



RESEARCH ARTICLE

Influence of Vitamin E on Productive Performance and Hepatic Enzyme Function in Japanese Quail

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ABSTRACT

This study is the assessment of vitamin E supplementation effect on productive performance and hepatic enzyme performance in Japanese quail. No significantly ($P > 0.05$) differences were evident on performance parameters FCR, FI, BW and WG were shown. However, the vitamin E-supplemented groups, particularly Group D, exhibited numerically higher FI and WG compared to the control. In terms of hepatic enzymes activity, the levels of aspartate aminotransferase (AST) were not statistically significantly different between treatment and control group. Conversely, alanine aminotransferase (ALT) levels were significantly lower in all vitamin E-treated groups than the control group, and the lowest concentration was found in Group D. These findings suggest that while vitamin E supplementation may not significantly alter performance traits under the given experimental conditions, it may play a beneficial role in maintaining liver health by reducing ALT levels.

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1. Introduction

Japanese quail (*Coturnix japonica*) are a vital species in poultry production and biomedical research due to their small size, rapid growth, early sexual maturity, and high egg-laying capacity. They serve as an excellent model for studying nutritional interventions and their effects on growth, reproduction, and health [1]. Among the various nutrients essential for optimal quail performance, Vitamin E (tocopherol) stands out as a critical micronutrient with profound implications for growth, immune function, and oxidative stress management. Vitamin E is a potent fat-soluble

antioxidant that protects cell membranes from oxidative damage induced by reactive oxygen species (ROS) and free radicals [2]. Oxidative stress is damaging to growth performance, reproductive efficiency, and hepatic function in Japanese quail under intensive production systems with high metabolic rates. Thus, this study is of great significance as it can help enhance health and productivity of Japanese quail by using the significance role of Vitamin E on their productive performance and its hepatic enzymes activity [2].

Oxidative strain is a commonplace challenge in poultry manufacturing, specifically in intensively reared birds like Japanese quail. An extra of free radicals, coupled with the

body's inadequate capability to neutralize them through antioxidants, consequences in oxidative stress. This circumstance can result in cellular damage, hindered increase, and dwindled reproductive [1,2]. Vitamin E serves as an effective antioxidant, correctly neutralizing free radicals and inhibiting lipid peroxidation, which helps keep mobile integrity and functionality. research has shown that supplementing the weight-reduction plan with nutrition E can enhance boom overall performance in quail by improving feed efficiency, increasing frame weight benefit, and optimizing nutrient usage [3]. Furthermore, vitamin E has been proven to enhance immune function, lowering the occurrence of illnesses that may negatively affect productivity [4].

The liver is a relevant organ in metabolism, cleansing, and nutrient utilization, making it an essential indicator of universal fitness in J. quail. The assessment of liver feature is typically performed through the size of hepatic enzymes such as alanine aminotransferase (ALT), and aspartate aminotransferase (AST) [1]. Elevated concentrations of these enzymes in the blood commonly endorse liver harm or stress, which can also get up from factors which include oxidative stress, insufficient nutrients, or touch with harmful substances [6]. Vitamin E has been shown to stabilize hepatic mobile membranes and reduce the leakage of these enzymes into the bloodstream, thereby assisting liver fitness and characteristic [7]. This protective effect is especially essential in Japanese quail, as liver dysfunction can cause decreased growth quotes, terrible feed conversion, and improved susceptibility to illnesses. Further to its function in increase and liver fitness, vitamin E is likewise essential for reproductive performance in Japanese quail. The antioxidant properties of nutrition E protect reproductive tissues and embryos from oxidative damage, thereby enhancing egg first-class, fertility, and hatchability [8]. That is specifically relevant in quail manufacturing, where reproductive efficiency immediately impacts profitability. Research has shown that vitamin E supplementation can beautify egg production and hatchability in quail, making it a valuable element of their food plan [9].

Despite the well-documented benefits of Vitamin E, determining its optimal inclusion levels in Japanese quail diets remains a challenge. Factors such as age, sex, environmental conditions, and dietary composition can influence the bird's Vitamin E requirements [10]. Excessive supplementation may not always yield additional benefits and could potentially lead to adverse effects. Therefore, a thorough understanding of the relationship between Vitamin E supplementation, productive performance, and hepatic enzyme function is essential for developing effective nutritional strategies for Japanese quail [1, 2, 10].

This study aims to investigate the influence of Vitamin E on the productive performance and hepatic enzyme function of Japanese quail. By evaluating growth

parameters, feed efficiency, and liver enzyme activity, the research seeks to provide insights into the optimal use of Vitamin E in quail diets. The findings will contribute to the broader understanding of how antioxidants can enhance poultry health and productivity, ultimately supporting sustainable quail production and improving food security.

2. Materials and methods

2.1. Ethical approval

This study was conducted with approval from the Animal and Use Committee of Peshawar Agricultural University, Pakistan in 2011-2013. All experimental procedures recorded in ethical guidelines for animal research.

