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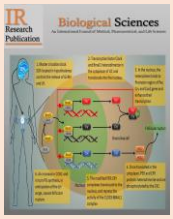

Performance and Physiological Response of Japanese Quails to Administration of *Parquetina nigrescens*

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ABSTRACT

The purpose of the study was to investigate the response of Japanese quails to the administration of Parquetina nigrescence leaf extract (PNLE). 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 in 1 litre of water for 72 hours, 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 phytochemicals, growth performance, and basic physiological 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 with the exception of feed conversion ratio (FCR) and final live weight at the finisher phase. The best FCR (3.18) was recorded in T3 at the starter phase while T5 had the best final live weight and FCR at the finisher phase. There was a significant difference ($P<0.05$) in the oxygen concentration and pulse rates of the Japanese quails. It can be concluded from the study that the administration of *Parquetina nigrescens* up to 0.80ml is safe for Japanese quails for optimum performance.

Introduction

Boosting the deficiency of animal protein in Nigeria with poultry birds that has a short generation interval like quail has been an alternative means of alleviating poverty. Quails are grown for meat and eggs and are attractive for farmers due to rapid growth rate (marketable at 5-6 weeks of age), early onset of egg production (6-7 weeks of age) and the nutritive value of their eggs and meat. The Japanese

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quails have the ability to bridge the obvious gap in the protein needs of Nigerians. In general, genetic gains have 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 (Chimezie et al., 2022; Akintunde et al., 2023a, b).

Information on the usage of *Parquetina nigrescens* leaf extracts as a feed component in the raising of quail is scarce. The purpose of this study is to evaluate the performance and physiological response of Japanese quails at various concentrations of *Parquetina nigrescens* leaf extract.

P. nigrescens contains various phytochemicals such as flavonoids, phenols, alkaloids, saponins, tannins, phlobatannis, anthraquinones, triterpenes, cardenolides, reducing sugar, cardiac glycosides, steroid, and terpenoids. Generally, phytochemicals from plants are known to possess therapeutic properties for managing various diseases. *P. nigrescens* possess analgesic, anti-inflammatory, and antipyretic potentials, as well as anti-ulcerative, antihelminthic, pro-hematopoietic, antidiabetic, and antioxidant properties. The analgesic, anti-inflammatory, and antipyretic effects of *P. nigrescens* leave extract have been documented by Owoyele et al. (2009).

This study focused on how the use of *P. nigrescens* leaf extract can boost the performance of Japanese quails thereby increasing the sources of animal protein and bridging the gap of protein deficiencies in Nigeria.

Materials and Methods

Sources and Preparation of *Parquetina nigrescens* Aqueous Extract

Parquetina nigrescens leaves were harvested from the Teaching and Research Farm, Babcock University, Ilishan-Remo, Ogun State Nigeria. The leaf samples were identified and authenticated by a botanist in the Department of Basic Sciences, Babcock University, Ilishan-Remo, Ogun State, Nigeria. The leaves of *Parquetina nigrescens* were rinsed to remove dirt and allowed to drain after which they were weighed. 600g of the washed leaves were cut into smaller pieces and soaked in one liter of water for 72 hours according to the procedures of Okhale et al., 2019) inside different containers, it was stirred vigorously at 12-hour intervals. After 72 hours, it was filtered with a muslin cloth, and the filtrates were given to the birds according to the treatments. The aqueous extracts were stored in a fridge to avoid fermentation and made in batches when needed (Nte et al., 2017).

Phytochemical analysis

The saponin content of the sample was determined by the double extraction gravimetric method described by Harborne (1984). The phytate content of the sample was determined according to the method outlined by Lucas and Markaka (1975). The tannin content of the sample was determined using methods described by AOAC (2005). The oxalate content of the powdered sample was determined by the modified method of Abeza et al. (1968). The alkaloid content of samples was determined using the gravimetric method of Harborne (1984).

Study Area

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

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	2.650

Experimental Animals and Management

Two hundred (200) day-old quails were purchased from a commercial hatchery. The birds were raised and managed under a deep litter system with wood shavings serving as litter material and housed in a typical tropical open-sided and well-ventilated poultry facility. Each unit of the pen replicate had a dimension of 150cm by 90cm and was well-demarcated using a wire mesh. The pens were equipped with cone-shaped drinkers and trough feeders. Feed and clean water were provided ad libitum throughout the experiment. The quails were assessed for their performance and reproductive parameters. The cocks on the dietary treatments were used for libido assessment per treatment.

