ABSTRACT

Aim of this study is to evaluate the effect of adding different levels of Zinc and Selenium on extender as antioxidants to improve Friesian-bull semen quality after cryopreservation. Semen was collected, pooled, and extended with five treatment extenders, including control without (E1), 0.3 mg/100ml Zn (E2), 0.6 mg/100ml Zn (E3), 0.2 mg/100ml Se (E4), and 0.5 mg/100ml Se (E5). Semen was evaluated for visual parameters after dilution, equilibration, and thawing. Also, semen was evaluated by CASA only after thawing. Results showed that there are no effects of all additives on sperm characteristics after dilution and thawing. Only visual progressive motility percentage increased (P<0.05) post-equilibration by E5. Percentages of acrosome integrity were enhanced by E4 and E5. Semen analysis by CASA revealed that non-motility, and total and head abnormalities percentages were decreased (P<0.05), while vitality, and total and rapid progressive motility percentages were increased (P<0.05) by E5. Dynamic sperm parameters straightness and wobble were increased (P<0.05) E5. In conclusion, adding selenium at a level of 0.5 mg/100ml to extender of cryopreserved Friesian-bull semen has beneficial effects on maintaining sperm parameters and improved sperm freezability. This may be used as a tool for improving cryopreserved semen in artificial insemination centers.

Keywords: Friesian semen, zinc, selenium, cryopreservation, sperm dynamics.

INTRODUCTION

Artificial insemination is a valuable tool in genetic improvement programs and a widely used as a breeding technique in farm animals (Sansone et al., 2000). Semen processing and cryopreservation cause considerable damage to the sperm DNA, motility apparatus, plasma membrane, acrosomal cap, leakage of intracellular enzymes, and reduced fertility (Rasul et al., 2001; Dhami and Kodagali, 1990; Chohan et al., 2006; Guthrie and Welch, 2006). Cryopreservation of semen induces the oxidative stress on function and structure of spermatozoa (Chatterjee and Gagnon, 2001). The production of excessive reactive oxygen species (ROS) damages the spermatozoa by lipid peroxidation in the sperm cell during freezing (Arabi et al., 2001; Hashem et al., 2013). Rising levels of ROS like superoxide, hydroxyl, and hydrogen peroxide significantly affect the semen quality parameters like motility, morphology, sperm functions and sperm DNA (Hellstrom et al., 1994).

Antioxidants are the agents, which break the oxidative chain reaction eliminating, taking up, or reducing the formation of ROS (Bansal and Bilaspuri, 2011) and thereby reduces the oxidative stress (Miller et al., 1993; Kumar and Mahmood, 2001). The antioxidants check the chemical breakdown of the substrate resulting from oxidation and neutralize the free radicals thus reducing the risk of damage to spermatozoa during cryopreservation (Strzezek, 2002; Pen’a et al, 2003; Roca et al, 2004). Antioxidants may be preventive antioxidants (metal chelators or binding proteins, such as lactoferrin and transferring), which prevent the formation of ROS, or scavenging antioxidants, like vitamins C and E, which removes the ROS that is already present (Lampiao, 2012).

Selenium (Se) is found in the earth’s crust in association with metals and in traces in water. It is a necessary trace nutrient for growth and development of humans and animals. In rat, mice, chicken, pig, sheep, and cattle (Baiomy et al., 2009), Se insufficiency has been associated with reproductive complications and decreased sperm quality. It constitutes a necessary part of glutathione peroxidase, an enzyme responsible for protecting cell internal structures from free radicals. It is considered an excellent antioxidant for cellular membrane lipids (Gutierrez et al., 2008). The significance of Se is pronounced from the fact that Se supplementation proves the better storage along the less release of lipids from the sperm cell during long time storage (Dimitrova et al., 2007). Several studies have reported the effects of antioxidants on semen extenders during the cryopreservation and significant correlation between Se level in the seminal plasma and sperm integrity (Watanabe and Endo, 1991; Noack-Filler et al., 1993). Selenium is an essential micronutrient which generally acts as a co-factor and is present in some enzymatic structures called selenoproteins in vivo (Sarkar et al., 2015; Zelha et al., 2015). Selenium at a level (2 μg/mL) can improve the quality of fresh and frozen semen of buffalo bull, mice, human, ram, bovine and other species (Blodeau et al., 2001). However, there is a very narrow margin between activity and toxicity of selenium (Lancot et al., 2017).

