

LAYING CHARACTERISTICS AND EGG GEOMETRY OF FOUR VARIETIES OF INDIGENOUS ASEEL CHICKEN IN PAKISTAN

A. Iqbal, M. Akram, A. W. Sahota, *K. Javed, J. Hussain, Z. Sarfraz and S. Mehmood

Department of Poultry Production, Ravi campus, University of Veterinary and Animal Sciences, Lahore, Pakistan.

*Department of Livestock Production, Ravi Campus, University of Veterinary and Animal Sciences, Lahore, Pakistan

Corresponding authors: amjadiqbaluvas@gmail.com

ABSTRACT

Aseel is an important and historic breed of chicken with many varieties and strains found in Pakistan. A four week study was conducted to assess the laying characteristics and egg geometry of four varieties (Lakha, Peshawari, Mushki and Mianwali) of Aseel chicken. Data from ten hens of each variety were recorded for feed intake, egg number, egg weight (g), clutch size (days), egg length (cm), egg width (cm), egg shape index (%), egg surface area (cm²) and egg volume (cm³) and analyzed through one way ANOVA. Duncan's Multiple Range Test was applied to compare the means. Significant differences were observed in feed intake during 3rd week (P<0.01) and 4th week (P<0.05) and egg number during 1st week of the study (P<0.01) while non-significant differences were observed in all other parameters studied. On an overall basis, the Aseel chickens consumed 71.7±13.8 g of feed per day and produced 2.8±1.0 eggs per clutch. The eggs were 43.1±3.0 g weight, 5.10±0.12 cm long, 3.87±0.10 cm wide, had a shape index of 75.85±2.13, volume of 39.04±2.93 cm³ and surface area of 57.78±2.87 cm². More detailed and long term studies should be conducted on these varieties of Aseel chicken to gather detailed baseline information about these varieties.

Key words: Egg Parameters, Native chicken, Backyard poultry, Genetic resources.

INTRODUCTION

In Pakistan, Aseel is a recognized indigenous ecotype and used either as a backyard poultry in the rural areas or as a game bird. More than 16 varieties and hundreds of strains of Aseel Chicken are indigenous to Pakistan (Khan, University of Agriculture, Faisalabad: Personal Communication). Aseel Chickens are well known for their excellent meat producing qualities and are among the ancestors of the White Cornish (Platt, 1925; Dohner, 2001) and Plymouth Rock (Platt, 1925), the parents of the modern day broiler.

Although various researchers described Aseel as a poor egg producer (Platt, 1925; Dohner, 2001; Pan, 2009), yet it has shown promising results after genetic improvement in India where genetically improved lines and backyard strains like CARI-Nirbheek and CARI-Shayama have been developed from Aseel (ICAR, 2004). The Central Avian Research Institute (CARI) reports 92 eggs per annum from Aseel with an average egg weight of 52 g (www.icar.org/cari/native.html) vs. 33 eggs per annum from unimproved Aseel Chicken in Bangladesh (Huque *et al.*, 1999; Bhuyian *et al.*, 2005). This shows a considerable room for genetic improvement regarding egg production as well.

The increasing demand for poultry products from non industrial or commercial production systems is offering an opportunity for indigenous breeds/strains of livestock and poultry to be introduced in current production systems (Blackburn, 2006) especially, in

Pakistan, where there is a strong preference for indigenous poultry meat and eggs, this is an opportunity for small scale poultry businesses with open sided houses to start new ventures in the production and marketing of free range organic poultry using indigenous breeds. Therefore, the assessment of productive potential of Aseel for development of backyard and commercial poultry strains indigenous to Pakistan. Keeping this in view, the present study was conducted to assess the laying characteristics and egg geometry of indigenous Aseel chicken.

MATERIALS AND METHODS

Study Site: The present experiment was conducted at Genetic Resource Centre for Indigenous Chicken (GenReCIC), Department of Poultry Production, Ravi Campus, University of Veterinary and Animal Sciences (UVAS), Lahore, to investigate the productive potential and egg geometry parameters of four varieties of indigenous Aseel chicken namely Lakha, Mushki, Mianwali and Peshawari Aseel.

Experiment Design: The experiment was conducted using completely randomized design on 40 birds of four varieties of Aseel chicken namely Lakha, Mushki, Mianwali, and Peshawari varieties. There were ten birds of each variety kept individually in separate cages. Every bird was regarded as an experimental unit.

Data Collection: The data regarding feed intake, egg production and egg weight were collected on daily basis for each bird. Feed was offered in the morning for two hours and residue was taken to calculate the feed intake.

