International Journal of Innovative Research and Advanced Studies (IJIRAS)
Volume 4 Issue 1, January 2017

ISSN: 2394-4404

Egg Production Pattern Of Japanese Quail (Coturnix Coturnix Japonica) In Northern Guinea Savannah Zone Of Nigeria

Kaye, J.

S. J. Luka

Department of Animal Production, Faculty of Agriculture, University of Jos

G. N. Akpa

Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Zaria

I. A. Adeyinka

National Animal Production Research Institute, Shika, Zaria

Abstract: ***A study was carried out with 48 Japanese quails (Coturnix coturnix japonica) at the poultry unit Department of Animal Science, Ahmadu Bello University, Zaria. The birds were individually caged and intensively reared for a period of 165 days to study the egg production pattern of the birds in terms of egg number, number of clutches, clutch size, number of pause, days pause and paused length; and also the association of each with egg number. It was observed that the 165 days egg production pattern characteristic of the birds were egg number 103 ± 15, number of clutches 38 ± 6, clutch size 3 ± 1, number of pause 38 ± 4, days pause 54 ± 14 and pause length 2 ± 1. The level of variation for the measured characteristic over the period was in the range of CV values of 15 to 33% with the highest level of variability exhibited by clutch size. There was a significant (P = 0.05) positive relationship between egg number and clutch size (r = 0.85) but negatively related with number of clutches, number of pauses, days paused and pause length (r = -0.46 to -0.72). While number of clutches was negatively correlated with clutch size (P = 0.01; r = 0.84) it was positively correlated with the number of pauses and days paused (r = 0.82 and 0.51). The clutch size was positively correlated with number of pauses (r = 0.75) and negatively with days paused and pause length r = - 0.75 and -0.27). The number of pauses was positively correlated with days paused and paused (r = 0.35). This study has shown that Japanese quails commence egg production at 71%, attained a peak production of 86% which gradually decline to 57% by 165 days of age. Egg number was favoured by clutch size but negated by number of clutches, number of pauses, days paused and pause length. The age at peak production was 12 weeks (84 days) of age.***

Keywords: Japanese quails, Egg pattern, Clutch size, paused length, Traits relationship

I. INTRODUCTION

The technology drive from egg production in relationship with genetic selection makes today's egg production quails quite different from those of a decade ago. For instance age at 5 percent production is now earlier and total egg number has increased. The quail eggs are renowned for their high biological value (George, 2002). Although it was first considered mainly as a model animal for commercial poultry (Wilson *et al*., 1961), the modern Japanese quail is a good egg layer in its own right (Baumgartner, 1994), and it is farmed intensively for egg production, especially in Japan and South East Asia (Minvielle, 1998).

The female Japanese quail may start laying eggs as early as 35 days (Varghense, 2002) of age under proper conditions. Piano et al. (2004) stated that under high intensive care, female Japanese quails start laying at an age of 42 days and reach peak production by 10 – 12 weeks of age. Randall,

(2001) and Przywarova, (2002) stated that Japanese quail under good conditions start laying eggs at day 50, they further stated that the birds approximately lay 200 – 300 eggs per bird per year. The reproductive performance and the relationships between egg size, clutch size, and female body size in poultry have been studied intensively (Sonoda Y, Ibraki K, Imai K, 1985 and Erensaymn C, Camcm Ö, 2003) on egg Production. A common finding is a large variation in both egg and clutch size within populations (Erensaymn C, Camcm Ö. (2003). The purpose for egg-type quails was to increase total egg mass, to get an earlier sexual maturity, to optimize egg weight in order to augment laying performance. For poultry, some researchers as stated by Nestor K.E, Bacon W.L. (1982), Marks H.L. (1979) and Marks H.L. (1991) reported that short or long term selection for body weight causes a reduction in egg production in respect to the control line but increased sexual maturity. Although, a lot of research was conducted to determine the relationship between selection and production traits, there was dearth information in study between selection and clutch and pause traits.

There are factors that affects the clutch traits as stated by Randall, (2001) , enumerated that if laying hens are to be moved to new quarters, it influences the day of paused production of 2- weeks instead of an average paused at 1 to 3 day. Schwartz and Allan (1981) suggested that high egg production could be as a result of the high metabolic rate response of Japanese quail to dietary modifications compared to the other spices and laying chickens.