Experimental Design

The experiment was arranged in a completely randomized design. The birds were randomly distributed into five treatments; each treatment was replicated four times with 10 birds per replicate. Each treatment was given extract via oral administration as follows:

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

Treatment 2 (T2): contained *Parquetina nigrescens* leaf extracts administered at 0.20 ml/bird

Treatment 3 (T3): contained *Parquetina nigrescens* leaf extracts administered at 0.40 ml/bird

Treatment (T4): contained *Parquetina nigrescens* leaf extracts administered at 0.60 ml/bird

Treatment 5 (T5): contained *Parquetina nigrescens* leaf extracts administered at 0.80 ml/bird

Data Collection

Body weight gains of experimental animals were recorded on a weekly basis by subtracting the values of initial body weight in grams from final body weight.

Weight Gain (g) = Final Weight (g) – Initial Weight (g)

Average weight gain/bird = (Final weight (g) - Initial weight (g))/(number of birds)

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

Feed intake per bird = (Feed supplied (g)-Left Over (g))/(number of birds)

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

FCR = (Total feed intake (g))/(Total body weight gain (g))

Respiratory Rate

This was calculated by the counting of panting breaths of the birds for 30 seconds and the value (X) is then multiplied by 2.

Oxygen concentration

A pulse oximeter was used to measure how much oxygen the hemoglobin in the blood is carrying. This is called the oxygen saturation and is expressed in percentage.

Body Mass Index

According to Akintunde et al. (2021), this was calculated by dividing body weight, stated in grams, by the square of body length, expressed in centimeters.

Results and Discussion

Table 2 shows the phytochemical screening of aqueous *Parquetina nigrescens* and the analysis revealed that it has oxalate of 3.10mg/g, phytate of 2.00%, saponin of 0.45%, flavonoid of 4.30%, phenol of 0.50mg/g, tannin of 0.001% and alkaloid of 0.36%.

Table 3 shows the performance characteristics of Japanese quails after administration of *Parquetina nigrescens* leaf extracts at the starter phase. The study showed that the administration of *Parquetina nigrescens* leaf extracts in drinking water did not significantly influence ($p>0.05$) all the performance parameters (final body weight, total feed intake and weight gain) except for the feed conversion ratio (FCR) at the end of the starter phase while birds with the administration of 0.40ml of *Parquetina nigrescens* leaf extracts had significantly best ($p<0.05$) FCR.

Table 4 shows the performance characteristics of Japanese quails during the administration of *Parquetina nigrescens* leaf extracts at the finisher phase. The results showed that the administration of *Parquetina nigrescens* significantly influenced ($p<0.05$) final body weight and feed conversion ratio at the finisher phase. Birds with the highest concentration of *Parquetina nigrescens* leaf extracts had the best final live weight and feed conversion ratio at the finisher phase.

Table 5 shows the physiological response of Japanese quails to the administration of *Parquetina nigrescens* leaf extracts. It was observed from the

Table 2. Phytochemical Analysis of Parquetina nigrescens.

Parameter	**Concentration**
Oxalate (mg/g)	3.10±0.01
Phytate (%)	2.00±0.02
Saponin (%)	0.45±0.01
Flavonoid (%)	4.30±0.10
Total Phenolic (mgGAE/g)	0.50±0.01
Tanin (%)	0.01±0,00
Alkaloid (%)	0.36±0.01

Table 3. Performance Characteristics of Japanese Quails to administration of Parquetina nigrescens Leaf Extracts at Starter Phase.

	T1	T2	T3	T4	T5
Initial Weight (g)	7.00 ± 0.00	7.20 ± 0.00	7.10 ± 0.02	7.00 ± 0.00	7.15 ± 0.00
BW (g)	68.33± 11.29	74.00 ± 11.93	81.33 ± 6.44	63.00 ± 1.73	71.67 ± 4.98
TFI/Bird-Starter (g)	288.33 ± 4.41	289.00 ± 0.58	290.00 ± 1.15	301.00 ± 2.08	288.67 ± 1.20
Weight Gain-Starter (g)	61.33± 11.29	66.97 ± 11.95	74.27 ± 6.48	56 ± 1.73	64.57 ± 4.94
FCR –Starter	5.10 ± 1.10^{c}	4.58 ± 0.74^{b}	3.96 ± 0.33^{a}	5.38 ± 0.16^{c}	4.52 ± 0.32^{b}

Note: ^{a,b}; Means with different superscripts along the same row are significantly (P<0.05), Body weight (BW), Total Feed Intake (TFI), Feed Conversion Ratio (FCR).

