Frozen semen production performance of Karan Fries bulls


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Abstract  A study was conducted to assess semen output characteristics of 4648 ejaculates of 52 Karan Fries bulls (Holstein Friesian crossbreds with 50 to 75% exotic inheritance) maintained at Artificial Breeding Research Centre, NDRI, Karnal, India. The objective of this study was to estimate expected frozen semen dose production. Semen production data were analysed using standard statistical tools. Age of the Karan Fries bulls (KF) ranged from 1.90 to 8.13 years, with a mean of 3.32±0.18 years. The average ejaculate volume (VOL, ml), mass activity (MA), initial motility (IM, %), sperm concentration per ml (SPC, millions) and total sperm output per ejaculate (SPCE, millions) from 52 KF bulls were 4.68±0.14 (2.74 - 6.98); 2.84±0.02 (2.57 - 3.08); 65.55±0.01 (61.40 - 69.65); 965.71±0.02 (865 - 1067.72) and 4516.90±7.61 (2600 - 6603.41, respectively). The average dilution rate for preservation was found to be 1: 12.07±0.10 with a range of 1:10.81 to 13.35. The expected number of ejaculates that could be frozen per year per bull was 44.46 (21 - 90) and correspondingly expected frozen dose produced per year per bull could be 10048.39 (3500 - 24669) in Karan Fries bulls.

Keywords : Karan Fries bull, dose produced and expected no. of ejaculate

Introduction

To increase the productivity of indigenous cattle, crossbreeding with exotic dairy breeds especially Holstein Friesian was taken up in the areas where adequate green fodder and marketing facilities are available. Consequently there has been an increase in the population of crossbred cows in last decades. With the economic surge accompanied by increasing demand for milk and other dairy products with the consumers, dairy industry has witnessed an increased demand for semen from superior exotic or crossbred bulls. India has the largest breeding infrastructure in the world. The total production is about 66.8 million frozen semen straws, which is covering only 25% of the breedable bovine population through AI but to achieve national target of 50% coverage 140 million straws will be required (www.nddb.org). The remaining animals are covered by natural service utilizing natural service with bulls of high genetic merit. Artificial Insemination using frozen semen is now the most widespread tool employed nationwide for improving the genetic potential of bovine. Attempts are being intensified to increase the coverage of AI so as to exploit full advantage of the technology (Ansari, 2005). The use of the best bulls is often restricted by the limited number of doses of semen produced due to various functional constraints to exotic crossbred bulls. There are enormous wastage of exotic crossbred bulls due to poor semen quality; poor freezability and poor libido (Suryaparakasam and Narsimha, 1993; Sudheer and Xavier, 2000 and Mukhopadhyay et al., 2010) resulting in huge economic losses as well as reduction in genetic gain. To satisfy the high demand for semen from superior sires, the AI industry has to optimize the number of spermatozoa per dose of semen in order to produce maximum number of straws. The objective of this paper to provide basic information on semen characteristics and expected frozen semen dose production of Karan Fries bulls, which will help in planning semen stations for meeting the growing demand of AI in the tropical climates.

Materials and Methods

Information of 52 Karan Fries bulls were collected from Artificial Breeding Research Centre, National Dairy Research Institute, Karnal, Haryana, India. Bulls are tested for approximately three
months on their weekly semen collection and judged on sexual behavior, size of the testes and sperm production. Bulls were kept in individual pens under loose housing system on concrete floor with the orientation of east-west direction through its long axis. The bulls were fed concentrate ration with 21 percent CP and 70 percent TDN @ 2.5 kg per bull. Institute farm grown seasonal green fodder such as maize, cowpea, berseem, jowar etc., depending on their availability, along with mixture of maize and oat silage during lean period was fed ad lib to the animals. The recorded data on a total of 4648 ejaculates of 52 Karan Fries bulls were obtained from Artificial Breeding Research Centre, NDRI, Karnal, India. Semen was collected in a prewarmed (42°C) bovine artificial vagina (IMV model-005417) with smooth neoprene liner (IMV-005331). On each collection, two ejaculates were taken 20 to 30 min gap between two successive ejaculates, and each ejaculate was preceded by a period of sexual preparation consisting of at least two false mounts separated by about one minute restraint. Quality of the semen was assessed for Volume and microscopic tests such as mass activity (Tomar et al., 1966), individual motility, concentration (Haemocytometer). Bulls not donating semen were excluded from the data set. The bulls which gave freezeable quality semen for at least six month were considered in the present study. Total sperm production (million), no. of ejaculate frozen/bull/year and frozen dose produced per bull per year were derived from the available information. A total of 4648 observations remained for analysis. In this experiment the expected frozen dose producing ability per bull per year was calculated by utilizing semen production data using standard statistical tools (Snedecor and Cochran, 1967).

