Nig. J. Anim. Prod. 2018, 45(4):66 - 71
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Nigerian Journal of Animal Production

Reproductive organ weight of Nigerian indegenous cocks fed diet with graded levels of tumeric (*Curcuma longa)*

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Abstract

A study was conducted to evaluate the reproductive performance/reproductive organ weight of Nigerian indigenous chicken (cock) fed diet with graded levels of turmeric rhizome powder (TRP). The objectives of the study were to determine the effect of TRP on the characteristics (relative organ weight), and to evaluate the effect of TRP supplemented diet on the reproductive organ weight of Nigerian Indigenous cocks. One hundred and twenty adult local breeding cocks divided into four groups with 30 birds in each group were used for the study. Each group was further replicated into three replicates of 10 birds per replicate. The birds in the experimental groups designated as T_1, T_2, T_3, and T_4 were fed with TRP supplemented diet at various inclusions, 0.0%, 0.25%, 0.50 %, and 0.75% respectively for eight weeks. The following parameters were measured, full reproductive organ (g), right vas deferens (g), paired vas deferens (g), right epididymis (g), left epididymis (g), paired epididymis (g), right testis (g), left testis (g) and paired testis. The result showed a gradual ($p < 0.05$) decline in reproductive morphometric weight and were significantly ($p < 0.05$) improved in the TRP supplemented group better than the control group. In conclusion, Turmeric powder supplemented diet at 0.25, and 0.5 % inclusions performed better in the reproductive morphometric of Nigerian indigenous cocks, although care should be exercised in prolonged supplementation above 0.5 % inclusion to prevent its deleterious effect on the organ weight. The reproductive organ weight of Nigerian indigenous cocks fed with Turmeric powder supplemented diet as observed in this study compared favorably and even better than the control T_1. This is an indication that Turmeric powder has a significant propensity to enhance the reproductive performance of our indigenous cock semen since semen quality is determined to a large extent by the size of the reproductive organ. Although, the Turmeric powder has no significant deleterious effect on the major reproductive organs which make it very safe for inclusion in the diet of our local indigenous cocks. Also from the study, to a better performance, good morphometric quality and size of the Nigerian indigenous cocks and with no negative effect on the reproductive performance of Nigerian Indigenous Cocks, 0.5% inclusion level is highly recommended.

Keywords: Reproductive organ, Nigerian indegenous cocks, tumeric (*Curcuma longa)*

Introduction

Small-holder farmers use poultry for multipurpose uses including source of income and means of food security, cultural and Social values such as rituals, sacrifice and symbolism., gifts to strengthen social bonds, and source of Economic empowerment for women FAO (2010). Attributed to their source of income, high quality animal protein, ability to be kept under limited inputs and management and adaptability to different, Agro-climates, chickens are the most important and widely produced avian species in developing countries by resource limited families (Kondombo, 2005).

With gradually rising human population, an increasing demand for poultry meat is expected in the nearest future. For this reason, poultry health is an important issue.

Due to the extremely crowded hen houses and consequently poor hygiene, the antibiotics are extensively used to maintain health and activate bird growth (Boeckel *et al.,* 2015). This is a problem since anti-microbial resistance can be derived from the excess use of antibiotics, and thus greater regulatory efforts are needed (World Health Organization-WHO, 2012). Moreover, in many countries there are laws and welfare codes protecting farm animals, including poultry, from distress and fear (Main, 2009 and Bonafoes *et al.,* 2010). In line with the above requirements, some plant-derived active compounds, as those present in turmeric, can be in used to reduce antibiotic overuse and simultaneously increase animal welfare (Palaniappan and Holey, 2010).

Indigenous chicken constitutes 80% of the 120 million poultry types raised in the rural areas in Nigeria (RIM, 1992). They are self-reliant and hardy birds with the capacity to withstand harsh weather condition and adaptation to adverse environment. They are known to possess qualities such as the ability to hatch their own eggs, brood and scavenge for major parts of their food and possess appreciated immunity from endemic diseases. Their products are preferred by the majority of Nigerians because of the pigmentation, Genetic improvement of chicken is important in order to increase their contribution to the much needed animal protein in Nigeria. One of the ways to enhance the Commercial value of the local chicken is to improve their fertility and breeding performance (Imasuen *et al.,* 2016). Hence it is important to improve the hormonal profile and morphometric organ weight. The productive potential of poultry birds (cocks) is determined to a large extent by the quality of the semen it produces. The assessment of semen quality characteristics of Nigerian local chicken gives excellent indices of its reproductive potential and has been reported to be a major determinant of fertility and subsequent hatchability of eggs (Peters *et al.,* 2004). Hence, the need to determine the effect of tumeric rizhome powder on the reproductive organ weight of Nigerian indigenous cocks.

