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Original article

Comparative study on production performance, egg geometry, quality and hatching traits in four close-bred stocks of Japanese quail

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A R T I C L E   I N F O

A B S T R A C T

Present study was conducted to compare four close-bred stocks {Major (M), Kaleem (K), Saadat (S) and Zahid (Z)} of Japanese quail at Avian Research and Training Centre, UVAS Lahore for the duration of 4 weeks. For this purpose, 144 birds were equally divided into four experimental groups having 36 birds for each CBS. The data were collected regarding production performance, egg quality, geometry and hatching traits. Statistical analysis of data in Completely Randomized Design (CRD) through one way ANOVA technique and comparison of mean by using Duncan's Multiple Range test with the help of SAS 9.1 revealed significant differences among feed intake / bird (g), body weight (g), production %, FCR / g egg mass, average egg weight (g), surface area (cm2), volume (cm3), shell thickness (mm), Haugh unit, hatchability, fertility and infertile egg % whereas livability, yolk index, shape index, dead germ and dead in shell % remained non-significant throughout the experimental period.

1. Introduction

The quail belongs to class Aves, order Galiformes, family Phasianidae and the Kingdom Animalia like chickens (Thear, 1998; Mizutani, 2003). Quails are agile and warm blooded animal and sensitive to external environment. Worldwide, almost 33 quail species are being bred from which officially recognized breeds are: Japanese, British

black, white English, Smoking, Marmara, Manchurian Gold and Pharaoh (Tülöbaev et al., 2012). Among different breeds, Japanese quail had a great impact on research field due to its unique properties of easy maintenance (Shanaway, 1994), low generation interval (3-4 generation / year) (Tarhyela et al., 2012), fast growth rate and better egg production (Minvielle, 1998). Due to its unique properties, many countries developed quail farming into an industry accompanied by a strong interest in scientific research. Literature regarding growth performance of different quail breeds are numerous (Marks, 1993; Minvielle et al., 2000; Oguz and Minvielle, 2001; Vali et al., 2005) whereas only few reports are available on egg production (Nestor et al., 1983; Bacon et al., 1986; Minvielle et al., 1997; Minvielle and Oguz, 2002). However, reliable values of close-bred stocks within a breed are even less common. Keeping above in view, present study was planned to evaluate some productive and reproductive traits among four close-bred stocks of Japanese quail.

2. Materials and methods

Present study was conducted at Avian Research and Training (ART) Centre for the duration for 4 weeks. A total of 144 birds were equally divided into four experimental groups having 36 birds of each CBS. Birds maintained in well ventilated octagonal quail house (33×12×9 ft.) having multi deck cages specially designed for breeding. Ad libitum water and feed prepared according to (NRC, 1994) were provided to experimental birds.

2.1. Parameters studied

Data were collected regarding productive and reproductive traits:
Production performance: - feed intake / bird (g), body weight (g), production %, FCR / g egg mass, average egg weight (g) and livability %
Egg Geometry: - shape index (%), surface area (cm2), volume (cm3)
Egg quality: - egg weight (g), shell thickness (mm), yolk index (%), Haugh unit
Hatching Traits: - hatchability %, fertility %, infertile egg %, dead germ %, dead in shell %

2.2. Statistical analysis

Data were analyzed according to Completely Randomized Design (CRD) through one-way ANOVA technique (Steel et al., 1997). For further interpretation of data General Linear Model (GLM) Procedures were used. Comparison of means were worked out using Duncan (1955)'s Multiple Range (DMR) test with the help of SAS 9.1 for windows (Statistical Analysis System).

3. Discussion

3.1. Production performance

Means and standard error of production performance traits is presented in table 1. In the present experiment, significant differences were observed in feed intake / bird / day among four close-bred stocks (CBS); CBS Z had the highest feed intake (34.12 g) whereas lowest in M (29.81 g). That might be due to genetic variation among different close-bred stocks. Similarly, in another study (Jatoi et al., 2013) significant differences in feed intake among different strains of Japanese quail was observed.

Significantly higher body weight (330.17g) in CBS M as compared to Z (280.33g) might be attributed to better utilization of feed in CBS M as compared to K, S and Z. Similarly, significant effect of strains on body weight was observed among different local and imported strains of Japanese quail (Jatoi et al., 2013).

