Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 17, Issue, 08, pp.34460-34465, August, 2025
DOI: https://doi.org/10.24941/ijcr.49439.08.2025

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

LAYING AND EGG QUALITY OF POPULATIONS OF JAPANESE QUAIL (Coturnixjaponica), TEMMINCK SCHLEGEL, 1848 NT) REARED IN SOUTHERN COTE D'IVOIRE

Brahima Soro[1]*, Kpahé Herbert-Michael Kanh[2], Isidore Kouadio Kpandji[1], Sandy N'dadjiban Bohoussou[1], Barnabe Bakary[3], Adama Bem[1] and Didier Paulin Sokouri[1]

[1]Laboratory of Biotechnology, Agriculture and Valorisation of BiologicalResources, UFR Biosciences, University Félix Houphouët-Boigny, Côte d'Ivoire, 22 BP 582 Abidjan 22, Côte d'Ivoire; [2]Department of Biochemistry and Genetics, Peleforo Gon Coulibaly University, Côte d'Ivoire, BP 1328 Korhogo, Côte d'Ivoire; [3]Lamé Agricultural and Fisheries Society, 01 BP 3446 Abidjan 01. Adzopé - Côte d'Ivoire

ARTICLE INFO

Article History:
Received 11th May, 2025
Received in revised form
24st June, 2025
Accepted 19th July, 2025
Published online 30th August, 2025

Keywords:

Reproductive Performance, Phenotype, Japanese Quail, Ivory Coast.

***Corresponding author:**
Sanihe Ariijii

ABSTRACT

The Japanese quail (Coturnix japonica) is a Galliformes and Phasianidae family domestic bird. It is a very interesting bird because of the nutritional quality of its meat and eggs. This study aimed to evaluate the reproductive performance of the Japanese quail Coturnix japonica. This study was conducted at the Société Agropiscicole de la Mé in Adzopé, Côte d'Ivoire. A total of 72 female quails of white, black, and isabella phenotype aged 9 weeks were laid. The results showed that the Japanese quail had an acceptable egg-laying rate over the four weeks of the experiment (from 38.89% to 54.76% at 9 weeks, rising to 80% to 90% at 11 weeks). The black phenotype exhibits an interesting feed conversion index for egg production. The average egg weight was 12.37 g with an average shape index of 78.41 cm. The shell, white, and yolk weights were 1.18, 8.38, and 3.84 g, respectively, corresponding to proportions of 9.51%, 50.06, and 31.93%, respectively. Eggs of the isabelle phenotype exhibited higher yolk weights and proportions than those of the other phenotypes.

Citation: Brahima Soro, Kpahé Herbert-Michael Kanh, Isidore Kouadio Kpandji, Sandy N'dadjiban Bohoussou, Barnabe Bakary, Adama Bem, and Didier Paulin Sokouri. 2025. "Laying and egg quality of populations of japanese quail (coturnixjaponica), temminck schlegel, 1848 nt) reared in southern cote d'ivoire". *International Journal of Current Research, 17, (08), 34460-34465.*

INTRODUCTION

Throughout the world, poultry farming has focused mainly on the production of chicken eggs and broilers. Poultry specialists have become interested in quail farming, also referred to as coturniculture, as a novel approach to enhancing diversity in poultry farming, offering consumers further flavor options and increasing meat output to meet the growing demand for animal protein (Ukashatu et al., 2014). Quails are farmed worldwide for their therapeutic properties. Their eggs strengthen the immune system, promote healthy memory, increase brain activity, and stabilize the nervous system. They treat anemia by increasing hemoglobin levels while eliminating toxins and heavy metals. (Tunsaringkarn et al., 2013). The Japanese quail (*Coturnix japonica*) belongs to the Phasianidaes family. Domestic quail species are commonly used as research models for animal physiology, genetics, nutrition, endocrinology, pathology, reproduction, and immunology (Huss et al., 2008). It is less susceptible to certain chicken diseases, such as coccidiosis and salmonellosis (Jatoi et al., 2013 ; Rahman et al., 2016). Since the 1960s, the Food and Agriculture Organization of the United Nations (FAO) has offered assistance to countries to characterize their animal genetic resources for food and agriculture and to develop conservation strategies. The FAO Council advised on the establishment of a global initiative in 1990 for environmentally sustainable management of genetically modified animals. Characterization of animal genetic resources includes all activities related to identifying, qualitatively and quantitatively assessing, and recording animal populations.