Table 4. Performance Characteristics of Japanese Quails to administration of Parquetina nigrescens Leaf Extracts at Finisher Phase.

	T1	T2	T3	T4	T5
Initial Weight (g)	68.33 ± 11.29	74.00 ± 11.93	81.33 ± 6.44	63.00 ± 1.73	71.67 ± 4.98
Final Live Weight (g)	119.75 ± 5.11^{a}	120.38 ± 3.45^{a}	134.75 ± 4.12^{ab}	125.88 ± 2.26^{a}	141.25 ± 4.89^{b}
TFI/Bird-Finisher (g)	486.88 ± 14.02	494.88 ± 7.59	502.75 ± 7.22	518.38 ± 8.18	490.88 ± 22.66
Weight Gain-Finisher (g)	51.63 ± 7.57	49.25 ± 5.13	52.38 ± 5.25	62.50 ± 2.87	70.75 ± 5.59
FCR-Finisher	12.35 ± 3.2^{8}	11.36 ± 1.90^{c}	10.55 ± 1.42^{c}	8.45 ± 0.49^{b}	7.15 ± 0.49^{a}

Note: ^{a,b}; Means with different superscripts along the same row are significantly (P<0.05), Body weight (BW), Total Feed Intake (TFI), Total Water Intake (TWI), Feed Conversion Ratio (FCR).

Table 5. Physiological parameters of Japanese quail administered Parquetina nigrescens leaf extract.

	T1	T2	T3	T4	T5
Respiratory Rate	35.8 ± 9.28	34.8 ± 7.55	30.2 ± 3.4	26.6 ± 1.69	34 ± 5.57
Oxygen Concentration (%)	59.2 ± 5.52^{ab}	50 ± 7.83^{a}	74.4 ± 7.91^{b}	66.8 ± 9.95^{ab}	45.4 ± 4.92^{a}
Pulse Rate	54.6 ± 6.46^{a}	78 ± 13.27^{ab}	93.6 ± 8.54^{b}	104.8 ± 9.2^{b}	91 ± 16.82^{b}
Body Mass Index g/cm^{2})	0.27 ± 0.08	0.25 ± 0.06	0.14 ± 0.09	0.27 ± 0.02	0.32 ±0.01

*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).

present study that there were significant differences (p<0.05) in oxygen concentration and pulse rate.

Discussion

The findings corresponded with the research conducted by Akinyemi and Dada (2013), who documented the phytochemical screening of *P. nigrescens* and noted the presence of compounds including flavonoids, alkaloids, tannins, anthraquinones, terpenoids, and cardiac glycosides. The findings also aligned with the findings of Airaodion et al. (2019), who reported that the leaves of *Parquetina nigrescens* contained flavonoids, phenols, alkaloids, saponins, and tannins. The alkaloid value found differed from the 0.0363% value that Airaodion et al. (2019) reported for the leaf of *Parquetina nigrescens* . This discrepancy could be the result of variations in the geographic areas where the research was conducted. Furthermore, a comparison

of the flavonoid concentration obtained in this study with the value of 0.03% reported by Airaodion et al. (2019) revealed a significant increase.

Strong natural antioxidants called flavonoids protect against degenerative diseases like cardiovascular disease by scavenging free radicals (Khan et al., 2021). Several noteworthy pharmacological characteristics of saponin include its antibacterial and antifungal activities (Odebiyi, 1978; Cheeke, 2000; Soetan et al., 2006). The tannin content of this result (0.01%) was fairly close to the Ndubuisi-Ogbonna (2021) report for Citrus sinensis fruits, which was 0.04 mg/100g. The tannin content found in this study is lower, confirming the safety of consuming *Parquetina nigrescens* leaf extract. Levels of tannins in the diet above 5% are frequently fatal (Reed, 1995). Tannins may prevent the growth of bacteria, viruses, fungus, and yeast (Prohp and Onoagbe, 2012). Important dietary minerals like zinc, calcium, iron, and magnesium are hidden by phytic acid once levels exceed allowable limits, making them physiologically inaccessible for absorption (Alagbe et al., 2019; Musa et al., 2020).

