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Optimization of age for higher fertility in bulls

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Abstract
Fertility means the ability of an animal to produce young one. Fertility of a herd is depended mainly on early sexual maturity of animal, timely heat detection, less breeding interval, conception rate and number of services per conception. Bull fertility helps in improving the herd productive and reproductive performance. Till date, most fertility related studies in dairy animals have done on female fertility but male fertility has not been completely investigated. Optimizing the age of breeding bulls in relation to their fertility will help in the selection and use of breeding bulls in right age that will improve the herd reproductive efficiency. In India sire conception rate in relation to optimize the age of service sires has not been completely investigated. Keeping the importance of improving the fertility in Sahiwal bulls, the present investigation has been proposed.

Keywords: Bull fertility, conception rate, optimization age, sire conception rate, bulls

Introduction
The term fertility denotes ability of an animal to produce young one. Evaluation of male breeding soundness depends on its fertility rate. A bull is said to be fertile, if it produces normal spermatozoa capable of fertilization. Fertility is difficult to measure exactly, but it is indicated for male by the percentage of services which result in conception. Since it depends on the fertility of female too, measures of fertility are of practical value only as comparative index calculated over large number of animal. Such estimates are useful in accessing the effectiveness of AI in breeding programme. Fertility is one of the important aspects of bulls performance for preservation of its germplasm.

Early detection of impairment in fertility and use of highly fertile bulls with superior genetic makeup is the important factor for getting optimum results in a planned breeding programme. Indiscriminate use of breeding bulls without proper evaluation poses a potential threat to the dairy industry as they may transmit undesirable traits besides contributing to poor fertility of the herd. For accurate assessment of breeding bulls, it is necessary to know the fertility pattern of breeding bulls. Bull fertility helps in improving the herd productive and reproductive performance. Bull fertility is often measured by the percentage of cycling females exposed to the bull and impregnated during a specific time period usually 60–90 days [13]. Bull's age affects the conception rate in US Holstein heifers [17]. Till date, most fertility related studies in dairy animals have done on female fertility but male fertility has not been investigated substantially in India.

Bull Fertility
Sire Conception Rate (SCR)
SCR is the expected difference in conception rate of a sire compared with the mean of all other evaluated sires [18]. Sire conception rate (SCR), a new and more accurate evaluation of artificial-insemination based service-sire fertility, bull fertility evaluations termed estimated relative conception rate [26]. Sire conception rate of Sahiwal breeding bulls range from + 6% to – 4% [21]. SCR of Holstein bulls ranges from +5% to -6% [32]. SCR of HF bulls ranged from +10.66% to -6.80% [25].

Which factors associated with service sire contribute to SCR?
- Inbreeding system of the bull
- Inbreeding system of the embryo from the mating
- Bull's age
- A.I. organization combined with year of the mating system
- Influence of the bull itself

Bulls are considered to be "more than half of the herd"

Bulls are called as a "more than half of the herd" because; the contribution of male in genetic improvement of herd is more than female. Artificial insemination was adopted on the organized farm because it was thought initially that "sire is half of the herd" in the progeny testing program. The importance of sire selection in the herd, research has shown that the total genetic gain obtained through sire to sire path and sire to dam path is about 64 percent, equating to more than a 50 percent contribution [7, 14, 23]. They reported that the increased genetic gain through sire over dam is due to the greater intensity of selection that can be applied amongst male parents, thus the greater accuracy for estimating the breeding value of sires and the production of a larger number of daughters which make contributions as replacement stock for the next generation.

Importance of optimization age of breeding bulls for higher fertility

Optimizing the age of breeding bulls in relation to their fertility will help in the selection and use of breeding bulls at right age thereby will improve the herd efficiency. The age of the bull at the time of mating was the major factor with the variation of conception rate and fertility was maximum at five years of age, and then decreased somewhat approximately up to age 9 or 10 years [18]. A deficiency in the breeding ability of one bull has larger impact on herd productivity. Using a sub-fertile bull may lead to longer calving intervals and lower number of calves produced in the herd. Till today, conception rate in relation to optimize age at first freezing and first service of Sahiwal bulls has not been investigated in India and early selection and use of Sahiwal bulls for better fertility under the breeding program are not being explored.

