

Effect of vitamin E and selenium on semen quality, sexual activity, and some blood parameters of Awassi Rams

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Summary

This study was conducted to evaluate the effect of supplementation of vitamin E and a combination of vitamin E+Se on reproductive performance of Awassi rams. Eleven Awassi rams averaging (2-2.5) years of age and 61.1±4.2 kg in weight were divided into three groups. In group one (T₁) the animals were treated weekly with vit. E (350 mg), whereas, the animals in group two (T₂) were treated with vit. E (140) and selenium (5600µg). The animals in group three (C) were assigned as a control group. The results showed that ejaculate volume was increased (p<.001) in T₂ (0.87±0.03ml) in comparison to T₁ (0.66±0.04 ml) and C (0.62±0.04 ml) groups. Treatment with vit E and vit. E+Se increased significantly (p<.001) mass activity and individual motility and decreased the percentages of abnormal and dead sperms.

Results of pen libido test showed that the reaction time for the first mount was reduced significantly (p<.01) in Vit. E+Se group (0.25±0.0 min) as compared with C (1.00±0.0 min) group, while the number of services was increased significantly (p<.05) in T₁ (2.50±0.65 serv.) and T₂ (2.25±0.25 serv.) in comparison to C (0.33±0.22 serv.) group. In the third month of treatment percentage of lymphocyte white cells increased significantly (p<.05) in T₁ (32.1±3.04%) and T₂ (37.6±2.77%) in comparison to C (25.8±2.09%) group, and Neutrophil percent reduced (p<.05) in Vit. E+Se group as compared to the control group.

In conclusion, treatment with Vit. E and Se improved semen physical characterization and increased sexual activity and immune response.

Keywords: Selenium; Lambs; Reproduction; Semen.

Introduction

Many new techniques in the area of animal sciences have been developed during the last decades. These techniques were approached to obtain the highest improvement of reproductive traits of animals. Artificial insemination and hormonal treatments, superovulation and embryo transfer (Bearden and Fuguay, 1997) were examples of these new techniques that have been applied to improve reproductive performance. Also, new studies have been referred to use one of the metabolic signals to stimulate gonadotrophic hormonal release (Hall *et al.*, 1992). Specific nutrients that are involved in reproduction (Martin and Walked-Brown, 1995), growth and development (Lindsay *et al.*, 1993, Foster, 1994) may be used for the same goal.

Previous reports have suggested that vitamin E and Selenium (Se) are one of the important nutrients that can affect many biological processes in the body such as immunity (Hernken *et al.*, 1998), metabolism (Awadeh *et al.*, 1998) and reproduction (Jerry, 1996). In addition vit E and Se improved spermatogenesis and semen quality (Marin-Guzman, 1990, Brzezinsks-Slebozinska, *et al.*, 1995).

Therefore, this study was conducted to evaluate the effect of Vit. E and the combination of Vit. E and Se on semen quality, sexual activity and the possible changes in some blood parameters.

Materials and Methods

This study was conducted in Animal Breeding Station during the period April to July/2000. Eleven Awassi rams were used. They were 2-2.5 years old with average weight

61.1±4.2 Kg. The animals were divided randomly to three groups. Animals in T₁ group (n=4) were treated with 350mg/head vit E, whereas rams in T₂ (n=4) were treated with 140mg Vit. E+5600µg Se/head. The treatment was fed orally every week and lasted for three months. Animals in C group (n=3) were used as a control group. Evaluation of semen volume, mass activity, individual motility, percentage of abnormal and dead sperm were estimated every week. Sexual activity was tested using pen libido test at the end of every month of the treatment.

