TESTICULAR MORPHOMETRY AND REPRODUCTIVE HORMONES OF RABBIT BUCKS FED DIETARY L-SELENOMETHIONINE AND D-α-TOCOPHEROL

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Abstract

This study evaluated the synergistic effects of dietary L-Selenomethionine and D-α-Tocopherol supplementation on testicular morphometry and reproductive hormones in rabbit bucks. Twenty 6–7-week-old weaned male rabbits were randomly assigned to four dietary treatments: T1 (Control: basal diet only), T2 (basal diet + L-Selenomethionine), T3 (basal diet + D-α-Tocopherol), and T4 (basal diet + both L-Selenomethionine and D-α-Tocopherol). After 12 weeks, testicular morphometry and hormonal profiles were assessed. Data were analyzed using One-Way ANOVA following the procedures of SAS, and significant means were separated using Duncan's Multiple Range Test (DMRT). Results showed a significant increase ($P < 0.05$) in all testicular parameters and in the concentrations of luteinizing hormone (LH) and testosterone in T2, T3, and T4 compared to the control (T1), with T4 recording the highest values. Follicle-stimulating hormone (FSH) did not differ significantly ($P > 0.05$) among the groups. These findings suggest that the combined supplementation of L-Selenomethionine and D-α-Tocopherol enhances male reproductive performance in rabbit bucks.

Keywords: Vitamin E, selenium, rabbit bucks, antioxidants, testosterone

Description of Problem

Rabbit production plays a vital role in sustainable agriculture by providing a high-quality protein source to alleviate food insecurity, especially in developing countries (1). The reproductive ability of male rabbits (bucks) is crucial for herd output, driven by their rapid breeding and adaptability (2). However, oxidative stress, caused by Reactive Oxygen Species (ROS), poses a significant threat to fertility by inducing lipid peroxidation and impairing testicular function (3). These disruptions affect testicular morphology and reproductive hormone balance, thereby limiting breeding efficiency.

Dietary antioxidants provide a promising strategy to alleviate oxidative stress and enhance male reproductive performance. L-Selenomethionine, a selenium-based organic compound, supports the synthesis of antioxidant enzymes such as glutathione peroxidase, which neutralizes ROS and protects testicular tissues (4). Similarly, D-α-Tocopherol (Vitamin E) prevents lipid peroxidation and supports testicular health (5). Recent studies suggest a synergistic effect between these antioxidants, leading to improved testicular morphometry and endocrine function (6). This study investigates the synergistic effects of dietary L-Selenomethionine and D-α-Tocopherol on testicular morphometry and reproductive hormones in rabbit bucks.

Materials and Methods

Experimental site

The experiment was conducted at the Rabbit Production and Research Unit, Teaching and Research Farm, Ladoke Akintola University of Technology (LAUTECH), Ogbomoso.

Diet preparation and Experimental treatments

Twenty (20) weaned male rabbits were balanced for weight and allotted to four dietary treatments (**T1**–**T4**) in a Completely Randomized Design (CRD), with five rabbits per group. All diets contained 16% crude protein and approximately

2400 kcal/kg metabolizable energy (Table 1). The treatments were as follows:

T1: Control (basal diet only)

T2: Basal diet + 250 mg/kg D-α-Tocopherol (Vitamin E)

T3: Basal diet + 0.3 mg/kg L-Selenomethionine (Se)

T4: Basal diet + 250 mg/kg D-α-Tocopherol + 0.3 mg/kg L-Selenomethionine

Dosage of the supplements is as described by (7)

Table 1: Gross composition of the basal diet

Feed Ingredients (%)	Basal diet
Maize	32.61
Soybean meal	16.39
Brewery dry grain	15.00
Rice husk	30.00
Fish meal (72%)	3.00
Oyster shell	2.00
Bone meal	0.25
Vitamin premix*	0.25
Salt	0.25
Lysine	0.15
Methionine	0.10
TOTAL	**100.00**
Calculated Nutrients	
CP (%)	16.20
Metabolizable Energy** (Kcal/kg)	2335.76
CF (%)	13.75

*Vitamin Premix: Supply per kg diet: 2 000 000 iuvit. A; 400 000 iu D_3; 8.0 g vit. E; 4 g vit. b_1; 1.0 g vit. B_2; 0.6 g vit.; 0.4 mg vit. B_{12}; 24.0 g Niacin; 0.2 g Folic acid; 8.0 g Biotin; 48.0 g Choline; 320.0 g BHT; 16.0 g Manganese; 8.0 g iron; 7.2 g] Zinc; 0.32 copper; 0.25 iodine; 36. 0 mg cobalt; 16.0 mg selenium. ** Metabolizable Energy calculated using (8).

Source of supplements

Vitamin E in the form of D-α- tocopherol, an organic source of vitamin E and Organic Se in form of L-Selenomethionine (L-SeMet) was procured from Thorne Research, USA.

Data Collection

Hormonal assay

At the end of the 12-weeks experiment, blood was collected via the marginal veins of the rabbits. Blood meant for hormonal assay was collected into the plain bottles. The protocol for the assay (testosterone) was according to the method described for the kits [Elabscience® ELISA Assay, USA].