Optimize age at first semen freezing of breeding bulls in relation to conception rate

Here, it should be emphasized that "bull age" refers to age of the bull when their semen was collected and first freezes for improvement of Sahiwal breed. Age of the bull has an effect on the semen quality, which in turn is reflected in terms of fertility in the herd as revealed by some studies [8, 3, 9, 20]. The effect of age on the ability of male to produce semen has long been recognized [24]. So far, there has been no report available on optimization of age at first semen freezing in Sahiwal bulls. Volume of semen increased first four years and that sperm concentration was maximized in the second and third year, with only slightly lower concentrations in the fourth year [33]. The general pattern of increasing conception rate with increasing age, followed by a decline after reaching a maximum from 5 to 8 years of age [31].

Semen of best quality with regard to sperm morphology, was observed in 3 to 5 year old Sahiwal bulls [29]. The frozen semen volume of bulls with age groups are in agreement with the findings of [2, 22, 34, 15]. They found that bulls produce a maximum semen volume around 4 to 5 years of age and thereafter it start to decline, which may be due to onset of senile changes. Semen collected from mature Sahiwal bulls (4.5 – 8 years of age) is of better quality than the semen of young and old bulls [4, 1, 3] also studied mature Sahiwal bulls showed better fertility as compare to young and old bulls. [2, 16, 28] reported the ejaculate semen volume increased (p<0.05) in mature Sahiwal bulls as compared to younger ones whereas motility remained insignificant due to age. On the contrary to our finding, [22, 15] observed higher conception rate in adult bulls.

However, [9, 13, 25] reported that there was significant increase in semen volume as the bulls grew beyond 3 and 2.5 years of age. Highest percentage of progressive motility of semen was found in bulls older than 5 years of age. However, [8, 9, 23] found that increased motility of semen with age of bull. Age of the bull up to 4 to 5 years is increased with volume and number of cells per ejaculate and this observation could be elaborated that the main factor involving the total number of sperms produced is the size of the testes [5, 20], which increases until at least 5 years after puberty [6]. Higher mass activity in the age group of 3 to 4 years of age was mainly due to more sperm concentration and less sperm abnormalities, which is also indicated by [12]. Similar way, [16] found that age of bull had significant effect on semen volume. It should be considered that the influence of age of bull is also influenced by managemental conditions in the farm. The main purpose of artificial insemination (AI) centers is producing a maximum number of frozen straws of elite bulls as compared to younger test bulls. So, poor quality bulls might not reach a higher age leaving a selected group of bulls in higher age classes. The influence of bull's age is important because of physiological changes that occur as bulls grow to sexual maturity. It has been noted that some young bulls raised in all-male groups may show temporary deficiencies in mating ability [11], which affect the semen production.

Optimize age at first A.I. / semen use of breeding bulls in relation to conception rate

So far, research work has not been carried out on optimization of AAFU of Sahiwal bulls for higher fertility in the herd. Most of studies have been reported that probability of the bull having a suitable age influences the conception rate in the herd. In dairy cattle, peak A.I. bull conception rate has been reported [10] at 2 year of age, whereas peak fertility at somewhat older ages of 3 to 4 years was also reported [30]. Age of the bull at the time of mating was the major factor with the variation of fertility and conception rate was maximum at 5 years of age, and then decreased somewhat approximately up to age 9-10 years [18, 15].

Semen of best quality, with regard to sperm morphology, was observed in 3- 5 year old Murrah bulls [29] and Nili–Ravi buffalo bulls [27]. Several older studies on bull' age was reviewed by [28] and generally supported the pattern of results obtained by [18]. Therefore, it is worthwhile to bear in mind that appropriate management of pre- pubertal Sahiwal bulls is of strong value; if bulls are to be prepared for breeding at right age [19]. Reported the average predicted conception rate based on first A.I. (CRFAI) was highest (39.95%) at <3.5 years and lowest (34.87%) at >4.5 years of age at first A.I/use. They found that average predicted overall conception rate (OCR) was highest (41.05%) at <3.5 years and lowest (39.42%) at >4.5 years of age at first A.I/use of Murrah bulls.

