EFFECT OF THE INJECTION OF VITAMIN E AND SELENIUM ON SEMEN CHARACTERISTICS AND SOME TESTICULAR MEASUREMENTS ON KARADI RAMS

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Abstract

The objective of this study was to determine the effect of vitamin E and selenium (Se) on physiological semen characteristics and some testicular measurements of Karadi rams. Fifteen (15) Karadi rams with average body weight 63 kg and 3-4 years of age were randomly divided into three groups (5 rams / group) and the rams were fed a standard diet equal in energy and protein and treated as follows. The first group (T1) was regard as control: rams were injected with 1ml normal saline once weekly, The second group (T2): rams were injected with 2 ml (2,5 mg vitamin E and 50 µg sodium selenite / kg body weight) once weekly. The third group (T3) animals were injected with 4 ml (5 mg vitamin E and 100 µg sodium selenite / kg body weight) twice in week (2ml /72 h.) and the experiment continue for 3 months. Results revealed that treatment with vitamin E and selenium Se led to a significant improvement (P≤0.05) on some semen characteristics and a significant (P ≤ 0.05) increase in testicular circumference and volume of Karadi Rams.

Keywords : Vit. E & Selenium, semen characteristics, Karadi Rams.

Introduction

Livestock is an essential part of the agricultural production sector, which suffers from a decline in animal production and productivity in Iraq. In order to raise the productive efficiency of farm animals, it must improve reproductive efficiency in the animals (Al-Sayegh et al., 1992). So some vitamins and minerals are important and essential elements in the reproduction of farm animals (Yousif et al., 2003).

Vitamin E and selenium are essential nutrients with complementary biological functions as antioxidants for minimizing cellular damage caused by endogenous peroxides (Kolb et al., 1997). Vitamin E prevents oxidative damage to sensitive membrane lipids by suppressing hydro peroxide formation (Chow, 2001) and protects cellular membranes thus maintaining membrane integrity and reducing oxidative stress (Hogan et al., 1993). There is physiological synergism between selenium and vitamin E. Previous reports have suggested that vitamin E and selenium (Se) are important nutrients that act synergistically and can affect many biological process including spermatogenesis and semen quality (Marin-Guzman et al., 1997 and Yousef et al., 2003). Research suggests the role of vitamin E and selenium in maintaining libido and improving semen quality (AL-Haboby et al., 2004, Zubair, 2017). The improvement of the reproductive efficiency of genetically modified rams is to increase the living sperm free of deformities that are able to reach the fertilization site actively, depending on the quality and quantity of the semen produced (Saacke et al., 1994). The objective of the study is the possibility of injecting the mixture of vitamin E and selenium for the Karadi rams and study its effect on semen characteristics and measurements of the testicles dimensions in the local Karadi rams.

Materials and Methods

The present study was carried out in animal field of animal resources, College of Agriculture and Forestry, University of Mosul. This study was conducted during January and March 2014, Fifteen karadi rams, aged 3-4 years and mean weight 63 kg, were placed in semi-enclosed pens. These rams were supervised by veterinarians throughout the experiment. The animals were fed a standardized diet. Concentrated in the field was provided by 1 kg in two morning and evening meals, and the diet consisted of 50% barley 38% bran 5% yellow corn 5% soybean 1% limestone, 1% salts with 13.32% raw protein and 2465 kcal. Me. (Khawaja et al., 1978) and gave hay as roughage at the rate of 500 g / animal / day, water and molds of mineral salts were available daily in front of animals. The rams were divided into three groups. The first as control group (T1) was left untreated. The second group (T2) was injected with (2 ml) vitamin E and selenium mixture (2.5 mg + 50 Ì¢g of vitamin and selenium / kg live weight) as intramuscular. The third group (T3) was injected with 4 ml of the same mixture (5 mg + 100 Ì¢g of vitamin and selenium / kg weight as intramuscular and the dose was divided twice every 72 hours during the week. Semen was collect by using the electroejaculator of sheep and goats at a rate of once every two weeks to study the effect of vitamin E and selenium injection on the semen characteristics of the rams in the experimental groups, semen was collected from the animals (one ram per day) of each group during the week of collection and continued collection during the duration of the experiment, which lasted three months. Semen was evaluated immediately upon collection for general characters (semen ejaculated volume, concentration, pH, mass motility, live, dead sperm and abnormal spermatozoa). Semen ejaculated volume (ml) was measured using a graduated collection tube to the nearest 0.1 ml. Mass motility was estimated according to the recommendations of Evans, Maxwell, (1990) and Chemineau et al., (1991) respectively, and the promise of sperm concentration using the hemocytometer counting chamber (Mayer, 1955). The percentage of live, dead and sperm abnormality was calculated by method of (Chemineau et al., 1991). Initial (pH) of semen was measured using a digital pH-meter device immediately after collection by immersing the end of the electrode in the semen directly from the collection tube.

