

Improvement of Conception Rate in Cows through Assessment of Semen used for Artificial Insemination Program at Government and Private Sector

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Abstract

The study was undertaken to investigate the semen quality of government and private sectors and to improve the conception rate of dairy cows. Laboratory methods of semen evaluation are used to select males for artificial insemination. The total dose adjusted conc. Million per ml was (123±27.3). The motility concentration of semen was higher in BRAC (30.16±18.98) and lower in ACI (8.72±0.77). The most significant things were that the motile percent of semen was higher in BRAC (49.40±9.76) and lower in MILK VITA (19.96±3.16). Abnormalities of sperm were varies in percentage. The highest abnormalities of semen were found in in PRAN Company (22.86±3.22) and lowest was in ACI (RAD) (13.24±1.80). Therefore, ACI (RDA) semen qualities are best among those companies or organizations. The higher conception rate was found in PRAN (65.68±10.35) and lower was in MILK vita (39.01±2.55) semen.

Key word

Artificial, Assessment, conception, insemination, semen.

I. INTRODUCTION

Bangladesh is one of the most densely populated countries in the world with a population of 150 million and the current population growth rate is about 1.50% per annum. Agriculture as well as livestock plays a vital role for the economic development of Bangladesh. Bangladesh has relatively high density of livestock population compared to many other countries of the world. The

number of cattle population in Bangladesh 2nd among the SAARC countries and 7th among the Asian countries [1]. In spite of high density of livestock population, the country suffers from an acute shortage of livestock products like milk, meat due to large number of people. The shortage of livestock products is attributed due to poor quality of livestock species and their low productivity. The low productivity of local breeds of animal is an important constraint to future development of the livestock sector in Bangladesh. For improvement of the productive and reproductive traits of local cattle in 1959, the technique of Artificial Insemination (AI) was first introduced in Bangladesh in 5 districts. Improvement in per animal productivity through artificial insemination will not only increase farmers' income but will also attract local and foreign investment. The profit of dairy farm depends on the production of more calf and more milk from the dairy cows with optimum fertility management. So it is important to measure the different productive and reproductive performances of both government and private dairy farm for overall productive and reproductive pictures of farms and accordingly putting some recommendation to improve the status. Artificial insemination is the process by which semen with living sperm is collected from the male and introduce into the female reproductive tract at a proper time by using instrument other than sexual intercourse or natural insemination. AI should be addressed to the technique is that it improves bio security and limits the risk of sexually transmissible diseases. So offers the same genetic advantages on the female side and further more by using the

technique genetic interval can be shortened considering the slow maturity of ruminant species [2]. Sperm cryopreservation offers a benefit for restoration of endangered species further more successfully frozen and thawed semen can be subsequently used to produce more offspring in farm animals. The goal of the AI field services is to maximize the number of viable offspring per breeding animal per unit time. This can be achieved by inseminating cows with sufficient progressively motile spermatozoa from a given ejaculate without reducing their fertilizing capacity. Thus, the small number of frozen-thawed spermatozoa in each insemination dose must be of very high quality to ensure acceptable pregnancy rates [3].

Conception is important to allow reproduction to occur and high rates of conception to allow effective breeding. High rates of conception are especially important in the reproduction of agricultural animals. Breeding livestock animals is costly and time consuming so it is important to have a high rate of conception so as not to waste money and time during breeding, whether it is natural or artificial insemination. For this region, author wants to assess the semen quality for the purposes of improving the fertility of dairy cows of government and private sectors.

II. MATERIALS AND METHODS

A. Study area

The study area was Rajshahi District Artificial Insemination Centre, Rajshahi and Pabna district. Data were collected from the District Livestock Service Office(Rajshahi), Rural Development Academy (Bogra), BRAC AI Enterprise (Pabna), Pran group (Dhaka), Milkvita Multipurpose Corporation society (Dhaka).

B. Collection, preservation, transportation and assessment of semen samples

The semen sample was collected from five different organizations, District Livestock Service Office (Rajshahi), Rural Development Academy (Rajshahi), BRAC AI Enterprise (Pabna), Pran Dairy (Pabna), Milkvita (Pabna) for improvement of conception rate in cows through assessment of semen used for AI programs at Government and private sectors. The collected semen type was frozen straw of five different organizations like District Livestock Service Office (Rajshahi), Rural Development Academy (Rajshahi), BRAC AI Enterprise (Pabna), Pran Dairy (Pabna), Milkvita (Pabna). All these were collected from Holstein Friesian Bulls semen. After collected the straw was preserved into a liquid nitrogen can. The can store in normal room

temperature for further assessment of semen quality to improvement of conception rate in cows. The collected samples carried out into the Department of Surgery and Obstetrics Laboratory, faculty of Veterinary Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh.