Zinc (Zn) is one of the important trace elements in the body deficiency of which causes infertility in most animals due to disorders of testes development and spermatogenesis (Massanyi et al., 2004). It plays basic role in membrane
stability and physical properties of the attached fibers, sperm tail morphology and sperm motility. Lack of Zn may increase oxidative damage, resulting in poor sperm quality (Colagar et al., 2009). Zinc in the sperm reacts to dense fiber that reacts with sulphydryl groups and prevents oxidation (Henkel et al., 2001). Some in vivo evidence suggests that Zn acts as in vivo as a superoxide cleaner produced by incomplete spermatozoids or leukocytes.

Other tests have shown that Zn can clean up radicals induced by various factors, including ionizing radiation, and reduce malondialdehyde (MDA) levels, so it is known as a highly antioxidant (Dani and Dhawan, 2005). Supplementation of Zn leads to improve fertility in Zn deficient animals by increasing concentration and motility of spermatozoa and sperm membrane integrity (Karaji et al., 2014). The high concentration of Zn may depress oxygen uptake (cell respiration) by sperm cells and influence the sperm motility. Zinc antioxidant capacity has been reported by many authors (Powell et al., 2000; Dissanayake et al., 2006). Buffalo semen samples with higher seminal plasma Zn content had higher sperm motility and viability, and lower abnormal morphology (Alavi-Shoushtari et al. 2009).

Aim of this study was to evaluate the effect of adding two levels of zinc in comparing with selenium, as antioxidants, to extender on sperm characteristics of cryopreserved semen of Friesian bulls.

**MATERIALS AND METHODS**

This study was conducted in Sakha Animal Production Research Station, Animal Production Research Institute (APRI), Agricultural Research Center.

Semen was collected from 3 Friesian bulls, early in the morning, twice a week for seven weeks, using artificial vagina. The ejaculates were placed in water bath at 37°C and transported to the laboratory of International Livestock Management Training Center (ILMTC) to semen evaluation. Initial motility was assessed immediately after collection, and ejaculates having over 70% percentage were chosen for further evaluation. On day of semen collection, semen was pooled and diluted with bovine base-extender OptiXcell (IMV technologies, France) supplemented with different antioxidants at a level of 1:15.

In this study, semen was diluted with OptiXcell supplemented with 0 (E1), 0.3 mg Zn/100ml (E2), 0.6 mg Zn/100ml (E3), (Zinc sulphate (monohydrate) extra pure, Oxford), 0.2 mg Se/100ml (E4), and 0.5 mg Se/100ml (E5), (Selenium DIOXIDE (Sublimed) 99% Extra Pure, Oxford).

After dilution of the semen with different supplementation at 37°C, then cooled to 5°C four hours as an equilibration period (Andrabi et al., 2006). After equilibration, semen straws of 0.25 mL capacity were packed and placed horizontally on rack at 5 cm higher on the liquid nitrogen vapors for 10 minutes. The frozen straws of semen were plunged into liquid nitrogen container and stored on this temperature for one month until further evaluation.

Semen extended with each supplement was evaluated in post-dilution, and post-equilibration, and post-thawing at 37°C for 20 s. According to Asr et al. (2011), percentage of progressive motility was measured by putting small drop of extended semen on warmed slide. This slide was enclosed with the help of cover slip to examine at 40x of phasecontrast microscope. Percentages of viability and morphological abnormalities of spermatozoa for at least 100 spermatozoa, were done using Eosin (0.5%-), Nigrosin (0.1%) staining mixture. Dead cells were stained by the Eosin (Barbas, and Mascarenhas, 2009).

