EFFECT OF VITAMIN E FORTIFIED DIET ON SEMEN QUALITY AND BODY WEIGHT OF GUINEA COCKS

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ABSTRACT
In spite of numerous advantages of guinea fowl over chicken, rearing of guinea fowl is believed to be uneconomical due to high information of PUFA that instigates poor semen quality. However, the study was designed to evaluate effect of vitamin E at different levels on semen quality and body weight of guinea cocks. Twenty-four guinea cocks were equally and randomly distributed into T1, T2, T3 and T4 of 0mg, 125mg, 250mg and 350mg vitamin E per kg diet respectively in a completely randomized design. Initial and final body weights were determined and semen samples were collected twice a week. Best values of semen volume, sperm concentration, sperm progressive motility, percentage live and dead sperm cells were obtained from cocks in T2. Reduction ($P<0.05$) in values of semen volume, sperm concentration, sperm progressive motility and percentage live were observed from cocks in T3 and T4 indicating that 250mg and 350mg vitamin E inclusion were in excess and had adverse effect on semen parameters of guinea cocks. Cocks in T2 had highest ($P<0.05$) gains in body weight than the control while cocks in T3 and T4 expressed significant ($P<0.05$) body weight lost. These results therefore prove that semen quality and body weight of guinea cocks were negatively influenced by 250mg and 375mg vitamin E inclusion while 125mg vitamin E inclusion had an improved semen quality at better body weight which is recommendable.
Keywords: Guinea fowl, guinea cock, vitamin E, semen characters, body weight,

INTRODUCTION
Increase in Nigerian population has not been marched by growth in agricultural productivity especially in the area of animal production. This has caused low intake of animal protein intake in Nigeria as reported by FAO(1989). To correct this shortfall, there is need to improve on indigenous farm animals like guinea fowl (*Numidameleagris*) which is predominantly reared in northern part of Nigeria. Guinea fowl has many advantages over chicken which include low production cost, premium quality meat, greater capacity to scavenge for insects and grains, better ability to protect itself against predators and better resistance to common poultry parasites and diseases (Microlivestock, 1991). Guinea fowl products also have numerous nutritive and socio-cultural values. In spite of these, rearing of guinea fowl is believed to be uneconomical due to their monogamous and seasonal reproductive behavours.
The use of Artificial Insemination (AI) has not been properly explored as better alternative to break the inbreeding and monogamous behaviours of guinea fowl(Aire*et al*., 1983). Rengaraj and Hong (2015) reported thatavians are rich in PUFA which instigate oxidative damages that causes infertility. These damages may be controlled by given certain minerals and vitamins to act as antioxidants which vitamin E is a well unknown one.Vitamin E is a fat soluble vitamin that accumulates in tissues like testes and other reproductive organs (Rengaraj and Hong, 2015). This trace element is necessary for effective functioning of hormonal regulation and the reproductive system (Herrera and Barbas, 2001). This element is to increase the value semen parameters like sperm concentration, sperm livability and semen volume (Danikowski*et al*., 2002).However, excessive inclusion of vitamin E has also been reported to decrease semen quality (Arscot *et al*., 1995) and body weight (Aburto and Britton, 1998)of guinea cocks.
Information on reproductive responses of chicken, turkey and quail given different levels of vitamin E has been investigated by many authors like Kling *et al*. (1987), Danikowiki *et al*. (2002), Lin*et al*. (2005), Hooda*et al*. (2007) and Biswas*et al*.(2009). Yet, no work has been done on effect of vitamin E inclusion on semenparameters and body weight of guinea cocks reared in humid tropics. Therefore, this work is designed to establish the level of vitamin E inclusion that will improve semen quality recommendable for natural and AI breeding management in guinea cocks with sustainable body fitness.