In the present scenario significant differences were observed in production % among four close-bred stocks; CBS M had the highest (81.17%) production % whereas the lowest in Z (73.35%). This could be due to better efficiency of feed use for egg production in CBS M. Similarly, significant effect of strains on production % was observed between two strains of guinea fowl (Bernacki et al., 2013).

Significantly improved FCR / g egg mass in CBS M as compared to CBS Z might be attributed to higher egg production in CBS M indicating that bird produced more number of eggs at the cost of decreased feed consumption. However, no significant effect of strains on feed efficiency was observed between two strains of quail (Sakunthala Devi et al., 2012).

In the present study, significant differences were observed in average egg weight among four close-bred stocks; CBS M had the highest egg weight (14.14g) followed by CBS K (13.77g), S (13.29g) and Z (11.86g). That might be due to higher body weight of CBS M, as there is positive association between egg weight and body weight. However, in another study (Vali et al., 2006) non-significant difference in egg weight was observed between two strains of quail. No significant effect of CBS on livability % was observed in current experiment.

3.2. Egg geometry

Means and standard error of some egg geometry parameters is presented in table 2. In the present study significant differences were observed in egg surface area among different close-bred stocks; CBS M had the highest (26.91cm2) egg surface area as compared to Z (23.62cm^2). This could be due to higher egg weight of CBS M, having slightly elongated shape largely due to intensive increase of long than the short axis of egg. Similarly, significant effect of strain on egg surface area was observed between two strains of quail (Genchev, 2012).

Significantly higher egg volume (12.92cm3) as compared to Z (10.65cm3) might be attributed to some genetic factors and individual traits largely depend on oviduct. Similarly, significant differences in egg volume was observed between two strains of quail (Genchev, 2012). However, no significant effect of Close-bred stocks on shape index was observed in the present experiment.

3.3. Egg quality

Means and standard error of some egg quality traits is presented in table 2. In the present experiment significant differences were observed in egg weight among four close-bred stocks; CBS M had the highest egg weight (14.15g) whereas the lowest in Z (11.66g). That might be due to genetic variance among different close-bred stocks. Similarly, in another study (Ashok and Reddy, 2010) significant differences in egg weight was observed among three strains of quail.

In the present study significant differences were observed in shell thickness among different four close-bred stocks; CBS M had the highest shell thickness (0.21mm) where the lowest (0.18mm) in S and Z. This could be due to higher egg weight of CBS M requiring more time in reproductive tract especially in uterus for calcification and pigmentation. Similarly, some other scientist found significant effect of strains on egg quality parameters of Japanese quail (Praharaj et al., 1989; Oroian et al., 2002).

Significantly higher Haugh Unit score in CBS Z (105.80) as compared to M (102.95) might be attributed higher viscosity of albumen in the eggs of CBS Z resulted higher value for albumen height and correspondingly Haugh unit score. Similarly in another study (Altinel et al., 1996) significant effect of strains on Haugh unit score was observed. However, no significant effect of CBS on yolk index was observed in current experiment.

3.4. Hatching traits

Means and standard error of reproductive traits is presented in table 3. In the present scenario, significant differences were observed in hatchability % among four close-bred stocks; CBS M had the highest (76.67%) hatchability % whereas lowest in Z (64.67%). That might be attributed to differences in egg quality traits among close-bred stocks. Similarly, significant effect of strains on hatchability % was observed between two genotypes of guinea fowl (Bernacki et al., 2013).

Significantly higher fertility (85.85%) in CBS M as compared to Z (77.64%) might be attributed to non-genetic factors i.e., pre-incubation and incubation requirements. However, no significant effect of strains on fertility % was also observed between two strains of quail (Vali et al., 2005).

Significantly higher infertile eggs (16.67%) in CBS Z as compared to M and K (10.67%) might be due to non-genetic factors i.e., nutrition, management and mating system. Contrarily, non-significant differences in infertility % between two strains of quails was observed (Vali et al., 2005). However, no significant effect of dead germ and dead in shell % was observed in present study.

