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Effects of Vitamin C and E Supplementation on Sperm Production Rate and Serum Immunoglobulin's of Nigerian Local Cocks during the Hot Dry Season

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ABSTRACT

The objective of the study was to investigate the effects of Vitamin C and E on sperm production rate and the level of serum immunoglobulins. A total of 80 mature local cocks were used for the study, the birds were divided into four groups. Group 1 served as control, group 2 received Vitamin C (250MG/Kg Feed), group 3 received were given Vitamin E(250Mg/ Kg feed), while birds in group 4 received a combination of Vitamin C and E. The experiment lasted for a period of 50 days. Findings of the research indicate a significant increase (P<0.05) in daily sperm production following supplementation with a combination of Vitamin C and E. Mean values of gonadal sperm reserve and sperm production per gram testes were not affected by treatments(P>0.05). Similarly, treatments had no significant effect on serum levels of immunoglobulin A and immunoglobulin G. A combination of Vitamin C and E resulted in significantly higher level of immunoglobulin M. The CD4 count value was significantly higher in Vitamin C group compared to control but similar to other groups. It can be concluded that combination of Vitamin C and E resulted in higher daily daily sperm production and improved immune status in Nigerian local cocks.

Keywords: *Chickens. Immunoglobulins, Sperm Researve, Vitamins*

INTRODUCTION

Meteorological factors are reported to influence the well being and performance of domestic chickens in tropical environments [1]. Heat stress result in economic loss due to stunted growth, reproductive failure and depressed immunity. It has also been observed that the adverse effect of heat stress on productivity of Broiler chickens is alleviated by antioxidant Vitamins A and E [2]. Heat stress result from high environmental temperature and humidity hindering thermoregulation and adversely affecting immunity, productivity and fertility. Heat stress lead to increase production of free radicals in the body resulting in oxidative stress [3].Oxidative damage results in decrease reproductive and productive performance. Adverse effect of heat stress on immune system has earlier been reported by [4]. The deleterious effect of heat stress on testicular function has also been documented [5]. Vitamin C supplementation has been reported to have positive effect on weight gain and improved immune functions in poultry [6]. Earlier reports also indicate that Vitamin C supplementation ameliorates the adverse effects of heat stress in layers [7]. Vitamin E supplementation was observed to increase serum levels of immunoglobulin G concentration in pregnant ewes [8].

MATERIALS AND METHODS

Location of the Study

The study was conducted at the Teaching and Research Farm of Faculty of Agriculture, Nasarawa State University, Keffi. The study area lies within the Guinea Savanna zone of Nigeria. The average maximum and minimum temperatures in the zone range from 39.8 °C to 18.0 °C

Experimental Animals and Design

A total of 80 mature local cocks were used for the study, the birds were randomly assigned into four groups. Group 1 served as control, group 2 received Vitamin C (250MG/Kg Feed), group 3 received were given Vitamin E (250Mg/ Kg feed), while birds in group 4 received a combination of Vitamin C and E. The birds were managed in deep litter system.

Commercial Broiler finisher was used for feeding and clean drinking water was provided ad libitum. The experiment lasted for a period of 50 days.

Determination of Testicular Sperm Reserve and Sperm Production Rate

Gonadal sperm reserve was estimated using haemocytometer as described by [9]. Daily sperm production (DSP) was estimated by dividing the gonadal sperm reserve by a time divisor of 3.66 corresponding to a time in days of the duration of the seminiferous epithelium cycle. Daily sperm production per gram testes was determined by dividing DSP by weight of testicular parenchyma.

Determination of Immunological Parameters

Serum level of immunoglobulins(IgG, IgM and IgA) were determined using EM 168 semi automatic analyser. CD4 count was determined using fast count machine.

Statistical Analysis

Data collected was subjected to Analysis of Variance (ANOVA) using statistical package for social sciences (SPSS). Statement of significance was based on P<005.

