Original Research

Semen Production Performance of Sahiwal Bulls and the Factors affecting it in an Organized Farm under Tropical Conditions

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Abstract

The present study was conducted to evaluate the semen production performance of Sahiwal bulls. The data of twenty years (1996-2015) of 57 bulls maintained at ICAR-NDRI, Karnal was evaluated. The age at first semen collection, age at first semen freezing, age at last semen freezing, frozen semen production period, age at last semen collection/disposal and semen production period were 32.43±0.97, 35.37±10, 59.78±2.98, 24.47±2.77, 62.047±3.00 and 29.64±2.9 months, respectively. The age at first semen freezing was significantly (P≤0.05) more in males born in winter than that of in rainy season (37.31±1.4 and 31.06±1.68 months). About 39.06% of semen ejaculates of Sahiwal bulls were freezable and rest 60.94% were poor and non-freezable indicting some kind of problems during semen collection process. Thus it can be concluded that season of birth of Sahiwal males has significant effect on semen quality which attracts ample scope for improving quality and production performance of semen from Sahiwal bulls.

Key words: Age, Bull, Semen Collection, Semen Freezing, Season

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Introduction

Among the milk producing cattle, Sahiwal is one of the best indigenous dairy cattle breed of India having high merit in economic traits. The bull has a high economic value attached with it and thus need to be maintained on proper nutrition and management to obtain optimum performance in terms of semen production. The demand for the best males has increased considerably due to a shortage in the number of proven bulls having better semen characteristics for sustaining a successful breeding program (Chenoweth and Lorton, 2014). According to Mukhopadhyay *et al.* (2010), for evaluation of breeding soundness of dairy bulls, optimum serving capacity and seminal profile are indispensable parameters. The management

of bull from early is generally not given due importance, as a result, its age at puberty and first semen collection get delayed. According to Dahiya and Singh (2013), the availability of semen at the earliest possible age from breeding bulls is not only economical but also may increase productive life span and proving the bulls under progeny testing program. Kuhn and Hutchison, (2008) have found that the fertility of herd got affected due to managemental differences. The semen production depends on age (Mandal *et al.*, 2010). The decreased fertility of bulls may be due to genetic, environmental and managemental causes. However environment mainly influences reproductive parameters (Mukhopadhyay *et al.*, 2010). The highest fertility of bull has been observed at around 2-4 years of age and started declining once bull attained more than 4 years of age (Thomas, 2009). Bulls donating larger volume of neat semen with higher mass activity are supposed to produce freezable semen (Sethi *et al.*, 1989). Randel (2002) found that Brahman bulls take longer to reach sexual maturity depending on the season in which they were born. The present study was undertaken to know about the factors affecting semen quality.

Materials and Methods

The data of twenty years (1996-2015) was used for study from record room of Animal Genetics and Breeding division, ICAR-NDRI of 57 Sahiwal bulls maintained at Artificial Breeding Research Centre (ABRC). The study was carried out at ABRC, ICAR-National Dairy Research Institute (NDRI), Karnal, Haryana, India. The ABRC is situated at an altitude of 250 meters above the mean sea level on 29.43°N latitude and 72.2°E longitude. The maximum ambient temperature goes up to 45°C approximately during summer and minimum about 2°C during winter. The annual rainfall is about 760 to 960 mm, most of which is received during the months of July and August. Relative humidity ranges from 41 to 85 percent. There are 4 seasons in a year, summer (April-June), rainy (July-September), autumn (October-November) and winter (December-March).

Housing and Management of the Animals

The young males are reared in a group on weaning system at Livestock Research Centre, NDRI, Karnal. Milk feeding is done according to farm schedule upto 2 months. Then upto 6 months they are fed concentrates and roughages according to farm schedule. At 6 months age they are shifted to ABRC. At 2 years of age males are separated and are housed in individual pens and then regularly trained for artificial semen collection.

The Sahiwal bulls were kept in concrete floored individual pens with corrugated asbestos roofed shed, with the orientation of east-west direction through its long axis. Cleaning of the shed was done once daily early in the morning. Concentrate ration with 21 percent CP and 70 percent TDN was provided to the bulls to the tune of 2.0 to 2.5 kg per bull at 9.00 AM. Institute grown green fodder was supplied to the bulls. Availability

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of water was ad lib throughout the day. Vaccination, deworming and another herd-health programme was followed as per the farm schedule, to ensure good health. Bulls were kept in an individual bullpen (30×10 feet) separated by solid partitions that restricted both direct physical and visual contact of bulls in adjacent pens as well as free movements within the shed. Bulls were given exercise once a week, the day before semen collection in the rotary exerciser so as to maintain the sexual vigour of bulls and ensure quality semen production. The semen was collected by artificial vagina technique at early in the morning. The bulls under study were not disposed until their predicted semen production of farm was achieved and those bulls which stopped donating semen at very earlier age were not included in the study.