The main aim of this research is to acquire a more in-depth comprehension of the genetic resources of animals, including their present and prospective future applications in the food and agriculture industries within specified environments, and their current standing as distinct racial groups **(FAO, 2012).** Currently, very little data are available on the egg-laying performance of different quail phenotypes raised on Côte d'Ivoire's SAP La Mé farm. This study aimed to determine the production performance of quail (Coturnix japonica) populations reared at the SAP la Mé farm in Adzopé, Côte d'Ivoire.

MATERIAL AND METHODS

Study site: The Société Agropiscicole de la Mé coturniculture farm is located in the Mé region. The town of Adzopé, the capital of the Mé Region and Department, is located in the southern part of Côte d'Ivoire, 105 km from Abidjan. Located on its northern border is the Department of Akoupé, with the Department of Abengourou situated to its north-east, the Department of Alépé to the south, the Department of Yakassé-Attobrou to the east, and the Department of Agboville to the west. It has six sub-prefectures: Adzopé, Annepé, Agou, Yakassé-Mé, Assiko, and Bécédi-Brignan (Figure 1). Adzopé has a humid tropical climate with a relatively constant temperature of approximately 27.5°C and four seasons of unequal length. The average annual rainfall ranges between 1,350 and 1,400 m. The average relative humidity currently stands at 75%. The prevailing winds are from the southwest.

Animals used and experimental conditions: At the age of 60 days, 72 white, isabella, and black quails were placed in 9 cages (6 females and 2 males per cage, i.e., a sex ratio of 3 females/male). After the breeding birds were placed in the cages, the cage enclosure was exposed to a 24-hour lighting program consisting of 10 and 14 hours of natural light and 14 hours of artificial light. The average temperature and humidity in the enclosure were 27°C and 70%, respectively. Lighting was provided by 100-watt bulbs. During the finishing phase, lighting was only used at night because of the darkness in the building. The average temperature and humidity in the enclosure were 27°C and 70%, respectively.

The feed distributed during the laying phase was special quail feed, as described by the company (Table I). The quails were fed with 3000 kcal/kg of feed and 20.60% crude protein. Feed rationing was adhered to throughout the experiment, with daily weighing of distributed feed and refusals using a scale accurate to within 1 g. A prophylaxis program was administered to the quails throughout the trial period. An anti-stress, anti-coccidial, anti-parasitic, and hepatoprotective agent was administered every 3 days. During the experiment, the birds were housed in a building measuring 20.5 m long and 10.7 m wide, covering an area of 219.35 m

Parameters studied

Average breeding bird weight: Throughout the rearing period, the individual body weights of the birds were weighed each week before they were fed, allowing the calculation of average weekly weights for both male and female birds separately.

$$\text{Average weight(g)} = \frac{1}{\text{number ofindividuals}} \sum \text{individual weights}$$

Feed consumption: Food consumption corresponds to the quantity of food ingested by an animal when it has free access to it. The amount of feed consumed was determined by weighing the daily feed allocation and leftovers. Each week's amounts were combined, and the total amount of feed ingested was calculated by subtracting the quantity distributed from the quantity refused (Tsivingaina, 2005).

