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Reproductive potentials of Japanese quails to administration of *Parquetina nigrescens* leaf extracts

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Abstract

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This study was carried out to investigate the effect of *Parquetina nigrescence* leaf extract (PNLE) on the reproductive abilities of Japanese quails. The study was carried out at the Poultry Unit of the Teaching and Research Farm, Babcock University, Ilishan-Remo, Ogun State, Nigeria. Two hundred (200) day-old quails were purchased from a commercial hatchery. *Parquetina nigrescens* leaves were harvested around Babcock University, Ilishan, Remo, Ogun State Nigeria. Six hundred grams of the leaf was cut into smaller pieces and soaked into 1 liter of water for 72 h, it was then filtered with a muslin cloth and the filtrate was given to the birds according to the treatments. The birds were randomly distributed into five treatments; each treatment was replicated four times with 10 birds per replicate. Treatment 1 (T1); without PNLE served as the control, T2, T3, T4, and T5 received PNLE at 0.20, 0.40, 0.60, and 0.80 ml/liter of water respectively. Data on growth performance, hemato-biochemical, and reproductive responses were collected and subjected to analysis of variance using a statistical analytical system.

According to the results obtained, all the parameters for growth were not significantly influenced ($p > 0.05$) by the administration of PNLE except feed conversion ratio (FCR). The best FCR (3.18) was recorded in T4. There was no significant difference ($P > 0.05$) in the production performance of the Japanese quails. Although, there was a significant difference ($P < 0.05$) in the ovary weight and the relative ovary weight with the T1 and T2 having the highest values (ovary weight 1.5 g, relative ovary weight 1.03% and 0.9% respectively). The administration of PNLE did not have a significant effect ($p > 0.05$) on testosterone, follicle-stimulating hormone and luteinizing hormone concentrations but birds administered with the highest level of PNLE had significantly least ($p < 0.05$) concentration of estrogen. It was therefore concluded that an inclusion level of 0.60 ml of PNLE per litter of water enhances the FCR of Japanese quails and administration at 0.20 ml of PNLE improves the reproductive parameters of Japanese quails.

Keywords: egg; fertility; hormones; phytogenics; sperm

Introduction

The poultry business is expanding quickly in sub-Saharan Africa (Shaw et al., 2019) with Nigeria as an active participant with around 249 million birds in 2022 (Statista, 2024). Food instability has exacerbated the already severe lack of animal protein among human populations, which is seen in most developing countries, including Nigeria (FAOSTAT, 2017). The average Nigerian's ability to consume an acceptable amount and quality of animal protein is constrained by the high price of livestock product especially that of poultry (Olumide et al., 2022a). This menace can be ameliorated through production of livestock with generation intervals, such as pigs, rabbits and poultry (Hamzat et al., 2003).

Similar to chickens, Japanese quails (*Coturnix japonica*) are members of the *Galliformes* order and the *Phasianidae* family (Santos et al., 2011). They have excellent nutritional value, quick growth rate (marketable at 5–6 weeks of age),

and early beginning of egg production (at 6-7 weeks of age) (Santos et al., 2011; Chimezie et al., 2022; Akintunde et al., 2023a, b).

Currently, quail flocks have been said to have low fertility of 45% (Okeniyi et al., 2013), a short reproductive period and high reproductive losses with short reproductive spans (Okeniyi et al., 2013; Santos et al., 2011).

To counter these problems, quail producers have to maintain large parental stocks, while compromising growth because high selection pressure leads to considerable fertility losses in successive generations (Okeniyi et al., 2013). In general, genetic progress has been slow; low general fertility and a decline in fertility rate are among the biggest constraints to successful commercial production and further development of the quail meat industry (Okeniyi et al., 2013).

At present, male quails, if selected, are selected for physical characteristics such as cloacal gland size and not based on semen properties. There is a dearth of basic information on quantitative and qualitative aspects of semen production and its quality, on male-to-male variations, on factors affecting semen quality (e.g., age and genotype), on the relationship between sperm function and egg fertility, and the possibility of male selection based on sperm characteristics (Santos et al., 2013). Quails therefore have the potential to complement the obvious gap in the protein needs of Nigerians, if their productivity is enhanced.