Parameters Generated Related to Age of Animals

The date of birth of each Sahiwal male animals was obtained from the calving register and then age of each male was calculated. The parameters that were generated were; age at first collection (AFSC), age at first freezing (AFSF), age at last freezing (ALSF), Frozen semen production period (FSPP), age at last collection or age at disposal (ALSC/AD) and semen production period (SPP). About 8246 ejaculates of Sahiwal bulls were also studied for acceptability on the basis of mass activity (semen quality). The mass activity of acceptable quality for freezing was ≥3. All the procedures were approved by the Institutional Animal Ethics Committee.

Statistical Analysis

Statistical analysis of different factors of semen production performance were analysed by DMRT method using SPSS (version16) software.

Result and Discussion

The age at first semen collection (AFSC), age at first semen freezing (AFSF), age at last semen freezing (ALSF), frozen semen production period (FSPP), age at last semen collection or age at disposal (ALSC/AD) and semen production period (SPP) of Sahiwal bulls are depicted in Table 1 and Fig. 1.

Table 1: Semen production performance of Sahiwal bulls with age (N=57)

Parameters	Age (ME±SE) in Months
Age at first semen collection	32.43±0.97
Age at first semen freezing	35.37±1.00
Age at last semen freezing	59.78±2.98
Frozen semen production period	24.47±2.77
Age at last semen collection/disposal	62.047±3.00
Total semen production period	29.64±2.9

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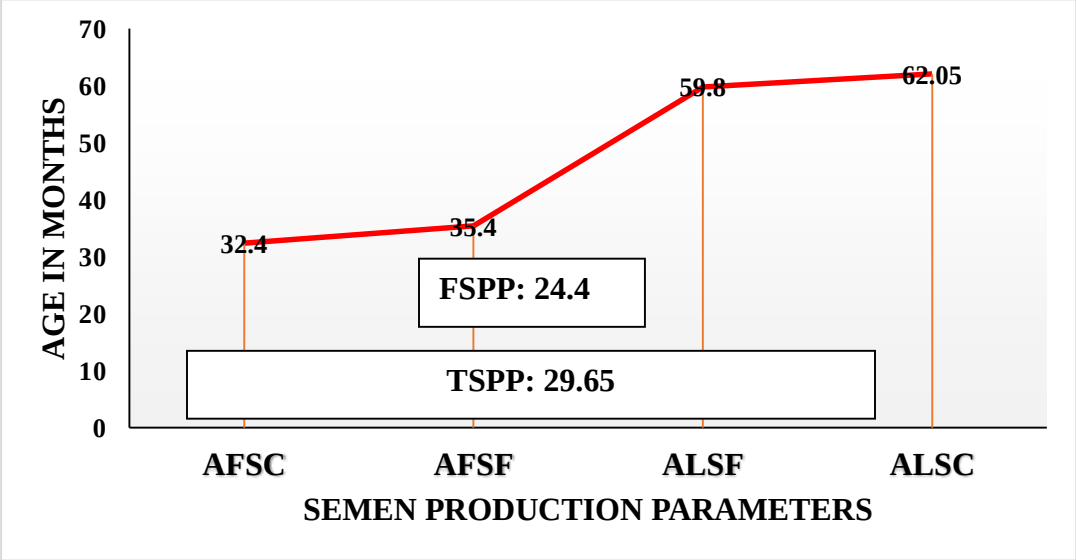

Fig. 1: Production ages for different semen parameters, AFSC: age at first semen collection, AFSF=age at first semen freezing, ALSF=age at last semen freezing, ALSC =age at last semen collection, FSPP: Frozen semen production period and TSPP: Total semen production period

The difference in birth weights (≥20 kg and <20 kg) don't show any significant difference in semen production performance Although numerically the age at first semen collection was less in bulls having higher birth body weight (Table 2).

Table 2: Effect of birth weight on semen production

Parameters	≥20 kg (ME±SE) (N=35)	<20kg (ME±SE) (N=22)
Age at first Semen collection	30.84±1 .08	33.26± 1.51
Age at first semen freezing	34.04± 1.25	36.04± 1.44
Age at last semen freezing	61.80± 4.34	58.22± 4.60
Frozen semen production period	27.86± 3.97	22.17± 4.71
Age at last semen collection /disposal	63.24± 4.38	61.67± 4.60
Total semen production period	32.43± 4.11	28.53± 4.05

The AFSF was significantly (P≤0.05) different between males born in winter and rainy season (Table 3).