For the recording of egg weight, all the eggs produced from every bird were weighed using electronic balance capable of measuring up to 0.1 g.

Ten eggs from each variety were collected for egg geometry calculations viz; egg length, egg breadth, shape index, egg surface area and egg volume. Egg length and breadth were measured with the help of ordinary vernier calipers capable of measuring up to 0.01 cm. The following formulae were used for calculation of shape index, egg volume and egg surface area.

Shape Index = (Egg Width/Egg Length) x 100 (Parmar *et al.*, 2006; Monira *et al.*, 2003)

Egg volume (V) was calculated using two formulae (Etches, 1996), one based on egg weight and the other based on length and width and then taking the average of both results

$$i. V = k \pi LB^2/6$$

Where,

k = constant, value ranges from 0.85 to 0.99 (Average = 0.929)

$\pi = 3.1415927$

L = egg length (cm)

B = egg breadth (cm)

and

$$ii. V = 0.913 W$$

Where,

W = egg weight (g)

Egg surface area (S) was calculated by taking the average of the following two formulae (Etches, 1996)

$$S = k (\pi LB^2/6)^{0.67}$$

Where,

k = constant, value ranges from 4.63 to 5.07 (average = 4.85)

$\pi = 3.1415927$

L = egg length (cm)

B = egg breadth (cm)

and

$$S = kW^{0.67}$$

Where,

k = 4.558 (constant)

W = egg weight (g)

Statistical Analysis: The data were analyzed by one-way ANOVA and means were separated using Duncan's Multiple Range Test. (Duncan, 1955)

RESULTS AND DISCUSSION

Feed Intake (g): Significant difference was observed in daily feed intake of the four varieties during week 3 (P = 0.0081) and week 4 (P = 0.0336) of the experiment. On an overall basis, daily feed intake per bird (Mean \pm S.D.) remained 77.5 \pm 13.5 g for Lakha, 81.8 \pm 10.9 g for Peshawari, 68.5 \pm 7.5 g for Mushki and 59.1 \pm 15.0 g for

Mianwali Aseel (Table 1). Earlier findings also report significant effect of genotype on feed intake. Scheideler *et al.*, (1998) found significant differences in feed intake among Dekalb Delta, Babcock B-300 and Hy-Line W-36. Similarly, Gunawardana *et al.*, (2009) found significant differences in seven commercial leghorn strains and Singh *et al.*, (2009) found significant difference in Lohmann White, H&N White, Lohmann Brown and non-commercial cross between RIR and Barred Plymouth Rock.

Egg Number: Significant difference was observed in egg production for the first week only (P = 0.0033) and non-significant difference was observed for the rest of the experimental period as well as on overall basis. Singh *et al.*, (2000) reported 33.17 eggs per year from Aseel chickens in India. More recently, 92 eggs have been reported on the CARI website (www.icar.org/cari/native.html). However, an estimate of annual egg production of the varieties studied presently will require a much long term research.

Clutch Size (days): Clutch size also showed non-significant difference (P = 0.123). The number of eggs in a clutch (Mean \pm S.D.) was highest of Peshawari observed to be 3.4 \pm 0.7 (P = 0.05), followed by Mushki (3.3 \pm 0.6) and Lakha (2.5 \pm 1.3). Mianwali (1.8 \pm 0.7) was recorded to have the shortest clutch size (Table 1). Though Singh *et al.*, (2000) reported 33.17 eggs per year from Aseel chickens and More recently, 92 eggs from Aseel chicken have been reported on the CARI website (www.icar.org/cari/native.html) but details about clutch size were not provided by the authors.

Egg Weight (g): Egg weight did not show significant difference between the varieties (P = 0.225). Average egg weights were 41.8 \pm 2.0 g for Lakha, 41.2 \pm 2.4 g for Peshawari, 43.5 \pm 4.3 g for Mushki and 45.9 \pm 1.2 g for Mianwali varieties (Table 1). These egg weights are lower than the 52 g reported by CARI (www.icar.org/cari/native.html). The results, however, are supported by those of Radwan *et al.*, (2010) who found non-significant difference in egg weight between Fayomi and Dandrawi breeds and Wall *et al.*, (2010) found non-significant effect of genotype on egg weight between Hy-Line White W-98 and Hy-Line Brown layers. Contrary to this, significant effect of genotype on egg weight has been observed in crosses of Naked-neck, Frizzle, normal feathered chicken from Nigeria, and exotic broiler breeder flock (Nwachukwu *et al.*, 2006), between Naked-neck and normal feathered birds in free range system (Yakubu *et al.*, 2008) and between indigenous Deshi, Cobb 500, Fayomi, RIR and Sonali (RIR x Fayomi) chickens (Islam and Dutta, 2010).