The utilization of plants, their seed, bark, root, and leaf extracts in animal production has found widespread scientific and commercial acceptance as a strategy to improve the health status and performance of the animals (Djakalia et al., 2011; Akintunde & Toye, 2014).

Phytogenics have appetizing, digestion-stimulating properties, and antimicrobial and reproductive-enhancing effects (Akintunde et al., 2020, 2021a, 2021c; Olumide et al., 2022a).

Parquetina nigrescens, known as *Kwankwani* in Hausa, *Mgbidingbe* in Igbo, and *Ewe ogbo* in Yoruba is a perennial plant with a twinning stem and woody base. It is 10-15 cm long, 6-8 cm broad with a smooth long stem on the leaves (Oluwafemi & Debiri, 2008; Ayoola et al., 2011).

Proximate analysis of *Parquetina nigrescens* leaf extracts, as reported by Olumide et al. (2022b), indicated that it has a high concentration of moisture (7.80%), crude fiber (9.38%), crude protein (8.40 %), ether extract (9.38%), and ash (6.90%). Mineral and vitamin analysis as observed by Olumide et al. (2022b) showed that *Parquetina nigrescens* leaf extract contained macro minerals (%) such as sodium (0.36), calcium (29.96), phosphorus (6.88), potassium (23.21), magnesium (4.05), micro minerals such as silicon (23.71 ppm), aluminum (4.34%), iron (3.59%), manganese (1.46 ppm) and chlorine (0.33%) and high content of vitamins A (2.27 mg/100 g), B1 (270.25 mg/100 g), B2 (850.26 mg/100 g), B3 (325.20 mg/100 g), C (16.20 mg/100 g) and E (0.015 mg/100 g) respectively. Phytochemical evaluation revealed that *Parquetina nigrescens* leaf extract have high contents of alkaloids (8.27 mg/100 g), flavonoids (2.25 mg/100 g), glycosides (0.06 mg/100 g), saponin (5.20 mg/100 g), steroids (0.20 mg/100 g), phenols (0.86 mg/100 g), terpenoids (0.52 mg/100 g), tannin (6.30 mg/100 g) and anthraquinones (1.55 mg/100 g) (Olumide et al., 2022b).

Information on the usage of African parquetina as a feed component in the raising of quail is scarce. The purpose of this study is to evaluate production performance and sperm storage assessment of Japanese quails at various concentrations of *Parquetina nigrescens* leaf extract.

Materials and Methods

Study Area

The field experiment was carried out at the Poultry unit of the Teaching and Research Farm, Babcock University, Ilishan-Remo, Ogun State, Nigeria. It is located in the rainforest vegetation zone of Nigeria with an average annual rainfall of 1500 mm and an altitude of about 300 m above sea level; while the mean annual temperature is about 27°C.

Experimental Animals and Management

Two hundred (200) day old quails were purchased from a commercial hatchery. They were raised and managed in a deep litter system with wood shavings serving as litter material. The pens were equipped with cone-shaped drinkers and trough feeders. Commercial feed and clean water were provided *ad-libitum* throughout the experiment. Standard procedures for vaccination and medication were strictly observed throughout the experimental period.

Sources and Preparation of Parquetina nigrescens Aqueous Extract

Parquetina nigrescens leaves were harvested around Babcock University, Ilishan-Remo, Ogun State Nigeria and certified by a botanist, The leaves were rinsed and allowed to drain after which they were weighed. Six hundred grams (600 g) of the washed leaves were cut into smaller pieces and soaked in one liter of water for 72 h. It was stirred vigorously at 12 h intervals and afterward filtered with a muslin cloth and the filtrate was used for the experiment.

