

A STUDY ON EGG QUALITY TRAITS IN JAPANESE QUAILS* (*Coturnix coturnix japonica*)

B. Punya Kumari¹, B. Ramesh Gupta², M. Gnana Prakash³ and A. Rajasekhar Reddy⁴

Sri Venkateswara Veterinary University
Tirupati, Andhra Pradesh 517 502, India.

Key words: Egg quality traits, Generations, Japanese quails

The Japanese quail (*Coturnix coturnix japonica*), due to its easy maintenance, early sexual maturity, shorter generation interval, high rate of egg production has become a pilot animal in the field of research. In meat lines of Japanese quail, the productivity and quality of the eggs is important for an economical breeding and also for propagation of the flocks. Hence, the present investigation was carried out to study the effect of selection on egg weight and egg quality traits in Black and Brown strains of Japanese quails.

The data on egg quality traits of 607 Black and Brown strains of Japanese quails maintained at Poultry Experimental Station, College of Veterinary Science, Hyderabad were utilized for the present study and subjected to Least-squares analysis (Harvey, 1979) to resolve the effect of strains, generations and hatches on various egg quality traits.

The birds were selected based on their body weight at 4 weeks age and their dams' age at first egg (AFE) and egg production up to 16 weeks age (EP 16). The eggs laid by a bird (at 16 weeks of age) consecutively for three days were utilized for the measurement of external and internal egg quality traits. The weight of each egg, albumen, yolk and shell were recorded to the accuracy of 0.01g. The longer and wider diameter of the egg

and the length and width of the thick albumen and yolk were measured by vernier calipers. The height of thick albumen and yolk were recorded with a spherometer. Yolk color was determined by using Roche yolk color fan. The Shape index, Albumen index (Heiman and Carver, 1936), Yolk index (Funk, 1948) and Haugh unit score (Kondaiah *et al.*, 1983) were computed and the weights of albumen, yolk and shell were calculated in relation to egg weight and expressed as percentages.

The least-squares analysis of variance revealed that the egg quality traits of Japanese quails were influenced significantly by one or the other effects of strains, generations or hatches. The overall least-squares means for egg weight, egg length, egg width, shell weight, shell thickness, albumen length, albumen width, albumen height, albumen weight, yolk diameter, yolk height, yolk weight, yolk colour, shape index, albumen index, yolk index and Haugh unit score were 13.71 g, 34.12 mm, 26.98 mm, 1.17 g, 0.21 mm, 43.14 mm, 33.81 mm, 4.88 mm, 7.80 g, 25.19 mm, 11.29 mm, 4.74 g, 5.37, 79.23, 0.13, 0.45 and 58.27, respectively. The albumen, yolk and shell constituted 56.83, 34.61 and 8.56 percent of the egg weight, respectively (Table 1). The least-squares means obtained in the present study for egg weight, egg length and egg width were within the range of means reported by Chaudhary *et al.* (1999), but were higher than those found by Oroian *et al.* (2002), Dhaliwal *et al.* (2003) and Kul and Seker (2004).

*Prepared from Ph.D thesis submitted by the first author to the Sri Venkateswara Veterinary University, Tirupati - 517 502.

¹Assistant Professor, Department of Animal Genetics and Breeding, ²Senior Scientist, AICRP on Pigs, College of Veterinary Science, Tirupati - 517 502, ³Professor and University Head, ⁴Professor, Department of Poultry Science, College of Veterinary Science, Hyderabad - 500 030.

The higher means for egg weight observed in the present study reflected the influence of selection of birds for higher body weights. However, the means for shell weight and shell thickness in the present study were similar to those reported earlier in the literature (Nazligul *et al.*, 2001 and Kul and Seker, 2004).

