Seasonal Variation in Libido and Semen Characteristics of Sinai Gabali Rabbits

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ABSTRACT

Fourteen bucks from Sinai Gabali rabbits were evaluated in a project of synthesizing new rabbit line. Reaction time (RT), ejaculate volume (V), individual motility % (IM), live spermatozoa % (LSP), and sperm abnormalities % for total, primary and secondary abnormalities (PRIM, SEC and TAB) and sperm cell concentration were evaluated in various months around the year under the Egyptian conditions. The results showed that the highest value of RT was observed in July (9.2 sec.), while the lowest value was obtained in January (5.9 sec.). Ejaculate volume was the highest in April (8.0 mL), while the lowest was obtained in May (5.0 mL). The highest values for live sperm in semen ejaculate (LSP) were observed in January (74.6 %), but the lowest ones were observed in June (68.9 %). The highest values for IM were recorded in January (59.5 %), while the lowest ones were obtained in July (55.2 %). The highest value for semen concentration (× 10⁶) was in February (478 × 10⁶), while the lowest one was in July (378 × 10⁶). The lowest values PRIM, SEC and TAB were found in January (16.5, 17.7 and 4.5 %, respectively), while the highest ones were observed in July (21.6 and 9.6 %) for TAB and PRIM, respectively and in June (6.7 %) for SEC. The effects of month on RT, IM, LSP, PRIM, SEC, TAB and sperm cell concentration were highly significant (P < 0.001). While a non-significant effects in various months were observed on V. It could be concluded that, the Sinai Gabali rabbits have good reproductive performance traits during month of winter season conditions of Egypt.

Keyword: Gabali Rabbits/ Semen/ Sperm cell/ Sperm abnormalities/ Seasonal variation

INTRODUCTION

Semen characteristics vary among seasons. Such variations may be attributed to ambient temperature and length of photoperiod (Amin et al., 1987). Increasing ambient temperature adversely affects semen quality, as well as, reducing the ability of Leydig and Sertoli cells to respond to LH and the diameter of the seminiferous tubules (El-Sherbiny, 1987). The disorders caused by high ambient temperature are amplified with the increase of relative humidity (Marai et al., 2010). Sperm abnormalities have long been associated with male infertility and sterility in most species studied. These abnormalities vary from morphological defects that are evident upon clinical examination, to those, which are more subtly defective. In general, sperm structure can play a substantial role in both fertilization and pregnancy outcome (Saacke, 2001).

Due to the lack of available information on Sinai Gabali rabbits in the literature, it was intended to study reaction time (libido) and physical semen characteristics during different months under Egyptian condition.
MATERIALS AND METHODS

Semen ejaculates were collected from 14 bucks once weekly during 7 months (from January up to July) by means of an artificial vagina. Reaction time, ejaculate volume of semen (v), individual motility, percentage of live spermatozoa, sperm abnormalities, total abnormalities and sperm concentration (N × 10⁶/mL) were evaluated. Libido or sexual desire was assessed according to the method described by (Daader et al. 1999a, 1999b). This was based on observation of the time (sec.) elapsed between introducing the doe to the buck till it's starting to mount. Volume of ejaculated semen was measured in milliliters using a 2 mL calibrated collecting tube. Any gel presented in the ejaculate was discarded and semen volume was measured soon after collection (El-Sherbiny, 1987). Percentage of advanced motility of spermatozoa was estimated by adding one drop of fresh semen to a test tube containing 1 ml warm physiological saline solution (0.9% NaCl) and suspended in a water bath at 37 °C, the mixture was shaken slowly and then extended semen was taken from the test tube with a warm Pasteur pipette and placed on a warm slide and then the drop was covered by a warmed covered slip and immediately examined under the high power magnification (X 10). Percentages of live spermatozoa and differentiation between live and dead spermatozoa was assessed by eosin-nigrosine stain technique. Duplicates smears were made and a total of 200 spermatozoa were counted. Live spermatozoa were unstained while dead spermatozoa were stained according to (Dott and Faster, 1972). The morphology of normal and abnormal spermatozoa were determined in the same smears prepared for a live/died ratio using high power magnification (X100) of a light microscope. The total per hundred spermatozoa was also calculated. Semen was extended 200 fold with a physiological saline solution (0.9% NaCl) plus a drop of eosin stain. Sperm cell concentration was estimated by using haemocytometer. Examination was made under the high power magnification (X40).

Statistical Analysis

Data of semen characteristics were analyzed using SAS software, SAS (2004) based on the following model:

\[ X_{ijk} = \mu + A_i + M_j + e_{ijk} \]

where, \( X \) is the observation of semen traits; \( \mu \) = the general mean; \( A_i \) = the effect of the i sire; \( M_j \) = the effect of the j month; \( e_{ijk} \) = the random error assumed to be normally distributed with zero mean and \( \sigma^2_e \).