Experimental Design

The birds were randomly distributed into five treatments; each treatment was replicated four times with 10 birds per

replicate. Each treatment received the extract via oral administration as follows:

Treatment 1 (T1); without *Parquetina nigrescens* leaf extracts served as the control

Treatment 2 (T2): contains *Parquetina nigrescens* leaf extracts to be administered at 0.20 ml.

Treatment 3 (T3): contains *Parquetina nigrescens* leaf extracts to be administered at 0.40 ml

Treatment (T4): contains *Parquetina nigrescens* leaf extracts to be administered at 0.60 ml

Treatment 5 (T5): contains *Parquetina nigrescens* leaf extracts to be administered at 0.80 ml

Composition of experimental Diet

Table 1. Gross Composition for Experimental Diets (g/100kg)

Ingredient, kg	Chick (Starter)	Growers/Adult
Maize	42.34	56.90
Soybean meal	41.56	25.30
Wheat offal	7.00	8.00
Fishmeal	4.00	–
Palm oil	–	3.00
Vegetable oil	1.55	–
Bone meal	1.05	2.00
Limestone	1.40	1.60
Dicalcium phosphate	0.50	1.25
Oyster shell	–	1.00
Salt	0.30	0.30
Methionine	0.20	0.30
Lysine	0.10	0.30
Avatec	–	0.05
Calculated Analysis % Crude Protein	25.95	18.00
Metabolizable Energy, Kcal/kg	2,600.00	2,650.00

Data Collection

Body weight gain: Body weight gain was recorded on weekly basis by subtracting the values of initial body weight in grams from the final body weight.

Feed intake: Feed intake was calculated by subtracting the weight of leftover feed from the weight initially provided to the birds.

$$\text{Feed intake} = \frac{\text{Feed supplied (g)} - \text{Left over (g)}}{\textit{Feed supplied (g)}}$$

The feed conversion ratio (FCR) was obtained by dividing the quantity of total feed consumed by the weight gain.

$$\text{FCR} = \frac{\text{Total feed intake (g)}}{\text{Total body weight gain (g)}}$$

Percentage mortality was determined using

$$\text{Mortality (\%)} = \frac{\text{Number of dead birds} \times 100}{\text{Total number of birds}}$$

Sperm Storage Assessment

Two males were randomly selected and sacrificed from each replicate (the requirement for humane killing was met). The left and right testes were removed and homogenized separately in 2 ml of normal saline. The suspension was thoroughly and gently mixed then filtered through a doubled layer of sterile gauze and analyzed immediately. A dilution ratio of 1:20 of homogenate to normal saline was done and sperm cells were counted using the hemocytometer. Testicular sperm reserve was estimated as the total number of sperm cells present in the testicular tissues homogenate.

Daily Sperm Production (DSP)

Daily sperm production was calculated from gonadal sperm reserve.

DSP = Spermatozoa count/Time divisor (Akintunde, 2018; Akintunde et al., 2020).

Hormonal Assay

The blood sample was taken through the jugular vein from two birds per replicate into heparinized tubes and then centrifuged at 3000 rpm for 15 min. Testosterone concentration was determined by Enzyme-Linked Immunoassay (ELISA) using a commercial kit (Testosterone-RT ref: RH1712), while estrogen was determined by ELISA using a commercial kit (Rapid lab, UK) according to the manufacturer's instruction. Hormones assay for luteinizing hormone (LH) and follicle-stimulating hormone (FSH) was determined by enzyme immunoassay method, using commercial kits Stratus (DADE International Incorporation in immune fluorescence apparatus BAXTER STRATUS II)

Reaction Time and Libido Score Evaluation

A cock was introduced to the hens every day to monitor their sex drive. In this study, reaction time was considered as an indication of libido. This is the time it takes the cock to mount the female, this time was recorded with a stopwatch, and libido was scored as the number of times the cock attempts to mount within a minute.

Statistical Analysis

All data obtained were subjected to analysis of variance (ANOVA) using Statistical Analytical System (SAS, 2003).

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

Results and Discussion

Table 2 shows the growth performance of Japanese quails administered with varying levels of the extracts of *Parquetina nigrescens*. A significant difference ($p < 0.05$) was observed only for feed conversion ratio, however, birds that received 0.600 ml/500 ml of water had the best FCR.