Feed intake = feed distribution - refusals

Laying rate: The laying rate is obtained by collecting daily laid eggs. Eggs were collected daily, which enabled the calculation of weekly egg production or laying rate.

$$\text{Laying rate (\%)} = \frac{\text{number of eggs laid X 100}}{\text{number of laid quails}}$$

Feed conversion index: The feed conversion index is the amount of feed consumed to produce 1 g of egg. The ratio between the quantity of feed ingested per week and the number of eggs laid or the weight of eggs corresponding to this period is calculated.

$$\text{Conversion rate (\%)} = \frac{\text{amount of food consumed}}{\text{number of eggs lais}}$$

Evaluation of egg quality: The eggs were collected daily, cleaned, and preserved for laboratory analysis. A total of 45 eggs (15 per phenotype) were washed, numbered, and analyzed in the laboratory. The study of egg quality involved assessing the external and internal characteristics of quail eggs. The eggs were individually weighed using a 0.1g precision electronic balance. The length and width of the egg were determined using a 0.01 mm precision electronic caliper. The shape index was also determined. The shells were washed with water to remove any remnants from inside the egg, dried at room temperature for a day, and weighed on a 1g precision electronic balance. The shell strength index was determined (Sauveur, 1988 ; Protais, 1994). After separation, the albumen and yolk were weighed separately using a 1 g precision electronic balance to determine their proportions (Silversides and Scoot, 2001 ; Çağlayan et al., 2009).

Statistical analysis: The collected data were recorded on a Microsoft Excel spreadsheet and analyzed using STATISTICA 7.1 software. The descriptive statistics (mean, standard deviation, minimum, and maximum) were estimated for each quantitative trait in each phenotypic group. Parametric data were then compared using a one-factor analysis of variance followed by Tukey's multiple comparison test for parameters showing variability ($p < 0.05$) to identify specific differences between phenotypes. The p-value was set at 5%, as was the alpha "α" of the test with a 95% confidence interval (CI).

RESULTS

Laying performance

Average weight of broodstock: The results of the statistical analysis showed no significant difference between the males of the different phenotypes during the entire experimental period. A notable distinction was found in females between the Black and Red phenotypes from the 2nd week of the study. For all phenotypes, sexual dimorphism was very marked, with a greater weight observed in females (Table 1). The different phenotypes exhibited weight variations during the experimental period. Breeding weights varied between 277.8 and 302.8 g (Table II).

Feed consumption: The daily food intake during the egg-laying phase is shown in Table III. Statistical analysis showed no significant difference between the different phenotypes during the first week of the experiment. Significant differences were observed between the different phenotypes from week 2

Table I. component of Japanese quail laying feed

Ingredients	Quantity (%)

Shell	10
Palm oil	1
Maize	60
Concentrated feed	2,5
Soya meal	25
Wheat bran	1,5

Table II. Average weight of breeding stock during experimental period

		White	Black	Isabella
Week 9	**Males**	283.7±28.38[b]	265.3±12.69[b]	274.7±19.62[b]
	Females	293.1± 26.72[a]	290.3±18.74[a]	311±36.72[a]
	Global	288.4	277.8	292.85
Week 10	**Males**	292±20.12[a]	271±15.43[a]	283±23.38[a]
	Females	297.6±28.19[ab]	286.6±20.71[a]	309.9±35.75[b]
	Global	294.8	278.8	296.45
Week 11	**Males**	296.3±17.04[b]	276.3±15.87[b]	291±27.18[b]
	Females	305.3±27.09[ab]	292.6±21.02[a]	315±34.38[a]
	Global	300.8	284.5	303
week 12	**Males**	289.3±7.87[b]	281.3±14.35[b]	292.7± 12.93[b]
	Females	307±27.77[a]	295±23.06[a]	312.9±34.62[a]
	Global	298.15	288.5	302.8

Mean±Standard deviation. Means marked with the same letters in the same column do not differ significantly at the 5% level ($p<0.05$).

Table III. Food consumption (g/subject/day) of quails according to phenotype

	White	Black	Isabelle
Week 9	53.33±2.6[a]	56.81±5.85[a]	60.88 ±7.79[a]
Week 10	51.25±5.04[a]	44.36±3.46[b]	60.49±4.41[a]
Week 11	55.38±3.87[a]	43.67±1.56[b]	61.67±2.96[a]
Week 12	53.23±3.35[a]	42.43±4.48[b]	61.1±4.07[a]

Mean±Standard deviation. Means marked with the same letters in the same column do not differ significantly at the 5% level ($p<0.05$).