In post-thawed semen, semen was evaluated by CASA (SPERMOLAB®, Cairo,Egypt) for sperm motility parameters including percentages of total sperm motility (TMS %), progressive sperm motility (PMS %), non-progressive sperm motility (NPMS %), immotile sperm (MMS %), rapid progressive motility, and slow progressive motility. Percentages of sperm vitality, normal sperm, and sperm abnormalities (head, neck, and tail) was also automatically determined by CASA and reported. In addition, sperm kinetic parameters, involving curve linear velocity (VCL), straight line velocity (VSL), and average path velocity (VAP) were estimated. Linearity (LIN), straightness (STR), and wobble (WOB) as ratios of the velocity parameters (VSL/VCL %, VSL/VAP %, and VAP/VCL %) were also calculated.

In post-thawed semen, the spermatozoa acrosomal integrity was monitored by mixing 500 μL of semen with 50 μL of 1% formaldehyde citrate in a test tube. A single drop of semen was observed below stage contrast microscope at 100X as described by Asr et al. (2011) to count two hundred sperms with acrosome abnormalities. Membrane integrity assessed by the hypo-osmotic swelling test (HOST), as described by Jeyendran et al. (1984). In brief, the hypo-osmotic solution (osmotic pressure =150 mOsml kg-1, Osmomat 030; Gonotec, Berlin, Germany) was prepared by dissolving 0.73 g sodium citrate and 1.35 g fructose in 100 mL of distilled water. Hypo-osmotic solution (500 μL) was mixed with 50 μL of semen and incubated at 37°C for 40 min. After incubation, a drop of semen sample was examined under a phase-contrast microscope (Model BX41, Olympus Corp., Tokyo, Japan) (400×) and 200 spermatozoa were counted in at least five different fields for their swelling character-erized by coiled tail indicating intact plasma membrane.

Data were statistically analyzed by one way-ANOVA using SAS program (SAS, 2004) to test the effect of supplementation. The significant differences among means were set at P<0.05 according to Duncan (1955). All percentage values were transformed to arcsine values before the statistical analysis.

**RESULTS AND DISCUSSION**

Results

**Post-diluted semen:**

**Visual sperm characteristics:**

The results in Table 1 show that adding both levels of Zinc or Selenium didn’t effect on the percentage of visual progressive motility, livability, and abnormality of spermatozoa in post-diluted semen as compared to control. Although the percentage of progressive motility was affected (P<0.05) by extender treatment, but the differences were significant between E3 and E5.
Table 1. Sperm characteristics as affected by adding zinc and selenium in extender of Friesian bull post- diluted semen.

<table>
<thead>
<tr>
<th>Sperm Parameter (%)</th>
<th>E1 (control)</th>
<th>E2 (0.3 mg/100ml Zn)</th>
<th>E3 (0.6 mg/100ml Zn)</th>
<th>E4 (0.2 mg/100ml Se)</th>
<th>E5 (0.5 mg/100ml Se)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progressive motility</td>
<td>71.67±1.67a</td>
<td>66.67±1.67b</td>
<td>71.67±1.67a</td>
<td>73.33±1.67a</td>
<td>73.33±1.67a</td>
</tr>
<tr>
<td>Livability</td>
<td>72.67±0.89</td>
<td>68.67±2.91</td>
<td>72.33±2.19</td>
<td>73.00±2.89</td>
<td>73.00±2.89</td>
</tr>
<tr>
<td>Total abnormality</td>
<td>17.67±2.19</td>
<td>21.00±1.10</td>
<td>18.67±0.67</td>
<td>15.33±1.45</td>
<td>15.33±1.45</td>
</tr>
</tbody>
</table>

Means in the same row with different superscript (a, b, c) differ significantly (P<0.05).

Post-equilibrated semen:
Visual sperm characteristics:
Post-equilibration, sperm progressive motility significantly increased (P<0.05) only with E5, but did not differ significantly with E2. However, sperm livability percentage increased in E5 compared to E1, but the differences were not significant. Moreover, there were no significant differences in sperm abnormality percentage (Table 2).

Table 2. Sperm characteristics as affected by adding zinc and selenium in extender of Friesian bull post-equilibrated semen.