The result of the morphometric characteristics of male Japanese quail at different inclusion level is presented in Table 3. It was observed that there was no significant difference ($p > 0.05$) in the live weight of the birds. There was no significant difference ($p > 0.05$) in all the parameters except the length of the right testis. Birds that received the highest dosages of the extract of *Parquetina nigrescens* (0.40, 0.60, and 0.80 ml per 500 ml of water) had significantly highest ($p < 0.05$) values ranging from 2.0 to 2.4 cm. There was however no significant difference ($p > 0.05$) in testicular

Table 2. Growth performance characteristics of Japanese quails to administration of *Parquetina nigrescens*

	T1	T2	T3	T4	T5
Initial Live Weight, g	7.00 ± 0.00	7.20 ± 0.00	7.10 ± 0.02	7.00 ± 0.00	7.15 ± 0.00
Final Live Weight, g at day 49	124.50 ± 7.57	122.83 ± 2.96	140.00 ± 3.21	126.83 ± 2.46	145.00 ± 8.54
Weight Gained, g	115.00 ± 4.90	112.05 ± 4.62	131.27 ± 4.04	106.25 ± 3.72	134.85 ± 13.34
Feed intake, g	519.07 ± 60.90	479.70 ± 17.70	584.55 ± 64.48	479.70 ± 3.33	566.02 ± 65.28
Water Intake, ml	1933.67 ± 78.79	1890.97 ± 124.16	2002.92 ± 142.93	1804.30 ± 69.46	1909.87 ± 80.09
FCR	5.04 ± 0.69^{b}	3.33 ± 0.19^{ab}	4.43 ± 0.53^{ab}	3.18 ± 0.02^{a}	4.61 ± 0.80^{ab}
Mortality, %	1.25 ± 0.25	1.25 ± 0.95	1.75 ± 0.48	1.25 ± 0.48	0.50 ± 0.29
Average Temperature – Morning, °C	25.99 ± 0.11	25.90 ± 0.12	25.93 ± 0.11	26.16 ± 0.10	25.89 ± 0.12
Average Temperature – Afternoon, °C	33.08 ± 0.24	33.30 ± 0.23	33.12 ± 0.24	32.71 ± 0.25	32.81 ± 0.19
Average Temperature – Evening, °C	31.66 ± 0.10	31.56 ± 0.08	31.39 ± 0.09	31.35 ± 0.11	31.32 ± 0.14
Average Humidity – Morning, %	52.55 ± 0.19	51.67 ± 0.19	52.26 ± 0.34	52.14 ± 0.18	52.03 ± 0.18
Average Humidity – Afternoon, %	32.79 ± 0.15	32.58 ± 0.03	32.97 ± 0.09	32.97 ± 0.03	32.87 ± 0.06
Average Humidity – Evening, %	37.93 ± 0.42	37.97 ± 0.33	38.60 ± 0.30	38.67 ± 0.37	38.56 ± 0.31

*ab = Mean within the same row with different superscripts are significantly different.
Group mean and Standard error of sample (x±sem) shown ($p < 0.05$), FCR – Feed Conversion Ratio

Table 3. Spermiogramic parameters and fertilizing potentials of male Japanese quails to Administration of *Parquetina nigrescens*