RESULTS AND DISCUSSIONS

1. Reaction Time (Libido, sec.)

Table (1) indicated that the longest reaction time was observed in July (9.2 sec.) but the shortest one was during January (5.9 sec.). Data in Table (2) revealed that month effect on reaction time was highly significant (\( P < 0.001 \)). Summer and high temperature have been shown to cause an adverse effect on the Libido as a result of the decrease in level of blood plasma testosterone (El-Maghawry and Soliman, 2002). Gabali males were found to respond faster than the Moshtohor and V-line males (Elokil, 2010). These results are in agreement with Tharwat et al. (2004) who demonstrated that the longest reaction time average was recorded during summer (21.1 ± 1.6 sec.) and the shortest average was recorded during winter (16.6 ± 1.9 sec.). Libido and semen quality of rabbit bucks are affected deleteriously by increasing ambient temperature and humidity (Daader and Seleem, 2005; Elokil, 2010).
2. Physical Semen Characteristics

The results obtained in Table (1) showed that the largest volume was in April (0.8 mL) while the smallest volume was obtained during May (0.5 mL). Table (2) revealed that the effect of month on ejaculate volume was non-significant. Generally, in the present study one observed that Gabali bucks have a small ejaculate volume.

The obtained results are in agreement with those obtained by (Tharwat et al. 2004; Tawfeek et al. 2010; Iraqi et al. 2012) who reported that Gabali bucks showed the smallest average of ejaculate volume among breeds. This may be due to that Gabali breed has low activity in accessory sex glands in response to testosterone hormone comparing with V- and Moshtohor lines (Iraqi et al., 2012).

Table (1) revealed also that the highest sperm cell concentrations ($\times 10^6$) were observed in January and February (472.3 and 478.0, respectively), while the lowest ones were recorded in June and July (384.0 and 378.0, respectively). Means of sperm cell concentration ($\times 10^6$) as affected by months of the season was given in Table 2 which showed highly significant differences ($P < 0.001$) in the sperm cell concentration ($\times 10^6$) of buck semen among months. The lower value of sperm cell concentration ($\times 10^6$) associated with the hot climate could be attributed to the decline in levels of testosterone and gonadotrophins essential for maintaining the testicular sperm producing potential (Ayyat and El-Aasar, 2008; Iraqi et al., 2012). These findings are in agreement with those obtained by (El-Sherbiny, 1987; Daader et al. 1999a, 1999b; Iraqi et al. 2012) who revealed that total-sperm output values were significantly higher in winter than in summer. Zeidan et al. (1997) stated that the decrease in sperm cell concentration ($\times 10^6$) might be attributed to the degeneration of germinal epithelium and a trophy of the somniferous tubules. High ambient temperature was found to affect the total sperm production (Ahmed et al., 2006). This could be attributed to a decrease in the activity of sertoli cells which in turn affects daily spermatogenesis (Iraqi et al, 2012).

Table (1) shows that the highest values for individual motility were obtained in January, February and March (67.9, 67.5 and 67.4 %, respectively), while the lowest values for individual motility were obtained in June and July (64.8, 62.4 %, respectively). Table 2 showed that month effect on individual motility was noticed to be significant ($P < 0.01$).

These results are in agreement with those obtained by Iraqi et al. (2012) who reported that the best means were recorded in autumn and winter, while the lowest were recorded during summer season. This could be due to high environmental temperature. These findings are also in agreement with Amin et al. (1987) who found that season having significant effect on individual sperm motility. Ayyat and El-Aasar (2008); Iraqi et al. (2012) reported that, the sperm motility decreased significantly ($P < 0.01$) than in winter during summer.

Table (1) represents the means of live sperm/ejaculate. The highest means were obtained in January, April and March (74.6, 73.9 and 73.0 %, respectively), while the lowest one was obtained in June (68.9%). Month effect on live sperm/ejaculate is highly significant ($P < 0.001$). These results are in harmony with the finding obtained by (Iraqi et al. 2012) who observed that the highest means of live spermatozoa were recorded in spring and winter while the lowest value was recorded during summer due to negative and deleterious effects of high environmental temperature. The same trend was noticed by (El-Maghawry and Soliman, 2002) who attributed the low percentage of dead spermatozoa during spring under Egyptian conditions to the suitable environmental conditions. As well as the percentage of dead spermatozoa was significantly higher during the period of high ambient temperature (Ahmed et al., 2006).
Table (1): Least-squares means ± S.E. for the effect of month on semen traits in Sinai Gabali rabbits.