Table IV. Conversion index (g/subject/layed egg) of laying quails according to phenotype

	White	Black
Week 9	9.16±7.90[a]	8.66±2.72[a]
Week 12	3.44±0.75[a]	3.03±0.46[b]

Mean±Standard deviation. Means marked with the same letters in the same column do not differ significantly at the 5% level ($p<0.05$).

to the end of the experiment. Food consumption was relatively constant in the isabella phenotype (61.04 ± 4.81). In the white phenotype, food consumption decreased in week 2 (from 53.33±2.6 to 51.25±5.04) and in the fourth week (from 55.38±3.87 to 53.23±3.35). In the black phenotype, there was a progressive decrease in food consumption during the experiment (from 56.81±5.85 to 42.43±4.48).

Spawning rate: The results of the statistical analysis showed no significant difference between the different phenotypes during the experimental phase (Figure 2). The oviposition rate varied throughout the experimental period. At the start of the experiment at 9 weeks of age, the black phenotype had a lower egg-laying rate (38.89±9.62) than the white (44.44±18.15) and isabelle (54.76±24.52) phenotypes. At the 11th week, all phenotypes had relatively close egg-laying rates, including the white phenotype (91.27±10.57), black phenotype (81.75±10.98) and the isabelle phenotype (86.51±11.04).

Feed conversion index: Table IV presents the evolution of the feed conversion index (g/subject/layed egg). In thisThisvaried from 7.39 to 9.16 for layers at the start of laying and from 3.44 to 3.84 for those aged 12 weeks (Table IV). Furthermore, the conversion index for layers at the start of laying decreases as the age of the animals increases. Statistical analysis. No significant difference was observed between the different phenotypes during the first week of the experiment ($p > 0.05$). However, during the other three weeks, there was a significant difference between the white and black phenotypes ($p<0.05$). ThroughouAll phenotypes showed a decrease in this index throughout the experiment.rease was greater in the black phenotype. The value decreased from 7.39 to 3.84 grams per subject per day, as indicated in Table IV.

The external and internal characteristics of the egg: Statistical analyses of various phenotypes found no significant variations in egg weight, length, and width, shape index, shell weight, strength index, shell thickness, spawn weight, proportion of spawn, and yolk colour (Table IV). However, for weight and proportion of yolk, there was a significant difference ($p<0.01$) between the white and black phenotypes and the isabelle phenotype.

DISCUSSION

The average weight of females was higher than that of males, regardless of the phenotype. Sexual dimorphism can explain this. In Japanese quail, females are heavier than males. In our experiment, the weight variation was between 5 and 10 g in the white phenotype, 14 and 25 g in the black phenotype, and 20 to 37 g in the isabella phenotype. The weight variations observed in this study can be explained by stress. Quails are very sensitive to various stresses and easily lose weight. The weights measured in this experiment (ranging from 277.8 to 302.8 g) were greater than those recorded by Mohammed (2000). He observed a weight of 179.68g for subjects aged 6 months on a 2500 kcal diet. Research in a hot and humid climate in eastern India, as reported by Banerjee (2010), yielded live weights ranging from 216 to 250 g by day 50, suggesting that diet, climate, and rearing methods can affect the live weight of quails (Banerjee, 2010 ; Berrama *et al*., 2011 ; Tarhvel *et al*., 2012 ; Hantanirina, 2013). The food consumption values obtained in our experiment (42.43–61.67 g) are higher than those reported by Mohammed (2000). In his study, the daily feed consumption of a quail between 8 and 18 weeks of age were 23.99 g on a 2500 kcal diet.