Conclusion

In organized herd under progeny testing program, Murrah bulls should be used at young age, i.e. prior to 3.5 years, which is expected to result in 5.08% better CRFAI and 1.63% better OCR in comparison to Murrah bulls used after 4.5 years of age. It should be emphasized that "bull' age" refers to age of the bull when semen is used in herd. Likewise, bull' age at insemination may have been 5 years but semen donated when the bull was 2-3 years old, for example, may have been used in the insemination program. In spite of this caveat,

results for bull' age are generally consistent with the previous research and clearly showed marked improvement in predictions when bull age at first use was used in the predictor for the improvement of Sahiwal breeds. Improved energy based nutrition and management could possibly lead to further reduction in age at first use and improvement in predictions of conception rate of Sahiwal bulls. However, the further study will be necessary to incorporating age of the bull at the time of collection, bull's age first time used in the herd along with seminal parameters for assessing improved bulls conception rate in the herd.

References

1. Aduli AEO, Abubakar BY, Dim NI. Phenotypic relationship between body weights and subsequent milk production of Friesian x Bunaji crosses. Asian-Australasian Journal of Animal Sciences. 1996; 21: 274-277.
2. Ahmad E, Ahmad N, Naseer Z, Aleem M, Sarwar KM, Ashiq M *et al*. Relationship of age to body weight, scrotal circumference, testicular ultra sonograms, and semen quality in Sahiwal bulls. Tropical Animal Health Production. 2011; 43:159-164.
3. Ahmad M, Asmat MT, Rehman N. Relationship of testicular size and libido to age and season in Sahiwal bulls. Pakistan Veterinary Journal. 2005; 25:67-70.
4. Ahmad M, Asmat MT, Rehman NU. Semen characteristics of Sahiwal bulls in relation to age and season. Pakistan Veterinary Journal. 2003; 23:202-206.
5. Almquist JO. Bull semen collection procedures to maximize output of sperm. Proc. 7th Tech. Conf. Artificial Insemination Reproduction Natl. Assoc. Anim. Breeders, Columbia, MO, 1978, 33-36.
6. Amann RP, Almquist JO. Bull management to maximize sperm output. Proc. 6th Tech. Conf. Artificial Insemination Reproduction Natl. Assoc. Anim. Breeders, Columbia, MO, 1976, 1-10.
7. Basu SB. Genetic Improvement of Buffaloes. Kalyani Publishers, New Delhi, India, 1985.
8. Bhosrekar MR, Purohit JR, Gokhale SB, Mangurkar BR. Semen characteristics and behavioural pattern of buffalo bulls in relation to age and season. Indian Journal of Animal Science. 1992a; 62:251-255.
9. Bhosrekar MR, Purohit JR, Gokhale SB, Mangurkar BR. Effect of seasons on production performance of surti buffalo bulls. Indian Journal of Animal Science. 1992b; 62:443-447.
10. Bishop MWH. Aging and reproduction in the male. Journal of Reproduction and Fertility. Supplements. 1970; 12:65-87.
11. Chenoweth PJ. Libido and mating behavior in bulls, boars and rams: A review. Theriogenology. 1981; 16:155-177.
12. Dhami AJ, Kodagali SB. Seminal characteristics and their interrelationship in surti buffalo. Indian Veterinary Journal. 1988; 65:61-64.
13. Hamilton T. Beef bulls fertility. Beef cattle production systems program lead, pp. 410-420. Ontario Ministry of Agriculture and Food, Ontario, Canada, 2009.
14. Jain JP. Statistical Techniques in Quantitative Genetics. Hindustan Publishing Corporation. Delhi, 1992.