Table 3: Effect of season of birth on semen production (ME±SE months)

Parameters	Winter (N=25)	Summer (N=8)	Rainy (N=17)	Autumn (N=7)
AFSC	33.74±1.45	31.68±2.13	28.96±1.47	31.71±20
AFSF	37.30^{a}±1.40	36.76^{ab}±2.31	31.06^{b}±1.68	32.79^{ab}±1.98
ALSF	62.90±2.63	59.92±2.37	59.53±2.37	54.24±2.99
FSPP	25.60±2.04	23.57±2.11	28.47±2.77	21.46±2.85
ALSC	65.45±2.49	66.79±2.79	59.95±2.32	54.33±2.70
SPP	31.70±2.13	35.28±2.70	31.15±2.99	22.6±2.81

p≤0.05, AFSC= age at first semen collection, AFSF=age at first semen freezing, ALSF=age at last semen freezing, FSPP=Frozen semen production period, ALSC/AD=age at last collection / disposal, SPP= semen production period.

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The total number of ejaculates produced from Sahiwal bulls were 8246, out of this 3221 (39.06%) were of freezable quality.

Our results are comparable to Mukhopadhyay et al (2010) who in Sahiwal bulls found AFSC 32.43±0.82, AFSF 36.19±0.87, FSPP 17.41±2.38, SPP 22.33±2.25, ALSC/AD 54.99±2.17 months. While in contrary to our results Mukhopadhyay *et al.* (2010) didn't found any significant difference for any of the seminal parameters on the basis of the seasons of birth of Sahiwal bulls. Bhakat *et al.* (2011) reported that semen quality of Sahiwal bulls was better upto 5 years (60 months) which is falling in line with our results.

Our results regarding the age at first semen collection are comparable to Suryaprakasham and Rao (1993) for Sahiwal and crossbred bulls and to Rao and Rao (1995) on Jersey× Ongole crossbred and Ongole bulls. Average age at first semen collection without affecting the semen quality and freezability, can be reduced by starting, training of bulls at an early age (Sethi *et al.,* 1989). The age of starting semen donation varies according to breed, AFSC is lower in crossbred than indigenous cattle breed (Mukhopadhyay *et al.,* 2010). The results as Randel (2002) confirm the relationship of season on sexual maturity of bull; they reported that sexual maturity of bull gets delayed in autumn-born bulls compared with spring-born bulls and the result is in contrary with our results. This variability in results may be due the difference in type of climate between the places of study.

Our results regarding age at first semen freezing of Sahiwal bulls is similar to the findings of Naha *et al.* (2015), who found age at first semen freezing of Sahiwal bulls 37.68±1.08 months (3.14±0.09 years) but in-contrary to our results found no significant effect of season on AFF. The effect of season of birth on age at first semen freezing might be due to exposure to various degrees of stress in different seasons (Abdullah *et al.,* 2015) during early age. Similar to our results Bhakat *et al*. (2011) found good quality of semen produced by Sahiwal bulls during rainy season. According to Tatman *et al.* (2003) season of birth affects sexual development; photoperiod which might be due to involvement in regulating testicular function immediately after puberty in Brahman bulls. The winter born calf get exposed to high-stress summer while as rainy season born calf get feasible winter environment with least stress. After weaning the growth of calf is influenced by the exposure of stress like availability of food, thermal humidity index etc. Kastelic (2014) reported that feeding bulls younger than 6 months of age, energy, and protein in excess of minimum requirements hastened puberty and increased mature SC and sperm production. No literature is available to compare our data with other parameters of semen production performance. The higher ejaculation rejection rate in Sahiwal bulls may be due to management issues like sexual sluggishness or shy nature, libido related problem (Singh, 2014). The ejaculation rejection rate may be seasonal stress especially summer as reported by Bhakat *et al*. (2009), it may be vaccination stress as reported by Bhakat *et al*. (2015). The management playing an important role in achieving early age at first semen collection (21.3 months) which we could achieve in one of experiment and the management package of practices like daily exercise, same bull

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handler and halter application helped in achieving it (Singh, 2014). To overcome the problem better strategies need to be formulated to overcome seasonal and vaccination stress. Our results regarding less freezable semen percentage indicates problems in semen collection processes.

Conclusion

Thus it can be concluded season of birth of males has noteworthy effect on semen quality which attracts ample scope for increasing semen production performance and semen quality in Sahiwal bulls.

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Conflict of Interest: None

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