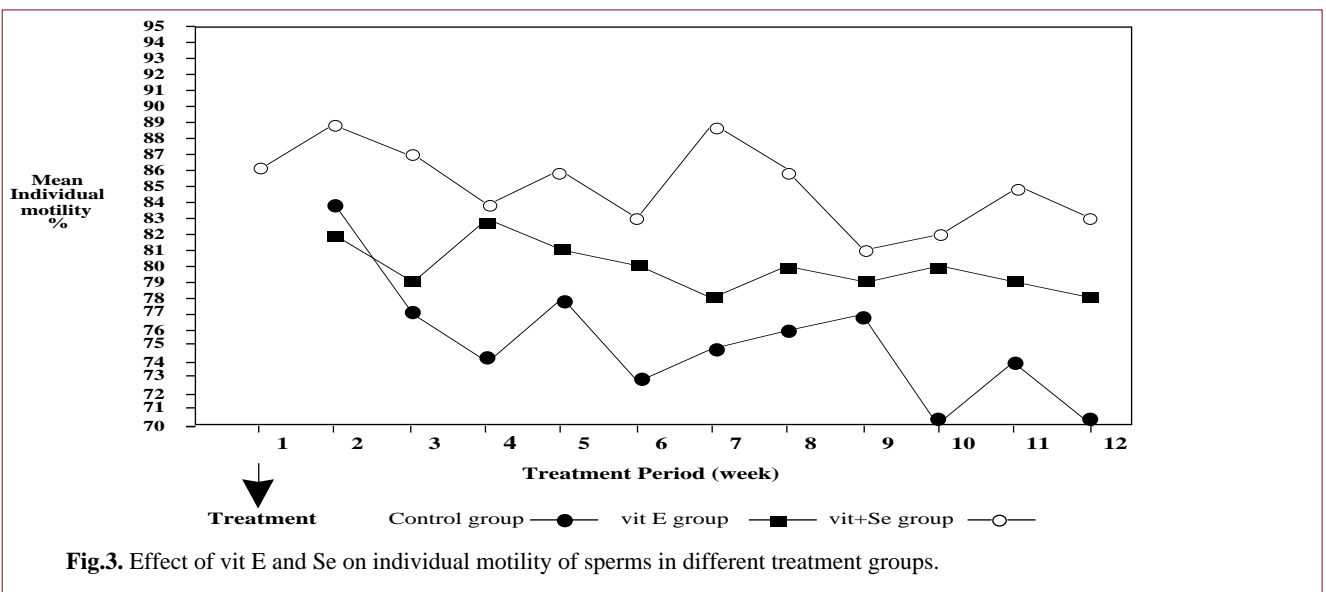
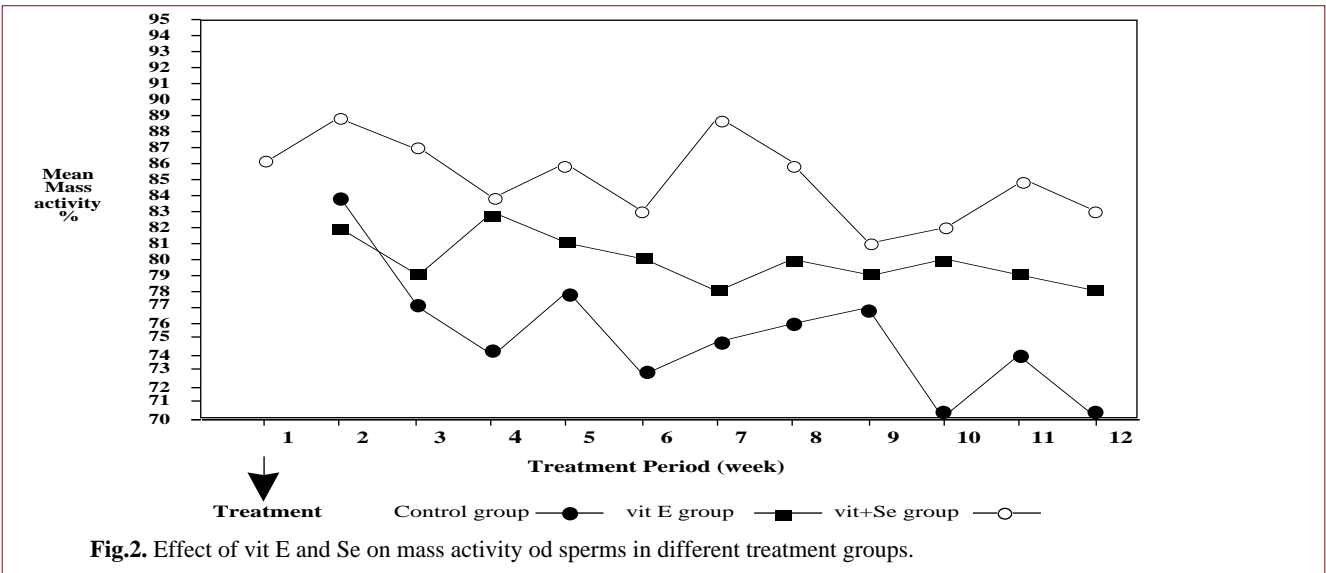
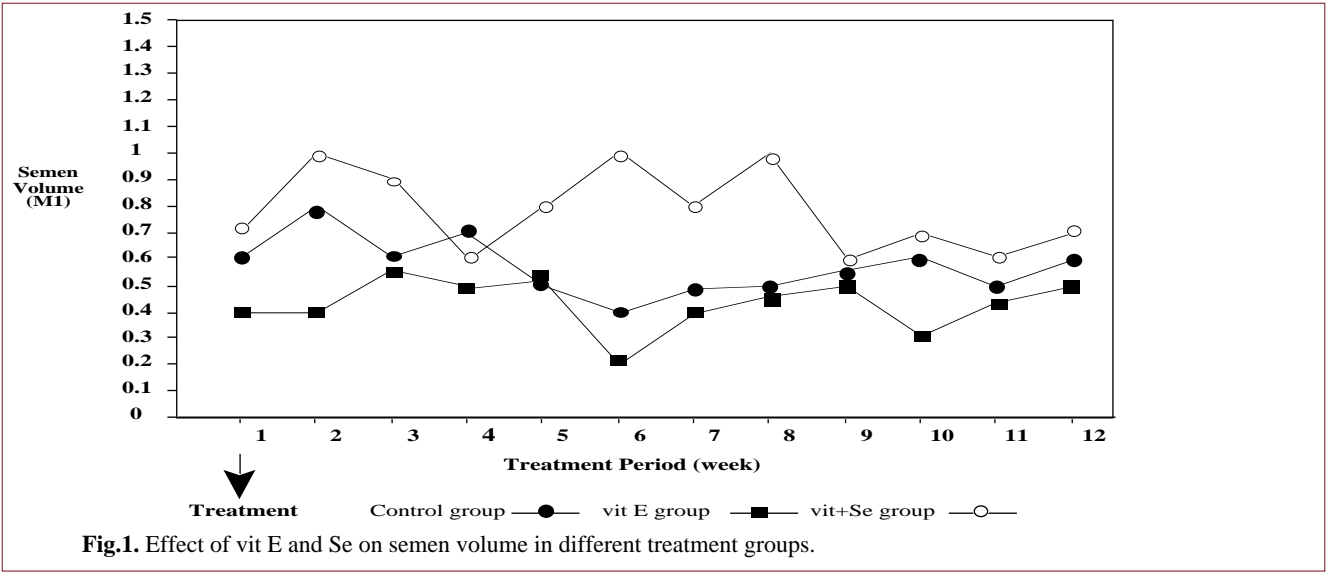
Blood samples (5ml) were taken from the jugular vein before treatment and at the end of every month during the whole experimental period. Packed cell volume (pcv) and differential white cell count were determined immediately.