<table>
<thead>
<tr>
<th>Sperm parameter (%)</th>
<th>E1 (control)</th>
<th>E2 (0.3 mg/100ml Zn)</th>
<th>E3 (0.6 mg/100ml Zn)</th>
<th>E4 (0.2 mg/100ml Se)</th>
<th>E5 (0.5 mg/100ml Se)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progressive motility</td>
<td>61.67±1.67a</td>
<td>61.67±1.67a</td>
<td>61.67±1.67a</td>
<td>68.33±1.67a</td>
<td>68.33±1.67a</td>
</tr>
<tr>
<td>Livability</td>
<td>66.00±1.53ab</td>
<td>62.67±0.67ab</td>
<td>62.00±1.53ab</td>
<td>68.67±2.91a</td>
<td>68.67±2.91a</td>
</tr>
<tr>
<td>Total abnormality</td>
<td>21.00±2.52</td>
<td>17.67±2.88</td>
<td>22.00±1.53</td>
<td>19.67±1.45</td>
<td>19.67±1.45</td>
</tr>
</tbody>
</table>

Means in the same row with different superscript (a, b) differ significantly (P<0.05).

Post-thawed semen:
Visual sperm characteristics:

Results presented in Table 4 revealed that only selenium treatments (E4 and E5) had remarkably positive influence on the percentage of acrosome integrity as compared to control (E1) and the other groups. Treatments in E2, E4, and E5 had no effect on plasma membrane integrity, but E3 showed adverse effect on post-thawed semen quality in term of decreasing membrane integrity percentage.

Table 3. Sperm characteristics as affected by adding zinc and selenium in extender of Friesian bull post-thawed semen.

<table>
<thead>
<tr>
<th>Sperm parameter (%)</th>
<th>E1 (control)</th>
<th>E2 (0.3 mg/100ml Zn)</th>
<th>E3 (0.6 mg/100ml Zn)</th>
<th>E4 (0.2 mg/100ml Se)</th>
<th>E5 (0.5 mg/100ml Se)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progressive motility</td>
<td>46.67±1.67a</td>
<td>48.33±1.67a</td>
<td>16.66±1.67c</td>
<td>41.67±1.67b</td>
<td>50.00±2.89</td>
</tr>
<tr>
<td>Livability</td>
<td>53.00±2.00ab</td>
<td>56.00±1.15a</td>
<td>24.00±2.08c</td>
<td>49.33±1.20a</td>
<td>58.67±2.33a</td>
</tr>
<tr>
<td>Total abnormality</td>
<td>25.00±2.88b</td>
<td>25.00±1.52ab</td>
<td>28.00±1.00a</td>
<td>25.33±1.20ab</td>
<td>22.66±1.45ab</td>
</tr>
</tbody>
</table>

Means in the same row with different superscript (a, b, c) differ significantly (P<0.05).

Table 4. Integrity of sperm plasma membrane and acrosome as affected by adding zinc and selenium in extender of Friesian bull post-thawed semen.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>E1 (control)</th>
<th>E2 (0.3 mg/100ml Zn)</th>
<th>E3 (0.6 mg/100ml Zn)</th>
<th>E4 (0.2 mg/100ml Se)</th>
<th>E5 (0.5 mg/100ml Se)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acrosome integrity (%)</td>
<td>55.33±0.667ab</td>
<td>59.33±1.33ab</td>
<td>54.67±1.76ab</td>
<td>62.00±0.00ab</td>
<td>62.67±3.53ab</td>
</tr>
<tr>
<td>Membrane integrity (%)</td>
<td>54.67±1.76ab</td>
<td>57.33±3.53ab</td>
<td>46.67±2.40ab</td>
<td>52.66±1.33ab</td>
<td>52.00±1.15abab</td>
</tr>
</tbody>
</table>

Means in the same row with different superscript (a, b, c) differ significantly (P<0.05).