Results and Discussion

The result indicate improved daily sperm production due to combine effects of Vitamins C and E (Table 1).The adverse effect of heat stress on testicular function was reported by [5]. Similarly [10] have also documented the adverse effect of heat stress on fertility Broiler breeders. The optimum ambient temperature range for poultry is 12- 26 °C [1].

Exposure of birds to ambient temperature outside their thermo neutral zone may have adverse effect on productivity and immune response [11]. Reduction in micronutrient uptake has been attributed to heat stress [12]. Micronutrients which include Vitamins A, C and E play important roles in the performance immunological status of poultry [6].

Heat stress result in increase production of free radicals in the body which is associated with increase in oxidative stress. Oxidative damage leads to adverse effects on production and reproductive performance. High ambient temperature increases the requirement of vitamins in the body [13]. It is therefore essential to provide antioxidant vitamins in the diet to alleviate the effects of heat stress.

Table1. *The effects of Vitamin C and E on sperm reserve and sperm production rate (Mean ± SEM)*

Parameters	Control	Vitamin C (250Mg/Kg)	Vitamin E (250Mg/Kg)	Vitamin C and E(250Mg/Kg)	LOS
GSR (10^6)[a]	13.00±1.15[a]	13.00± 0.58[a]	13.33.± 0.33[a]	14.67±1.20[a]	NS
DSP (10^6)	3.52± 0.29[a]	3.55± 0.16[a]	3.64 ± 0.09[a]	4.69±0.31[b]	*
DSP/ g (10^6)	2.08± 0.18[a]	1.74± 0.04[a]	1.82± 0.05[a]	1.95± 0.15[a]	NS

Means within same raw showing different superscripts are significantly different (P<0.05)

GSR = Gonadal Sperm Resesrve

DSP = Daily Sperm Production Rate

Daily Sperm Production per gram testes

LOS= Level of significance

** = Significant at P<0.05*

The result (Table 2) indicate improved concentration of immunoglobulin M due to combine effect of vitamins C and E. Significantly higher CD4 Count was also recorded in response to vitamin C supplementation. Both Vitamins C and E play very important roles in the body antioxidant system. The beneficial effect of both vitamins C and E on the immune system of heat stressed broilers has been reported. Vitamin C is a water soluble free radical scavenger, it also play a role in regeneration of oxidized vitamin E in cell membranes. Vitamin C is important in regeneration of reduced glutathione from oxidized form in plasma.

Heat stress lead to elevated glucocorticoids secretion. High levels of glucocorticoids act on hypothalamus to decrease GnRH synthesis and secretion. It also acts on the anterior pituitary gland to reduce pituitary responsiveness to GnRH [14]. This adversely affects testicular functions. It can be concluded that supplementation with both vitamins C and E resulted in improved immune response and sperm production in Nigerian local Cocks during the hot dry season. In order to improve poultry production in the study area, adequate measures must be taken to alleviate the adverse effects of heat stress during the hot dry season.

Table2. *The effects of Vitamin C and E on some immunological parameters of Nigerian local Cocks (Mean ± SEM)*

Parameters	Control	Vitamin C (250Mg/Kg)	Vitamin E (250Mg/Kg)	Vitamin C and E (250Mg/Kg)	LOS
IgG (g/l) NS	2.15±0.05	2.1300± 0.06	2.08.± 0.09	2. 10±0.09	
IgM (g/l)	0.5± 0.06 [a]	0.73± 0.08 [a]	0.88 ± 0.09 [a]	1.33±0.06[b]	*
IgA (g/l)	1.25± 0.12	1.38± 0.21	1.75± 0.12	1.75± 0.17	NS
CD4 Count(Cell/ml)	121.25± 1.65[a]	170.75± 18.85[b]	153.25± 6.33[ab]	157.75 ±2.84[ab]	*

Means within same raw showing different superscripts are significantly different (P<0.05)

IgG = Immunoglobulin G

IgM = Immunoglobulin M

IgA= Immunoglobulin A

LOS= Level of significance

** = Significant at P< 0.05*

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