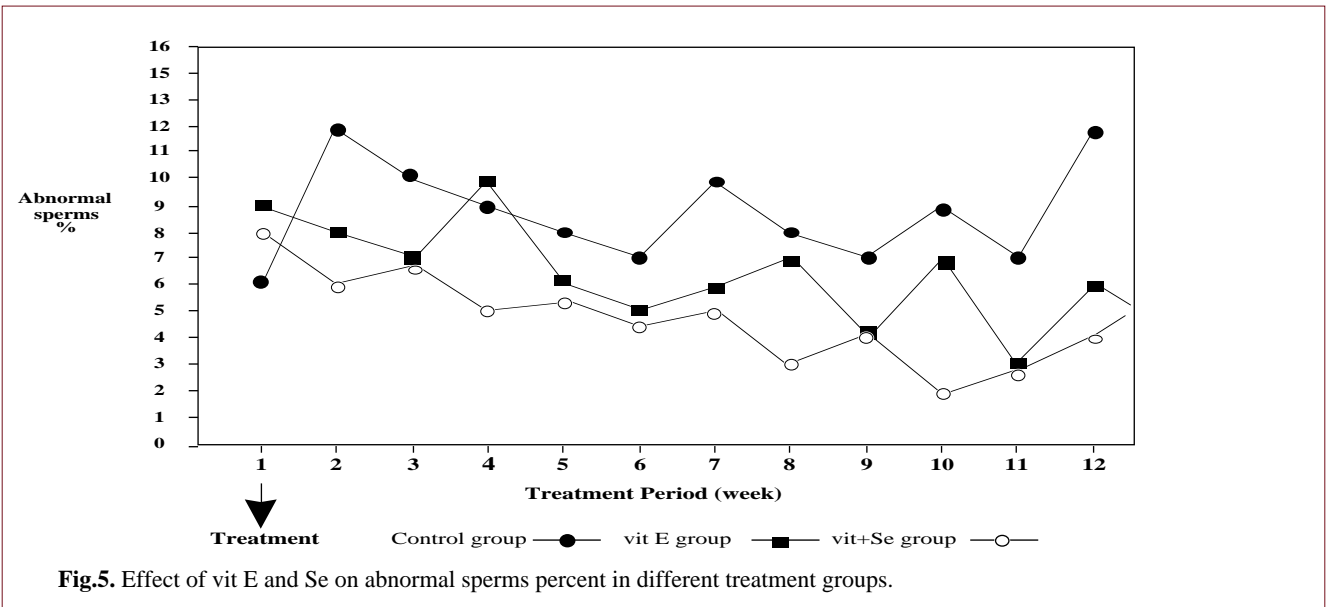
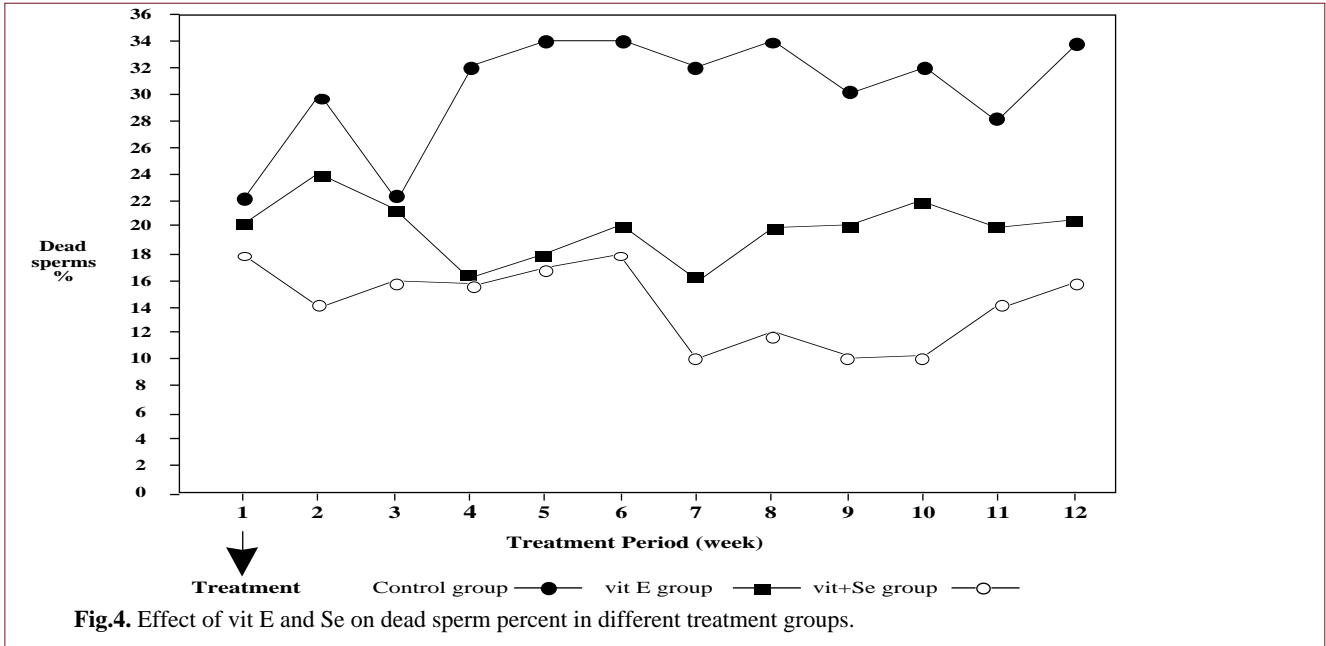
General Linear Model procedure (GLM) for SAS (1992) were used for determining the effect of treatment on semen quality, sexual activity and some blood pictures. Significant differences between means were tested using Duncan Multiple Range Test.