C. Computer Assisted Semen Analysis (CASA)

A semen analysis is a test performed to screen for male fertility problems. In order to perform a semen analysis, a man must collect a semen specimen into a sterile cup. This is usually done by masturbation though in some cases, using a special condom, a semen specimen can be obtained during intercourse. For many years, evaluation of the semen has been performed by a laboratory technician looking through a microscope and manually counting sperm.

A standard or manual semen analysis will give only a few parameters;

- Concentration of sperm
- Overall motility-Percent of sperm showing any movement: Rapid motility-Percent of sperm traveling at a speed of 25 $\mu\text{m}/\text{sec}$ or faster
- Linearity-Percent of sperm moving in a straight line path
- Progressive motility-Percent of sperm moving rapidly and in a straight path
- Mean velocities-An average speed for all sperm in the field of view
- Amplitude of lateral head displacement-The average distance that the sperm head “wiggles” back and forth while moving.
- pH (the acidity of the fluid)
- Morphology (appearance of the sperm)

It was completely arbitrary as to what was differentiated a fast moving sperm from a sperm with medium velocity or a slow moving sperm. Studies showed that different technicians would sometimes come up with very different numbers for such things as sperm counts or sperm motility.

D. Statistical analysis

One-way ANOVA, SPSS, MS Excel was used to determine individual organization variations with regards to the conception rate, sperm concentration per ml, sperm motility, proportion of live spermatozoa, proportion of spermatozoa with normal acrosome, mid piece and tail, and with normal head morphology.

III. RESULTS AND DISCUSSION

Table 1. Semen characteristics of AI bulls used in artificial insemination

Semen characteristics	AI Organizations					Grand total
	DLS	Milk Vita	ACI (RDA)	BRAC	PRAN	
Dose adjusted conc. Million/ml	117 ±4.5	126± 4.2	109±2.8	122±11.2	142±59.7	123±27.3
Motile conc. Million /ml	17.05±6.1 ^b	13.18±2.2 ^b	8.72±0.77 ^b	30.16±18.98 ^a	11.81±5.90 ^b	16.18±11.46
Motile mean alh	9.88±1.62 ^a	8.96±1.10 ^{ab}	7.26±1.88 ^{bc}	9.26±1.73 ^{ab}	6.44±0.86 ^c	8.36±1.89
Motile mean area	10.35±1.87 ^b	11.99±0.65 ^a	12.77±0.66 ^a	12.93±0.60 ^a	12.82±0.57 ^a	12.17±1.35 ^a
Motile mean bcf	23.96±1.06 ^b	27.29±1.69 ^{ab}	27.31±4.67 ^{ab}	26.31±2.94 ^{ab}	30.52±3.76 ^a	27.07±3.57
Motile mean lin	31.45±1.62	31.39±2.91	31.46±1.41	33.08±3.80	36.07±7.40	32.69±4.14
Motile mean str	61.93±1.22 ^c	62.86±3.30 ^c	68.67±4.95 ^b	69.86±2.70 ^b	78.36±2.73 ^a	68.34±6.70
Motile mean vap	95.89±3.28 ^a	82.18±1.13 ^{ab}	58.41±1.28 ^c	85.83±1.17 ^{ab}	75.38±8.00 ^b	79.52±1.57
Motile mean vcl	1.82±1.25 ^a	1.57±1.13 ^{abc}	1.34±1.90 ^c	1.64±3.20 ^{ab}	1.37±1.46 ^{bc}	1.55±2.53
Motile mean vsl	62.57±1.83 ^a	42.53±1.75 ^b	46.86±8.65 ^b	57.85±7.61 ^a	60.03±8.59 ^a	53.97±9.97
Motile mean wob	52.39±3.98 ^{ab}	48.76±1.44 ^b	43.16±3.96 ^c	50.48±1.55 ^{ab}	52.82±1.43 ^a	49.52±3.36
Field count	6.00±1.00 ^a	4.80±0.45 ^b	4.80±0.45 ^b	5.00±0.71 ^{ab}	5.60±0.89 ^{ab}	5.24±0.83
Progressive percent of total	8.80±1.14 ^b	4.02±0.75 ^c	3.80±3.67 ^c	14.84±1.98 ^a	16.44±4.00 ^a	9.58±5.91
DMR percent of total	3.20±0.15	5.48±1.87	2.80±1.18	4.42±0.97	8.02±8.83	4.78±4.20
Motile percent of total	46.46±7.25 ^a	19.96±3.16 ^b	25.96±1.06 ^b	49.40±9.76 ^a	43.20±5.10 ^a	36.99±1.39

