

Effect of Sire on Reproductive and Growth Performance of Japanese Quails

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Abstract

This study aimed to evaluate sire impacts on the reproductive and growth performance of Japanese quails. Thirty-six (36) matured Japanese quails comprising 30 hens, and 6 cocks were used as the base population of the study. The birds were assigned to 6 pens at a mating ratio of 5:1, with each representing a treatment. A completely randomized design (CRD) was used for this study. The progenies of the base population were raised to sexual maturity. For the progeny population, reproductive and growth performance were taken every week. Data collected on the reproductive and growth performance were analyzed using a one-way analysis of variance (ANOVA) with the SPSS statistical software. The sire did not have a significant effect ($P>0.05$) on the reproductive and growth performance of Japanese quails, but it did have a significant effect ($P<0.05$) on body weight and linear body measurements like body length, shank length, and wing length, but not for breast girth. It was concluded from the findings of this study that selection could be done based on sire for rapid improvement in Japanese quails.

Keywords: Effect, Sire, Reproductive, Growth, Performance, Japanese Quails

1.0 Introduction

Japanese quails are increasingly recognized for their economic value in poultry production, particularly due to their rapid growth rates, prolific egg-laying capabilities, and adaptability to various environmental conditions. The popularity of chicken and chicken products has been rising due to their availability, high nutritional quality (particularly amino acids), and relatively low cost (Akpa *et al.*, 2010; Sam *et al.*, 2010). The performance of these birds can be significantly affected by genetic factors, including those inherited from sires, which may impact traits such as body weight; age at sexual maturity, egg production rates, and overall health (Obi *et al.*, 2018). The growing number of people in Nigeria is causing a greater need for animal and poultry products, which are currently not enough to meet the demand. Japanese quails are valuable and have been identified as important genetic resources in the bird family. They can help address the shortage of animal protein. Japanese quails and their products are affordable

sources of animal protein for many people, playing important roles in our societies both socially and economically. Understanding the genetic potentials of Japanese quails could be a valuable tool for selection for better production. Various sire lines can determine how genetic differences contribute to the reproductive efficiency and growth performance of their offspring. By examining parameters like reproductive and growth performance of the Japanese quails across different sire groups, it can help to identify optimal breeding strategies that can enhance productivity in quail farming (Arunrao *et al.*, 2023). The objective of the study is to investigate effect of sire on the reproductive and growth performance of the Japanese quails.

2.0 Materials and Methods

2.1 Location of the Study

The experiment was done at the Livestock Teaching and Research Farm of the Faculty of Agriculture, Shabu-Lafia Campus, Nasarawa State University, Keffi, Nasarawa State. Nasarawa State is located in the Southern Guinea Savanna Zone of Nigeria. Lafia is situated between latitude 7° and 9°N and Longitude 7° and 10°E. The region has a tropical climate with temperatures ranging from 20°C in October to 36°C in March. Rainfall varies from 13.73 cm to 14.00 cm in different areas.

2.2 Experimental Procedure

A total of 30 mature hens and 6 cocks were intentionally placed in six separate pens, each pen containing 5 hens and a cock, making a total of six replicates. The eggs laid were collected twice daily and sorted based on sire. The eggs were stored in egg crates at room temperature with proper air circulation for 7 days. After 7 days of collecting eggs, they were taken to the BBS Poultry Hatchery farm in Lafia. The eggs were then placed in an automatic electric incubator for breeding.

Eggs that were in the process of hatching were placed flat in special boxes. These boxes were then put in a larger tray and set in the incubator based on the sire. The eggs were turned automatically every 4 hours each day. Turning the eggs was stopped three days before they were expected to hatch to prevent the beak from moving out of position for when the chick would break out. On the 6th day, a process called candling was done to check if the eggs were fertile. To get a better idea of how many eggs were fertile and how many embryos had died early, candling was done again on the 13th day of incubation. After the chicks hatched, they were removed from the incubator. The eggs that didn't hatch were opened under the sun to check for early and late embryo mortality. The chicks were then weighed and given vaccines for Gumboro and Lasota.

The chicks were placed in pens based on sire. These pens were specifically for keeping the chicks warm and safe. Before the chicks were due to hatch, the pens were cleaned really well with disinfectant and left to dry for two weeks. Once the chicks hatched, they were moved to a special room for warmth. For the first 15 days, stoves and light bulbs were used to keep the chicks warm and lighted. Wood shavings were put on the floor of the pens to keep them clean and comfortable, with a depth of 5cm. The chicks were kept warm at a temperature of 35°C and given enough space for drinking and eating. The temperature was lowered by 3.5°C each week as they grew. They had light on for 24 hours a day to prevent overcrowding and death.

2.3 Experimental Design

A simple random sampling technique was used to select the base population. Both the base population and the progenies used in the study were arranged in a Completely Randomized Design (CRD) into six treatments and two replicates each.