On day 63, Sadi *et al.* (2007) found a value of 21.62–22.06 g for a diet based on an "Oregano" essential oil residue, indicating that the type of diet fed to the animals influenced the quantity of feed consumed. The laying rate for the study period (9–13 weeks of age) varied between 38.89% and 91.27%. This is due to the egg-laying peak of the Japanese quail that has not yet been reached. The quail's laying peak occurs between the 4th and 5th months and decreases after the 6th month (Lucotte, 1975). Amoah *et al.* (2010) found that feeding rice to laying quails at 10 and 13 weeks of age resulted in laying rates of 94.76% and 80.71%, respectively. Soares *et al.* (2003) reported an 80.88% egg-laying rate on day 63 in birds fed a diet containing 18% protein. Sadi *et al.* (2007) reported an egg-laying rate of 87.4%. Phenotypes had no effect on egg production at the start of laying. Razafimandimby (2013) reported that the laying rate varied according to the phenotype from the age of 6 months (24 weeks). Therefore, this parameter is influenced more by the rearing conditions during this period. The feed conversion index reflects the feed efficiency. It indicates the quantity of feed ingested to obtain one gram of egg or 1 egg. The feed is

Table V. External and internal parameters of Japanese quail eggs according to phenotype

Phenotypes	White	Black	Isabelle
	n=15	n=15	n=15
Egg weight	12.27± 0.96[a]	12.47± 0.74[a]	11.87±0.74[a]
Egg length	33.56±1.13[a]	33.52±0.99[a]	33.05±1.28[a]
Egg width	26.17±0.75[a]	26.32±0.58[a]	26.02±0.56[a]
Shape index	78.07±3.18[a]	78.56±1.84[a]	78.59±2.97[a]
Shell weight	1.13±0.35[a]	1.2±0.41[a]	1.2±0.41[a]
Shell proportion	9.27±2.83[a]	9.08±3.93[a]	10.18±3.68[a]
Shell strength index	20.88±6.47[a]	22.08±7.58[a]	22.16±7.66[a]
Shell thickness	0.89±0.27[a]	0.94±0.32[a]	0.94±0.33[a]
Weight of blank	6±1[a]	5.87±0.92[a]	6.33±0.90[a]
blank proportion	48.72±5.34[a]	47.99±5.79[a]	53.46±7.37[a]
Weight of egg yolk	3.6±0.51[a]	3.8±0.41[a]	4.13±0.35[b]
Proportion of yolk	29.31±3.14[a]	30.52±3.22[a]	35.97±3.27[b]

Mean±Standard deviation. Means marked with the same letters in the same column do not differ significantly at the 5% level (p<0.05).