Legends: n = 25 (Each AI organization contains 5 bulls)

Table 1 shows the data on the evaluation of different organization semen. A significant result reveals from semen evaluation is the higher dose adjusted concentration Million/ml in PRAN (142±59.7) semen and the lower dose adjusted concentration Million/ml of semen in ACI (RDA)(109±2.8).The Grant total dose adjusted conc. Million per ml was (123±27.3). The motility concentration of semen was higher in (30.16±18.98) and lower in ACI (8.72±0.77) but Grant total motility was (16.18±11.46). The Motile mean alh of DLS was (9.88±1.62) and (6.44±0.86)of PRAN semen but the total Motile mean alh was (8.36±1.89). Motile mean bcf of total was (27.07±3.57). Among the total Motile mean bcf lower in PRAN and higher in DLS semen.

In semen evaluation higher concentration of Motile mean area, Motile mean lin, Motile mean str, Motile

mean vap, Motile mean VSL, Progressive percent of total, DMR percent of total, was in BRAC (12.93±0.60), PRAN (36.07±7.40), PRAN (78.36±2.73), DLS (95.89±3.28), DLS (62.57±1.83), PRAN (16.44±4.00), PRAN (8.02±8.83) respectively and lower concentration of Motile mean area, Motile mean lin, Motile mean str, Motile mean vap, Motile mean VSL, Progressive percent of total, DMR percent of total, was in DLS (10.35±1.87), MILKVITA (31.39±2.91), DLS (61.93±1.22), ACI (58.41±1.28), MILK VITA (42.53±1.75), ACI (3.80±3.67), ACI (2.80±1.18). The most significant things were that the motile percent of total was higher in BRAC (49.40±9.76) and lower in MILK VITA (19.96±3.16) but grand total (36.99±1.39).

Table 2. Abnormalities of sperm in AI bulls

Source of semen	Semen Abnormalities %					Grand total
	field count	bent tail	coiled tail	distal droplet % of total	proximal droplet % of total	
DLS	6.00±1.00	5.96±2.43	2.70±1.13	6.52±1.77	2.84±0.90	18.14±2.34

MILK VITA	4.80±0.45	6.80±1.15	1.58±1.16	8.76±1.24	3.56±0.46	20.70±3.50
ACI (RDA)	4.80±0.45	4.30±0.67	0.94±0.45	6.00±2.23	2.02±1.16	13.24±1.80
BRAC	5.00±0.71	6.86±2.44	1.16±0.48	7.76±2.92	3.46±2.12	19.24±2.66
PRAN	5.60±0.89	11.80±4.81	2.86±1.48	12.86±9.35	5.34±2.74	22.86±3.22
TOTAL	5.24±0.83	7.14±3.56	1.84±1.24	8.38±4.88	3.44±1.92	20.8±0.00

Abnormalities of sperm were varies in percentage. There were several companies semen was studied for evaluation of semen from different organizations. The abnormalities those were studied in evaluation of semen were, field count, bent tail, coiled tail, distal droplet % of total, proximal droplet % of total. The studied companies or organization were DLS, MILK VITA, ACI (RDA), PRAN and PRAN. THE highest percentage of field count (6.00±1.00) in dls semen and lowest were milk vita and ACI. Bent tail abnormalities in PRAN semen were highest during studied with lower coiled tail abnormalities. But most lower coiled tail abnormalities were ACI (0.94±0.45).

The higher coiled tail abnormalities were DLS semen. The highest distal droplet percentage (12.86±9.35) of total were PRAN semen but lower (6.00±2.23) in ACI(RDA) semen .the ACI (RDA) semen were contain (2.02±1.16) % Proximal droplet of total which was lowest than other organization semen. The highest (5.34±2.74) proximal droplet of total was PRAN semen. The highest (22.86±3.22) abnormalities of semen were in PRAN Company and lowest (13.24±1.80) was ACI (RAD). Therefore, basically ACI (RDA) semen qualities are best among those companies or organizations.