MATERIALS AND METHODS

Location and duration of the study: This study was conducted in the Poultry Unit of the Teaching and Research Farm of the Department of Animal Science, University of Nigeria Nsukka, Enugu State. Nsukka lies in the derived savannah region, and is located on longitude $6^{o}\,25^{1}$ N and latitude $07^{o}\,24^{1}$ E, at an altitude of 430m above sea level (Ofomata, 1975). The climate is a typical humid tropical type with a relative humidity range of 56.01% - 103% (Energy Centre UNN, 2008). Average diurnal minimum temperature ranges from 22.0°C–25.2°C while the average diurnal maximum temperature ranges between 33^{0}C-37^{0}C (Energy Centre UNN, 2008). Annual rainfall ranges from 1567.05mm to 1846.98 mm (Energy Centre UNN, 2008). The study lasted 18weeks in which two weeks were used to acclimatize the birds.

Procurement, distribution and management of experimental guinea cocks: A total of twenty-four mature guinea cocks of 35-37 weeks old were procured from dealers in Abuja and acclimatized to the farm environment. The cocks were randomly allotted into four treatments: T1, T2, T3 and T4 of six cocks per treatment at different levels of vitamin E: 0mg, 125mg, 250mg and 375mg inclusion respectively. Initial and final body weights of the cocks were also determined. Diet containing metabolizable energy and crude protein of 2650Kcal/kg and 16.5% respectively was formulated which met the dietary recommendation for guinea fowl breeders under tropical conditions as recommended by NRC (NRC 1994) and served at 110g/day/cock as prescribed by Embury (2001). Water was given *ad libitum*.Other procedures carried out in this study were complied with the provisions of theUniversity of Nigeria, Nsukka Ethical Committee on the use of animals for biomedical research (2005).

Collection of semen samples: The guinea cocks were trained on semen collection within the period used for acclimatizing the birds. Semen samples were obtained by massage technique as described by Burrows and Quinn (1935). Semen samples were collected twice per week i.e. Saturdays and Wednesdays and were evaluated considering the processes described by Ugwu and Oleforu (2008).

Experimental design and statistical analysis: The experimental design that was used is a completely randomized design (CRD): $\mathbf{X_{ij} = \mu + T_i + E_{ij}}$; where$\mathbf{X_{ij}}$= individual observations of (ith) guinea cock fed with (jth) different level of vitamin E; **μ**= overall mean of the experiment; **T**i= effect of vitamin E on (ith) individual guinea cock;$\mathbf{E_{ij}}$= experimental error associated with observations of guinea cock fed with (jth) different level of vitamin E. The data were subjected to analysis of variance based on a Completely Randomized Design (CRD) using Statistical Package for Social Sciences (SPSS) computer package (SPSS, 2001). Significant means were separated using the Duncan option of SPSS.

RESULTS AND DISCUSSION

Results in Table 1 showed that there were significant differences ($P<0.05$) among the cocks in semen volume, progressive motility, sperm concentration, percentage dead sperm cells, percentage live sperm cells and total sperm cells with best mean values obtained for cocks fed with 125mg vitamin E (T2).The mean values of semen volume, live sperm cells and total sperm cells obtained for cocks in T3andT4 were significantly lower ($P<0.05$) than number of dead sperm cells whencomparedwith the control.Semen of cocks in T3 and T4 had slightdecrease ($P<0.05$) in progressive motility and sperm concentration values when compared with control treatment. These resultstherefore indicate that inclusion of125mg vitamin E

Table 1: Physical semen characters of the guinea cocks fed with different dietary levels of vitamin E