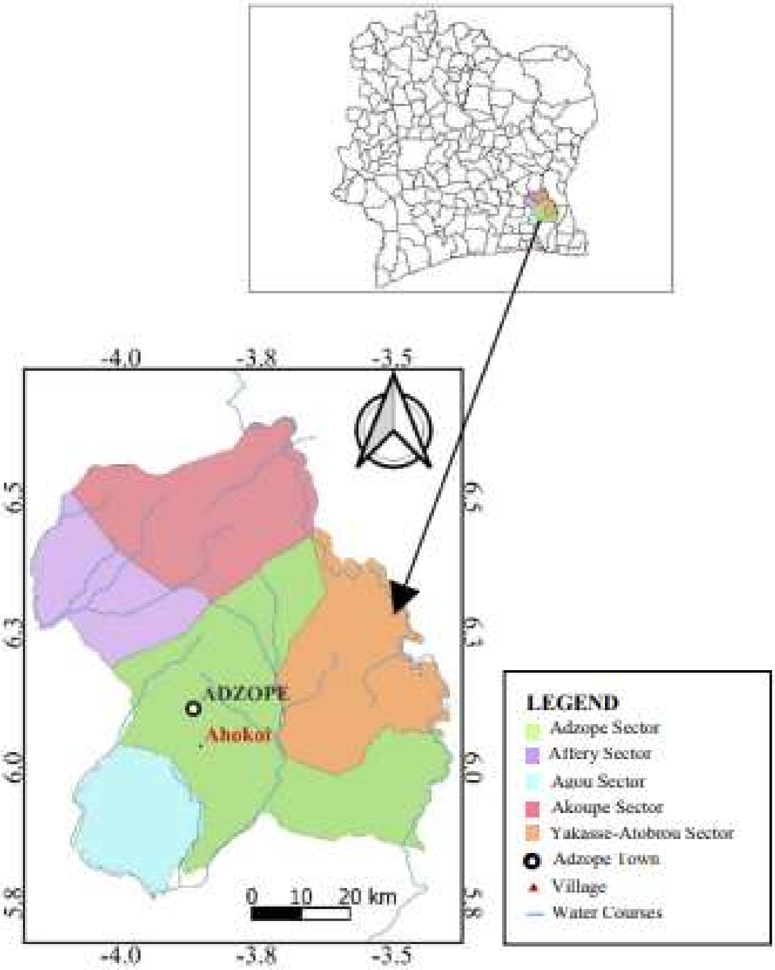

Figure 1. Study site

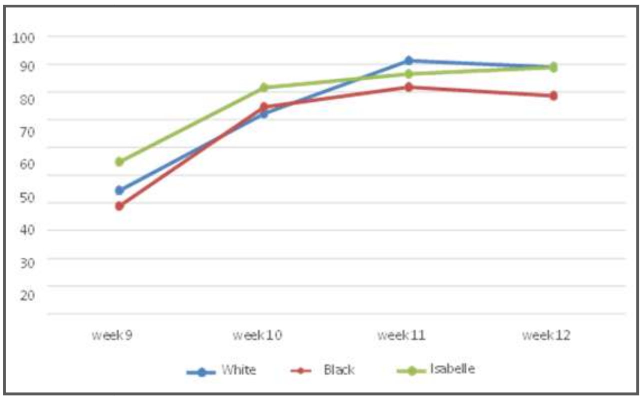

Figure 2. Evolution of the Japanese quail laying rate as a function of phenotype

efficient when the index is low. In our experiment, we observed a decrease in the feed conversion index of the different phenotypes over the 4 weeks. This can be explained by the fact that the feed conversion index of laying hens at the start of laying decreases as the age of the animals increases. Adult quails are better feed processors than younger ones. The black phenotype showed the lowest conversion index, indicating that it assimilates feed better than the other phenotypes. According to Razafimandimby (2013), this index generally remains stationary at the age of 6 months. For producers and consumers alike, egg weight is the crucial parameter, particularly in circumstances where eggs are produced by small poultry breeds, and their weight is significantly lower, typically several times less than the standard weight of a hen's egg (60 - 63 g) (Genchev, 2012). Egg weight was not influenced by the phenotype in our study. The average egg weight in this study was 12.73 g. Our results are close to those reported by Zita *et al.* (2013), who observed weights between 11.96 and 12.69 g between weeks 9 and 13. These results are superior to those of Ouaffai *et al.* (2018) who analysed egg weight variations as a function of density. These results are also superior to those of N'gbo *et al.* (2023), who studied egg weight as a function of diet. These results show that the weight of eggs in Japanese quails can be linked to the type of production and housing density, apart from genetics. The length and width of Japanese quail eggs did not vary according to phenotype. The mean values were 3.34 and 2.62 cm. These results are close to those reported by Ouaffai et al. (2018), who reported length and width values of 3.25 and 2.54 cm, respectively. Egg length and width are not influenced by phenotype or rearing conditions. Umba *et al.* (2022) reported that egg length and width are functions of age. This similarity can be explained by the fact that the shape index did not vary according to phenotype. The mean value was 78.41. Our values are also close to the results obtained by Hrncar et al. (2014) for meat-type quail eggs (78.18), but this author observed lower values in laying-type quail (76.7). Our results are superior to those reported by Genchev (2012), who reported a shape index of 78.08 at the start of egg laying in Pharaoh quail. During the experiment, Genchev demonstrated that the form index decreased with the age of the layers. According to Nedeljka Nikolova (2006), the youngest clutches have higher shape indices and rounder eggs, which explains the values obtained during our 4-week experiment. The results of our experiment showed no significant difference in weight and white blood cell proportion among the three phenotypes. However, the weight and proportion of yolk were greater in the isabelle phenotype than in the other two. In our experiment, the average weights of the white and yellow samples were 8.38 and 3.84 g, respectively, giving relative proportions of 50.06% and 31.94%, respectively. These results are superior to those of Ouaffai et *al.* (2018), who obtained the sphere's average white and yellow weights 5.8 and 3.5 g, i.e., 50.3% and 30.4%.