Results

The effect of Vit. E, Vit. E+Se on semen volume, mass activity and individual motility are shown in Fig. 1, 2, 3 respectively. The results showed that treatment with vit. E and Se increased semen volume. Semen volume increased significantly (p<.001) in Vit. E+Se treated group (0.87±0.03ml) in comparison to Vit. E group (0.66±0.04ml) and control group (0.62±0.04ml) (Fig. 1). Mass activity also, was higher (p<.001) in T₂ group than T₁ and C groups (Fig2). Values of mass activity increased starting from the fourth week of treatment. They were 81.5±3.54, 87.0±1.44 and 72.5±7.78% in T₁, T₂ and C groups respectively. The same trend was found in individual motility (Fig. 3). Differences between treatment

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groups were started at the fourth week of treatment and continued until the end of the experiment. Individual motility percents were 84.5 ± 4.73 , 91.0 ± 2.39 and $75.5 \pm 2.94\%$ in T₁, T₂ and C groups respectively.

The dead and abnormal sperms decreased significantly ($p < .001$) by treatment with Vit. E+Se (Fig.4,5). Dead sperm percentages were lower in Vit. E+Se group (17.0 ± 5.3) and Vit. E group (22.0 ± 1.05) as compared to C group (31.0 ± 1.43) (Fig.4). The same results were found in abnormal sperms percent. They were 7.0 ± 0.53 , 7.0 ± 0.46 and $11.0 \pm 0.60\%$ in T₁, T₂ and C groups respectively (Fig.5).

The results of sexual activity using libido pen test are shown in Table 1. At the second month treatment the number of service increased significantly ($p < .05$) in T₁ and T₂ group. Also number service increased ($p < .01$) in Vit.E+Se group (2.25 ± 0.25) and Vit. E group (2.50 ± 0.65) as com-

pared to control group (0.33 ± 0.22) at the third month of treatment.

Also the ratio of mount to service decreased ($p < .01$) in Vit. E group (12.53 ± 3.98) and Vit. E+Se group (13.53 ± 1.77) in comparison to control group (88.08 ± 56.12).

The results of some blood values are shown in Table 2. No significant difference ($p > .05$) was found in pcv, basophil and acidophil white cell counts between groups. However, lymphocyte white cell count increased significantly ($p < .05$) in T₁ and T₂ groups at the third month of treatment.

The values were 32.1 ± 3.04 , 37.6 ± 2.77 and $25.8 \pm 2.09\%$ in T₁, T₂ and C groups respectively. Neutrophil white cell counts were decreased ($p < .05$) in Vit. E+Se group (48.3 ± 4.92) in comparison to Vit. E group (51.0 ± 5.18) and control group (56.2 ± 4.17).

Table 1. Sexual activity (mean±S.E) of rams in different treatment groups.

Month	Parameters	Time to First mount (min)	Time to First service (min)	No. of mounts	No. of service	Mount to service ratio
		Sig	**	N.S	N.S	*
Treatment		**	N.S	N.S	*	**
1	T1 (Vit.E)	0.500±0.10 (a)	4.750±2.14 (a)	39.75±9.78 (a)	1.25±0.25 (b)	36.12±1.61 (a)
	T2 (Vit.E+Se)	0.563±0.31 (a)	6.375±4.38 (a)	44.50±11.44 (a)	1.50±0.50 (a)	42.15±3.15 (a)
	C	1.167±0.79 (a)	0.00±0.00 (a)	43.33±3.93 (a)	0.10±0.00 (a)	433.33±39.30 (b)
2	T1 (Vit.E)	6.88±0.36 (a)	2.562±1.47 (a)	20.75±7.99 (a)	1.525±0.63 (b)	39.08±22.0 (a)
	T2 (Vit.E+Se)	0.563±0.24 (a)	4.375±2.09 (a)	27.75±5.72 (a)	1.75±0.48 (b)	19.07±6.78 (a)
	C	1.083±0.17 (a)	0.00±0.00 (a)	27.00±9.54 (a)	0.10±0.00 (a)	270.00±95.39 (b)
3	T1 (Vit.E)	0.563±0.31 (b)	4.187±1.83 (a)	23.750±2.95 (a)	2.50±0.65 (a)	12.53±3.98 (a)
	T2 (Vit.E+Se)	0.250±0.00 (a)	1.625±0.63 (a)	29.500±2.40 (a)	2.25±0.25 (a)	13.53±1.77 (a)
	C	1.000±0.00 (b)	1.53±0.50 (a)	29.333±5.90 (a)	0.333±0.22 (b)	88.08±56.12 (b)

* Means with different letters refer to significant differences (p<.05).
 ** Means with different letters refer to significant differences (p<.01).