Blood samples were collected to measure Serum testosterone concentration every 15 days from the jugular vein into 10 ml tubes. The samples were immediately transported to the laboratory and centrifuged at 2500×g for
significant effect of the treatments × month on the pH values of semen. This result is similar to the finding of Yue et al. (2010) and in agreement with Anita & Jacyno (2005). A significant effect (p≤0.05) of vitamin and selenium treatments on mass motility of sperms, with the second and third groups gave the highest mass motility compared to control group, these results were agreed with Mahmoud et al. (2013) and Soleimani et al. (2009) and in agreement with Li-quanq Shi et al. (2010), Anita & Jacyno (2005) while the results (Table 2) did not show any significant effect of months on mass motility and agree with Hussein et al. (2012) and Daham (2002). The treatment with vitamin and selenium gave a significant effect (p≤0.05) on the percentage of individual motility of sperms in raw semen and it was 91% in second group followed by 83% in third group compared to 77% in control group (Table 1). These results were agreed with Mahmoud et al. (2013), Dulaimi (2010) and Ammar et al. (2009) and in agreement with Anita & Jacyno (2005). While Statistical analysis did not show any significant effect of months on the individual motility percentage in raw semen, these results were agrees with Hussein et al. (2012), Daham (2002), Taha et al. (2000a). Also a significant effect (p≤0.05) of the treatments (Table 1) on live and dead sperms, with the highest percentage 84% of live sperm in second group, which differed significantly from 76% in third group to 70% in control group. In contrast dead sperm decreased from 30.4% in control group to 23.9% in second group and 15.8% in second group, these results were agreed with Mahmoud (2013) Dulaimi (2010) and Soleimani et al. (2009). A significant effect of month on the percentage of live and dead sperm (Table 2), the results were agrees with Hussein et al. (2012) and Daham (2002) and in agreement with Taha et al. (2000a) who did not get a significant effect of month on the percentage of live and dead sperms. Also a significant decrease (p≤0.05) in abnormal spermatozoa from 5.83% in control group to 4.6% in third group and 3.9% in second group (Table 1) these results were similar to the finding of Hussein et al. (2012), Dulaimi (2010) and Daham (2002) who gets an increase in sperm abnormalities during the winter months, while Taha et al. (2000a) did not find a significant effect of month in the percentage of abnormal spermatozoa. Moreover the results of vitamin E, selenium and month interaction (Table 3) showed a significant (p≤0.05) effect on semen characteristics of rams.

A significant increase (p≤0.05) in sperm concentration in second and third groups which gave the highest concentration of sperm compared to control group. These results were agreed with Ammar et al. (2009), Anisa & Jacyno (2005) and in agreement with Hodgson et al. (2001). Also a significant (p≤0.05) effect of month in sperm concentration with the highest concentration in the third month and was significantly (p≤0.05) different than sperm concentration in the first month, while there was no difference observed between second and first, third months, these results were agreed with Tajangookeh et al. (2007) and Taha et al. (2000a) and in agreement agree with Deham (2002).
improvement in semen characteristics of rams in treatment groups. The superiority of the semen ejaculated volume of glands of the male reproductive system, including prostate selenium, to increase the effectiveness of the accessory sex (Bearden and Fuquay, 1997). Underwood (1981) reported a affects on the effectiveness of the accessory sex glands due to the increase in secretion of testosterone (Fig. 1), which rams that were injected with vitamin E and selenium may be a. b. c. means in the same column have the different superscript are significantly different at (p ≤ 0.05)