In most poultry, egg production is characterized by the number of eggs in a clutch and the period between clutches where oviposition fails to occur because of pause which results in missing egg between clutches. The cycle laying process is described by some clutch traits such as the number of the number of clutches, the average clutch size, the number of pauses and the pause size between clutches. Number of eggs in a clutch is determined by circadian cycle which consists of asynchrony in the development of the oviduct rhythm and a period called delay (Sadeghi *et al*., 2013).

The developing countries dietary intake especially for teenagers are under nourish and quail egg is said to be very rich in nutrients, the quails are known to be inexpensive rearing requirements, rapid maturation and adaptability to wide range of husbandry conditions (Schmidt and Figueiredo, 2005). Therefore new selection traits are searched in quail breeding to improve egg production, so that quail breeders must consider traits that are economically important especially traits that are difficult to apply sufficient selection on key traits in laying stock (egg production rate, pause rate, clutch size) and effects of average egg production in a week. The objective of this study was to determine the 165 days egg production pattern of Japanese quail in terms of quail egg, number, clutch traits, pause traits and to ascertain relationship between the traits.

II. MATERIALS AND METHODS

Forty Eight Japanese quails aged 14 days were sourced from the National Veterinary Research Institute (NVRI), Vom, Plateau State, Nigeria. These quails were then taken to the Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Samaru, Zaria, Kaduna State-Nigeria. Zaria is found within the Northern Guinea Savannah zone of Nigeria with a latitude of 11^0 12' N and longitude 7^0 33'E. The elevation above the sea level is 610m. Day season of the sea level is 610m. Dry season of the area begins around middle of October and ends in February with temperature ranging from 14^0c to 24^0C. This is followed by hot, dry weather from March to April with a temperatuire of 19 to 360C. Rainfall stands toward the end of April. The relative humidity varies between 19% to 60% in the dry season and between 63% and 80% in the wet season (Akpa et al., 2006).

The quails were place in 14.4 x 3061m^2 / 48 birds caged length With partition of 48 cages in all with spacing of 0.30 x 0.61m^2 / bird to study the egg production patterns. There was 16 hour light and 8 hours dark cycle used. The indoor temperature was 36^0C. The birds had ad libitum acess to food and water. They were fed with starter and grower diet containing 24% crude protein and 2904kcal/kg, ME up to 35 days of aged. Thereafter, they were fed with breeder diet containing 23% crude protein and 2800k, cal/kg ME.

Constant sanitation of the pen was carried out. Forty-eight drinkers were washed every morning and placed back with clean cool water. The same process was carried out for the feeders and feeding. Observation of the birds/ their medication and vaccination against disease were carefully carried out, even though the birds hardly came down with any known disease. Their hardy condition notwithstanding, medication involved giving antibiotics (neoterramycin) to the birds every two (2) months as preventive measure.

Observation on egg was for a total of 165 days. Eggs were collected twice daily (9a.m and 4p.m) and recorded on a chart. Each egg collected was marked according to cage number and the productions were summarized on weekly and individual basis.

III. EGG PRODUCTION TRAITS

Egg production characteristics were determined as follows:

- ✓ Egg number = total number of eggs produced per birds in 165 days
- ✓ A clutch = one batch of egg laid without a skip
- ✓ Number of clutches = total number of batches within the laying period.
- ✓ Clutch size = total number of eggs laid in a given batch. This was summed up for all the batches and divided by the number of batches.
- ✓ Pause = the skipped period between one batch of eggs and another in a given laying period.
- ✓ Number of pauses = the total number of the skipped periods in a given laying period. This was averaged for all the birds involved.
- ✓ Paused length = the number of days per skip and averaged for all the birds.
- ✓ Days paused = total paused length in a giving laying period. Average for all the birds.

IV. STATISTICAL ANALYSIS

Simple statistics was used to summarize the data generated to show the egg production pattern of the quail hens. Correlation and regression analysis were used to determine the relationships between egg number and other characteristics that were observed.

V. RESULTS

The egg production characteristics of the Japanese quails in Table 1. Shows that the egg number, number of clutches, clutch size, number of pauses, days paused and paused length were 103, 38, 3, 38, 54 days and 2 days, respectively. There were wide variations in the traits measured as indicated by the minimum and maximum for each traits which were further amplified by the coefficient of variation values, ranging from 15% to 33% with the most variable trait being clutch size.

