

## PRE AND POST- MOULT EGG GEOMETRY DURING THREE DIFFERENT AGES IN FOUR VARIETIES OF INDIGENOUS ASEEL CHICKEN

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### ABSTRACT

The effects of moulting and age on egg geometry were evaluated during three age groups in four varieties of Aseel chicken. For this purpose, a total of 168 eggs from four varieties of Aseel hens (Mushki, Lakha, Mianwali and Peshawari), each having 3 age groups (young, 50-67 weeks; medium, 80 -97 weeks and old, 115-132 weeks) were collected during pre and post-moult phases. The data on egg geometry parameters thus collected during both the phases of the study were analyzed using analysis of variance technique through Randomized Complete Block Design. The results showed significantly higher egg breadth and egg shape index in post-moult phase than that of pre-moult, whereas, non-significant differences were observed in egg surface area, egg length and egg volume. Better values for egg length, egg volume and egg surface area were recorded in Lakha and Mushki, whereas, better egg shape index was observed in Mianwali and Peshawari varieties. Egg breadth was better in Lakha and Mianwali. Non-significant differences were observed in egg volume, egg surface area and egg shape index in different age groups. Egg length was significantly greater in older birds, while, egg breadth was the lowest in younger birds.

**Key words:** Aseel chicken, Moulting, Shape Index, Surface Area, Egg Volume.

### INTRODUCTION

Aseel is considered to be very smart, strongly muscled, native poultry breed maintained in different areas of Pakistan, which is considered to be the ancestors of Cornish breed; used in male line of modern day broilers (Bhatti *et al.* 1991). Aseel being heavier in size, with higher breast development has a great potential to be developed as a good meat producing poultry breed. The concerted efforts for improving genetic potential of this breed both for egg and meat production are being made at Indigenous Chicken Genetic Resource Centre, Department of Poultry Production, University of Veterinary and Animal Sciences, Ravi campus, Lahore, Pakistan. This experiment was undertaken as a part of other studies being conducted on different aspect of indigenous Aseel chicken at this center.

Egg geometry bears a significant importance because of its application in demonstrating other important parameters like chick weight (Narushin, 2005; Narushin *et al.* 2002), egg hatchability (Narushin, 2005; Narushin and Romanov, 2002a), shell quality (Narushin, 2005; Narushin 2001a) and interior egg quality (Narushin, 2005; Narushin and Romanov, 2002b). Moulting has been reported to improve egg geometry (Lee, 1982; Baker *et al.* 1981; Nakazawa *et al.* 1970). No significant effect of strains on egg length and breadth (Riaz *et al.* 2012) and egg shape index (Enaiat *et al.* 2009) has been documented. On the contrary, it has been reported that heavier strains laid eggs with greater egg

length and breadth (Bell and Weaver, 2002). Similarly, some researchers (Ali *et al.*, 2012; Anderson, 1996) reported highly significant effect of strains on egg shape index. Higher egg shape index (75.60%) in brown layers than in white egg strains (74.10%) have been observed in some studies (Rayan *et al.* 2010; Chatterjee *et al.* 2007a; Brand *et al.* 2004), also brown layers had higher egg volume (Rayan *et al.* 2010). Anderson (1996) and Anderson *et al.* (2004) reported highly significant effect of strains on egg surface area; however Rayan *et al.* (2010) did not observe any effect of strains on egg surface area.

Age of birds has been reported to have significant effect on egg length, breadth, (Hussnain *et al.* 2012; Johnston and Gous, 2007; Ahmad *et al.* 2012; Riaz *et al.* 2012), volume (Ahmad *et al.* 2012; Hussnain *et al.* 2012; Riaz *et al.* 2012; Rayan *et al.* 2010) and shape index (Ahmad *et al.* 2012; Riaz *et al.* 2012). Egg geometry parameters such as shape index are negatively affected with advancing age (Brand *et al.* 2004; Gunlu *et al.* 2003; Monira *et al.* 2003). The significant effect of age of pheasants on shape index of eggs has been observed earlier (Esen *et al.* 2010).

The previous studies indicate inconsistent findings on effect of moulting, age and strain of birds on egg geometry parameters. There was no documented reports regarding effects of moulting on egg geometry in our indigenous poultry breeds especially Aseel. Therefore, the present study was conducted to investigate pre- moult and post- moult effect on egg geometry

parameters during different age periods in four different varieties of indigenous Aseel.