2.4 Growth Traits Measured

Body Weight (BW): The weights of the chicks were measured right after they hatched using a special scale and then every week until they were 6 weeks old.

Body Linear Measurement: A measuring tape was used to measure body length, shank length, wing lengths, and breast girth of the body every week until it reached maturity (6 weeks).

Body Length (BL): The distance from the tip of the beak to the base of the tail. This was done by ensuring the bird was in a natural standing position to get an accurate reading.

Shank Length (SL): The length of the leg from the hock joint to the foot was measured while the bird was held upright.

Wing Length (WL): This was measured from the shoulder joint to the tip of the longest primary feather.

Breast Girth (BG): The circumference around the breast area was taken by wrapping a measuring tape around the widest part of the breast, ensuring that it is snug but not too tight.

2.5 Reproductive Traits

Fertility: Fertility was calculated by counting all the eggs that were set. The percentage of fertility was shown as:

$$Fertility = \frac{\text{Number of fertile eggs}}{\text{Total egg set}} \times 100 \dots \text{Equation 2.1}$$

Embryonic Mortality: This is the fertilized embryo that did not survive before hatching. This was measured at two levels of embryo mortality: early and late mortality. Early embryo mortality was found by checking the eggs at 7 days to see which ones did not survive at that point. Late embryo mortality was determined at 14 days of incubation to see which embryos did not make it at that stage. After hatching, eggs that did not fully develop into a chick or developed into a chick but did not survive before hatching were considered late embryonic mortality.

$$\% \text{ Early embryonic mortality} = \frac{\text{Number of dead embryo at 7 days}}{\text{Total number of fertile eggs}} \times 100 \dots \text{Equation 2.2}$$

$$\% \text{ Late embryonic mortality} = \frac{\text{Number of dead embryo at 14 days}}{\text{Total number of fertile eggs}} \times 100$$

.....Equation 2.3

Hatchability: The hatchability rate was determined by looking at the number of fertile eggs compared to the total number of eggs set.

$$\% \text{ Hatchability based on fertile egg} = \frac{\text{Number of hatched chicks}}{\text{Total number of fertile eggs}} \times 100$$

.....Equation 2.4

The ability to reproduce (Percentage of eggs that hatch out of all eggs laid)

$$\text{Reproductive capacity} = \frac{\text{Number of hatched chicks}}{\text{Total egg set}} \times 100$$

.....Equation 2.5

2.6 Data Analysis

The data collected on reproductive and growth performance parameters were analysed using the SPSS Statistical Software (2011) with a One-way Analysis of Variance (ANOVA). Where significant difference was observed, the means were separated using the Duncan Multiple Range Test (DMRT) (Duncan, 1955). The statistical model used was as follows:

$$Y_{ijk} = \mu + S_i + e_{ij}$$

Y_{ij} = the j^{th} observation on the i^{th} Sire

μ = Overall mean

S_i = Fixed effect of the i^{th} sire (1, 2, 3, 4, 5 and 6)

e_{ij} = Random residual error

3.0 Results and Discussion

Table 3.1 displays how the sire influences the reproductive performance of Japanese quails. The sire did not have a significant impact ($P>0.05$) on the reproductive performance of Japanese quails. In this study, the fertility percentages for various sires matched the range of 66.70 – 85.8 % found by Sachadev *et al.* (1985). The results also aligned with Oke (2002), who noted a fertility percentage range of 70.58 -73.19 in Guinea fowl. However, some sires in our study had higher values compared to those reported by Oke (2002). In the study, the hatchability percentage was higher than the range of 50.41–57.17% that was reported for the three strains. This was lower than what Aboul-Hassan *et al.* (1999) reported, and hatchability is important for breeding any type of breed successfully. The variation in results could be because of differences in laying rate and pre-incubation storage, as mentioned by Screenivasaiiah *et al.* (1987).

Table 3.2 shows how sire affects the weight and body measurement (size) of Japanese Quails. Sire effect was significant (<0.05) on BW and all the linear body measurements, considered with the exception of BG. Highest BW was recorded against Sire 3 and Sire 4 while the least BW was recorded against Sire 5 and Sire 6. Sire 6 had the highest BL (13.27 ± 0.10), followed by Sire 3 (12.59 ± 0.10), while Sire 4 had the least BL (11.89 ± 0.10). While the SL of Sires 1, 2, 3, 5 and 6 were similar and Sire 4 had the longest shank (4.32 ± 0.03). Sire 3 had the longest wings (9.15 ± 0.05), followed by Sire 4 (8.94 ± 0.05), with Sire 1 having the least (8.54 ± 0.05).

