by small- and medium-sized farms Number of cattle per livestock household is 3.5 and that of 0.94 for all household (BBS, 2002). Along with indigenous/local zebu cattle, some exotic and their crosses (not exceeding 10%) constitute the national herd. Among the indigenous types (Mason, 1988), non-descript Deshi, Pabna, Red Chittagong are predominant. In Bangladesh, 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. The main goal in a commercial dairy operation is to optimize calf production per cow as economically as possible. First service av. age was 1179 days in case of deshi cattle of Bangladesh (Majid et al. 1995). The average calving interval ranged from 365-536 days among the indigenous and crossbred cattle. The average postpartum service period is ranged from 103-161 days in indigenous and crossbred cows. The reproductive performance of cattle of Bangladesh is not satisfactory (Rahman et al. 2009). The target of a dairy farm is to get one calf from a cow every year. The closer a farm gets to this target, the better will be the economic return (Shamsuddin et al., 2006), but it is seldom achieved in the dairy farms of Bangladesh. The application of estrus synchronization would improve our cattle's reproductive performance. Estrous synchronization is the manipulation of the reproductive process so that females can be bred with normal fertility during a short, predefined interval (Stevenson et al., 2000). Although the total amount of labor involved with insemination may not be reduced, it is concentrated into a shorter period. Other advantages of estrous synchronization include creating a more uniform calf crop, enabling more cows to be artificially inseminated (AI) to a genetically superior bull and reducing the length of the calving interval. It has limited disadvantages such as use of this technology generally requires skilled management and adequate facilities. Cows will respond poorly if not fed properly or if body condition is less than adequate.

In Bangladesh, *Chars* are low-lying areas prone to flood and erosion in or adjacent to major rivers. About 80% of the poor and 36% of ultra-poor people in *chars* rear livestock as a major means of livelihood (Hodson, 2006; Howes, 2006). They rear a number of unproductive cows, and are unable to ensure food security especially from September to November. It is imperative to ensure calf birth within three-month by estrous synchronization in order to increase food production and would help to alleviate poverty in *Chars*. The main object of the study was to know the success of Estrus Synchronization with GnRH-PGF2 -GnRH protocol.

Materials and Methods

Experimental animals

Two hundred and sixty four female cattle were selected from the beneficiaries of MJSKS (Mahideb Jubo Somaj Kallayan Somity), Ulipur, Kurigram. These cattle were brought from local cattle markets and all are locally available indigenous type. Among those cattle, two hundred and forty five were heifer and nineteen were dry cow (parity 1). The age of heifers were almost about (2.5-3.0) years. The BCS (Body condition score) of all heifers and cows were above (3.5). Before estrus synchronization treatment all animals were treated with anthelmintics, appetizer and multivitamin preparations. Animals were maintained by straw and locally available grasses. Sometimes concentrate feeds and Napier grass was supplied from MJSKS. Regular monitoring of cattle health was performed by the local supervisors of MJSKS. All heifers and cows were confirmed non-pregnant by rectal palpation and history taking.

Treatment and post-treatment monitoring:

There are several methods of estrus synchronization. The Ovsynch method of estrus synchronization was used. The Ovsynch program calls for an injection of GnRH on day 1, an injection of prostaglandin on day 8, the second injection of GnRH on day 10 and then insemination has done after detection of estrus.
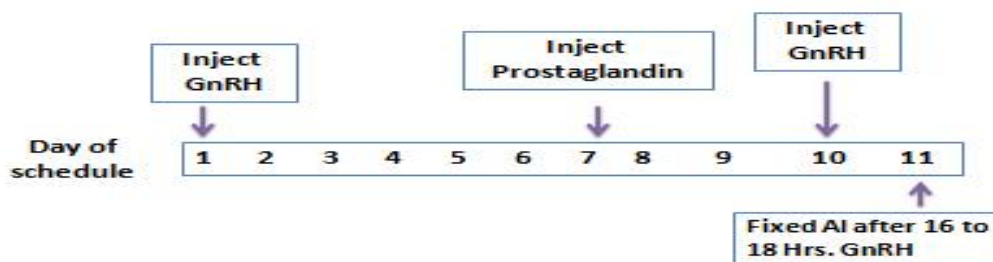
Figure: Steps of Ovsynch method