Testicular morphometry

The rabbits were humanely sacrificed in accordance with the ethics and regulation guiding the use of research animals as approved by the Faculty of Agricultural Sciences, LAUTECH, Ogbomoso, Oyo state, Nigeria. Testes were carefully dissected from the sacrificed animals and trimmed off adhering tissues. Testis length, testis weight and testis volume were measured. The testis length was measured with the aid of a pair of vernier calipers, testis weight was determined using a sensitive digital scale and the testis volume was measured by water displacement according to Archimedes principle (9).

Statistical analysis

Data collected was subjected to One-way Analysis of Variance (ANOVA), using the procedure of Statistical Analysis System (10) and means were separated using Duncan's multiple range test (DMRT) of the same statistical package.

Results

The results presented in Table 2 show that supplementation with L-Selenomethionine and D-α-Tocopherol significantly ($p < 0.05$) increased all testicular morphometric parameters in T2, T3, and T4 compared to the control group (T1).

Discussion

The enhanced testicular morphometry observed in the supplemented groups reflects the positive influence of dietary antioxidants on male reproductive anatomy. Fadl *et al.,* (6) similarly reported improved testicular development in rabbits treated with Vitamin E and selenium, which was attributed to reduced oxidative stress and better testicular function. This protective effect is likely due to the antioxidant role of vitamin E and Se in limiting lipid peroxidation and supporting spermatogenesis. Asebe *et al.,*

(5) noted that Vitamin E supplementation in rabbit bucks improved growth performance, which could be tied to healthier reproductive organs. Gabr and Zaghloul (3) also emphasized that antioxidants like Vitamin E and selenium enhance reproductive outcomes by countering oxidative damage in reproductive tissues.

The hormonal findings of this study also showed clear benefits from antioxidant use. LH and testosterone levels were significantly elevated in the supplemented groups, suggesting better endocrine regulation. Al-Rifaie *et al.,* (11) and Fadl *et al.,* (6) both reported similar increases in testosterone with combined supplementation, supporting this outcome. The unchanged FSH levels suggest that while Leydig cell activity was enhanced, Sertoli cell function may have remained unaffected, which points to a more targeted mechanism of action and presents an area for further investigation.

Table 2: Effect of L-Selenomethionine and D-α-Tocopherol on Testicular Morphometric Parameters of Rabbits

Parameters	T1 (Control)	T2 (Vit. E)	T3 (Se)	T4 (Vit.E+Se)	SEM
Left testis weight(g)	1.02[b]	2.39[a]	2.39[a]	2.41[a]	0.14
Right testis weight(g)	1.05[b]	2.41[a]	2.40[a]	2.41[a]	0.14
Left testis length(cm)	2.20[b]	3.38[a]	3.38[a]	3.42[a]	0.12
Right testis length(cm)	2.20[b]	3.44[a]	3.46[a]	3.48[a]	0.13
Left testis width(cm)	0.75[b]	0.98[a]	0.97[a]	0.98[a]	0.02
Right testis width(cm)	0.75[b]	0.99[a]	0.98[a]	0.98[a]	0.02
Left testis volume(ml)	0.21[b]	0.38[a]	0.37[a]	0.37[a]	0.02
Right testis volume(ml)	0.22[b]	0.38[a]	0.37[a]	0.37[a]	0.02
Left epididymis weight(g)	1.09[b]	2.66[a]	2.65[a]	2.65[a]	0.16
Right epididymis weight(g)	1.10[b]	2.68[a]	2.67[a]	2.66[a]	0.16
Left epididymis length(cm)	10.50[b]	17.48[a]	17.48[a]	17.60[a]	0.70
Right epididymis length(cm)	10.52[b]	17.52[a]	16.98[a]	17.60[a]	0.70

[ab]: Mean within the same row different superscripts differs significantly p (<0.05)SEM: Standard error of mean

Table 3: Effects of Dietary L-Selenomethionine and D-α-Tocopherol Supplementation on the Reproductive Hormones of Rabbit Bucks

Parameters	T1 (Basal Diet)	T2: Vit E	T3: Selenium	T4: Vit E + Se	SEM
Luteinizing Hormone (ng/mL)	1.80[b]	3.48[a]	3.47[a]	3.50[a]	0.08
Follicle Stimulating Hormone (ng/mL)	2.75[a]	2.76[a]	2.77[a]	2.77[a]	0.02
Testosterone (ng/mL)	0.91[b]	1.41[a]	1.42[a]	1.44[a]	0.05

[ab]: Mean within the same row different superscripts differs significantly p (<0.05). SEM: Standard error of mean

Also, Gabr and Zaghloul (3) found that similar supplementation in does did not significantly improve litter size or embryo quality, contrasting with the improvements seen in bucks in this study. This contrast raises the possibility of sex-specific responses to antioxidant therapy, suggesting that male rabbits may derive more pronounced benefits, particularly in testicular development and spermatogenesis.

Conclusion and Application

It can be concluded from this study that the combined supplementation of Vitamin E and Selenium significantly enhanced male reproductive performance in rabbit bucks. Further research is recommended to determine optimal dosages and evaluate the long-term

effects of such supplementation on reproductive outcomes.

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