The least-squares means for various internal egg quality traits and indices observed in the present investigation agreed well with those reported by Oroian *et al.*, 2002 and Kul and Seker, 2004, but were higher than those of Chaudhary *et al.* (1999), Nazligul *et al.* (2001) and Dhaliwal *et al.* (2004), while, Altinel *et al.* (1996) noticed higher means for shape index, albumen index, yolk index and Haugh unit score in similar studies.

Brown Japanese quails exhibited significantly higher means (Table 1) for egg width (27.07 mm), shell weight (1.18 g), albumen length (44.03 mm), yolk diameter (25.30 mm), yolk colour (5.50), shape index (79.57) and percentage of shell (8.61), while Black quails were found superior for albumen width (33.98 mm), albumen height (4.98 mm), albumen index (0.13) and Haugh unit score (59.50), which showed the existence of significant genetic differences. Significant effect of strains on egg quality traits was also reported by Praharaj *et al.*, (1989) and Oroian *et al.* (2002).

The differences among the generations were significant ($P < 0.01$) for external and internal egg quality traits and percentage albumen, yolk and shell, but not for quality indices. The quails of generation 5 recorded significantly ($P < 0.01$) higher means for egg length, egg width, shell weight, albumen length, yolk diameter, yolk weight and percentages of yolk and shell.

The hens of hatch 7 produced significantly heavier eggs and consequently recorded higher means for egg weight (14.37 g), egg length (34.80 mm), egg width (27.36 mm), albumen weight (8.16 g) and yolk height (11.62 mm), while the birds of

hatch 8 recorded superior mean shell weight (1.23 g), yolk weight (5.06 g) and percentage yolk (37.37). The significant differences among hatches for egg quality traits may be attributable to the variations in environment as the hatches were spread over a period of two years.

SUMMARY

The data on egg quality traits of 607 Black and Brown strains of Japanese quails, at 16 weeks of age, obtained from 109 sires maintained at College of Veterinary Science, Hyderabad was utilized to study the effect of strains, generations and hatches. Strains, generations and hatches had a significant effect on majority of egg quality traits. Generation 5 recorded significantly higher means for egg length, egg width, shell weight, albumen length, yolk diameter, yolk weight and percentages of yolk and shell, which have declined in later generations. No specific trend could be observed for other egg quality traits. Hatch 7 produced significantly heavier eggs.

REFERENCES

- Altinel, A., Gunes, H., Kirmizibayrak, T., Corekci, S.G. and Bilal, T. (1996). The studies on egg quality characteristics of Japanese quails. *Veteriner Fakultesi Dergisi Istanbul* 22: 203-213. Cited from *CAB Abstracts*, 1996.
- Chaudhary, M.L., Brah, G.S., Sandhu, J. S., Shashi Saijpaul. and Saijpaul, S. (1999). Comparison of two lines of Japanese quails and their reciprocal crosses for body weights and egg quality. *Indian J. of Poultry Sci.*, 34: 147-154.
- Dhaliwal, S.K., Chaudhary, M.L. and Brah, G.S. (2003). Genetic analysis of egg quality in selected and control line of Japanese quails. *Indian J. of Poultry Sci.*, 38: 89-95.
- Funk, E. M. (1948). The relation of yolk index determined in natural position to the yolk

- index as determined after separating the yolk from albumen. *Poultry Sci.*, 27: 376-380.
- Harvey, W.R. (1979). Least squares analysis of data with unequal sub-class numbers. USDA, Agricultural Research Service 28: 8.
- Heiman, V. and Carver, J. S. (1936). The albumen index as a physical measurement of observed egg quality. *Poultry Sci.*, 15: 141-148.
- Kondaiah, N., Panda, B. and Singhal. (1983). Internal egg quality measure of quail eggs. *Indian J. of Animal Sci.*, 53: 1261-1264.
- Kul, S. and Seker, I. (2004). Phenotypic correlation between some external and internal egg quality traits in the Japanese quails. *International J. Poultry Sci.*, 3: 400-405.
- Nazligul, A., Turkyilmaz, K. and Bardakcioglu, H.E. (2001). A study on some production traits and egg quality characteristics of Japanese quail. *Archiv fur Geflugelkunde* 68: 280-283.
- Oroian, T., Vlaic, A. and Cighi, V. (2002). Some aspects concerning the egg production performances in two Japanese quail varieties. Cited from *CAB Abstracts*, 2002.
- Praharaj, N. K., Ayyagari, V. and Mohapatra, S.C. (1989). Studies on the inheritance of egg quality traits in Japanese quails (*Coturnix coturnix japonica*). *Indian J. of Poultry Sci.*, 24: 107-111.