Injection Fertilon® was used as GnRH (generic name – Synthetic Gonadorelin, 100 microgram/5 ml vial, dose-5ml/cattle intramuscularly, Marketed by Techno Drugs) and Injection Dinoprost® was used as prostaglandin (generic name-Trometamol, 5mg/5ml vial, dose-5ml/cattle intramuscularly, Marketed by Techno Drugs). After the second GnRH injection, the animals were kept under close observation for detection of the estrous sign. The estrous signs and time of estrus were recorded by the owner/field worker of MJSKS. The selected animals were divided into three groups on the basis of days required to show estrus, such as Group-1 ;(0-10) days, Group-2; (11-20) days, Group-3; (21-35) days.

Estrus cattle were bred artificially by the local AI (artificial inseminator) worker of BRAC (Bangladesh rural advancement committee) at the proper time with (50% HF or 50% SW) semen. Cows/Heifers that non-reversed to estrus were assumed to be pregnant. Those cows/heifers reversed to estrus after first AI they were again bred on the next heat. Cows/heifers reversed second time they were bred naturally/artificially. Those reversed third time they were treated as conception failure. The following data were recorded including days required to estrus, conception rate, and conception failure. After that, all the recorded data were computerized and descriptive statistical analysis was done.

Results

All the treated cattle were not responding to estrus synchronization program within the normal time. Synchronized animals were shown estrus range from 0-35 days. Among 244 Heifers 177 were response to treatment within different time. It represents 27.48% of total treated population were non responsive. In case of heifer the use of Ovsynch method of estrus synchronization around 30% population fails to show heat (Pursley et al., 1995). In this experiment, the percentage of non responsiveness is not too much. On the other hand among cows the non responsiveness is 35%. Ovsynch method has no importance on cows reproductive profile improvement but it improves heifer's reproductive performance (Stevenson et al., 1999).

Table: 4.1 Onset of estrus after synchronization with GnRH-PGF2 -GnRH in cattle

Animals	Heat shown after synchronization							Total	Repeat to heat 2nd time	Repeat to heat 3rd time
	0-10 (Days)	%	11-20 (Days)	%	21-35 (Days)	%	Av			
Heifer (n=244)	75	42.37	67	37.85	35	19.77	33.33	177	60	17
Cow (n=20)	8	61.53	3	23.03	2	15.38	33.31	13	4	1
Total (N= 264)	83		70		37			190	64	18
Heifer (n=244)	75	42.37	67	37.85	35	19.77	33.33	177	60	17

Table 4.1 shows the onset of estrus after synchronization with GnRH-PGF2alpha-GnRH protocol. Among 244 heifers 177 were shown estrous at the different time. The highest number of heifers shows estrous within (0-10) days 75; 42.37%, followed by 67; 37.85% and 35; 19.77% within (11- 20) and (21-35) days respectively. It's due to that the heifers at first group were responded to this synchronization method and this synchronization program enhance to show estrous for the next two groups.

Table: 4.2 Conception rate of AI in cattle after estrus synchronization with GnRH-PGF2alpha-GnRH

	Insemination			Conception			Conception Rate			OCR	SPCR
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd		
Heifer(n=244)	177	60	17	89	35	08	50.28	58.33	47.05	54.09	1.4
Cow(n=20)	13	4	1	10	01	01	76.92	25	100	60	1.3
Total	190	64	18	99	36	09	52.11	56.25	50.00	54.54	1.38

*OCR=Overall conception rate. *SPCR=service per conception rate

Discussion

In this recent study has shown the percentage of non responsiveness is not too much. On the other hand among cows the non responsiveness is 35%. Ovsynch method has no importance on cows reproductive profile improvement. The result of positive number of heifers shows estrous within (0-10) days 75; where the percentage is 42.37%, followed by 67; where the percentage is 37.85% and 35; where the percentage is 19.77% within (11-20) and (21-35) days respectively. The selected heifers of first group were responded to this synchronization method and this synchronization program enhance to the show estrous for the next two groups. Among the cows highest number was shown estrous within (0-10) days 8; 61.53% followed by 3; 23.03% and 2; 15.38% within (11-20) and (21-35) days respectively. The range of onset of estrus in ovsynch method is very narrow usually after 16-24 hrs of 2nd GnRH injection. About 8 to 16% may show heat around the time of the PGF2 injection (Stevenson et al., 1999).The deviation may be due to the quality of hormone used, nutrition, age, breed, health status of cattle. Among 177 responsive heifers, 33.89% were repeated to heat 2nd time and 9.6% were repeated to heat 3rd time. 35% of heifer repeats estrus at the 2nd time (Stevenson et al., 2000).