Parameter	T1	T2	T3	T4	T5
Testicular Weight, g	2.00 ± 0.22	1.50 ± 0.15	0.50 ± 0.05	2.40 ± 0.00	0.00 ± 0.00
Right Testis Weight, g	1.00 ± 0.10	0.50 ± 0.05	0.50 ± 0.05	1.20 ± 0.00	0.00 ± 0.00
Left Testis Weight, g	1.00 ± 0.01	1.00 ± 0.01	0.00 ± 0.00	2.00 ± 0.00	0.00 ± 0.00
Right Testis Volume, ml	1.75 ± 1.25	0.50 ± 0.00	0.50 ± 0.00	0.55 ± 0.15	0.30 ± 0.00
Left Testis Volume, ml	1.75 ± 1.25	0.55 ± 0.05	0.50 ± 0.00	0.60 ± 0.10	0.35 ± 0.05
Paired Testes Vol., ml	5.00± 1.00	5.60± 1.60	5.50± 0.50	3.80± 0.20	5.30± 0.40
Right Testis Length, cm	0.97 ± 0.09^{a}	0.93 ± 0.18^{ab}	1.97 ± 0.68^{c}	1.03 ± 0.44^{c}	2.07 ± 0.03^{bc}
Left Testis Length, cm	1.23 ± 0.32	0.90 ± 0.21	1.43 ± 0.26	0.70 ± 0.25	1.63 ± 0.12
Right Testis Circumference, mm	2.25 ± 1.75	1.50 ± 0.50	3.00 ± 0.00	4.00 ± 0.00	3.25 ± 0.25
Left Testis Circumference, mm	1.75 ± 1.25	0.55 ± 0.05	0.50 ± 0.00	0.60 ± 0.10	0.35 ± 0.05
Right Testis Density, g/ml	0.96± 0.07	1.24± 0.19	1.37± 0.25	1.37± 0.02	0.92 ± 0.02
Left Testis Density, g/ml	1.31± 0.04	1.23± 0.10	1.00± 0.14	1.28± 0.46	0.98 ± 0.00
Paired Testis Density, g/ml	1.11 ± 0.03	1.23 ± 0.15	1.14 ± 0.19	1.30 ± 0.25	0.95 ± 0.01
Right Epididymis Density, g/ml	3.65 ± 0.45	3.50 ± 0.90	4.02 ± 0.24	2.30 ± 0.90	1.76 ± 0.09
Spermatozoa Reserves – Right Testis	3.09 ± 0.91	3.38 ± 1.13	3.31 ± 0.47	3.51 ± 0.07	4.13 ± 0.73
Spermatozoa Reserves – Left Testis	2.71 ± 2.26	4.36 ± 0.01	3.68 ± 0.07	3.80 ± 1.11	3.63 ± 0.66
Daily Sperm Production	1.60± 0.36	1.65± 0.03	1.72± 0.73	2.10± 0.12	1.54 ± 0.86
Hen inseminated/Day	31.99± 7.28	33.08± 0.55	34.39± 14.58	41.99± 2.43	30.86± 17.25
Relative Testes Weight, %	1.43 ± 1.43	1.25 ± 1.25	0.42 ± 0.42	3.17 ± 0.00	0.00 ± 0.00

^{a,b,c} means within a row with different superscripts are significantly different ($p < 0.05$)

Weights, testicular volumes, testicular lengths, testicular circumference, testicular diameter, testicular density and spermatozoa reserves in the testes.

In Table 4, it was observed that there was no significant difference ($P > 0.05$) in the production performance of the Japanese quails (day at first lay, the weight of the first egg, the average weight of the egg).

Table 5 shows the morphometrics of the female reproductive organs. Significant differences ($P < 0.05$) were observed in ovary weight and relative ovary weight with the control and quails administered the zero-dosage of *Parquetina nigrescens* had the highest values.

Table 6 shows the levels of glucose and cholesterol, and the hormonal profiles of Japanese quails to varying levels of the administration of *Parquetina nigrescens.* The administration of *Parquetina nigrescens* did not have a significant effect ($p > 0.05$) on glucose, cholesterol, testosterone, luteinizing hormone and follicle-stimulating hormone concentrations. However, a significant difference ($p < 0.05$) was observed in the concentration of estrogen. Birds with the highest administration of *P. Nigrescens* had significantly the least ($p < 0.05$) values for estrogen.

Table 7 shows the libido score of Japanese quails to the administration of *Parquetina nigrescens,* however, no significant difference ($p > 0.05$) was observed in libido and reaction time.