CASA sperm characteristics:
Sperm motility:

Results in Table 5 revealed that E5 had significantly positive effect on enhancing the percentages of vitality, progressive motility, and rapid progressive motility compared with control extender. Each of E2 and E4 did not alter sperm characteristics in comparing with E1, except for non-progressive motility percentage. On the other hand, E3 showed negative effects on most of sperm characteristics.

Table 5. Sperm vitality and motility examined by CASA as affected by adding zinc and selenium in extender of Friesian bull post-thawed semen.

<table>
<thead>
<tr>
<th>Sperm parameter (%)</th>
<th>E1 (control)</th>
<th>E2 (0.3 mg/100ml Zn)</th>
<th>E3 (0.6 mg/100ml Zn)</th>
<th>E4 (0.2 mg/100ml Se)</th>
<th>E5 (0.5 mg/100ml Se)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vitality</td>
<td>89.13±1.39a</td>
<td>87.31±2.97b</td>
<td>56.33±6.53a</td>
<td>71.20±6.33a</td>
<td>98.76±1.89a</td>
</tr>
<tr>
<td>Total motility</td>
<td>74.18±1.09ab</td>
<td>74.47±2.19ab</td>
<td>46.31±6.29a</td>
<td>63.49±4.99ab</td>
<td>86.44±1.45a</td>
</tr>
<tr>
<td>Non-motility</td>
<td>25.82±1.09ab</td>
<td>25.53±2.19ab</td>
<td>53.69±6.29a</td>
<td>36.50±4.99ab</td>
<td>13.57±1.45a</td>
</tr>
<tr>
<td>Progresive motility</td>
<td>54.04±1.82ab</td>
<td>57.26±1.67ab</td>
<td>23.99±1.48ab</td>
<td>51.55±3.90ab</td>
<td>72.20±1.18a</td>
</tr>
<tr>
<td>Non-progressive motility</td>
<td>20.14±1.21ab</td>
<td>17.21±1.50ab</td>
<td>20.32±4.82ab</td>
<td>11.94±1.33ab</td>
<td>14.24±0.27ab</td>
</tr>
<tr>
<td>Rapid progressive motility</td>
<td>35.70±1.44ab</td>
<td>35.33±4.30ab</td>
<td>14.51±1.68ab</td>
<td>29.09±3.91ab</td>
<td>57.98±2.54ab</td>
</tr>
<tr>
<td>Slow progressive motility</td>
<td>18.33±2.45ab</td>
<td>21.92±3.05ab</td>
<td>11.48±1.78ab</td>
<td>22.46±0.13ab</td>
<td>14.22±1.67ab</td>
</tr>
</tbody>
</table>

Means in the same row with different superscript (a, b, c, d) differ significantly (P<0.05).
Sperm abnormalities:

Table 6 revealed that E5 enhanced (P<0.05) post-thawed semen quality by declining total sperm abnormality and abnormal head percentages to the lowest values as compared to E1 and other treatments. On the other hand, E3 showed an opposite trend to E5. However, the differences among treatments and control regarding the percentage of abnormality in neck and tail were not significant.

Table 6. Sperm morphological abnormalities by CASA as affected by adding zinc and selenium in extender of Friesian bull post-thawed semen.

<table>
<thead>
<tr>
<th>Sperm parameter (%)</th>
<th>E1 (control)</th>
<th>E2 (0.3 mg/100ml Zn)</th>
<th>E3 (0.6 mg/100ml Zn)</th>
<th>E4 (0.2 mg/100ml Se)</th>
<th>E5 (0.5 mg/100ml Se)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total abnormality</td>
<td>55.23±2.60b</td>
<td>56.40±4.26b</td>
<td>68.60±0.451</td>
<td>64.43±0.775</td>
<td>37.21±5.29c</td>
</tr>
<tr>
<td>Abnormal head</td>
<td>53.33±2.91b</td>
<td>54.85±4.72ab</td>
<td>64.03±1.64a</td>
<td>62.05±1.21ab</td>
<td>34.52±3.60f</td>
</tr>
</tbody>
</table>

Means in the same row with different superscript (a, b, c) differ significantly (P<0.05).