## MATERIALS AND METHODS

The present study was conducted at Indigenous Chicken Genetic Resource Center (ICGRC), Department of Poultry Production, University of Veterinary and Animal Sciences (UVAS), Ravi Campus, Pattoki, Pakistan, with the objectives to evaluate pre and post-moult egg geometry of three different age groups in four varieties of native Aseel chickens. The birds in three different age groups, young (50-67 weeks), medium (80-97 weeks) and old (115-132 weeks) were maintained

separately in each of four varieties of Aseel (Lakha Mushki, Peshawari and Mianwali). Each age group comprised 14 Aseel birds which were kept in cages for 16 weeks to evaluate their pre-moult egg geometry and again the same procedure was repeated to evaluate post moult egg geometry using the same birds. The experimental birds were fed a ration, formulated according to NRC (1994) standards and recommendations made by Summers and Leeson (2005) for the broiler breeder 1 and breeder 2 diets. A total of 168 eggs from four varieties of Aseel hens each having 3 age groups were collected during pre and post-moult phases for evaluating egg geometry parameters.

### Experimental plan

The detailed experimental plan is presented in Table 1. Table 1

Varieties	Lakha	Mianwali	Mushki	Peshawari
Age groups(weeks)	Younger (50-67) Medium (80-97) Older (115-132)	Younger (50-67 ) Medium (80-97) Older (115-132)	Younger (50-67) Medium (80-97) Older (115-132)	Younger (50-67 ) Medium (80-97 ) Older (115-132 )

42 birds in each variety divided into 3 replicates of 14 birds each

**Statistical Analysis:** The data thus collected were statistically analyzed by Analysis of Variance (ANOVA) technique, (Factorial ANOVA) in Randomized complete Block design using SAS 9.1 for Windows (2002-3). Comparison of means was made through Duncan's Multiple Range (DMR) test (Duncan, 1955).

Effects of moulting, age group, and variety of Aseel on the dependent variables were represented by the model:

$$Y = \mu + M_i + A_j + V_k + E_{ijk}$$

Where

Y = dependent variable (egg breadth, egg length, egg surface area, egg shape index and egg volume)

$\mu$  = overall population mean

$M_i$  = fixed effect of  $i$ th moulting ( $i$  = pre-moult, post-moult)

$A_j$  = fixed effect of  $j$ th age group ( $j$  = 1, 2, 3)

$V_k$  = fixed effect of  $k$ th varieties of Aseel ( $k$  = 1, 2, 3, 4)

$E_{ijk}$  = residual error term.

## RESULTS AND DISCUSSION

**Egg length (cm):** In the current study, non-significant difference was observed in pre and post-moult phase with respect to egg length (Table 2). Variety had significant association with egg length in our results. The highest egg length ( $5.15 \pm 0.03$ cm, mean  $\pm$  SE) was observed in Mushki, while the lowest ( $4.96 \pm 0.03$ ) in Peshawari variety of Aseel chicken. This could be attributed to different strains or varieties of Aseel that laid eggs with different weight and size due to their different body

weights (Bell and Weaver 2002). Similarly, Arafa *et al.* (1982) reported that strains of different body weights laid eggs with different weight and size resulting into variations in egg length and breadth.

The results of current study indicated that advancing age was associated with greater egg length (Table 2). The egg length was the highest ( $5.17 \pm 0.01$ ) in older birds while the lowest ( $4.91 \pm 0.02$ ) in younger birds. Similar to current findings, Hussnain *et al.* (2012) Johnston and Gous (2007b) reported improvement in egg length with increasing age. However, a recent study did not show any effect of age on egg length (Riaz *et al.* 2012). In contrast to results of the present findings some researchers documented an inverse relationship of age with egg geometry (Brand *et al.* 2004; Gunlu *et al.* 2003; Monira *et al.* 2003).

**Egg breadth (cm):** In this study, significantly higher egg breadth was recorded in post-moult phase ( $4.03 \pm 0.01$  cm, Mean  $\pm$  S.E) as compared to pre-moult ( $3.97 \pm 0.01$ ; Table 2). This could be attributed to effect of moulting which appeared to improve the production factors (Nakazawa *et al.* 1970). The improvement in size of the post-moult egg has been associated to rest period of the ovarian function (Akram, 1998).

The results of the present study further revealed that egg breadth was the highest ( $4.03 \pm 0.01$ cm) in Mianwali and the lowest in Peshawari variety ( $3.92 \pm 0.03$  cm) of Aseel which could be attributed to its heavier body weight. These results are in agreement with the findings of Bell and Weaver (2002) who reported greater

egg breadth in heavy strains. However, some researchers did not find any association between bird strain and egg breadth (Riaz *et al.* 2012; Enaiat *et al.* 2009).