The table (4.2) represents the conception rate of experimental heifers and cows. The overall conception rate was 54.09 and 60 in heifer and cow respectively. Ovsynch protocol transpired that, after cows were started on this protocol between days 5 and 12 of the estrous cycle, conception rates nutated to be greater than at other stages of the cycle (Vasconcelos et al., 1999). Conception rate is around 50% in Ovsynch protocol (Stevenson et al., 1999). In this study, the conception rate was higher than 50%.The services per conception rate were 1.40 and 1.30 in heifer and cow respectively in this study. Heifers usually required 1.5 services per conception (Badingia et.al., 1985).

References

Badingia. L., Collier, R.J., Thatcher, W.W. and Wilcox, C.J.(1985); Journal of Dairy Science Volume 68, Issue 1 , Pages 78-85.

BBS(2002). Statistical Yearbook of Bangladesh. Bangladesh Bureau of Statistics,Government of Bangladesh, Bangladesh.

BBS(1999). Statistical Yearbook of Bangladesh. Bangladesh Bureau of Statistics,Government of Bangladesh, Bangladesh.

FAO(2004). Food and Agricultural Organization of the United Nations, Ministry of Fisheries and Livestock. Bangladesh, pp;65

Hodson, R (2006): The Char Livelihood Programme: The Story and Strategy So Far. CLP Secretariat, RDA campus, Bogra.

Howes, M (2006): An Introduction to the Char Livelihood Programme (mick.howes1@ ntlworld.com). CLP Secretariat, RDA campus, Bogra.

Mason, I.L., (1988). Sheep a World Dictionary of Livestock Breeds, Types and Varieties. 3rd Edn., CAB International, Wallingform, Oxen, UK.

Majid, M.A., Nahar, T.N., Talukder, A.H. and Rahman, M.A.(1995). Factors attecting the reproductive efficiency of crossbred cows. Bangladesh J. Anim. Sci.,28:59-64.

Pursley, J. R., Mee, M. O. and Wiltbank, M. C. (1995) Synchronization of ovulation in dairy cows using PGF2_ , and GnRH. Theriogenology 44:915-923.

Rahman, M.S., Alam, N., Rahman, A. K. M. A., Huque, A.K.M.F., Ahasanand, M.S. and Song, H.J.(2009).Seroprevalance of specific *Brucella* infection of cattle in Bangladesh Agricultural University Veterinary Clinics and its surrounding areas. Korean J. Vet. Service, 32:219-225.

Shamsuddin, M., Bhujyan, M.M.U., Chanda, P.K., Alam, M.G.S. and Galloway, D. (2006), Radioimmunoassay of milk progesterone as a tool for fertility control in smallholder dairy farms. Trop. Anim. Health Prod., 38:85-92.

Stevenson, J. S., Kobayashi, Y.and Thompson, K. E. (1999) Reproductive performance of dairy cows in various programmed breeding systems including Ovsynch and combinations of gonadotropin- releasing hormone and prostaglandin F2 . J. Dairy Sci. 82:506-515.

Stevenson, J. S., Smith, J. F. and Hawkins, D. E. (2000) Reproductive outcomes of dairy heifers treated with combinations of prostaglandin F2 , norgestomet, and gonadotropin-releasing hormone. J. Dairy Sci. 83:1-8.

Vasconcelos, J.L.M., Silcox, R. W., Rosa, G. J., Pursley, J. R. and Wiltbank, M. C. (1999) Synchronization rate, size of the ovulatory follicle, and pregnancy rate after synchronization of ovulation beginning on different days of the estrous cycle in lactating dairy cows. Theriogenology 52:1067-1078.