2.2 Experimental Birds and Housing

After a 1-week adaptation period, birds were randomly divided into four nutritional treatment groups. Each group contains three replicas, each of which is assigned replicas of nine birds. The quail was housed in a deep throwing system on a 24-inch concrete floor covered with wooden chips. The lighting program was maintained for 24 hours throughout the experiment, with ambient temperature being kept at 20 C°. In contrast, the test groups were administered vitamin E (dl- α -tocopherol acetic Super's Diana, S. L.) at various supplemental levels: formulated or exceeded 50 mg/kg in group B, 100 mg/kg in group C, 150 mg/kg in group D, and group A as control birds had unlimited access to feed and water.

2.3 Growth Performance Test

Feed intake (FI) was measured daily, but body weight (BW) was recorded at the end of each week. Average daily gain (ADG) and feed conversion rate (FCR) were calculated using the following calculations taking into account FI and weight gain (WG) data:

$$\text{ADG (g/day)} = (\text{Final BW} - \text{Initial BW}) / \text{Number of days}$$

$$\text{FCR} = \text{Feed Intake (g)} / \text{Weight Gain (g)}$$

2.4 Feed Analysis

The adiabatic bomb calorimeter (IKA®), which was calibrated with benzoic acid (Work, USA). Analysis of raw protein content was performed according to the AOAC [11]. method of analysis. Metabolic energy estimation involves treating 1 g of excretion (collected in 5 birds per replica) into pellets using a pellet press (Parr Instrument Co.), and then disintegrated with fleeting material (VM). The calculation of metabolic energy was performed using the following equation: Metabolic Energy = (Energy Intake - Energy Loss) / Feed

2.5 Blood Sample and Liver Enzyme Analysis

After completing the 42-day experiment, it was frequently selected in the mud. A 3 mL blood sample was obtained by jugular venous puncture. Samples were then centrifuged at 2000 rpm for 15 min to separate serum and obtained at 20 °C until further examination. The concentrations of alanine aminotransferase (ALT), aspartate aminotransferase (AST) and alkaline phosphatase (ALP) in serum were determined using a biochemical kit (Randox Laboratories Ltd.) according to established protocols. Enzyme activity was reported using international units per liter (IU/L).

2.6 Statistics Analysis

Treatment measures were compared using Tukey post hoc tests, and P <0.05 was selected as the significant level.

3. Results

Feed conversion rate (FCR), feed intake (FI), body weight (BW), and weight gain do not differ significantly depending on the analysis of performance function (Figures 1 and 2). However, the vitamin E-supplemented groups, particularly Group D, exhibited numerically higher FI and WG compared to the control. Regarding liver enzyme function, the concentration of aspartatamine transferase (AST) showed no significant variation between the treated and control groups. In contrast, all groups treated with vitamin E showed a significant reduction in alanine aminotransferase levels (ALT) compared to the control group.

Table 1. Chemical composition of experimental diet (dry

| matter basis) | |
|---|-------|
| Ingredient (%) | % |
| Soybean meal (46%) | 170 |
| Rice | 14 |
| Corn | 41 |
| Gluten meal (27%) | 3 |
| Fish meal | 3 |
| Molasses | 4 |
| Canola meal | 7 |
| Rice polish | 5 |
| Guar meal | 3 |
| Marble chips | 0.50 |
| Dicalcium phosphate | 1.70 |
| DL-methionine | 0.1 |
| Salt | 0.60 |
| Vitamin + mineral remix I | 0.24 |
| L-lysine HCl | 0.3 |
| Analyzed composition | |
| Lysine (%) | 1.32 |
| DL-methionine (%) | 0.51 |
| Metabolizable energy (kcal kg ⁻¹) | 2900 |
| Crude protein (%) | 24.00 |

Provided per kg of diet: vitamin A (retinol) - 12,000 IU; vitamin B2 (riboflavin) - 6 mg; folic acid - 1 mg; choline chloride - 200 mg; Cu - 5 mg; Mn - 80 mg; Fe - 60 mg; vitamin D3 (cholecalciferol) - 2,400 IU; Co

- 0.2 mg; I - 1 mg; Se - 0.15 mg; vitamin E (DL- α -tocopherol) - 50 IU; Zn - 60 mg; vitamin K (menadione) - 4 mg; itamin B1 (thiamine) - 3 mg; vitamin B5 (pantothenic acid) - 25 mg; vitamin B6 (pyridoxine) - 5 mg; vitamin B12 (cyanocobalamin) - 0.03 mg;

