



EFFECT OF NON-GENETIC FACTORS ON AGE AT FIRST SEMEN COLLECTION IN SAHIWAL BULLS

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ABSTRACT

The aim of this study was to investigate factors affecting the age at first semen collection (AAFSC) in Sahiwal bulls. The records of 43 Sahiwal bulls during 27 years (1987-2013) maintained under 8 sets of Sahiwal breeding project at National Dairy Research Institute (NDRI), Karnal (India). On standardization and normalization of age at first semen collection, 41 bulls for age at first semen collection was considered for final study. The present study revealed that the average age at first semen collection in Sahiwal breeding bulls was estimated at (2.57 ± 0.014) years with the coefficient of variation of 6.6 %. The fixed linear models were used to estimate the effect of non-genetic factors. The overall least-squares mean for age at first semen collection was estimated as (2.49 ± 0.005) years in Sahiwal breeding bulls. Period of semen collection had significant effect on age at first semen collection ($P < 0.01$) in this study. Season of first semen collection did not have significant effect on AAFSC. Since, temporary environmental factors play a major role in inheritance of this trait so better breeding management should be implemented.

KEY WORDS: Age at first semen collection, Bull fertility, Non-genetic factors, Sahiwal bulls.

INTRODUCTION

Sahiwal is distinctly the pride of best indigenous dairy cattle breed of India which is having high merit in economic traits. Due to lack of scientific selection of bull based on their performance, there may be possibility of serious deterioration in the quality of indigenous germplasm. Bulls are considered to be “more than half of the herd”, are selected at an early age as future breeding bulls. Reproduction parameters are more influenced by environment (Mukhopadhyay *et al.*, 2010). Optimizing the age of breeding bulls in relation to their fertility will help to assess the breeding soundness of bovine bulls. Kuhn and Hutchison (2008) found that the age of the bull at the time of mating was the major factor and the variation of conception rate and fertility was maximum at five years of age, then decreased somewhat approximately up to age of 9 or 10 years. 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. However, research has shown that the total genetic gain obtained through sire-to-sire path and sire to dam path is almost 64%, equating to more than a 50% contribution (Basu, 1985). There are many non-genetic factors, which influence the phenotypic expression of AAFSC of Sahiwal bulls which helps in suitable management practices in the farms. Therefore, the present study was undertaken to investigate the influence of various non-genetic factors on AAFSC in Sahiwal bulls.

MATERIALS & METHODS

Karnal is situated at an altitude of 235 to 252 meters (748 feet) above the mean sea level at 29.68°N latitude and 76.98°E longitude in eastern zone of Haryana which

comes under the Trans-Gangetic plain agro climatic zone of India. The climate that prevails is subtropical in nature. The temperature in summer months (April to June) ranges between 24°C-44°C. Karnal experiences moderate rainfall in the months of July and lasts till September. Winters are extremely cold. The temperature ranges from 4°C to 32°C in winter months (October, November, December and January). Each year was sub-classified into four major seasons viz., winter (December to March), summer (April to June), rainy (July to September) and autumn (October to November), depending on prevalent meteorological factors as recorded in CSSRI, Karnal (Singh, 1983). The present study was conducted on 43 Sahiwal breeding bulls maintained under 8 sets at the Artificial Breeding Complex under Sahiwal progeny testing project at NDRI, Karnal. Data on reproductive trait like AAFSC on Sahiwal bulls were generated as well as collected. The data were classified into various sub-classes for season and period of first semen collection on AAFSC

Statistical analysis

Mean and standard error of the AAFSC was calculated using standard statistical procedure (Snedecor and Cochran, 1967). To ensure the normal distribution of records, the outliers were removed and data within the range of mean ± 3 standard deviation was only considered for the study. Hence after standardization and normalization, a record of 41 bulls for AAFSC was retained for analysis. The data were adjusted for significant non-genetic factors for Sahiwal bulls using fixed linear models. Since the data were non-orthogonal, the least-squares technique suggested by Harvey (1990) was used to estimate the effect of non-genetic factors, and the means were compared using Duncan's multiple range

test (Kramer 1957). The model used for AAFSC of Sahiwal bulls was as follows:

$$Y_{ijk} = \mu + P_i + S_j + e_{ijk}$$

where, Y_{ijk} is the observation on the k^{th} bull in i^{th} period, j^{th} season; μ is the overall mean; P_i is the effect of i^{th} period (1 to 8); S_j is the effect of j^{th} season (1 to 4); e_{ijk} is the random error $\sim \text{NID}(0, \sigma^2_e)$.