<table>
<thead>
<tr>
<th>Month</th>
<th>No.</th>
<th>Reaction Time (sec)</th>
<th>V (ml)</th>
<th>CON(x10^6)</th>
<th>IM (%)</th>
<th>LSP (%)</th>
<th>PRIM (%)</th>
<th>SEC (x10^6)</th>
<th>TAB (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>January</td>
<td>15</td>
<td>5.9±0.6</td>
<td>0.6±0.1</td>
<td>472.3±4.8</td>
<td>67.9±1.5</td>
<td>74.6±1.6</td>
<td>7.7±0.9</td>
<td>4.5±0.7</td>
<td>16.5±1.6</td>
</tr>
<tr>
<td>February</td>
<td>26</td>
<td>7.2±0.5</td>
<td>0.7±0.1</td>
<td>478.0±4.1</td>
<td>67.5±1.5</td>
<td>72.1±1.6</td>
<td>9.1±0.5</td>
<td>6.1±0.4</td>
<td>20.8±0.9</td>
</tr>
<tr>
<td>March</td>
<td>29</td>
<td>8.1±0.4</td>
<td>0.6±0.1</td>
<td>415.1±3.9</td>
<td>67.4±2.9</td>
<td>73.0±1.5</td>
<td>8.2±0.5</td>
<td>4.9±0.4</td>
<td>17.7±0.9</td>
</tr>
<tr>
<td>April</td>
<td>25</td>
<td>8.3±0.4</td>
<td>0.8±0.1</td>
<td>399.3±3.9</td>
<td>66.8±1.6</td>
<td>73.9±1.5</td>
<td>7.9±0.5</td>
<td>6.0±0.4</td>
<td>18.6±0.9</td>
</tr>
<tr>
<td>summer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>7</td>
<td>8.5±0.8</td>
<td>0.5±0.2</td>
<td>398.2±7.3</td>
<td>65.9±2.7</td>
<td>72.9±2.8</td>
<td>8.0±0.9</td>
<td>5.4±0.7</td>
<td>18.8±1.7</td>
</tr>
<tr>
<td>June</td>
<td>25</td>
<td>8.5±0.5</td>
<td>0.6±0.1</td>
<td>384.0±4.1</td>
<td>64.8±1.6</td>
<td>68.9±1.9</td>
<td>8.2±0.5</td>
<td>6.7±0.4</td>
<td>20.3±0.9</td>
</tr>
<tr>
<td>July</td>
<td>8</td>
<td>9.2±0.8</td>
<td>0.6±0.2</td>
<td>378.0±6.8</td>
<td>62.4±2.0</td>
<td>70.7±2.6</td>
<td>9.6±0.6</td>
<td>5.9±0.5</td>
<td>21.6±1.2</td>
</tr>
</tbody>
</table>

Means with the same letters within each trait are not-significantly different (P ≤ 0.05).
Table (2): F-ratio of least-squares analysis of factors affecting semen traits in Sinai Gabali rabbits

<table>
<thead>
<tr>
<th></th>
<th>df</th>
<th>Reaction Time</th>
<th>V</th>
<th>CON</th>
<th>IM</th>
<th>LSP</th>
<th>PRIM</th>
<th>SEC</th>
<th>TAB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sire **</td>
<td>14</td>
<td>1.1 ns</td>
<td>0.7 ns</td>
<td>0.78 ns</td>
<td>4.7 ns</td>
<td>4.9 ns</td>
<td>3.2 ns</td>
<td>0.9 ns</td>
<td>3.1 ns</td>
</tr>
<tr>
<td>Month</td>
<td>6</td>
<td>3.3***</td>
<td>0.5 ns</td>
<td>80.35 ns</td>
<td>1.2***</td>
<td>1.2***</td>
<td>1.3***</td>
<td>2.8***</td>
<td>2.6***</td>
</tr>
<tr>
<td>Error MS</td>
<td>4.5</td>
<td>0.3</td>
<td>343.12</td>
<td>53.6</td>
<td>50.6</td>
<td>5.6</td>
<td>3.1</td>
<td>18.1</td>
<td></td>
</tr>
<tr>
<td>Error DF</td>
<td>115</td>
<td>ns</td>
<td>0.3</td>
<td>343.12</td>
<td>53.6</td>
<td>50.6</td>
<td>5.6</td>
<td>3.1</td>
<td>18.1</td>
</tr>
</tbody>
</table>

ns = non-significant; *** = $P \leq 0.001$

Sperm abnormalities have long been associated with male infertility and sterility in most species. In general, sperm structure can play a substantial role in both fertilization and pregnancy outcome (Saacke, 1998). The causes of defective sperm structure may be environmental, genetic or a combination of both, while the environmental causes are considered to be the most common (Chenoweth, 2005).

Means of primary, secondary and total abnormalities are given in Table 1. The highest values for primary and total abnormalities were obtained in July (9.6 and 21.6 %, respectively), while the highest value of secondary abnormality was obtained in June (6.7 %). The lowest values of primary, secondary and total abnormalities were recorded in January. Table (2) showed a highly significant ($P < 0.001$) effect for month on primary, secondary and total abnormalities. This may be attributed to the deleterious effect of the hot weather months on the normal spermatozoa of rabbit semen (Nasr, 1994, Meshreky; Abbas, 2000; Seleemet et al., 2010). These results are in harmony with the finding of Iraqi et al. (2012) who reported that there was increasing of sperm abnormalities/ejaculate (%) in summer (14.92 %) which was higher than other seasons. This may be attributed to the negative and deleterious effects of high environmental temperature during summer.

It could be concluded that male Sinai Gabali rabbits have good reproductive performance during winter months under conditions of Egypt and more adapted in winter months than summer months.

ACKNOWLEDGMENTS

The authors wish to dedicate this work to the spirit of Dr. Kamel Elwan, may God bless his soul and rest it in peace. The authors, also, would like to thank the Faculty of Agriculture at Moshtohor, Banha University, Egypt for providing the animals.

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