Characteristics	N = 48	Mean	SD	Min	Max	CV%
Egg number		103	15	72	133	15
Number of clutch		38	6	29	55	16
Clutch size		3	1	1	4	33
Number of pauses		38	4	28	63	18
Days paused		54	1	27	87	26
Paused length (day)		2	1	1	3	21

N = number of females used.

Table 1: Mean for 165 days egg production characteristics in Japanese Quail (Coturnix coturnix japonica)

The correlated relationships amongst the observed traits (Table 2) were significant (P<0.01) except the relationships of pause length with number of clutches and number of pauses. The relationships of egg number with number of clutch, number of pauses, days paused and pause length were negative (r = - 0.46 to -0.72) while its relationship with clutch size was positive (r = 0.85). There were in addition, negative relationships between clutch size and number of clutches (r = -0.84); days paused and clutch size (r = -0.75); and clutch size and pause length (r = -0.27). However, positive relationships existed amongst number of clutches and number of pauses, and days paused; number of pauses and days paused; days paused and pause length.

Characteristics	Egg No	No of Clutches	Clutch size	No Pauses
Number of clutch	-0.46**	-	-	-
Clutch size	0.85**	-0.84**	-	-
Number of pauses	-0.47**	0.82**	0.75**	-
Days paused	-0.72**	0.51**	-0.75**	0.35**
Paused length	-0.55**	-0.10^{NS}	-0.27**	0.02^{NS}

*NS = Not significant, ** = P<0.01.*

Table 2: Correlated relationship amongst egg production pattern characteristics of Japanese quails

The linear regression equations relating egg number with other egg characteristics are presented in Table 3. although the regression coefficient of egg number on the other egg traits were significant (P<0.01) the coefficients of determination for these relationships were poor (R^2 = 22-30%) except the relationship of egg number with clutch size (R^2 = 72%) and days paused (R^2 = 52%).

Characteristics	N=48	Coefficient		
		a	b	R^2%
Number of clutches		147.332	-1.172	22**
Clutch size		50.380	18.838	72**
Number of pauses		140.900	-0.999	22**
Days paused		143.4437	-0.762	52**
Paused length		10.078	-25.910	30**

N = number of female used

*** P<0.01*

Table 3: Regression equation for egg number in Japanese quail

Figure 1. shows the 24 weeks egg production pattern of the Japanese quails. The graph, shows that a week after the quails started laying, they attained 71% egg production performance which was maintained up to the 10th and 12th week of lay. At the 12th week of lay, a peak production of 86% was attained and maintained to the 17th week. Thereafter, production dropped back to 71% and gradually to 57% at the 22nd week.

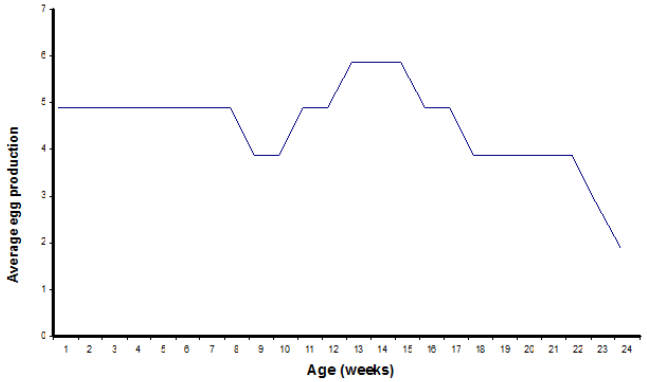

Figure 4.1: Average egg production pattern of Japanese quail

VI. DISCUSSION

The average production of 103 eggs in 165 days observed in this study falls within the range reported by Randall (2001) and Przywarona *et al* (2002). They observed that properly managed quail pullets lay approximately 200-300 eggs in 365 days (i.e. 100-150 eggs in 176 days per bird). Egg production however varied widely which could be attributed partly to genetic and non-genetic factors. Ibe and Okonkwo, (1994) had observed that genotype of individual and several non-genetic factors have effect on egg production in birds.

