

EFFECT OF AQUEOUS GARLIC EXTRACT ON SEMEN QUALITY AND QUANTITY OF BREEDER COCKS REARED IN HOT HUMID ENVIRONMENT

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Abstract

Optimum reproductive efficiency has been hindered by high temperature and relative humidity. This experiment was carried out to examine the effects of Aqueous Garlic Extracts (AGE) on semen quality and quantity of breeder cocks. Garlic bulbs (50g) were peeled, blended, made up with water to 100mL and filtered to obtain AGE. Rhode Island Red breeder cocks (n=54) aged 40 weeks were randomly allotted to six treatments: ordinary water (T₁), served as negative control, 300ppm of Ascorbic Acid-AA (T₂), served as positive control, 1% AGE (T₃), 2% AGE (T₄), 3% AGE (T₅) and 4% AGE (T₆) in triplicates of three cocks each. They were fed diet containing 2,802.01 Kcal/kg metabolisable energy and 20.62% crude protein for 20 weeks. Semen was assessed for its volume (ml), spermatozoa concentration (SC) ($\times 10^6$ /ml), abnormality and its pH. Data were analysed using descriptive statistics and ANOVA at $\alpha_{0.05}$. SC were significantly ($p < 0.05$) higher in T₆ (8.28 ± 0.70) compared to T₁ (5.68 ± 0.50), while there were no significant ($p < 0.05$) difference when compared with T₂ (6.57 ± 0.46), T₃ (7.69 ± 0.60), T₄ (6.93 ± 0.52) and T₅ (6.96 ± 0.43). Spermatozoa's abnormality at T₅ was reduced ($p < 0.05$) significantly (2.67 ± 0.6) compared with that of T₁ (9.0 ± 0.8), and not different ($p < 0.05$) significantly with those of T₂ (4.65 ± 0.9), T₃ (4.00 ± 0.7) and T₆ (3.3 ± 0.8). Oral administration of AGE at 3-4% enhanced the quality and quantity of semen.

Keywords: Cocks, semen, Aqueous Garlic Extracts, Spermatozoa.

Description of Problem

Optimum reproductive efficiency has been judged to have a much greater impacts on animal profitability than improvement in general production techniques do. This has been hindered by high temperature which adversely affects spermatogenesis in avian species (1). Quality of semen diminished as soon as cocks were exposed to high temperature coupled with elevated relative humidity. Over the past few years, garlic has been utilized as potential feed supplement in order to improve reproductive performances of chicken, (2). The main active component of garlic is Allicin, (3). It has been used to improve performance in livestock production (4). This work evaluated the antioxidant effects of garlic in cocks' semen quality.

Materials and methods

Experimental Site:

The study was carried out at the University of Ibadan Teaching and Research Farm. This institution is situated geographically between latitude $7^{\circ}20'1''$ N and longitude $3^{\circ}50'1''$ E at an altitude of 200–300m on top of sea level. Its climate is hot and humid.

Experimental Animals and their Management

A total number of fifty-four mature Rhode Island Red breeder cocks were purchased at a reputable farm in Ibadan. Prior to arrival of those birds, the experimental pens were well disinfected, wood-shaving was spread and feeders and drinkers were properly placed. The experimental birds were acclimatized for two weeks before the administration of the feeding trial. The experimental birds were randomly allotted to six treatments with varied percentage inclusion of AGE:

Treatment (T) T₁: ordinary water (negative control) T₂: 300ppm of AA/L (positive control)

T₃: 1 % AGE, T₄: 2 % AGE, T₅: 3 % AGE, T₆: 4 % AGE (Table 1).

Production of AGE

The superficial membrane of garlic bulbs was detached and washed with distilled water. Fifty grams of the washed garlic bulbs were ground

with a blender. Water was added to 100mL and filtered, giving an aqueous garlic extract. Appropriate dilutions were made to obtain 1, 2, 3 and 4% aqueous garlic extracts, that were offered to the experimental birds according to the assigned treatments.

Table 1: Composition of the Experimental Diets

Ingredient	Value (%)
Maize	52.00
Wheat bran	10.30
Soybean meal	30.00
Palm Kernel Cake	06.00
Calcium carbonate	00.50
Di-Calcium phosphate	00.50
Methionine	00.10
Lysine	00.10
Salt	00.25
Breeder Premix	00.25
Total	100.00

Proximate analysis of diet

Samples of the experimental diet were examined for ash, crude fiber, ether extract and crude protein, as described by (5). While the organic

matter was measured as the variation between dry matter and ash contents, with ash content determined by combustion at 600°C in a muffle furnace for 5 hours (Table 2).

Table 2: Proximate Analysis of the Experimental Diet

Parameters	Value (%)
Crude Protein	38.50
Ash Content	12.03
Ether Extract	07.07
Crude Fibre	04.05
Nitrogen Free Extract	38.35
Dry matter	93.02

Semen samples' collection and evaluation

Semen samples were harvested from the cocks across the six treatments through the abdominal rub-down technique of collection as illustrated by (6). These were transported in a flask immediately to the physiology laboratory for evaluation. The parameters analysed for were: semen volume, its pH, motility, spermatozoa concentration and morphology. A graduated collection tubes were used to measure the

volume. A digital pH meter was used to evaluate the pH.