Discussion

Improvement in artificial insemination programs could be obtained by preserve sperm motility and fertility which affected negatively by steps of cryopreservation processing. Cryopreservation processing (cooling and freeze-thawing) loads a stress in both physical and chemical of sperm membrane (Chatterjee and Gagnon, 2001). Oxidative stress leads to defect in physiological characteristics of spermatozoa (Bilodeau et al., 2001). Previous studies have evaluated the effective of antioxidant additives supplementation in semen extender on the preservation of spermatozoa (Beconi et al., 1993; Szczesniak-Fabiánczyk et al., 2003).

The present study aimed to evaluate the effect of adding different levels of Zn and Se, as antioxidants, in extender on sperm characteristics examined visually and by CASA after dilution, equilibration, and freezing-thawing. At first, different levels of Zn and Se were added on fresh-diluted semen to evaluate which the proper level had the positive effect on sperm characteristics after cryopreservation. The effect of Zn and Se levels on sperm parameters after dilution and thawing was not significant as compared to the control extender. These results go along with Nair et al. (2006) or Pratt et al. (1980), who revealed no effect was recorded by adding Se before cryopreservation on sperm characteristics. Also, several authors showed the same results in ram and bovine spermatozoa (Pratt et al., 1980; Siegel et al., 1980; Alabi et al., 1985; Seremak et al., 1999). Meanwhile, extender with 0.5 mg/100ml of Se (E5) improved (P<0.05) visual sperm motility in post-equilibrated semen as compared to the control extender. These results are in agreement with other in vitro and in vivo studies in buffalo, ram, and bovine (Pratt et al., 1980; Siegel et al., 1980; Seremak et al., 1999; Dorostkar et al., 2012). Beside the positive enhancement in visual sperm progressive motility post-equilibration, plasma membrane integrity percentage was also improved (P<0.05) by E5 in post-thawed semen. These results may indicate a protection effect of Se from cold shock on sperm motility during equilibration.

In addition, sperm motility parameters measured by CASA, including progressive motility and rapid progressive motility significantly increased, while sperm immobility and slow progressive motility significantly decreased by E5. Also, sperm vitality increased significantly, while sperm total morphological and head abnormalities significantly decreased by E5. Dorostkar et al. (2012) showed similar results in buffalo bull semen. Pratt et al. (1980) reported that Se addition lead to increase the concentration of ATP utilized enzymes and revival pathway of spermatozoa which are assessed by motility and oxygen consumption of sperm, that lead to improvement of spermatozoa progressive motility. Acrosome integrity is important key to evaluate the active function of sperm membrane (Silva and Gadella, 2006). Some authors observed that Se had a potential protection of spermatozoa membrane in different species (Gutierrez et al., 2008; Dorostkar et al., 2012; Angrimani et al., 2017). Premature cryocapacitation of sperm with standard cryopreservation before freezing is related to the change in the acrosomal integrity and makes sperm incapable to fertilize egg (Sansores et al., 2011). The beneficial function of Se is on antioxidant system of cells and protects the cell by forming catalytic site for antioxidant enzymes e.g. Glutathione peroxidase (Alvarez and Storey, 2012).
1989). The active protection of Se may preserve spermatozoa from oxidative stress which produced by cryopreservation technique (Kempna et al., 2004).

In our study, adding 0.5mg/100nl Se in treatment extender showed an improvement in spermatozoa viability percentage. Others earlier authors, observed same results in buffaloes, rams, and boar (Sansores et al., 2011; Dorostkar et al., 2012; Anghel et al., 2010). The possibility of Se capacity to reduce lipid peroxidation rate is by reacting within chain during the oxidative stress metabolism (Beconi et al., 1993; Kadirvel et al., 2009; Khan et al., 2012).