The shell weight and proportion did not vary according to the phenotype. Their mean values in our experiment were 1.18 and 9.51, respectively. These results are lower than those of Ouaffai et al. (2018), who observed an average shell weight of 1.4 g or a proportion of 12.8 g. Our results are also lower than those of N'gbo (2023). However, our results are similar to those reported by Djinandji et al. (2022) for the control and subjects treated with 5% moringa leaf powder. The shell thickness varies with the rearing conditions. The mean shell thickness value did not vary according to phenotype in our experiment. Its mean value was 0.92 mm. The obtained results surpass those documented by de Bensalah (2016) and Djinandji et al (2022), as well as N'gbo (2023). Furthermore, studies by Ahmadi and Rahimi (2011) and Gerber (2006) indicated that several factors, including feed and water quality, age and variety, stress levels, and elevated temperatures, can affect bird shell quality.

CONCLUSION

The reproductive performance of the Japanese quail (*Coturnix japonica*) was examined. The results show that the quail with the isabella phenotype has the best egg-laying performance. Black quail had a better feed conversion index. The external and internal characteristics of the eggs were similar across all phenotypes. The Japanese quail is a bird that is easy to rear, adapts well to our climatic conditions, and is of significant economic and social interest. In the future, it could become a significant source of protein after chicken.

CONFLICT OF INTERESTS: The authors have not declared any conflict of interests.

ACKNOWLEDGEMENTS: The authors would like to thank the management of SAP Lamé for enabling this work.

REFERENCES

Ahmadi, F. and Rahimi, F. (2011) Factors Affecting Quality and Quantity of Egg Production in Laying Hens: A Review. World Applied Sciences Journal, 12, 372-384

Amoah J., Martin E., 2010, Quail (Coturnix coturnix japonica) layer diets based on rice bran and total or digestible aminoacids, Journal of Applied Biosciences 26 : 1647-1652p

Banerjee,2010. Carcass studies Japanese quail (Coturnix coturnix japonica) Reared in hot and humid climate in eastern India, World Applied Sciences Journals: 174 – 176

Bensalah, A. (2016) Effets de quelques formules alimentaires sur les performances zootechniques et le profil Biochimique de la caille japonaise. Mémoire de Magistère en sciences vétérinaire. Département de Productions Animales, Université des Frères Mentouri Constantine, Constantine, Algeria, 131 p.

Berrama, Z, Mefti, H, Kaidi, R, and Souames, S 2011, Zootechnical characterization and genetic parameters of the growth performance of the Japanese quail Coturnix japonica reared in Algeria', Livestock Research for Rural Development, vol, 23, no 1.

Çağlayan, T., Alaşahan, S., Kırıkcı, K. et Günlü, A., 2009. Effect of different egg storage periods on some egg quality characteristics and hatchability of partridges (Alectorisgraeca). Poultry Science, 88, p.1330-1333.

Djinandji M.G., Ernest Z.N.G., Brahima K. et Koffi K., 2022 Effets de la poudre de feuilles de Moringa oleifera sur la croissance, la ponte et la qualité des oeufs de la caille Coturnix japonica en élevage en Côte d'Ivoire, (1) : 9162-9172.

Genchev, A 2012, Quality and composition of japanese quail eggs (*Coturnix japonica*), Trakia Journal of Sciences, vol, 10, no. 2, pp. 91-10.

Hantanirina, J. M. O., & Benbow, S. 2013. Diversity and coverage of seagrass ecosystems in south-west

Madagascar. African Journal of Marine Science, 35(2), 291-297.

Hrncar C, Hanusova E, Hanus A et Bujko J. 2014 Effect of genotype on egg quality characteristics of japanese quail (Coturnix japonica). National Agricultural and Food center. Research Institute for Animal Production Nitra. Slovak Journal of Animal Science 47 (1) : 6-11.

Jatoi, A. S., Khan, M. K. Sahota, A. W. Akram, M. Javed K., Jaspall M. H., Khan S. H. (2013). Post-peak egg production in local and imported strains of Japanese quails (*Coturnix coturnix japonica*) as influenced by continuous and intermittent light regimens during early growing period. Journal of Animal and Plant Sciences, 23 (3) : 727-730.