Table 4. Female Production Performance of Japanese quails to administration of *Parquetina nigrescens*

	T1	T2	T3	T4	T5
Day at First Lay	47.00 ± 1.47	46.25 ± 1.11	49.25 ± 1.89	46.25 ± 0.85	47.50 ± 0.29
Weight of First Egg, g	6.13 ± 0.27	6.61 ± 0.62	6.36 ± 0.70	6.28 ± 0.77	6.01 ± 0.70
Average Weight of Eggs, g	8.31 ± 0.07	8.52 ± 0.11	8.55 ± 0.26	8.77 ± 0.07	9.27 ± 0.22

($p > 0.05$) = No significant difference

Table 5. Morphometrics of female reproductive organs of Japanese quails to administration of *Parquetina nigrescens*

	T1	T2	T3	T4	T5
Live weight, g	145.50 ± 0.50	157.50 ± 8.50	147.00 ± 9.00	154.50 ± 3.50	136.00 ± 9.00
Weight of Oviduct, g	2.00 ± 1.00	2.50 ± 0.50	1.00 ± 1.00	1.50 ± 1.50	1.50 ± 1.50
Length of Oviduct, cm	16.25 ± 2.75	12.00 ± 3.00	11.25 ± 2.25	11.25 ± 0.75	9.50 ± 3.50
Weight of Infundibulum, g	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
Length of Infundibulum, cm	8.00±1.00	8.50 ± 0.50	7.45± 2.00	8.67 ± 4.98	14.75 ± 7.75
Ovary Weight, g	1.50 ± 0.50^{b}	1.50 ± 0.50^{b}	0.00 ± 0.00^{a}	0.50 ± 0.50^{ab}	0.00 ± 0.00^{a}
Follicle Number (Large)	3.50 ± 1.50	3.00 ± 0.00	2.00 ± 2.00	4.00 ± 0.00	2.00 ± 2.00
Follicle Number (Small)	31.00 ± 4.00	37.00 ± 4.00	36.00 ± 5.00	36.00 ± 6.00	21.50 ± 7.50
Relative ovary weight, %	1.03 ± 0.35^{b}	0.94 ± 0.27^{b}	0.00 ± 0.00^{a}	0.33 ± 0.33^{ab}	0.00 ± 0.00^{a}
Relative Oviduct Weight, %	1.38 ± 0.69	1.57 ± 0.23	0.64 ± 0.64	0.99 ± 0.99	1.18 ± 1.18

^{a,b}means within a row with difference superscripts are significantly different ($p < 0.05$)

Table 6. Glucose, Cholesterol and Hormonal profiles of Japanese quails to administration of *Parquetina nigrescens*

	T1	T2	T3	T4	T5
Glucose, mg/dl	22.67 ± 2.73	24.33 ± 4.70	24.50 ± 8.50	25.00 ± 0.00	21.00 ± 0.00
Cholesterol, mg/dl	135.00 ± 12.70	136.33 ± 12.25	137.50 ± 0.50	139.00 ± 0.00	136.50 ± 0.50
Testosterone, ng/ml	0.28 ± 0.08	0.27 ± 0.02	0.31 ± 0.01	0.35 ± 0.00	0.24 ± 0.04
Oestrogen, pg/ml	32.86 ± 0.33^{c}	32.18 ± 0.37^{bc}	31.09 ± 0.79^{ab}	32.22 ± 0.12^{bc}	30.51 ± 0.01^{a}
LH, miu/ml	0.20 ± 0.10	0.23 ± 0.03	0.19 ± 0.11	0.15 ± 0.05	0.30 ± 0.00
FSH, miu/ml	0.03 ± 0.00	0.02 ± 0.01	0.03 ± 0.01	0.02 ± 0.00	0.06 ± 0.00

^{a,b,c}means within a row with difference superscripts are significantly different ($p < 0.05$)
LH – Luteinizing hormone FSH – Follicle-stimulating hormone

Table 7. Effect of the administration of *Parquetina nigrescens* on libido score of Japanese quails