Egg Geometry

Egg Length (cm): Egg length (Mean \pm S.D.) showed no significant difference (P = 0.249). Similar results have

been found between three genotypes of naked neck under tropical climate from India (Rajkumar *et al.*, 2009) in Fayomi and Dandarawi breeds (Radwan *et al.*, 2010) where no significant difference was observed in the egg length. The Mushki variety showed maximum egg length (5.18 ± 0.06 cm) followed by Mianwali (5.16 ± 0.17 cm), Peshawari (5.05 ± 0.09 cm). The minimum egg length (5.02 ± 0.08 cm) was found to be that of Lakha (Table 2). Very close to these results, egg length of Aseel has been reported earlier to be 5.2 ± 0.01 cm (Singh *et al.*, 2000)

Contrary to these findings, significantly higher values of egg length have been found in Naked-neck genotype as compared with the normal feathered Nigerian indigenous chickens (Yakubu *et al.*, 2008). A comparison of heavy and light ecotypes of Nigerian local chickens and their F₁ crosses also revealed significant difference in egg length (Momoh *et al.*, 2010). Significant difference in egg length among different genetic groups of Nigerian Normal Local, Naked Neck and Frizzle \times Exotic broiler breeder stock and their reciprocal crosses has also been reported (Nwachukwu *et al.*, 2006).

Egg Width (cm): There was no significant difference in egg width ($P = 0.099$). Similarly, no significant difference was observed between egg width between three genotypes of naked-neck chicken under tropical climate from India (Rajkumar *et al.*, 2009) and dimensions of eggs between Fayomi and Dandarawi breeds (Radwan *et al.*, 2010). The egg width was maximum ($P = 0.05$) for Peshawari variety (3.96 ± 0.05 cm) and minimum ($P = 0.05$) for Lakha variety (3.76 ± 0.07). The average egg width for Mianwali and Mushki variety were 3.90 ± 0.13 cm and 3.86 ± 0.07 cm respectively (Table 2). The results of Peshawari variety are remarkably similar to those of Singh *et al.*, (2000) who reported the egg width of Aseel to be 3.96 ± 0.01 cm.

However, significantly higher values of egg width have been found in Naked-neck genotype as compared with the normal feathered Nigerian indigenous chickens (Yakubu *et al.*, 2008). A comparison of heavy and light ecotypes of Nigerian local chickens and their F₁ crosses also revealed significant difference in egg width (Momoh *et al.*, 2010). Significantly higher values of egg width have been found in Naked-neck genotype as compared with the normal feathered Nigerian indigenous chickens (Yakubu *et al.*, 2008).

Shape Index (%): The shape index did not show significant difference ($P = 0.071$). The highest ($P = 0.05$)

shape index was 78.41 ± 0.45 of Peshawari variety and lowest ($P = 0.05$) was observed in Mushki variety (74.45 ± 1.96). Shape Index was 75.61 ± 1.07 for Mianwali and 74.94 ± 2.38 for Lakha variety (figure 6). A shape index of 75.46 ± 0.12 has been reported earlier (Singh *et al.*, 2000) which is close to that of Mianwali Aseel in the present study. Similarly, no significant difference was observed between shape indices between three genotypes of naked-neck chicken under tropical climate from India (Rajkumar *et al.*, 2009).

The egg shape index ranges between 57 and 92, but it is believed that values above and below 74 are a cause for higher incidence of cracked and broken eggs (Narushin and Romanov, 2002; Narushin *et al.*, 2004; Narushin, 2005). Generally 70-74 is considered normal shape index for commercial layers (Zeidler, 2002). These results for Mushki Mianwali and Lakha variety are quite in agreement with this range of 70 – 74. However, Peshawari variety showed a rather large deviation from this range with wider eggs and a rounded shape as compared to the normal ovoid shape.

Contrary to these results, significantly higher values of shape index have been found in Naked-neck genotype as compared with the normal feathered Nigerian indigenous chickens (Yakubu *et al.*, 2008). In a recent study from Bangladesh it was found that shape index differs in the order Fayoumi > Indigenous > RIR > Sonali > Cobb 500 and highly significant differences were observed in egg volume (Islam and Dutta, 2010).