The sire's effect on BW indicates that the genetic contribution from the father (sire) plays a notable role in determining the body weight of the offspring. This suggests that sires with superior genetic potential for growth may pass on desirable traits, leading to heavier offspring. The sire's genetic influence on BW could be an important factor for selective breeding programs aimed at improving the size and meat production of Japanese quails (Oke, 2002). The sire effect was significant for various linear body measurements, implying that the genetic contribution of the sire has a substantial impact on traits such as length of the body, wings, or shanks. These linear measurements are often correlated with growth, feed conversion efficiency, and overall body conformation. While sire had a significant effect on BW and most linear body measurements, it did not show a significant effect on BG. This could suggest that factors other than genetics, such as environmental conditions or maternal influence, might play a larger role in determining body girth.

Effect of sire on growth performance of Japanese Quails is presented in Table 3.3. The result shows that sire had no significant effect ($P>0.05$) on the growth performance of Japanese quails. All the sires 1 - 6 had similar IBW, FBW, GR and BWG. The growth performance indicators revealed that the starting body weight, ending body weight, rate of growth, and weight gain were not significantly ($P>0.05$) different among the six sires of Japanese quails. This suggests that adult quails are able to maintain their body weight consistently. The lack of significant sire influence on these parameters suggests that the sires in this study were genetically similar regarding their impact on growth performance. This could imply that the genetic variation among the sires for growth-related traits (such as feed efficiency, metabolic rate, or growth potential) was low.

Table 3.1: Effect of sire on reproductive performance of Japanese quails

Parameters	Sire 1	Sire 2	Sire 3	Sire 4	Sire 5	Sire 6	P-Value
Fertility	76.65±6.45	83.16±2.95	78.55±2.68	81.10±5.10	79.68±2.76	81.11±6.34	0.9390 ^{NS}
Early embryonic mortality	8.51±4.26	7.99±2.03	0.00±0.00	3.51±3.51	6.01±3.80	4.11±2.41	0.4090 ^{NS}
Late embryonic mortality	8.30±3.05	14.47±4.03	11.67±6.01	6.68±3.35	8.33±8.33	9.32±3.42	0.8980 ^{NS}
Hatchability	83.19±1.32	77.50±5.47	88.33±6.01	89.81±6.09	85.65±8.68	86.57±1.19	0.6760 ^{NS}
Reproductive capacity	63.87±5.94	64.74±6.40	69.30±4.61	72.87±6.71	68.28±7.26	70.33±6.22	0.9040 ^{NS}

Table 3.2: Effect of sire on body weight and linear body measurement of Japanese quails

Trait	Sire 1	Sire 2	Sire 3	Sire 4	Sire 5	Sire 6	P- value
BW (g)	61.45±0.62 ^b	61.65±0.62 ^b	63.24±0.62 ^{ab}	63.66±0.62 ^a	58.68±0.62 ^c	58.68±0.62 ^c	0.0000*
BL (cm)	12.44±0.10 ^{bc}	12.20±0.10 ^c	12.59±0.10 ^b	11.89±0.10 ^d	12.50±0.10 ^{bc}	13.27±0.10 ^a	0.0000*
BG (cm)	9.45±0.08	9.49±0.08	9.49±0.08	9.67±0.08	9.52±0.08	9.48±0.08	0.5260 ^{NS}
SL (cm)	3.98±0.03 ^b	3.96±0.03 ^b	4.02±0.03 ^b	4.32±0.03 ^a	3.97±0.03 ^b	4.00±0.03 ^b	0.0000*
WL (cm)	8.54±0.05 ^d	8.83±0.05 ^{bc}	9.15±0.05 ^a	8.94±0.05 ^b	8.80±0.05 ^c	8.88±0.05 ^{bc}	0.0000*

Table 3.3: Effect of sire on growth performance of Japanese quails

Trait	Sire 1	Sire 2	Sire 3	Sire 4	Sire 5	Sire 6	P-value
IBW	6.83±0.44	6.83±0.44	6.44±0.44	6.55±0.44	6.73±0.44	6.45±0.44	0.9720 ^{NS}
FBW	125.86±1.55	125.80±1.55	126.50±1.55	128.26±1.55	125.12±1.55	124.90±1.55	0.6920 ^{NS}
GR	2.43±0.03	2.43±0.03	2.45±0.03	2.48±0.03	2.42±0.03	2.42±0.03	0.6820 ^{NS}
BWG	242.93±3.26	242.79±3.26	245.01±3.26	248.38±3.26	241.62±3.26	241.74±3.26	0.6560 ^{NS}

IBW = Initial body weight; FBW = Final body weight; GR = Growth rate; BWG = Body weight gain (P<0.05), BW = Body weight; BL = Body length; BG = Breast girth; SL = Shank length; and WL = Wing length, NS= Not significant, ^{abc} means within a row with different superscripts differs significantly

4.0 Conclusion and Recommendation

It was concluded from the findings of this study that selection could be done based on sire for rapid improvement in Japanese quails. Sire 6 showed better genetic potential, leading to higher body weight in the offspring compared to other sires, so it is suggested for use.

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