Figure 1. Vitamin E's impact on Japanese quail performance characteristics

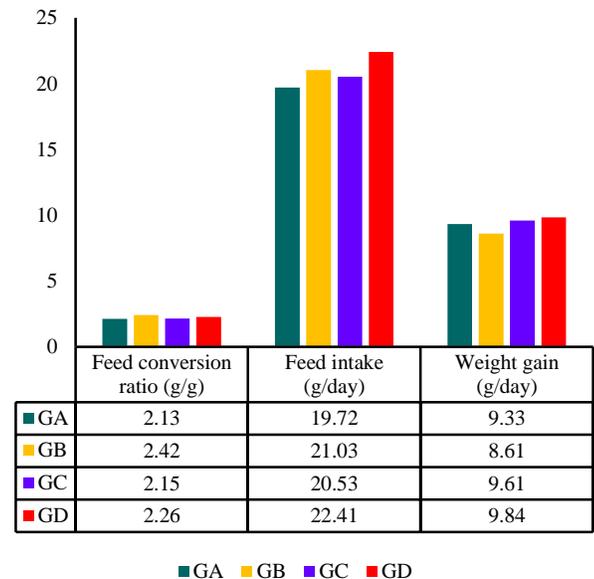


Figure 2. The influence of Vitamin E on the performance traits of Japanese quail

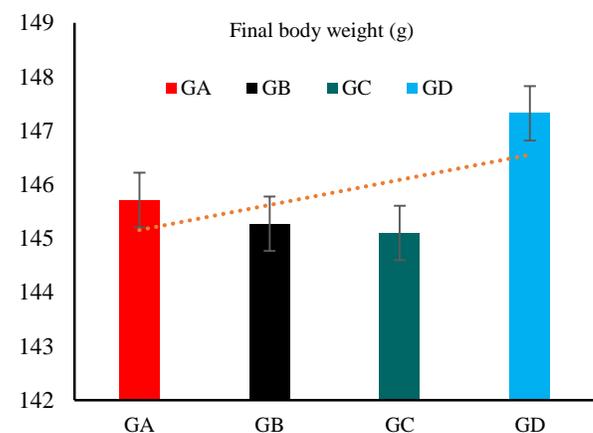
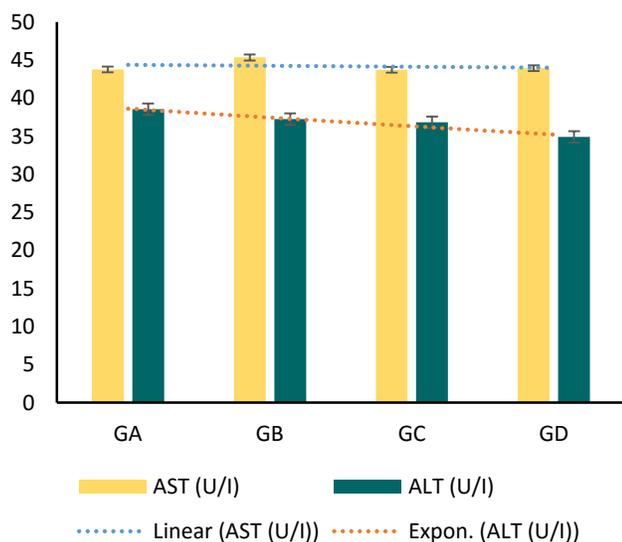


Figure 3. Impact of vitamin E on serum liver enzyme levels in Japanese quail.



4. Discussion

Modifying the feed composition can help mitigate the adverse effects of low ambient temperatures, as heating animal housing is often impractical and undesirable. Vitamin E supplementation is particularly beneficial in such conditions, as environmental stress reduces vitamin E levels in serum and tissues [1]. Unlike vitamin C, which poultry can synthesize, vitamin E must be supplemented through the diet [1,12].

Modifying the feed composition can help mitigate the adverse effects of low ambient temperatures, as heating animal housing is often impractical and undesirable. Vitamin E supplementation is particularly beneficial in such conditions, as environmental stress reduces vitamin E levels in serum and tissues [12]. Unlike vitamin C, which poultry can synthesize, vitamin E must be supplemented through the diet (Shah et al., 2019). In this study, inclusion of vitamin E in different levels did not affect the performance function of quail elevated at low ambient temperatures. Previous studies have reported that high doses of 250 mg/kg can improve wing performance. Under environmental heating stress conditions, Japanese quail was shown in addition to improvements in vitamin E in corpses, body weight and digestibility [2,3]. In related studies, Shah et al. [1] found that adding 250 mg/kg of vitamin E to the nutrition of cold Japanese quail at 6°C improved bird body weight, dry matter absorption, feed conversion ratio (FCR) and egg production. These results suggest that higher doses of vitamin E may be required to improve the performance of quail grown in cold environments. In this study, birds showed a significant reduction in alanine aminotransferase levels. Lower liver enzyme levels are often associated with liver dysfunction and

oxidative stress in liver tissue, indicating improved liver health [13]. Control groups and bird aspartate aminotransferase (AST) and ALT mirrors fed vitamin E at doses of 150 mg/kg or 200 mg/kg were found to be Ajakaiye et al. [14] and Jiang et al. [15]. Similarly, Perić et al [13], reported on similar findings at Broiler which received 0.3 ppm selenium. The acceptance of liver enzyme levels observed in this study may be due to the antioxidant properties of vitamin E. Vitamin E reduces oxidative stress and plays a role in improving liver function [2].

5. Conclusions

These findings suggest that while vitamin E supplementation may not significantly alter performance traits under the given experimental conditions, it may play a beneficial role in maintaining liver health by reducing ALT levels.

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The study was not received any internal or external funds.

Conflicts of interest

There are no conflicts of interest.

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