Table 1: Effect of treatment of vitamin and selenium mixture on semen characteristics in rams (mean ± standard error)

<table>
<thead>
<tr>
<th>Treat.</th>
<th>Item</th>
<th>Semen volume ml</th>
<th>ph</th>
<th>Sperm conc. ×10</th>
<th>Mass motility (Degree)</th>
<th>Individual motility %</th>
<th>Live Sperm %</th>
<th>Dead sperm %</th>
<th>Abnormal sperm %</th>
</tr>
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<tbody>
<tr>
<td>T1</td>
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<td>T3</td>
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Table 2: Effect of months of experiment on semen characteristics in rams (mean ± standard error)

<table>
<thead>
<tr>
<th>Month</th>
<th>Item</th>
<th>Semen volume ml</th>
<th>ph</th>
<th>Sperm conc. ×10</th>
<th>Mass motility (Degree)</th>
<th>Individual motility %</th>
<th>Live Sperm %</th>
<th>Dead sperm %</th>
<th>Abnormal sperm %</th>
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The results of this study showed a significant (p ≤ 0.05) improvement in semen characteristics of rams in treatment groups. The superiority of the semen ejaculated volume of rams that were injected with vitamin E and selenium may be due to the increase in secretion of testosterone (Fig. 1), which affects on the effectiveness of the accessory sex glands (Bearden and Fuquay, 1997). Underwood (1981) reported that there is a contribution to some minerals, including selenium, to increase the effectiveness of the accessory sex glands of the male reproductive system, including prostate gland and seminal vesical gland. Also Smith et al. (1979) found highest concentration of selenium in sex glands (prostate, seminal vesical, and cowper gland) respectively, which increases the efficacy of glutathione peroxides (GSH_px) and its ability to eliminate free radicals produced internally by metabolic processes and thus increasing the secretion of these glands for the Selenium element is essential in increasing the effectiveness of GSH_px (Flohe, 1976).

Table 3: Effect of the interaction of treatment × months on semen characteristics in rams (mean ± standard error)

<table>
<thead>
<tr>
<th>Treat.</th>
<th>Month</th>
<th>Semen volume ml</th>
<th>ph</th>
<th>Sperm conc. ×10</th>
<th>Mass motility (Degree)</th>
<th>Individual motility %</th>
<th>Live Sperm %</th>
<th>Dead sperm %</th>
<th>Abnormal sperm %</th>
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<td>T1</td>
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a. b. c. means in the same column have the different superscript are significantly different at (p ≤ 0.05)
The production of good sperms depends on the extent to which the testicular tissue is supplied with selenium, which is often exist as a form of Selenoprotein-P, because the lack of selenium leads to product sperms that cannot continue to fertilize the egg in the female reproductive system (Burk et al., 2007). Selenium deficiency also leads to a decrease in the concentration of sperm in pigs (Liu et al., 1982). While Udala et al. (1995) injected bulls with (0.75mg Vit.E) or (0.05mg Se / kg body weight) observed a significant increase in sperm concentration. Cooper et al. (1987) showed that vitamin E deficiency led to a decrease in germ cells and thus reduced in sperm production. also the results of this study were agrees with the finding of Yousef et al. (2003) and Hedayati et al. (2009) in the role of vitamin E and selenium to increase the concentration of sperm.

Our current study has shown that vitamin E and selenium have a positive effect in improving alive of sperm and reducing the percentage of dead sperm. These results confirm the findings of Lodhi et al. (2008) who reported that there is appositive correlation with high alive sperm and negative with dead and sperm abnormality. While Bartle et al. (1980) and Daramola et al. (2016) did not observe any effect of vitamin E and selenium in improving semen quality, this may be due to experimental conditions on one hand and to experimental animals on the other, which may not be deficient in vitamin E and selenium, moreover the results showed a positive improvement of month in semen characteristics (sperm ejaculate volume, sperm concentration, live and dead sperm percentage) during the months of experiment. Possibly due to the increase in sperm vitality and the decrease of dead sperm (Taha et al. 2000a) or as a result of vitamin and selenium mixture treatment, which was useful and led to a positive effect and improved semen characteristics during experimental months.