In our study, Zn at a level of 0.6 mg/100ml show a reverse result as compared low level of Zn, Se levels, and control. High level of Zn may cause a remarkable decrease in sperm characteristics after freeze-thawed Friesian bull semen. These results are in agreement with Dorostkar et al. (2014), who revealed that Zn at levels 0.576 and 1.152 µg/L as a zinc sulphate, result in deleterious defects on sperm characteristics. Earlier reports suggested that the reasons of the negative effects of high levels of Zn are increased release of free Zn fraction and its subsequent uptake by spermatozoa (Carpino et al., 1998) and decrease in oxygen consumption, since high levels of Zn in semen impairs the oxygen consumption of spermatozoa (Sorensen et al., 1999). This elevated free Zn fraction may be accounted for lower sperm characteristics by E3.

Evaluating the semen of different extenders by CASA showed an association of improvement in motility parameters, vitality, acrosome integrity, and morphological abnormalities in E5 with kinetic sperm parameters such as LIN, STR, and WOB, which may indicate the positive impact of addition of Se at a level of 0.5 mg/100ml.

Based on the obtained results, it was supposed that the differences between in the effect of Zn and Se on sperm characteristics can be related to variation in levels of the supplements, different antioxidant capacity of each sperm in the testing stage, extender composition, and the interaction between type of extender and the supplementation. These factors may explain why both levels of Zn or Se at a low level did not improve the sperm characteristics.

CONCLUSION

Adding selenium at a level of 0.5 mg/100ml to extender of cryopreserved Friesian-bull semen ha beneficial effects on maintaining sperm parameters and improved sperm freezability. This may be used as a tool for improving cryopreserved semen in artificial insemination centers.

REFERENCES


Dorostkar, K.; Alavi-Shoushtari, S. M. and Mokarizadeh, A. (2012). Effects of in vitro selenium addition to the semen extender on the spermatozoa characteristics before and after freezing in water buffaloes (Bubalus bubalis). In Veterinary research forum (Vol. 3, No. 4, p. 263). Faculty of Veterinary Medicine, Urmia University, Urmia, Iran.


الزئبق والسيلينيوم كاضافات إلى مخفف السائل المنوي بعد الحفظ بالتجهيد

وانع فكري محمد فؤاد و ايمان فؤاد عاشور

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تهدف هذه الدراسة إلى تقييم تأثير إضافة مستويات مختلفة من الزئبق والسيلينيوم على مخفف السائل المنوي لتمهيد الأجنة المخصصة لتحسين جودة السائل المنوي لطائرات الفريزيان خلال مراحل الحفظ المختلفة. تم جمع السائل المنوي وتحقيق بعض مضادات معامل ، بما في ذلك المخفف الغير معامل (مخفف معامل (ب) (0 مللي ليتر/ملي ليتر)) المخفف معامل بتركيز 100 مللي ليتر/ملي ليتر (مخفف معامل (ب) (1 مللي ليتر/ملي ليتر))، و مخفف معامل بتركيز 100 مللي ليتر/ملي ليتر (مخفف معامل (ب) (2 مللي ليتر/ملي ليتر))، و مخفف معامل بتركيز 100 مللي ليتر/ملي ليتر (مخفف معامل (ب) (3 مللي ليتر/ملي ليتر)). تم تقييم محفزات الحياة من السيلينيوم باستعمال المجهر بعد التخسيس والстал. أظهرت النتائج عدم وجود تأثير لجميع المواد المضافة على خصائص الحيوانات المنوية بعد التخفيف والذوبان. أيضا، تم تقييم ثبات السائل المنوي بواسطة محدد زئبق. أظهرت النتائج عدم وجود تأثير للإثير المذكور على خصائص السائل المنوي بعد التخسيس والذوبان. زادت نسبة الحركة المتقدمة للحيوانات المنوية بعد التخسيس والذوبان بواسطة محدد زئبق. وظهرت النتائج وجود تحسن في سلامة الأجنة المخصصة لتحسين جودة السائل المنوي لطائرات الفريزيان في حالة إضافة السيلينيوم (مخفف معامل (ب) (1 مللي ليتر/ملي ليتر))، وظهرت النتائج وجود تحسن في سلامة الأجنة المخصصة لتحسين جودة السائل المنوي لطائرات الفريزيان في حالة إضافة الزئبق (مخفف معامل (ب) (2 مللي ليتر/ملي ليتر)).