Results and Discussion

The AI industry aims to evaluate the sexual performance of breeding bulls and more concern about production of maximum amount of semen from these breeding bulls. Therefore, the expected frozen dose producing ability per bull per year was calculated for Karan Fries bulls. The results are presented in Table 1. Age of the Karan Fries bulls (KF) at the time of collection during the study period ranged from 1.90 to 8.13 years, with a mean of 3.32±0.18 years as shown in Table 1. The average semen volume, 4.68±0.14 ml, ranging from 2.74 to 6.98 ml was comparable with the findings of Sethi et al. (1989), Mathur et al. (2002), Ulfina and Raina (2002), Jain (2004), Mukhopadhyay et al. (2010) and Bhakat et al. (2010). However, others have reported lower (Tomar et al., 1985 and Sagdeo et al., 1990) as well as higher (Pathak et al., 1990; Singh and Pangawkar, 1990 and Keshava, 1996) values of ejaculate volume. The mass activity of semen (2.84±0.02; 2.57 to 3.08) was similar to the earlier findings (Singh and Pangawkar, 1990; Panwar and Nagpal, 1994, Mathur et al., 2002 and Bhakat et al., 2010) and slight higher mass activity was reported by Mukhopadhyay et al. (2010). The average progressive sperm motility was 65.55±0.01 % (61.40 to 69.65%), however, Singh and Pangawkar (1990) reported higher progressive motility. Concentration of sperm (million/ml) ranged from 865 to 1067.72, with a mean of 965.71±7.61, whereas some workers reported higher (Singh and Pangawkar, 1990 and Ulfina and Raina, 2002) values. The total sperm output per ejaculate (millions) in the present study was 4516.90±128.34 (2600 to 6603.41). The average dilution rate was found to be 12.07±0.10, with a range of 10.81 to 13.35. The variations in semen quality parameters were recorded in the present investigation, which was well supported by earlier reports. This variation in semen quality parameters may be due to individual variations (Saxena and Tripathi, 1978), ejaculate frequency (Nath, 1988), difference in age (Bhat et al., 2002), genetic make up of the bull (Tomar et al., 1966) season of study (Tuli, 1984), data size and agro climatic conditions. The expected number of ejaculates that could be frozen per bull per year was 44.46 (21 to 90) and correspondingly expected frozen dose produced per bull per year could be 10048.39 (3500 to 24669) in Karan Fries bulls. Roy (2006) also calculated expected frozen semen dose per ejaculate to be 220.70 straw from HF crosses, as only 44.46 ejaculates were of freezable quality in a calendar year, we can assume that 9812.32 semen doses can be produced per bull per year in crossbred bulls, which was in agreement with the present study.

Table 1  Average seminal attributes and expected frozen semen dose production in KF bulls.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>No. of bulls</th>
<th>Mean</th>
<th>S.E.</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age (Yr.)</td>
<td>52</td>
<td>3.32</td>
<td>0.18</td>
<td>1.90-8.13</td>
</tr>
<tr>
<td>Average volume (ml)</td>
<td></td>
<td>4.68</td>
<td>0.14</td>
<td>2.74-6.98</td>
</tr>
<tr>
<td>Average mass activity (0-5 scale)</td>
<td></td>
<td>2.84</td>
<td>0.02</td>
<td>2.57-3.08</td>
</tr>
<tr>
<td>Average Initial motility (%)</td>
<td></td>
<td>65.55</td>
<td>0.01</td>
<td>61.40-69.65</td>
</tr>
<tr>
<td>Average concentration (million/ml)</td>
<td></td>
<td>965.71</td>
<td>7.61</td>
<td>865-1067.72</td>
</tr>
<tr>
<td>Average total sperm production (million)</td>
<td></td>
<td>4516.90</td>
<td>128.34</td>
<td>2600-6603.41</td>
</tr>
<tr>
<td>Average dilution rate</td>
<td></td>
<td>12.07</td>
<td>0.10</td>
<td>10.81-13.35</td>
</tr>
<tr>
<td>Calculated no. of ejaculate frozen /bull/year</td>
<td></td>
<td>44.46</td>
<td>2.32</td>
<td>21-90</td>
</tr>
<tr>
<td>Calculated frozen dose produced per bull/year</td>
<td></td>
<td>10048.39</td>
<td>612.72</td>
<td>3500-24669</td>
</tr>
</tbody>
</table>
Conclusions

From these findings it can be concluded that the expected number of ejaculates that could be frozen per bull per year was 44.46 (ranged 21 - 90) correspondingly expected frozen dose produced per bull per year could be 10048.39 (ranged 3500 to 24669) in Karan Fries bulls. The production of semen from these bulls can be increased by following interventions (i) If the housing and environmental variation can be controlled through providing comfortable housing conditions throughout the year (ii) Feeding management from the calf hood and supplementation of minerals and vitamins and (iii) vaccination rescheduling, development of new vaccine with less anaphylactic stress.

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References


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