The Japanese quails lay eggs in a good number of clutches. The clutch size of 3 eggs as observed in this study however is lower than production even in the wild. Varghese, (2002) reported that wild Japanese quails lay eggs in small clutch sizes of 5-12 eggs. Sadeghi et al. (2013) stated that the mean clutch number in Japanese quail for selection for high body weight was 5.96, which was similar with the present study. Thompson, (2001) reported average of 10-12 eggs but indicated that during the dryer periods of the year clutch size tend to be smaller. This may have partly accounted for the small clutch size in the present study since the period of study, December to May, falls within the dry period of the year in this part of the country. To have good number of clutches and to maintain constant egg production of 29-55 batches good management must be practiced.

The pause length of days observed in this study is normal. Quails under good production must skip 1-3days on average (resting period) in order to regain body weight lost as a result of egg production before continuing production (Varyhese,

2002). However if birds under production in a certain environment are moved to a new one, a prolonged pause length may be observed instead of the normal 1-3 days length (Randall, 2001).

The significant and positive correlation between egg number and clutch size indicates that any improvement in management aimed at increasing clutch size would invariably increase egg number. Positive relationship between egg number and clutch size had been reported by Render *et al.* (1984). On the other hand, egg number would be decreased by increasing the number of clutches; numbers of pauses, days paused and pause length within a given laying period due to its negative correlations with these traits. Negative correlation of this nature had been reported by Nozchev and Kuneue, (1973) and Harms *et al.,* (1982). The implication of the observed result on quail egg production under Zaria environment, would be that the production environment should favour large clutch sizes with smaller number of clutches. This would increase egg number at the rate of 18.84% while number of pauses, days paused and pause length would reduce. This assertion is further buttressed by the R^2 value of 72% for egg number and clutch size, which indicates that clutch size accounted for 72% of the variation in egg number with only 28% of such variation being attributable to other sources. Although, the pause length only accounted for 30% of the total variations in egg number, it is important to note the high rate (-25.91%) at which it can decrease egg number. This has to be checked in order to achieve optimum egg production by the quails. Other characteristics that would decrease egg number are number of clutches, number of pauses and days paused.

The egg production curve of Japanese quails indicates that soon after the beginning of lay, production quickly reached 71%. This is a good egg production pattern for either backyard or large scale production. Production rose sharply and reached a peak of about 86%, in 12 - 17 weeks. The genetic make-up of flock, environmental factors, and resistance to diseases are the major determinants of good egg production. Jacob *et al.* (2003) similarly found that chicken egg production rises sharply after the beginning of production and reaches a peak of about 90%, 6-8 weeks later. Randall, (2001) and Przywarova, (2002) stated that proper cared for quail pullets attain approximately 56.18-84% production in 356 days. University of Florida / Institute of Food Agriculture Science (2003) stated the factors that affect egg production in chicken were enumerated to be age, resistance to disease, light control, quality of feed, temperature, humidity, molting, condition of the laying house and handling.

VII. CONCLUSIONS

The egg production in Japanese quail in Guinea savannah of Nigeria environment begins at 7-8 weeks of age. Peak production of 86% was attained at the 12th and maintained to the 17th week of age. Clutch size was positively correlated with egg number, therefore, improving the clutch size would increase the egg number attainable in a given period.

The high relationship between egg number and clutch size in Japanese quails, suggests that clutch size can be used as a yardstick for measuring egg production in a quail production industry.