15. Javed MT, Khan A, Kausar R. Effect of age and season on some semen parameters of Nili-Ravi buffalo (Bubalus bubalis) bulls. Veterinary Archive, 2000; 70:83-94.
16. Koonjaenak S, Chanatinart V, Ekwall H, Rodriguez-Martinez H. Morphological features of spermatozoa of swamp buffalo AI bulls in Thailand. Journal of Veterinary Medicine Series A-Physiology Pathology Clinical Medicine. 2007; 54:169-78.
17. Kuhn M, Hutchison J, Norman H. Modeling nuisance variables for prediction of service sire fertility. Journal of Dairy Science. 2006; 91(7):2823-2835.
18. Kuhn MT, Hutchison JL. Prediction of dairy bull fertility from field data: use of multiple services and identification and utilization of factors affecting bull fertility. Journal of Dairy Science. 2008; 91:2481-2492.
19. Mir MA, Chakravarty AK, Gupta AK, Naha BC, Jamuna V, Patil CS *et al*. Optimizing age of bull at first use in relation to fertility of Murrah breeding bulls. Veterinary World. 2015; 8(4):518-522.
20. Murugan RT, Raman KS. Influence of age and body weight on semen production traits in Murrah bulls. Indian Journal of Animal Science. 2003; 3:767-768.
21. Naha BC, Chakravarty AK, Mir MA, Patil CS, Singh AP, Maher D. Identifying the Factors Affecting Birth Weight and Conception Rate in Sahiwal Bulls. Journal of Animal Research. 2015; v5(2):223-226.
22. Nordin W, Hilimi M, Bongso TA. Semen characteristics related to age in buffalo bulls. International Journal of Andrology. 1990; 13:337-343.
23. Pal A, Chatterjee PN, Chakravarty AK. Genetic Study of Dairy Cattle and Buffalo Bulls Based on Growth, Milk Production and Reproductive Traits. Iranian Journal of Applied Animal Science. 2012; 2(3):239-245.
24. Pant HC, Sharma RK, Patel SH, Shukla HR, Mittal AK, Kasiraj R *et al*. Theriogenology. 2003; 60:27-34.
25. Peñagaricano F, Weigel KA, Rosa GJ, Khatib H. Inferring quantitative trait pathways associated with bull fertility from a genome-wide association study. Frontiers in genetics, 2012, 3.
26. Pinedo PJ, De Vries A, Webb DW. Dynamics of culling risk with disposal codes reported by Dairy herd improvement dairy herd. Journal of Dairy Science. 2010; 93(5).
27. Saeed A, Chaudhry RA, Khan IH, Khan UN. Morphology of semen buffalo bulls of different age groups. Recent Advances in Buffalo Research. 1990; 3:17-19.
28. Salisbury GW, Van Demark NL, Lodge JR. Physiology of reproduction and artificial insemination of cattle. 2nd ed. W. H. Freeman and Company, San Francisco, CA, 1978.
29. Singh P, Dahiya SS, Chauhan TR, Sajjan S, Kumar B, Sharma RK *et al*. Effect of feeding different sources of rumen undegradable protein on sexual maturity and semen production in buffalo bulls. Indian Buffalo Journal. 2004; 2:74-77
30. Tanabe TY, Salisbury GW. Influence of age on breeding efficiency. Journal of Dairy Science. 1946; 29:337-344.
31. Taylor JF, Everett RW, Bean B. Systematic environmental, direct, and service sire effects on conception rate in artificially inseminated Holstein cows. Journal of Dairy Science. 1985; 68:3004-3022.
32. Van Raden. Sire conception rate in Holstein bulls. Journal of Dairy Science. 2008; 90(5):223-285
33. Van Demark NL, Boyd LJ, Baker FN. Potential services of a bull frequently ejaculated for consecutive years. Journal of Dairy Science. 1956; 39:1071-1072.

34. Younis M. Studies on semen quality, freezability and fertility of buffalo bulls during low and peak breeding seasons. Ph. D Thesis. University of Agriculture. Faisalabad, Pakistan, 1996.