Discussion

Vit. E and Se exerted a significant effect on semen quality. Supplementation of Vit. E and Vit. E+Se in this study improved significantly the reproductive performance of males. The increase in semen volume may be due to the increase of testosterone hormone concentration. The high level of testosterone has a direct effect on the stimulation and secretion of secondary sexual glands. Besides it may be responsible for the improvement of sexual activity of treated animals in this study. It is known that a positive correlation is found between testosterone concentration and sexual activity (Bearden and Fuquay, 1997).

Supplementation of Vit. E and Se increased the mass activity, individual motility and decreased abnormal and dead sperm percentages. This may be related to the effect of Vit. E and Se on sperm conformation (Marin-Guzman *et al.*, 1997), metabolism (Calvin, 1978). Moreover, Vit. E and Se play a role as antioxidant agents. Those agents may protect sperms from peroxides that cause damage in sperm cell membrane (Brezzinsk-Slebozinska *et al.*, 1995). These results were in agreement with Erdine *et al.*, (1986) and in contract with Segerson *et al.*, (1981). The conflict between these studies may be related to the differences in the species or the amount of vitamin deficiency in diet. In male rats a deficiency in Vit. E resulted in a degeneration of the testes and permanent sterility (Bearden and Fuguay, 1997). Therefore, supplementation of Vit. E may used for solving some reproductive problems.

Previous studies have shown that Vit. E and Se can affect lymphocyte white cell production from bone marrow (St. Laurent, *et al.*, 1990 and Hogan *et al.*, 1993). Similar results were obtained in this study. Lymphocyte percent has increased by treatment with Vit. E and Se. Moreover

the combined role of Vit. E and Se may increase the viscosity of phagocyte cell membrane. This would improve the phagocytes process to the foreign body (Bendich, 1990) and may increase production of immunoglobins (IgM and IgG) (Reddy *et al.*, 1986 and St-Laurent *et al.*, 1990). All the above factors would improve immune response in the body. Hernken et al 1998, referred that deficiency in Vit. E and/or Se caused reduction in the immunity response.

In conclusion, supplementation of Vit. E and Se would improve reproductive performance in male sheep.

Implications

Vitamin E and selenium supplementation improved some fertility traits and immune response in sheep. Fertility in native Iraqi sheep is low due to various reason. Such vitamin supplementation could improve fertility in sheep flocks. Supplementation using gelatin cospule is an easy way and can be practiced by flock owners with no risk and with no need for special tools.

Table 2. Some blood parameter (Mean+S.E) of rams in different treatment groups.