RESULTS & DISCUSSION

The motto of this study is to reveal the effect of non-genetic factors on Age at first semen collection in Sahiwal bulls. The study was not showed any factor affecting on seminal parameters to evaluate the bull fertility. Age at first semen collection indicates the age of Sahiwal bulls when the semen is collected for first time. The effect of age of the bull is important because of physiological changes that occur as bulls grow to sexual maturity early. Though, many literatures showed that there is having variation of seminal parameters from bull to bull between periods and seasons proceeding to the adverse effect on bull performance. Under the Sahiwal improvement programme, bulls are mainly judged based on the daughter's performance in the herd. Minimum 6 to 10 bulls in each set are used in Sahiwal breeding programme and the set duration of each set (test cycle) is around 24 months. But set duration of Sahiwal bulls may be vary from one set to another set due to less numbers of progeny in that particular time. In this study, 8 sets of Sahiwal bulls were used at NDRI herd, evaluated with minimum number of three bulls in IIIth and IVth set and maximum number of eight bulls in Xth set. It was observed that average Age at

first semen collection of Sahiwal bulls varied in different sets with different coefficient of variation.

Effect of period and season on AAFSC in Sahiwal bulls

Semen collection is the important criteria for evaluating a bull and the objective is to get the sufficient number of frozen semen doses from a Sahiwal bull at the beginning of the set. The target of semen collection for AI in breeding programme is to use the bulls randomwise i.e; all bulls must have almost the same number of AI at completion of set and all bulls must be use from the starting of the set. The overall least-squares mean for AAFSC was estimated as (2.49 ± 0.005) years in this presented study. Period of first semen collection had significant effect ($p < 0.01$) on AAFSC but season of first semen collection did not have significant effect on AAFSC in the presented study (Table 1). Period had a favourable influence on AAFSC of breeding bulls which could be due to better care, training, feeding, and other management practices. In comparison to our study, Mukhopadhyay *et al.* (2010) reported, similar AAFSC in Sahiwal bulls. Mukhopadhyay *et al.* (2010) also found that period and season of first semen collection had significant effect ($p < 0.05$) on AAFSC in Sahiwal bulls. According to Bhoite *et al.* (2005), AAFSC of indigenous cattle (Gir bulls) was more as compare to our reported study. There are only few reports about this AAFSC trait in indigenous bulls. As compared with Bos Taurus bulls, in Bos indicus bulls is having delay AAFSC (Brito *et al.* 2004). Our findings on AAFSC was comparable to Sahiwal and crossbred bulls as reported by Suryaprakasham and Rao (1993) and Rao (1995) on Jersey×Ongole crossbred and Ongole bulls. Age at first semen collection could be reduced by introducing the bulls on training at an early age without affecting the semen quality (Sethi *et al.*, 1989).

TABLE 1: Analysis of variance (M.S. values) of age at first semen collection in Sahiwal bulls

Sources of variation	Mean sum of squares
	Age at first semen collection (years)
Period	1.16**(7)
Season	0.17(3)
Error	0.24(30)

Figures in parentheses indicate respective degrees of freedom. ** $p < 0.01$

CONCLUSION

From the research works, it could be concluded that the overall least-squares mean for AAFSC of Sahiwal breeding bulls was estimated as 2.57 ± 0.014 years. Period had significantly affected the AAFSC of Sahiwal breeding bulls. Season had no significant effect on AAFSC considered in this study. However, no consistent trend could be inferred for the influences of different non-genetic causes on AAFSC trait. The healthy bulls may be extensively utilized to procure good quality semen from them by subjecting the young male bulls to training at an early age.

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