Materials and methods

Experimental site

The study was carried out in the Poultry Unit of the University Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike (MOUAU), Abia State in the South Eastern Nigeria. Umudike falls within Lattitude 5° 28' North and Longitude 07° 35' East and lies at an altitude of 112m above sea level. The location has an annual precipitation rainfall of 177-2,000cm per annum, (April–October) and a short period of dry season (November-March) with a relative humidity of about 50-90% and monthly temperature range of 17°C -36°C.

Sourcing and processing of test ingredient

The harvested rhizomes of turmeric plant that was used for this work was obtained from and identified by Genetic resource unit of National Root Crop Research Institute, Umudike. The rhizomes were carefully washed with clean water, peeled, air-dried and oven-dried at a temperature of 65°C. The dried rhizomes were polished to remove the rough surface by handpicking and finally milled into turmeric rhizome powder meal using hammer mill. The meal was then used to formulate the bird's experimental diet containing 0.00 %, 0.25 %, 0.50 %, 0.75% for treatments T_1, T_2, T_3, T_4, respectively.

Table 1: Experimental Diet Level (%) of Turmeric Rhizome Powder

Ingredient	T_1(kg/100kg)	T2	T3	T4
Maize	45	42.50	40.00	38.50
Soya bean	7.5	7.5	7.5	7.5
Wheat offal	12	12	12	12
Turmeric	0	.25	.50	.75
Bone meal	2.5	2.50	2.5	2.5
Palm kernel cake	12	12	12	12
Groundnut cake	15	15	15	15
Premix	0.25	0.25	0.25	0.25
Toxin Binder	0.15	0.15	0.15	0.15
Salt	0.3	0.3	0.3	0.3
Methionine	0.20	0.20	0.20	0.20
Lysine	0.10	0.10	0.10	0.10
Total	100	100	100	100
Calculated Composition of TRP				
Crude protein	17.06	17.04	17.04	17.04
ME (kcal/kg)	3,210	3210	3180	3182

Management of experimental animals

One hundred and twenty (120) 16 weeks old mature normal feathered local cocks were used for this experiment. The birds were procured from Oriegbe Market in Ebonyi State. All cocks were quarantined for 2 weeks, weighed, and then randomly assigned to four experimental diets. The birds were randomly divided into four treatment groups of 30 birds per replicate. Each treatment group was further divided into three replicates to give 10 birds per replicate per treatment group. The levels of turmeric rhizome powder (TRP) that was included in the diet were 0.0%, 0.25%,0.50 %, 0.75% represented as T_1, T_2, T_3, T_4 respectively (Table 1). Treatment 1 (T_1) which contained no TRP was used as the control. The birds were raised for 6 weeks in deep litter. Feed and water were supplied *ad-libitum*.

Statistical analysis

Data collected in all the parameters measured were subjected to analysis of variance in a completely randomized design as outlined by Steel and Torrie, (1980). The treatment means were separated using Duncan's New Multiple Range Test at 5% probability as described by Obi, (1990).

Results and discussion

Effect of turmeric on the reproductive morphometric

The effect of turmeric rhizome powder on the reproductive morphometric of indigenous cocks is presented in Table 2.

There were significant ($p<0.05$) differences among the treatment groups in all morphometric parameters measured compared with the control group. There were significant ($P<0.05$) differences among the treatment group in full reproductive organ weight of the cocks. Cocks on 0.25 % (T2) and 0.50 % (T3) groups recorded the highest reproductive organ weight 13.60 g and 14.96 g respectively, which were significantly ($p<0.05$) different from T1and T4. The lowest full reproductive organ weight was recorded in T4 (11.07 g) compared with the T1 (12.15 g).

There were significant ($p<0.05$) differences between T1 and T2, T3 and T4 in testicle, epididymis and vas deferens. While there were no significant differences ($p > 0.05$) among T1, T2 and T4 in right, left and paired epididymis. Treatment 3 (0.50 % inclusion) ranked highest significant (1.03

Table 2: Effect of Turmeric Powder on Reproductive Morphometric (Gonadosomatic Index)