Table 3. Effect of semen on conception

Sources of semen	Total No. AI	Total No. Of Conception	Conception Rate
DLS	1201	593	49.62±4.16 ^b
MILK VITA	314	124	39.01±2.55 ^c
ACI	392	150	40.34±2.62 ^c
BRAC	600	378	63.06±3.82 ^a
PRAN	405	266	65.68±10.35 ^a
TOTAL	2912	1511	51.88±11.82

The main findings of the present investigations were the significant effect on the reproductive performance in dairy cow. From the study, the motile percent of semen in BRAC, PRAN and DLS was found 49.40, 43.20 and 46.46 which is nearly similar to post-freezing 45-50%.³ Assessment of different organizations semen it shows that variations among different organizations. The sperm concentration depends on breed and location, one of the influencing factors [4]. From the study, motility concentration of semen was higher in BRAC (30.16±18.98) and lower motility concentration in ACI (8.72±0.77) but total motility concentration was (16.18±11.46).

No single test of semen has been found suitable for the prediction of fertilizing capacity. Therefore, seeking for a test or combination of tests to predict accurately the fertilizing capacity of semen has been the subject of continuous research [5, 6, 7]. To frequent semen collection or prolonged sexual rest can be produce poor quality semen characteristics by

increased frequency of abnormal spermatozoa which in turn may cause reduce fertility [8, 9]. During processing, quality of preserved semen can be influenced by the extender used [8]. According to the Analytical Documentation of the Artificial Insemination program of BRAC, the conception rate of BRAC semen was 61.5% and DLS semen was 46.5%. From my study the conception rate of BRAC semen was 63.06% and DLS semen was 49.62 were positively correlated to the analytical documentation of the artificial insemination program of BRAC.

IV. CONCLUSION

Assessment of the semen used for AI program at govt. and private sectors is important for the conception rate. The motile percent of total was higher in BRAC(49.40 ±9.76) and the lower motile percent of total was in Milk vita (19.96±3.16) .The higher abnormalities were found in Pran semen (22.86±3.22) and the lower abnormalities were found in ACI (RDA) (13.24±1.80). Effect of semen of

different organizations on conception in dairy cow these study shows that the higher conception rate was found in Pran (65.68 ± 10.35) and the lower conception rate was found in Milk vita (39.01 ± 2.55)

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COMPETING INTEREST

Authors have no interest to compete anybody regarding this manuscript.

REFERENCES

- [1] Alam J., Livestock Resources of Bangladesh, Present Status and Future Potential, University Press Limited, 1995.
- [2] Foote, R. H., The history of artificial insemination: Selected notes and notables. *Journal of Animal Science*, 80: pp 1–10, 2000.
- [3] Brinsko, S. P. and Varner, D.D., Artificial insemination. In: A O McKinnon and J L Voss (editor) *Equine Reproduction*, pp 790-797, 1993. Lea and Febiger, Philadelphia, USA.
- [4] Godfrey, R.W., Effect of season and location on semen quality and serum concentration of luteinizing hormone and testosterone in Brahman and Hereford bulls. *Journal of Animal Science*, 68: pp734-749, 1990.
- [5] Lindford, E., Glover, F.A., Bishop, C. and Stewart, D.L., The relationship between semen evaluation methods and fertility in the bull. *Journal Report of Fertility*, 47: pp 283-291, 1976.
- [6] Budworth, P.R., Amann, R.P. and Chapman, P.L., Relationships between computerized measurements of frozen- thawed bull spermatozoa and fertility. *Journal of Andrology*, 9: pp 41-54, 1988.
- [7] Sorderquist, L., Sperm characteristics and fertility in dairy AI bulls. PhD Thesis, Department of Obstetrics and Gynaecology, Faculty of Veterinary Medicine, Swedish University of Agricultural Science, Uppsala, Sweden, 1991.
- [8] Sullivan, During processing, quality of preserved semen can be influenced by the extender used . W.H. Freeman and Company , San Francisco. pp. 286-320, 1978.
- [9] Amann, R. P., G. E. Seidel, Jr., and Brink, Z. A., Exposure of thawed frozen bull sperm to a synthetic peptide before artificial insemination increases fertility. *J. Androl.* 20:42–46.