Lucotte G 1975 La production de la caille. Edition Vigot frères, Paris, 79 p.

Mohammed A., 2000, Effect of dietary energy on some productive and physiological Traits in Japanese quail (CoturnixCoturnix Japonica), B. Sc., Agric. Sci. (Animal production), AL-AZharUniv, 176p

N'gbo Martin Luther King, Disseka William Kwithony,Tchumou Messou & Kouamé Lucien Patrice,2023. Caractéristiques physiques et organoleptiques des oeufs et de la chair de caille japonaise nourrie avec les trois régimes alimentaires différents à base de produits locaux en Côte d'Ivoire. International Journal of Innovation and Applies Studies ISSN 2028 – 9324 Vol.40 No. 1445 – 1457.

Nedeljka Nikolova, DK.2006 Foming egg shape index as influenced by ambient tempertaures and age of hens. Biotechnology in Animal Husbandry 22 (1 – 2) : 119 – 125.

Ouaffai, A., Dahloum, L., Fassih, A., Milagh, M. and Halbouche, M. (2018) Growth Performances, Egg Laying and Egg Quality in Japanese Quails (Coturnix coturnix japonica). Archivos de Zootecnia, 67, 168-176. https://doi.org/10.21071/az.v67i258.3651

Rahman, M.M., Abe, S.K., Rahman, M.S. 2016. Maternal Anemia and Risk of Adverse Birth and Health Outcomes in Low- and Middle-Income Countries : Systematic Review and Meta-Analysis. American Journal of Clinical Nutrition, 103, 495-504. https://doi.org/10.3945/ajcn.115.107896

Razafimandimby, N. 2013. Zootechnical performance of Japanese quail (Coturnix japonica) in Madagascar. Dissertation for the diploma of Agricultural Engineer, Livestock option, 90p.

Sadi C., Bayram I., Akkaya B., Uyrlar C., Sahin H., Sengor E., 2007, Utilisation of Oregano (origanumonites) in laying quails (*Coturnix Coturnix Japonica*) : the effects oregano on performance carcass yield, liver and some blood parameters, Archiva Zootechniva vol 10, 57-65p

Soares R., Fonsera Jb., Santos As., Mercandante Mb., 2003, Protein Requirement of Japanese quail (*Coturnix coturnix japonica*) during rearing and laying periods, Brazilian Journal of Poultry Science v5/n2/ 153-156p

Tarhvel R., Tanimomo B., Hena S., 2012, Effect of sex, color and weight group on carcass characteristics of Japanese quail, Scientific Journal of Animal Science 1(1): 22-27p

Ukashatu, S. Bello, A. Umaru, M. A. Onu, H. E. Shehu, S. A. Mahmuda, A. Saidu, B. A. 2014. Study of some serum biochemical values of Japanese quails (Coturnix Coturnix japonica) fed graded levels of energy diets in Northwestern Nigeria. Scientific Journal of Microbiology 3 (1) : 1-10. DOI: 10.14196/sjmi.v3i1.1175

Umba M.J, Boloko. B.A., Luyau D.J, Badibanga K.D. et Kabamba M.M.W,2022. Effets d'incorporation de poudre de feuille de Moringa oleifera à deux rations commerciales sur le rapport entre le jaune et le blanc d'oeufs de la caille japonaise (*Coturnix coturnix japonica*). Journal of Animal and Plant Sciences J.Anim.Plant Sci. ISSN 2071 – 7024) Vol.53 (3) : 9777 – 9793.

Tunsaringkarn,T. Tungjaroenchai, W. Siriwong,W. 2013. Nutrient benifics of quail (*Coturnix coturnix japonica*) eggs. International Journal of Scientific and Research, Volume 3, Issue 5, May 2013 ISSN 2250-3153.

Zita L., Ledvinka Z. & Klesalova L (2013). Effet de l'âge de la caille japonaise sur la qualité des oeufs. In V et Arch, 83 : 223 – 232.

****