Table 1
Least squares means of egg quality traits of Japanese quails

	Overall		March		March		March		March		March		March	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
Egg weight (g)	5.25	0.03	5.15	0.03	5.25	0.03	5.15	0.03	5.25	0.03	5.15	0.03	5.25	0.03
Egg length (mm)	44.2	0.1	44.0	0.1	44.2	0.1	44.0	0.1	44.2	0.1	44.0	0.1	44.2	0.1
Egg width (mm)	34.8	0.1	34.7	0.1	34.8	0.1	34.7	0.1	34.8	0.1	34.7	0.1	34.8	0.1
Egg height (mm)	14.7	0.05	14.6	0.05	14.7	0.05	14.6	0.05	14.7	0.05	14.6	0.05	14.7	0.05
Egg shell thickness (mm)	0.3	0.01	0.3	0.01	0.3	0.01	0.3	0.01	0.3	0.01	0.3	0.01	0.3	0.01
Yolk weight (g)	2.5	0.02	2.5	0.02	2.5	0.02	2.5	0.02	2.5	0.02	2.5	0.02	2.5	0.02
Yolk height (mm)	11.5	0.05	11.5	0.05	11.5	0.05	11.5	0.05	11.5	0.05	11.5	0.05	11.5	0.05
Yolk width (mm)	10.5	0.05	10.5	0.05	10.5	0.05	10.5	0.05	10.5	0.05	10.5	0.05	10.5	0.05
Yolk thickness (mm)	3.5	0.05	3.5	0.05	3.5	0.05	3.5	0.05	3.5	0.05	3.5	0.05	3.5	0.05
Albumen weight (g)	2.7	0.02	2.7	0.02	2.7	0.02	2.7	0.02	2.7	0.02	2.7	0.02	2.7	0.02
Albumen height (mm)	10.5	0.05	10.5	0.05	10.5	0.05	10.5	0.05	10.5	0.05	10.5	0.05	10.5	0.05
Albumen width (mm)	10.5	0.05	10.5	0.05	10.5	0.05	10.5	0.05	10.5	0.05	10.5	0.05	10.5	0.05
Albumen thickness (mm)	3.5	0.05	3.5	0.05	3.5	0.05	3.5	0.05	3.5	0.05	3.5	0.05	3.5	0.05
Shell weight (g)	0.8	0.01	0.8	0.01	0.8	0.01	0.8	0.01	0.8	0.01	0.8	0.01	0.8	0.01
Shell length (mm)	44.2	0.1	44.0	0.1	44.2	0.1	44.0	0.1	44.2	0.1	44.0	0.1	44.2	0.1
Shell width (mm)	34.8	0.1	34.7	0.1	34.8	0.1	34.7	0.1	34.8	0.1	34.7	0.1	34.8	0.1
Shell height (mm)	14.7	0.05	14.6	0.05	14.7	0.05	14.6	0.05	14.7	0.05	14.6	0.05	14.7	0.05
Shell thickness (mm)	0.3	0.01	0.3	0.01	0.3	0.01	0.3	0.01	0.3	0.01	0.3	0.01	0.3	0.01
Yolk index	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01
Albumen index	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01
Shell index	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01
Yolk ratio	0.45	0.01	0.45	0.01	0.45	0.01	0.45	0.01	0.45	0.01	0.45	0.01	0.45	0.01
Albumen ratio	0.45	0.01	0.45	0.01	0.45	0.01	0.45	0.01	0.45	0.01	0.45	0.01	0.45	0.01
Shell ratio	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01	0.15	0.01