Month	Parameters	Packed cell Volume (PCV)%	Differential white cell count				
			Lymphocyte %	Monocyte %	Neutrophil %	Acidophil %	Basophil %
Sig		N.S	*	N.S	*	N.S	N.S
Treatment		N.S	*	N.S	*	N.S	N.S
0	T1 (Vit.E)	29.3±1.11 (a)	38.2±1.64 (a)	12.0±2.76 (a)	40.3±4.15 (a)	8.4±0.29 (a)	1.0±0.00 (a)
	T2 (Vit.E+Se)	26.0±1.47 (a)	40.4±1.97 (a)	11.0±2.13 (a)	37.1±3.01 (a)	10.0±3.94 (a)	1.5±0.61 (a)
	C	27.0±0.58 (a)	36.8±3.009 (a)	10.9±1.64 (a)	40.5±6.67 (a)	11.1±6.93 (a)	0.7±0.17 (a)
1	T1 (Vit.E)	28.5±1.04 (a)	40.2±0.69 (a)	12.1±1.37 (a)	37.9±5.21 (a)	8.2±4.71 (a)	1.6±0.47 (a)
	T2 (Vit.E+Se)	26.0±1.29 (a)	41.7±3.61 (a)	11.4±1.71 (a)	39.1±2.78 (a)	6.2±1.90 (a)	1.6±0.32 (a)
	C	26.7±1.45 (b)	45.5±0.00 (a)	15.7±3.49 (b)	29.5±4.93 (b)	8.0±2.08 (b)	1.3±0.44 (b)
2	T1 (Vit.E)	27.0±0.71 (a)	42.0±1.37 (a)	12.0±2.72 (a)	41.0±2.42 (ab)	3.4±1.37 (a)	1.6±0.69 (a)
	T2 (Vit.E+Se)	25.3±0.88 (a)	41.5±1.000 (a)	13.5±1.47 (b)	36.3±1.76 (b)	7.8±3.29 (b)	0.9±0.24 (a)
	C	27.5±1.74 (a)	41.0±2.52 (a)	13.3±3.84 (a)	42.0±1.15 (a)	3.3±1.86 (a)	0.4±0.17 (a)
3	T1 (Vit.E)	27.5±1.71 (a)	32.1±3.04 (a)	11.1±1.68 (a)	51.0±5.18 (b)	4.7±1.03 (a)	1.1±0.13 (a)
	T2 (Vit.E+Se)	26.8±0.63 (a)	37.6±2.77 (a)	9.7±1.64 (a)	48.3±4.92 (b)	3.9±1.36 (a)	0.5±0.35 (a)
	C	26.7±0.67 (a)	25.8±2.09 (a)	13.8±1.69 (a)	56.2±4.17 (a)	3.5±2.75 (a)	0.7±0.33 (a)

* Means with different letters refer to significant differences (p<.05).

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تأثير فيتامين E والسلينيوم في نوعية السائل المنوي والرغبة الجنسية وبعض صفات الدم في الكباش العواسية

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الخلاصة:

شملت الدراسة (11) كبشاً عواسياً بعمر 2-2.5 سنة ومعدل وزن 4.2±61.1 كغم. قُسمت الكباش عشوائياً إلى ثلاثة مجاميع بواقع (4) كباش للمجموعتين الأولى والثانية و(3) كباش للمجموعة الثالثة (القياسية) عُولمت المجموعة الأولى بفيتامين E بمقدار 350 ملغ / كبش أسبوعياً بينما عُولمت المجموعة الثانية بفيتامين E+السلينيوم وبمقدار 140 ملغ فيتامين E±5600 مايكروغرام سلينيوم / كبش / أسبوع. وقد استمرت التجربة ثلاثة أشهر وقد أشارت نتائج التجربة إلى تفوق (p<001) كباش مجموعة فيتامين Se+E في متوسط حجم القذف على المجموعة المعاملة بفيتامين E فقط والمجموعة القياسية. حيث بلغ 0.0+0.66 مللتر، 0.03±0.87 مللتر و0.04±0.62 مللتر لكل من المجموعة الأولى والثانية والثالثة على التوالي. كما أدت المعاملة بفيتامين E وفيتامين Se+E إلى زيادة معنوية في الحركة الجماعية والفردية للحيامن وإلى انخفاض معنوي (p<001) في نسبة الحيامن الميتة والمشوهة مقارنةً بالمجموعة القياسية كما أشارت النتائج إلى تحسين الفعالية الجنسية للكباش حيث انخفض (p<01) زمن الاستجابة لأول وثبة في كباش مجموعة فيتامين Se+E (0.0±0.25 دقيقة) وزداد (P<01) عدد التسفيدات في كباش المجموعة الأولى (0.65±2.500 تسفيدة) والثانية (0.25±2.250 تسفيدة) مقارنةً مع كباش المجموعة القياسية (0.22±0.333 تسفيدة).

أما نتائج قياسات بعض فحوصات الدم فقد أشارت إلى عدم وجود فروقات معنوية في حجم خلايا الدم المرصوصة (PCV) بين المجاميع المختلفة بينما تفوقت (P<05) مجموعة فيتامين E (3.04±32.0%) ومجموعة فيتامين Se+E (2.77±37.6%) في نسبة الخلايا اللمفية خلال الشهر الثالث من المعاملة مقارنةً بالمجموعة القياسية (2.09±58.8%).

من نتائج هذه الدراسة يمكن الاستنتاج إلى أن المعاملة بفيتامين E والسلينيوم تؤدي إلى تحسن كبير في الرغبة الجنسية والصفات الفيزيائية للسائل المنوي للكباش.

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