The results of this study (Table 4) showed that the treatment with vitamin E and selenium Se significantly improved the testicular volume of Karadi rams to (1009 cm³) in the second group compared with (811.6 cm³) in control group. While insignificant improvement was found between the second and third group, or the third group with (844.6cm³) testicular volume compared to control group. also the results of the statistical analysis showed that a significant improvement (p≤0.05) in scrotal circumference of Karadi rams in treatment groups compared to the control group (Table 4), these results were agrees with Shi Li-quaqu et al. (2010) and Soleimani et al. (2009) and in agreement with Mahmoud et al. (2013) and Anita and Jacyno (2005) who did not found significant improvement in measurements of testicular dimensions, and there was no significant effect for months on measurement of testicular dimensions (Table 5).

The increase in testicular volume of Karadi rams was associated with the formation of sperm (spermatogenesis) where the volume increases with increasing sexual effectiveness and the increase is mainly due to the total increase in the length and diameter of seminiferous tubules (Yarney and Sanford, 1986) and reduction or decrease in selenium may reduce diameter of seminiferous tubules and small testicular volume (Behne et al., 1996, Marin-Guzman et al., 2000).
Table 4: Effect of treatment with vitamin and selenium mixture on testicular volume (cm3) of Karadi rams (mean ± standard error)

<table>
<thead>
<tr>
<th>Item</th>
<th>Fist month</th>
<th>Second month</th>
<th>Third month</th>
<th>Average of treatments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treat.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T1</td>
<td>801.20 ± 62.77</td>
<td>813.60 ± 64.94</td>
<td>63.93±820.00</td>
<td>811.60 ±34.21B</td>
</tr>
<tr>
<td>T2</td>
<td>996.20 ±101.25</td>
<td>1011.20 ±104.71</td>
<td>104.16±1020.00</td>
<td>1009.13 ±55.32A</td>
</tr>
<tr>
<td>T3</td>
<td>841.20 ±154.17</td>
<td>845.20 ±152.94</td>
<td>847.40 ±152.12</td>
<td>844.60 ±81.82AB</td>
</tr>
<tr>
<td>Average of months</td>
<td>879.53 ±64.19</td>
<td>890.00 ±64.88</td>
<td>895.80 ±64.70</td>
<td></td>
</tr>
</tbody>
</table>

A.B.C. means in the same column have the different superscript are significantly different at (p ≤ 0.05)

Table 5: Effect of treatment with vitamin and selenium mixture on scrotal circumference (cm) (mean ± standard error)

<table>
<thead>
<tr>
<th>Item</th>
<th>Fist month</th>
<th>Second month</th>
<th>Third month</th>
<th>Average of treat.</th>
</tr>
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<tbody>
<tr>
<td>Treatments</td>
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</tr>
<tr>
<td>T1</td>
<td>28.60 ± 1.20b</td>
<td>28.80 ± 1.35b</td>
<td>28.80 ± 1.35b</td>
<td>28.73 ± 0.70C</td>
</tr>
<tr>
<td>T2</td>
<td>36.60 ± 1.28a</td>
<td>37.20 ± 1.49a</td>
<td>37.80 ± 1.71a</td>
<td>37.20 ± 0.81A</td>
</tr>
<tr>
<td>T3</td>
<td>30.60 ± 0.87b</td>
<td>31.00 ± 0.83b</td>
<td>31.40 ± 0.87b</td>
<td>31.00 ± 0.46 B</td>
</tr>
<tr>
<td>Average of months</td>
<td>31.93 ± 1.09</td>
<td>32.33 ± 1.16</td>
<td>32.66 ± 1.24</td>
<td></td>
</tr>
</tbody>
</table>

a.b.c. means in the same column have the different superscript are significantly different at (p ≤ 0.05)

A.B.C. means in the same column have the different superscript are significantly different at (p ≤ 0.05)

**Conclusion**

This study has demonstrated a clear positive effect of vitamin E and Se injection on semen characteristics, testes measurements in Karadi rams. Thus this method of administration or injection could be employed in improving the reproductive performance of Karadi Rams in Iraq.

**References**