Table 1. Contd.,

	Batch 5 (n = 30)		Batch 6 (n = 25)		Batch 7 (n = 30)		Batch 8 (n = 25)		Batch 9 (n = 20)	
	M _{mean}	SE	M _{mean}	SE	M _{mean}	SE	M _{mean}	SE	M _{mean}	SE
Egg weight (g)	13.00 ^a	0.10	13.31 ^a	0.12	14.37 ^b	0.11	13.02 ^a	0.13	13.49 ^a	0.18
Egg length (mm)	33.92 ^a	0.12	34.41 ^a	0.14	34.80 ^b	0.13	34.20 ^{ab}	0.15	34.22 ^{ab}	0.21
Egg width (mm)	26.92 ^a	0.07	26.94 ^{ab}	0.09	27.36 ^b	0.08	27.29 ^{ab}	0.09	27.29 ^{ab}	0.13
Shell weight (g)	1.15 ^a	0.02	1.15 ^a	0.02	1.22 ^b	0.02	1.23 ^b	0.01	1.23 ^b	0.01
Shell thickness (mm)	0.21 ^a	0.01	0.21 ^a	0.01	0.21 ^a	0.01	0.21 ^a	0.01	0.21 ^a	0.01
Alluraea length (mm)	42.98	0.24	43.55	0.29	43.68	0.28	43.27	0.31	44.13	0.44
Alluraea width (mm)	33.02	0.20	34.02	0.24	33.92	0.23	33.46	0.25	32.99	0.35
Alluraea length (mm)	4.97	0.05	4.26	0.06	4.90	0.06	5.01	0.07	4.29	0.10
Alluraea width (mm)	7.90 ^b	0.07	7.93 ^b	0.08	8.16 ^b	0.08	7.34 ^a	0.09	7.27 ^a	0.12
Yolk diameter (mm)	24.72 ^{ab}	0.09	25.17 ^b	0.11	25.24 ^b	0.11	26.12 ^b	0.12	26.32 ^b	0.17
Yolk height (mm)	11.31 ^a	0.06	11.19 ^a	0.07	11.62 ^a	0.07	11.44 ^{ab}	0.07	11.46 ^{ab}	0.10
Yolk weight (g)	4.53 ^b	0.04	4.73 ^b	0.05	4.99 ^b	0.05	5.06 ^b	0.05	4.99 ^b	0.07
Yolk fat content (%)	5.45 ^a	0.05	5.44 ^a	0.06	5.46 ^{ab}	0.06	4.82 ^a	0.06	4.97 ^a	0.09
Streptococcus	79.45	0.26	78.42	0.31	78.78	0.30	80.06	0.33	80.01	0.46
Alluraea index	0.13	0.01	0.13	0.01	0.13	0.01	0.13	0.01	0.13	0.01
Yolk index	0.46	0.01	0.45	0.01	0.45	0.01	0.44	0.01	0.44	0.02
Haugh unit	59.18	0.07	57.44	0.20	57.30	0.27	61.12	0.25	60.44	1.20
Percentage alluraea	58.07 ^a	0.21	57.33 ^{ab}	0.25	56.54 ^a	0.24	53.02 ^a	0.26	53.80 ^a	0.37
Percentage yolk	33.46 ^{ab}	0.21	34.20 ^{ab}	0.25	34.92 ^a	0.24	37.27 ^a	0.27	37.19 ^a	0.37
Percentage shell	8.47 ^a	0.05	8.26 ^a	0.06	8.46 ^a	0.05	8.94 ^a	0.06	9.02 ^a	0.08

Means followed by the same superscript(s) in a row with in each effect do not differ significantly (P<0.05)