The findings demonstrated that the phenols value (0.50 mgGAE/g) obtained was less than the values reported by Olumide et al. (2022a) and Airaodion et al. (2019) for *Parquetina nigrescens* leaf extract and *Parquetina nigrescens* leaf, respectively, of 0.86 mg/100g and 7.71 mg/g. Furthermore, the alkaloid value found in this investigation was less than the 8.27 mg/100 g of *Parquetina nigrescens* leaf extracts reported by Olumide et al. (2022a). The variation may arise from the extraction process. Like vitamin C, phenols play a similar role in the prevention of disease by acting as antioxidants and scavenging free radicals (Bose et al., 1998: Hollman, 2001; Olafadehan et al., 2020). Because oxalate has a detrimental effect on the availability of minerals, it is a concern. An excessively high oxalate diet has been linked to kidney stones and may raise the risk of renal calcium absorption (Chai and Liebman, 2004).

The study's findings, which are consistent with the findings of Akintunde et al. (2023c), where quails were given an aqueous solution of an egg-lime molasses mixture, show that the administration of soaked *Parquetina nigrescens* leaf extracts did not significantly affect any of the growth parameters ($p>0.05$), with the exception of feed conversion ratio during the starter phase. It should be mentioned, though, that the birds given 0.40 ml of PNLE had the best FCR during the starter phase.

While feed consumption was unaffected, the Japanese quail's finisher phase final live weight and feed conversion ratio were significantly affected by the administration of *Parquetina nigrescens* leaf extracts through drinking water. The birds with the highest feed conversion ratio and final live weight were those given the highest doses of PNLE. On the other hand, this was not the case in the report by Akintunde et al. (2023c), in which the administration of leaf extract from *Parquetina nigrescens* did not significantly affect any of the performance parameters. The variation may have resulted from the different methods used in the two trials to extract the *Parquetina nigrescens* leaf. The current study's findings are consistent with those of Gilchrist et al. (2020), who found that broiler chicken growth performances were enhanced by a molasses-enriched, cassava fiber-based diet supplemented with enzymes, without affecting feed intake or feed conversion ratio. Although enzymes were not used in this investigation, it is important to note that the lime might have served as a source of organic acids. The findings are also partially corroborated by studies showing that the inclusion of certain phytogenics in poultry diets, such as *Parquetina nigrescens* leaf extracts, Carica papaya seeds and *Moringa oleifera* seed meal, had no appreciable effect on feed efficacy (Akintunde et al., 2023c; Olumide et al., 2022b; Akintunde and Toye, 2014).

The outcomes demonstrated that the respiratory rates were not adversely affected by the addition of PNLE. The respiratory rate was both normal and within the range that Nurmeiliasari et al. (2020) had reported for broiler chickens. Furthermore, the body mass index fell within the range that Akintunde et al. (2021) had reported. Nonetheless, the oxygen concentration values were less than those published by Akintunde et al. (2023d), who examined the basic physiological response of Japanese quails to the egg-lime-molasses mixture application. The variation may have resulted from seasonal variations during the study period and/or differences in the test ingredients. The oxygen concentration and pulse rate were noticeably higher in the birds given PNLE at 0.4 and 0.6 milliliters. This supports the claim made by Akintunde et al. (2023d), who investigated *Parquetina nigrescens* ' antioxidant potential in the production of broiler chickens.

Conclusion

The study's findings indicated that Japanese quail performance was impacted by the administration of *Parquetina nigrescens* , particularly in terms of feed

conversion ratio. Thus, for optimal performance, Japanese quails can safely be given up to 0.80 ml.

Contribution of authors

Ahmed O. Akinola (AOA (1)), Adeyinka Oye Akintunde (AOA (2)) and Martha Dupe Olumide (MDO). AOA (1) wrote the initial draft of the manuscript, carried out the study, and collected the data. AOA (2) designed the study, co-supervised the study, analyzed the data, interpreted the results and finalized the manuscript. MDO co-designed and supervised the study and approved the manuscript. All authors have read and approved the finalized manuscript.

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Conflict of Interest

The authors hereby declare that there is no conflict of interest in the course of this work.

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