Parameter	T_1	T_2	T_3	T4	T5
Libido	2.57±0.35	2.59±0.36	2.70±0.05	2.60±0.05	2.55±0.30
Reaction time	4.43±0.40	4.26±0.45	4.12±0.43	4.00±0.34	4.10±0.41

Means with different superscripts in the same row are significantly different ($P < 0.05$)

Discussion

According to the results from this study, all the parameters for growth were not significantly influenced ($p>0.05$) by the administration of the soaked extracts of *Parquetina nigrescens* except feed conversion ratio and this was in agreement with the report of Habibu et al. (2014) and Akintunde et al. (2023b) where quails were administered molasses and egg-lime-molasses mixture respectively. It should however be noted that the best FCR and weight gained was recorded in the birds administered with 0.60 ml which was T4 while the other treatment groups that received the highest levels of soaked extracts of *Parquetina nigrescens* did not show significant differences compared to the control group.

Administration of the soaked extracts of *Parquetina nigrescens* solution through drinking water did not alter the feed consumption of Japanese quail. The feed conversion ratio (FCR) ranged from 3.18 to 5.04. The results were higher than the optimum value of 2.0 reported for broilers by Prakbakaran (2003) and this could be as a result of no differentiation of Japanese quails into meat or egg type presently. The non-significance observed for other performance indicators showed that the administration of soaked leaf extracts of *Parquetina nigrescens* had no negative impact on their diet intake. The results on FCR was in agreement with the report of Oladele-Bukola et al. (2020) who also observed significant differences in rabbits fed sole or mixtures of leaves of *Parquetina nigrescens* and sunflower.

Also, the mortalities rate, was not significantly different ($P > 0.05$) among treatments and fell within the best ranges for mortalities in well-managed birds especially less than 3% as reported by Atteh (2015).

Understanding the genitalia morphometry of male and female species is crucial since it can be used to produce these species more abundantly and with greater output. To assess and estimate quantitative changes in testicular components and spermatogenic function resulting from factors like age, season, temperature, and diseases, morphometric analysis on the testis of any species or breed is required (Akintunde et al., 2020, 2021b). Additionally, nutrition has some impact on gonadal sperm stores and testicular morphometric parameters of livestock (Akintunde et al., 2020).

Mammalian testes were characterized as perfect predictors of spermatozoa production by Gage & Freckleton (2003). According to Perry & Petterson (2001), the size, length, and width of the testes can be utilized to gauge and assess a livestock's capacity to produce sperm. The basic morphometric properties of the reproductive organs must be understood to measure and anticipate not only sperm production but also the breeder male's capacity for fertilization and sperm storage. Significant connections between paired testes' weight and body weight, sperm output, and reserve potentials in boars have been found in mammalian species (Gbore & Egbunike, 2008; Akintunde et al., 2021b). There is a correlation between avian testicular growth and body weight (Kumaran & Turner, 1949; Akintunde et al., 2021b). Many traditional accounts of the male reproductive system exist, all of which attempt to draw a connection between shape, testicular size, age, and sexual maturity (Bull et al., 2007; Ewuola et al., 2015).

The findings of this study are consistent with those made by Akintunde et al. (2020), who found that testicular morphometrics of Yoruba Ecotype Nigeria Local Chickens and Isa Brown Chooks fed varying amounts of *Moringa oleifera* seed meal showed a significant difference.

According to Oyeyemi & Okediran (2007), a higher concentration of spermatozoa may indicate a high fertility rate due to the quantity of spermatozoa present during service or insemination. However, the administration of the extracts did not significantly influence spermatozoa reserves and daily sperm production. This implies that administration of the extracts of *Parquetina nigrescens* in water did not have any deleterious effects on the male quail's ability to reproduce.

Ahemen et al. (2016) reported that spermatozoa reserves in the left testis of normal feather birds, naked neck, and frizzle feather chickens were not significantly ($p > 0.05$) different from each other. The aqueous administration of the extracts of *Parquetina nigrescens* in water in the current investigation had no significant impact on these parameters either.