4. Conclusion

From the above discussion it can be concluded that different CBS had significant effect on feed intake / bird (g), body weight (g), production %, FCR / g egg mass, average egg weight (g), surface area (cm2), volume (cm3), shell thickness (mm), Haugh unit, hatchability, fertility and infertile egg %. However, no significant effect on livability %, shape index, yolk index, dead germ and dead in shell.

Table 1

Comparison of production performance traits among 4 close bred stocks of Japanese quail.

*CBS Parameters	Major	Kaleem	Sadaat	Zahid	P-Value
Feed intake / bird (g)	29.81 ± 0.45^c	32.57 ± 0.42^b	31.66 ± 0.57^b	34.12 ± 0.29^a	0.0001
Body Weight (g)	330.17 ± 11.26^a	320.00 ± 8.35^a	284.67 ± 11.84^b	280.33 ± 9.05^b	0.0044
Production %	81.17 ± 2.11^a	79.71 ± 1.77^a	78.01 ± 1.81^{ab}	73.35 ± 1.28^b	0.0291
FCR / g egg mass	2.11 ± 0.03^c	2.36 ± 0.03^b	2.38 ± 0.05^b	2.88 ± 0.03^a	0.0001
Average egg weight (g)	14.14 ± 0.08^a	13.77 ± 0.03^b	13.29 ± 0.21^c	11.86 ± 0.03^d	0.0001
Livability (%)	98.16 ± 0.66	96.74 ± 0.55	96.94 ± 0.91	97.20 ± 1.25	**NS

Note: Different superscripts on values represent significant differences among their means (P≤0.05).

* Close Bred Stocks.

** Non-Significant.

Table 2

Comparison of egg quality and geometry traits among 4 close bred stocks of Japanese quail.

*CBS Parameters	Major	Kaleem	Sadaat	Zahid	P-Value
Shape Index (%)	76.29 ± 1.29	78.27 ± 1.84	78.09 ± 2.38	79.53 ± 1.42	**NS
Surface Area (cm^2)	26.91 ± 0.06^a	26.49 ± 0.25^a	25.55 ± 0.17^b	23.62 ± 0.55^c	0.0001
Volume (cm^3)	12.92 ± 0.04^a	12.63 ± 0.18^a	11.96 ± 0.12^b	10.65 ± 0.37^c	0.0001
Egg weight (g)	14.15 ± 0.05^a	13.83 ± 0.20^a	13.10 ± 0.13^b	11.66 ± 0.41^c	0.0001
Shell Thickness (mm)	0.21 ± 0.004^a	0.19 ± 0.01^b	0.18 ± 0.003^b	0.18 ± 0.002^b	0.0068
Yolk Index (%)	49.53 ± 0.42	48.55 ± 1.74	49.75 ± 0.60	52.11 ± 1.11	**NS
Haugh Unit	102.95 ± 0.78^b	104.60 ± 0.77^{ab}	103.75 ± 0.48^{ab}	105.80 ± 0.64^a	0.0440

Note: Different superscripts on values represent significant differences among their means (P≤0.05).

* Close Bred Stocks.

** Non-Significant.

Table 3

Comparison of Hatching Traits among 4 Close Bred Stocks of Japanese quail.

*CBS Parameters	Major	Kaleem	Sadaat	Zahid	P-Value
Hatchability (%)	76.67 ± 1.61^a	74.00 ± 1.37^a	68.67 ± 1.23^b	64.67 ± 1.23^b	0.0001
Fertility (%)	85.85 ± 1.29^a	82.98 ± 1.91^{ab}	80.53 ± 1.24^{bc}	77.64 ± 1.42^c	0.0063
Infertile Eggs (%)	10.67 ± 1.69^b	10.67 ± 1.98^b	14.67 ± 1.69^{ab}	16.67 ± 1.23^a	0.0438
Dead Germs (%)	6.00 ± 1.71	8.67 ± 0.67	8.67 ± 1.23	9.33 ± 0.84	**NS
Dead in Shell (%)	6.67 ± 1.33	6.67 ± 1.69	8.00 ± 1.46	9.33 ± 1.69	**NS

Note : Different superscripts on values represent significant differences among their means (P≤0.05).

* Close Bred Stocks.

** Non-Significant.

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