Semen Characters	T1 (control) (0mg vit. E)	T2 (125mg vit. E)	T3 (250mg vit. E)	T4 (375mg vit. E)
Semen volume (ml)	0.038^{a}±0.01	0.044^{a}±0.02	0.022^{b}±0.03	0.020^{b}±0.02
Progressive motility (%	45.43^{b}±3.25	65.22^{a}±4.05	40.40^{b}±4.15	40.40^{b}±4.15
Sperm Concentration ($x10^{6}$/ml)	2.35^{b}±0.09	4.35^{a}±1.13	2.20^{b}±0.21	2.00^{b}±0.16
Live sperm cells (%)	90.12^{a}±3.34	92.56^{a}±3.40	82.28^{b}±2.28	81.53^{b}±2.21
Dead sperm cells (%)	10.34^{b}±0.04	8.29^{a}±0.22	18.77^{c}±1.58	19.56^{c}±1.50
Total sperm cells (10^{9}/ ejaculate)	0.83^{a}±0.018	0.91^{a}±0.025	0.51^{b}±0.017	0.41^{b}±0.010

a, b, c Means with different superscripts in a row are different (P<0.05).

perkg diet improved semen quality of guinea cocks.Further increase of vitamin E to 250mg and 375mg may progressively reduce values thesesemen parameters. These values were in accordancewith those of Arscot*et al*. (1995) and Danikowski*et al*. (2002) who reported that semen parameters of cocks may be negatively affected when they are given high level of 250mg vitamin E in diet.

Table 2: Daily live-weight gain of guinea cocks fed with different dietary levels of vitamin E

Body weight	T1 control (0mg vit. E)	T2 (125mg vit.E)	T3 (250mgvit. E)	T4 (375mgvit. E)
Initial weight(kg)	0.65±0.075	0.64±0.080	0.63±0.067	0.65±0.082
Final weight(kg)	0.78^{b}±0.063	0.82^{a}±0.403	0.56^{c}±0.055	0.56^{c}±0,057
Total weight gain (kg)	0.13^{b}±0.021	0.18^{a}±0.028	-0.07^{c}±0.019	-0.09^{c}±0.023
Daily Live-weight gain(g)	3.09^{b}±0.19	4.28^{a}±0.24	-1.67^{c}±0.15	-2.01^{c}±0.07

a, b, c Means with different superscripts in a row are different (P<0.05)

Results in Table 2 showed that cocks in T2 had highest (P<0.05) daily live-weight gains (4.28^{a}±0.24) while cocks in T3 and T4 had negative values (P<0.05) live-weight gains of -0.71g±0.15 and -0.92g±0.07 respectively indicating a reduction in body weights when compared to 3.98g±0.19 daily live-weight gain for the birds in control treatment. Also, similar trends were observed in final weight and individual weight gain of cocks given the different dietary levels of vitamin E (Table 2). These results agreed with the reports of Yates *et al*. (2009) that body, liver and heart weights of rats given dietary vitamin E were better at lower levels (42 IU and 242 IU) than (2042 IU and 20,042 IU). Similarly, Aburto and Britton (1998) observed that the body weights and bone ash of broilers were reduced significantly at high levels of vitamin E supplementation when compared with increased body weights and bone ash obtained forbroilers fed with lower levels of vitamin E. Dju*et al*. (1950) observed that fowls fed with excess vitamin E for a prolong period eliminate more than 75% of ingested feed through faeces. This may cause great loss of metabolizable nutrients including the energy required for production of quality semen and body development among others. In contrast, Pudelkiewics *et al.* (1960) reported that chicken receiving diet supplemented with 35g of vitamin E/kg diet defecate only 23% of ingested feed. This proves that more nutrients will be stored and utilized for production of semen of good quality and sustaining better body development among the chickens.

CONCLUSION AND RECOMMENDATIONS

These results suggest that guinea cocks required reduced amounts of vitamin E for body growth, gamete production and subsequent fertility. Deficiency or long-term omission of vitamin E in the diets of breeding guinea cocks may not significantly affect semen production, fertility and body weight

gains while excessive inclusion of 250mg to 375mg of vitamin E per kg impair semen quality with significant loss of body weight which may further cause emaciation. These results showed that 125mg of vitamin E per kg diets reduces the oxidative damages of PUFA and therefore improves the semen parameters recommendable for natural and AI operations with better body fitness essential for optimum guinea fowl production.

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