The non-significance of most of the female morphometric parameters could be due to the assertion of Nester et al. (1983) that the ovarian follicle number and weight of ovary of quails were influenced by body weight but not by the concentration of yolk. The observations of the number of follicles were also in line with the reports of Kimaro (2006) who found that the ovary contained between 25 to 30 follicles. The average weight of ovary was reported as 19.23 grams in Aseel birds (Banerjee et al., 2008). Administration of higher dosages of the extracts of *Parquetina nigrescens* (0.40–0.80 ml) repressed the weights of the ovaries.

The use of the aqueous extracts of the whole plant of *P. nigrescens* for their antihyperlipidemic effect in traditional medicine has been supported by a study by Ojuade et al. (2021). The antihyperlipidemic effect of the aqueous extract of the whole plant was investigated using streptozotocin-nicotinamide-induced type 2 diabetic rat models. In the study, serum lipase, low-density lipoproteins, total cholesterol, total triglyceride, atherogenic index, coronary risk index, pancreatic-amylase, and lipase activities were all reduced after

treatment with aqueous extracts (400 and 800 mg/kg) of the whole plant for 14 days. An aqueous root extract of *P. nigresecens* was investigated for anti-lipid activity in albino rats.

The results revealed that a dose administered at 100 mg/kg body weight caused an increase in mean total cholesterol levels, low-density lipoproteins, and no alteration in high-density lipoprotein after 21 days. However, extract administered at a dose of 150 mg/kg showed a significant increase in mean total cholesterol, triglycerides, low-density lipoprotein, and high-density lipoprotein when compared to the control (10 ml/kg of normal saline). However, in this study the administration of the leaf extracts of *Parquetina* nigrescens did not significantly affect the blood cholesterol of Japanese quails and this could be as a result of variations in lipid metabolism in different animal species.

The anti-diabetic activity of aqueous extract of the whole plant of *P. nigrescens* was evaluated in streptozotocin–nicotinamide induced type 2 diabetic rats, administered at doses of 200, 400, and 800 mg/kg body weight. The results showed that the aqueous extract of the whole plant reduced blood glucose, α-glucosidase, and glucose-6-phosphatase activity and produced a significant increase in glycogen content and glucose tolerance (Ojuade et al., 2021). The results showed that the aqueous leaf extract significantly reduced the blood glucose level. The non-significance of blood glucose in the present study showed that the administration of the extracts did not increase blood glucose levels.

The present investigation found that oral administration of *P. nigrescens* leaf extracts had no effect on serum glucose concentrations, which is consistent with Basit et al. (2020) findings on POLM supplementation in broiler chickens. Cholesterol and triglyceride levels in the blood are thought to be indications of lipid metabolism (He et al., 2015; Akintunde et al., 2021a). The current investigation found that administering *P. nigrescens* leaf extracts did not affect serum cholesterol levels.

The results obtained in the present study were also in contrast with the reports of Akintunde et al. (2023a) who reported that the administration of an egg-lime-molasses mixture in drinking water of male Japanese quails induced higher ($P < 0.05$) levels of testosterone concentrations. The higher levels of testosterone detected in the egg-lime-molasses group could be owing to a decline in the amounts of oxidative stress, which inhibits steroidogenic enzymes for testosterone synthesis. However, the non-significance of the testosterone concentration in the study showed that the administration of *Parquetina nigrescens* is safe for use without altering the reproductive capability of the male and this could also account for the non-significance of the libido score. The non-significance of the leutenizing hormone and follicle stimulating hormone concentrations could also account for the non-significance of the follicle number and subsequent egg production performance as observed in the present study.

Conclusion

It can be concluded from the study that the administration of *Parquetina nigrescens* affects performance, especially the feed conversion ratio (FCR) of Japanese quails. For the best FCR, an inclusion level of 0.60 ml of *Parquetin nigrescens* leaf extract into 1 l of water is the best. Also, the administration of *Parquetina nigrescens* leaf extract into 1 l of water did not impair the performance, reproductive profiles, and hormonal profiles of Japanese quails.

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