Spermatozoa motility was strong-minded by integrating a drop of freshly collected semen with normal saline and placing it on a glass slide then covered with a cover slip and examined on a microscope under the magnification of (×400) objective lens. The motility of spermatozoa was estimated and the motility grade was subjectively rated between 0 and 100 as modified (7).

Spermatozoa concentration of the semen was estimated through an ocular count underneath the microscope through an improved Neubauer haemocytometer. Normal saline was used as diluents with a dilution ratio of 1:20. The combination was homogeneously mixed and in the course of the capillary action allowed to run under the cover slide placed on the haemocytometer. After a few minutes, the spermatozoa were counted inside five cells placed transversely from top to bottom in the ruled area of the haemocytometer. The entire count was getting held by adding the counts from the five squares multiplied by the dilution factor, area of the counter and number of squares counted divided by the depth of the haemocytometer (7).

Statistical analyses

Data collected were subjected to descriptive statistics and one-way Analysis of the variance procedure of Statistical Analysis System (8) and

means were compared using Duncan's multiple range test of the same software.

Results and Discussion

Semen volume (V) of the layers' breeder cocks administered AGE

As it is shown in Figure 1, T₃ (1% AGE) produced the highest volume of semen (0.64mL). While T₄ (2% AGE) gave 0.52mL and T₆ (4% AGE) produced 0.47mL. While T₁ (0% AGE) gave 0.37mL which was nearly similar to T₂ (300ppm of ascorbic acid/L in water) that produced 0.38mL, likewise, that of T₅ (3% AGE) 0.36mL. This result confirmed the statement of (9) who reported that low doses of garlic administration significantly increase superoxide dismutase activity which eventually minimised the effects of reactive oxygen species in those treatment groups

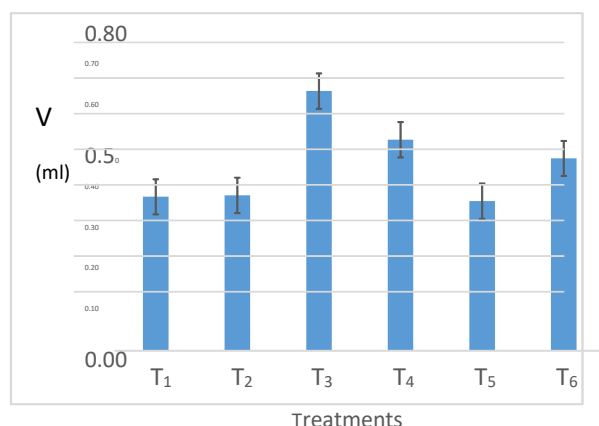


Figure 1: Shows the semen volume of the experimental birds

Semen quality of the layers' breeder cocks administered AGE

As presented in figure 2, spermatozoa concentration in treatment 6, was significantly ($p < 0.05$) different compared to treatment 1. This report reflected the conclusion of (10) who stated that administration of garlic increased testicular testosterone level. As it is shown in Table 3, the progressive motility (%) ranged from 80.98 to 86.72 (%). The semen pH was significantly ($p < 0.05$) different in T₅ (7.07) compared with T₂

(7.02), meanwhile, not significantly ($p < 0.05$) different with T₁ (6.94), T₃ (6.98), T₄ (7.09) and T₆ (7.10). While the cells' abnormality (%) was significantly ($p < 0.05$) lower in T₅ (2.67) compared with T₁ (9.00). Meanwhile, that of T₂ (4.65), T₃ (4.00), T₄ (3.00), and T₆ (3.33) were not statistically different from that of T₅.

Conclusion and Application

Conclusively, oral administration of aqueous garlic extracts (2 to 3 %) improved sperm cells quality in breeder cocks.

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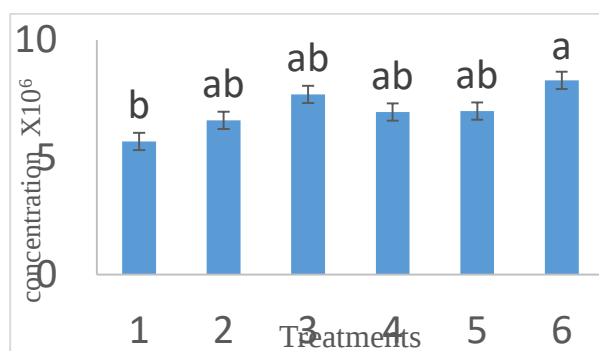


Figure 2: Shows the concentration of sperm cells

Table 3: Shows the semen parameter of the Experimental birds

Treatment	Semen parameters		
	Motility (%)	Semen pH	Abnormality (%)
T ₁	80.98	6.94 ^{ab}	9.00 ^a

T ₂	83.80	7.02 ^b	4.65 ^b
T ₃	84.37	6.98 ^{ab}	4.00 ^{bc}
T ₄	86.72	7.09 ^{ab}	3.00 ^{bc}
T ₅	85.13	7.07 ^a	2.67 ^c
T ₆	82.91	7.10 ^{ab}	3.33 ^{ac}
SE M	00.72	0.30	0.56