Egg Volume (cm³): Non-significant differences were observed in the egg volume ($P = 0.190$). Contrarily, highly significant difference was observed in egg volume of Fayomi, Indigenous, RIR, Sonali and Cobb 500 in Bangladesh (Islam and Dutta, 2010). Egg volume of Mushki was found to be 39.99 ± 0.66 cm³ and that of Peshawari was 39.99 ± 1.22 cm³, followed by Lakha (35.87 ± 0.76 cm³) and Mianwali (40.32 ± 4.93 cm³). This is less than the egg volume reported as 63.0 cm³ for a standard chicken egg (Zeidler, 2002)

Surface Area (cm²): There were non-significant differences ($P = 0.172$) in the surface area of eggs of the eggs of the four varieties. The egg surface area was 59.02 ± 4.76 cm² for Mianwali variety, followed by 58.78 ± 1.22 cm² of Peshawari, 58.71 ± 0.58 cm² of Muski and 54.61 ± 0.74 cm² of Mianwali variety (table 2) which is less than 68.0 cm² reported by Zeidler (2002) for a standard chicken egg.

Table 1. Overall Productive Performance of Four Varieties of Aseel

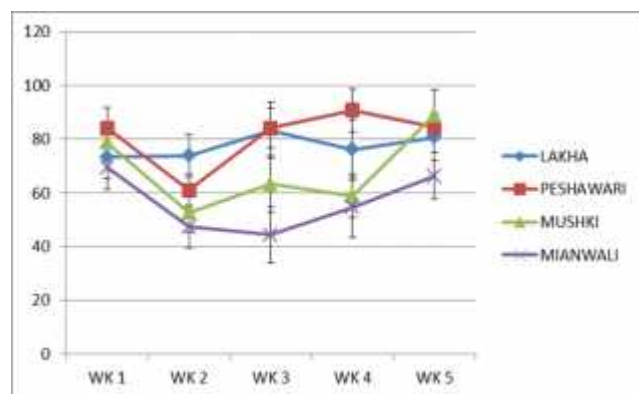
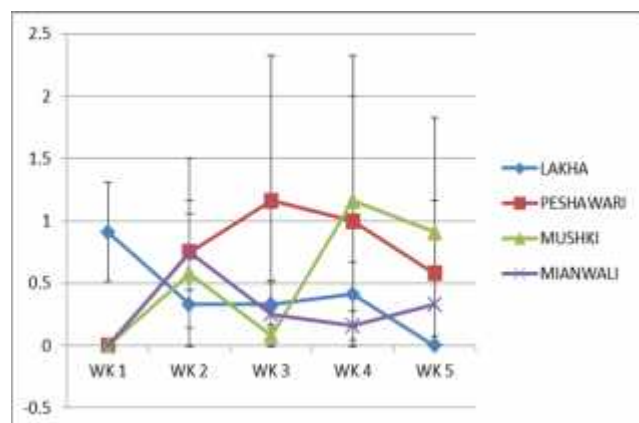
Parameter Variety	Feed Intake	Egg Weight	Clutch Size
	------(g)±S.D.-----		-----No.-----
Lakha	77.5±13.5	41.8±2.0	2.6±1.3 ^{ab}
Peshawari	81.8±10.9	41.2±2.4	3.4±0.7 ^a
Mushki	68.5±7.5	43.5±4.3	3.3±0.6 ^{ab}
Mianwali	59.1±15.0	45.9±1.2	1.8±0.7 ^b
Mean	71.7±13.8	43.1±3.0	2.8±1.0

Means within a column with different superscripts are significantly different at P<0.05

Table 2: Egg Geometry of Four Varieties of Aseel

Parameter Variety	Egg Length	Egg Width	Shape index	Volume	Surface Area
	------(cm)-----			-----cm ³ -----	-----cm ² -----
Lakha	5.02±0.08	3.76±0.07 ^b	74.94±2.38 ^b	35.87±0.76	54.61±0.74
Peshawari	5.05±0.09	3.96±0.05 ^a	78.41±0.45 ^a	39.99±1.22	58.78±1.22
Mushki	5.18±0.06	3.86±0.07 ^{ab}	74.45±1.96 ^b	39.99±0.66	58.71±0.58
Mianwali	5.16±0.17	3.90±0.13 ^{ab}	75.61±1.07 ^{ab}	40.32±4.93	59.02±4.76
Mean	5.10±0.12	3.87±0.10	75.85±2.13	39.04±2.93	57.78±2.87

Means within a column with different superscripts are significantly different at P<0.05.

**Fig 1: Week-wise feed intake per day (g)****Fig 2: Weekly egg production**

Conclusion: Significant difference was observed in feed intake during 3rd and 4th week of and egg number during 1st week of the experimental period among the breeds.

However, on an overall basis, significant differences were not found perhaps due to short duration of the study suggesting more detailed and long term research to be conducted on these varieties to get a clearer picture.

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