REFERENCES

[1] Abdallah AG, Harms R (1997). Eggshell quality as influenced by clutch size in hens laying eggs with heavy or light shell weight. J Appl Res, 12, 113-120.
[2] Akpa, G.N; O.E. Asiribo, O.O. Oni, J.P. Alawa, N.I. Dim; O.A. Osinowo and B.Y. Abubakar (2002). Milk production by Agrospastoral Red Sokoto goats in Nigeria. *Tropical Animal Health and Production, 34 (6): 525-533.*
[3] Baumgartner, J. (1994). Japanese quail production, breeding and genetics. World's *Poultry Science Journal 50:227-235*.
[4] Chen CF, Tixier-Boichard M (2003). Estimation of genetic variability and selection response for clutch length in dwarf brown-egg layers carrying or not the naked neck gene. Genet Sel Evol, 35, 219- 238.
[5] Erensaymn C, Camcm Ö (2003). Effect of clutch size on egg production in Japanese quail. Arch Geflugelk, 67, 38-41.
[6] George, L.G. (2002) Basic production and management of quails. Penn. State College of Agricultural Science Research pp 1-16.
[7] Harms, R.H., Costa, T.P and Miles, R.D. (1982). Daily feed intake and performance of laying hens grouped according to body weight Poultry Science. 61 (60) 1021.
[8] Ibe, S.N and Okonkwo, J.C. (1994). Relationship between laying age and repeatability of egg quality traits. Nigeria. Journal of Animal Production 21: 66-70.
[9] Jacob, H.R., Wilson, H.R., Miles, R.D., Butcher, G.D. and Malher[2] F.B. (2003). Factors affecting egg production in background chicken flocks[1]. Animal Sc. Department florida cooperative Ext. Serv. Inst. of food and Agric. Sc. Univer. of florida file: // A: factors % 20 affecting % 20 egg % of production htm.
[10] Marks HL (1979). Changes in unselected traits accompanying long-term selection for four-week body weight in Japanese quail. Poult Sci, 58, 269-274, 1979.
[11] Marks HL (1991). Divergent selection for growth in Japanese quail under split and complete nutritional environments. 4. Genetic and correlated responses from generations 12 to 20. Poult Sci, 70, 453-462.
[12] Minvielle, F. (1998). Genetics and breeding of Japanese quail for production around the world. In: proceeding of the 6th Asia pacific poultry congress, Nagoya, Japanese, pp. 122-127.
[13] Nestor KE, Bacon WL (1982). Divergent selection for body weight and yolk precursor in Coturnix coturnix japonic a. 3. Correlated responses in mortality, reproduction traits and adult body weight. Poult Sci, 61, 2137-2142.
[14] Nozchev, S, and Kunev, K. (1973). Correlation between egg production and some production characteristics in white leghorn hens. ABA 41(7): 367.
[15] Piano, J. Okonmoto, S; Kobayashi, S and Wada, Y. (2004). Purebred and crossbred performance from a

ISSN: 2394-4404

Japanese quail body size. graduate school of Agricultural. Uni. Animal. Dol. PDF Res. Science. 53.

[16] Przywarona, A; Parametru, H and Snasky, U. (2002). Evaluation of egg production efficiency of laying lines of Japanese quail (*(Coturnix coturnix japonica)* Mendel University of agriculture and forestry Brno. Pp. 110.

[17] Randal, Maurice, (2001). Raising Japanese quail. Department of Pri. Industries series NSR: Newsouth Wales Govt's Portal. 1-8pp.

[18] Render, J.A; Mc Daniel, G.R and Mc Quire, J.A. (1984): Egg characteristics and production efficiency of dwarf white leghorn hens divergently selected for body weight. *Poultry Science. 63 (2): 214.*

[19] Sadeghi, R; Pakdel, M.M. Shahrbabok and H. M. Shahrbabok (2013). Divergent selection effect on reproduction traits in Japanese quail. Research Journal of poultry Sc. 6(1): 18-22.

[20] Schmidt, G.S. and Figueiredo, E.A.P. (2005). Selection for reproduction traits in white egg stock using independent culling levels. Braz. J. Poult. Sci; 7: 23-235.

[21] Schwartz, Z. G and Allen, N.K. (1981) Effects of aging on the protein requirements of matured female Japanese quail for egg production *Poultry Science 60:3-348.*

[22] Sonoda Y, Ibraki K, Imai K (1985). Clutch pattern and oviposition cycles in laying WE strain quails. Japan Poult Sci, 22, 297-303.

[23] Thompson, M. (2001) Gamsel's, Quail "(Callipepla gambelii) "Animal Deversity. The "Canku Ota". A News better magazine: Celebrating. Native. America. http:// animal diversity. Ummz. Umich. Edu/site/accounts/ information/callipepla gambelii.html.

[24] University of Florida / Institute of Food and Agricultural Science (1993). Factors that influence egg production. Animal science Department, Inst. of food and Agricultural Science, University Florida. EDIS Web site at http://edis.Ifas.Uf /edu.

[25] Varyhense, K.S. (2002) The Japanese quail. Mich. State University Department A.B., 4094. Ross St. R.R. n5, Forest, Out. Non. I. Jo. .

[26] Wilson, W.O., Abbot, U.K and Aplanalp H. (1961). Evaluation of *coturnix* (Japanese Quail) as a pilot Animal for Poultry. Poultry Science. 40: 697.