Morphometric Parameters	T_1 (0.00%)	T_2 (0.25%)	T_3 (0.50%)	T_4 (0.75%)
Full rep organ (%)	0.79 ± 0.00^{c} (12.14)	1.26 ± 0.00^{a} (13.60)	1.28 ± 0.00^{a} (14.96)	1.05 ± 0.01^{b} (11.07)
Right testicle (%)	0.31 ± 0.00^{c} (5.00)	0.51 ± 0.00a (5.07)	0.52 ± 0.00^{a} (5.83)	0.43 ± 0.01^{b} (4.06)
Left testicle (%)	0.36 ± 0.00^{c} (5.15)	0.55 ± 0.00^{a} (6.09)	0.55 ± 0.00^{a} (6.77)	0.47 ± 0.01^{b} (5.03)
Paired testicle (%)	0.67 ± 0.01^{b} (10.15)	1.07 ± 0.11^{a} (11.16)	1.13 ± 0.09^{a} (12.60)	0.94 ± 0.05^{a} (9.09)
Right epididymis (%)	0.02 ± 0.00^{b} (0.29)	0.02 ± 0.00^{ab} (0.39)	0.03 ± 0.00^{a} (0.49)	0.02 ± 0.00^{ab} (0.33)
Left epididymis (%)	0.02 ± 0.00^{c} (0.37)	0.04 ± 0.00^{ab} (0.53)	0.05 ± 0.00^{a} (0.54)	0.03 ± 0.00^{bc} (0.41)
Paired epididymis (%)	0.05 ± 0.00^{b} (0.66)	0.07 ± 0.01^{ab} (0.92)	0.09 ± 0.00^{a} (1.03)	0.06 ± 0.00^{ab} (0.75)
Right Vas deference (%)	0.02 ± 0.00^{c} (0.66)	0.05 ± 0.00^{ab} (0.74)	0.06 ± 0.00^{a} (0.63)	0.04 ± 0.00^{b} (0.58)
Left Vas deference (%)	0.04 ± 0.00^{b} (0.67)	0.06 ± 0.00^{a} (0.76)	0.06 ± 0.00^{a} (0.68)	0.04 ± 0.00^{b} (0.64)
Paired Vas deference (%)	0.07 ± 0.01^{b} (1.33)	0.12 ± 0.00^{a} (1.55)	0.13 ± 0.00^{a} (1.33)	0.11 ± 0.00^{a} (1.23)

Note: Values are presented as means ± S.E.M, where a, b and c represent sign ificant differences. Values of $p < 0.05$ is considered significant. Values in parentheses represent the weight of reproductive morphometric in grams.

g) paired weight of the testes (12.60 g) and epididymis (1.03 g) compared with T1, T2 and T4, while T2 ranked the highest paired vas deferens (1.55 g). The variations between the right and left reproductive morphometric evaluated followed the same trend as left parts weighed heavier than the right parts. The lowest value of paired testes, epididymis and vas deferens were recorded in T4 (9.09 g), T1 (0.66 g), and T4 (1.23 g), respectively. Treatment 3 recorded the highest values in right epididymis (0.49 g) left epididymis (0.54 g) and paired epididymis (1.03 g) respectively than T1, T2, and T4. There were significant differences ($p<0.05$) among the treatment groups in testicular weight, but the left testicular weighed more than the right testicular and this confirms the report of Banerjee, (2007), who reported that left testicular is usually heavier than the right testes. The values recorded in this study on testes weight (9.09 to 12.60 g) fell within the range reported by Oke and Ihemeso (2010) on paired testes, but fell below range of values (56 to 60 g) for a star cross broiler strain warren rose broiler strain (57±0.200) reported by Onuora (1985) in gold duck. The role of these portions (vas deferens, testes and epididymis) on semen output in domestic fowl is well known (Hafez, 1987) i.e. the size of these organs are related to semen output and that is why birds with large size of reproductive organs will likely produce larger quantity of semen.

Conclusion

The reproductive potential of poultry birds (cocks) is often determined to a large extent by the have been studied extensively (Schneider, 1992; Bah *et al*., 2001; Tuncer *et al*., 2006; Peters *et al*., 2008b and Isidahomem *et al*., 2009) in indigenous tropical chicken breeds, and it has been reported to be an excellent indicator of reproductive potentials and a major determinant of fertility and subsequent hatchability of eggs (Peters *et al*., 2004). Also, the type of food supplement or diet formulations and feeding regimen have a

great impact on the growth /organ performance of the Nigerian indigenous chickens which has a direct influence on their reproductive performance (Schneider, 1992; Bah *et al*., 2001; Tuncer *et al*., 2006 and Peters *etal*., 2008).The reproductive organ weight of Nigerian indigenous cocks fed with Turmeric powder supplemented diet as observed in this study compared favorably and even better than the control T_1 This is an indication that Turmeric powder has a significant propensity to enhance the reproductive performance of our indigenous cock semen and the quality of the organ weight, since semen quality is determined to a large extent by the size of the reproductive organ. Although, the Turmeric powder has no significant deleterious effect on the major reproductive organs which make it very safe for inclusion in the diet of our local indigenous cocks.

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Received: 19th September 2018

Accepted: 25th December, 2018