Significantly higher egg breadth ( $4.02 \pm 0.01$  cm) in older birds (115-132 weeks) and lower in younger birds ( $3.95 \pm 0.01$  cm, 50-67 weeks) was recorded which could be explained to be due to increase in body weight and feed intake, which have direct relationship to the size and weight of the eggs. Similar findings have earlier been reported indicating increased egg breadth with advancing age (Johnston and Gous, 2007 and Rizzi and Chiericato, 2005), due to greater weight of oviduct in older birds.

**Egg volume (cm<sup>3</sup>):** The results of present study showed no effect of moulting and age on egg volume (Table 2). Ahmad *et al.* (2012) reported non-significant difference in egg volume in different age groups. The varieties had significant effect on egg volume. The highest egg volume was observed in Mushki ( $41.96 \pm 1.07$  cm<sup>3</sup>), while, the lowest was in Mianwali ( $36.48 \pm 0.64$ ) (cm<sup>3</sup>) variety of Aseel. This could be attributed to higher egg length and breadth in these varieties. Similar results have been reported by Rayan *et al.* (2010) who observed significantly higher egg volume in brown breeder hens as compared to those of white.

**Surface area (cm<sup>2</sup>):** The results of this study further showed greater egg surface area in Lakha ( $61.90 \pm 0.70$  cm<sup>2</sup>) and Mushki ( $62.30 \pm 1.04$  cm<sup>2</sup>) varieties of Aseel than those of other varieties. This could be due to egg length, which remained the highest in the present study. Similar findings (Anderson, *et al.* 2004; Anderson. 1996) indicated strain variation in egg surface area.

In the present study, non-significant difference in egg surface area with respect to pre and post-moult phases as well as age groups was observed although the egg surface area numerically increased with age (Table

2). In line with current results, Riaz *et al.* (2012) and Ahmad *et al.* (2012) observed non-significant differences in egg surface area during different age groups. A recent study partially supported our results in which the surface area was significantly increased with increasing age (Hussnain *et al.* 2012).

**Shape index (cm<sup>3</sup>):** In the present study, significantly higher shape index was observed in post-moult phase ( $79.98 \pm 0.38$  cm) than that of pre-moult ( $78.54 \pm 0.39$  cm). This could be due to increased egg breadth after moulting (Bell and Weaver 2002). Similar findings indicating improved egg geometry due to moulting has been reported (Nakazawa *et al.* 1970).

The results of the present study showed significantly higher shape index in Mianwali ( $81.31 \pm 0.88$ cm) and Peshawari ( $82.06 \pm 0.69$  cm) varieties of Aseel which could be due to lesser gap between egg breadth and length ratio. It has been reported that shape index is directly proportional to egg width and inversely related to egg length (Brand *et al.* 2004; Gunlu *et al.* 2003; Monira *et al.* 2003). Similar findings have been reported in earlier studies, indicating difference in egg shape index in different strains (Ali *et al.* 2012; Rayan *et al.* 2010; Brand *et al.* 2004; Anderson, 1996).

The present results further revealed non-significant difference in shape index in three age groups of Aseel which might be due to similar increase in egg length and egg breadth in all the age groups. These results are in agreement with those of Brand *et al.* (2004), Gunlu *et al.* (2003), and Monira *et al.* (2003) who reported that egg shape index was directly proportional to egg breadth and inversely related to egg length. Similarly, non-significant difference was also observed in shape index in another study during different age groups (Ahmad *et al.* 2012).

**Table 2: Pre and post-moult egg geometry in four varieties of Aseel chicken at three different ages**

	Egg length(cm)	Egg breadth(cm)	Egg volume(cm <sup>3</sup> )	Surface Area(cm <sup>2</sup> )	shape index(cm)
<b>Moult</b>					
Pre-moult	5.07±0.02	3.97±0.01 <sup>b</sup>	39.47±0.75	59.78±0.75	78.54±0.39 <sup>b</sup>
Post-moult	5.05±0.02	4.03±0.01 <sup>a</sup>	38.95±0.49	59.35±0.50	79.98±0.38 <sup>a</sup>
<b>Varieties</b>					
Lakha	5.12±0.02 <sup>a</sup>	4.01±0.01 <sup>a</sup>	41.46±0.71 <sup>a</sup>	61.90±0.70 <sup>a</sup>	76.71±0.67 <sup>b</sup>
Mianwali	5.02±0.02 <sup>b</sup>	4.03±0.01 <sup>a</sup>	36.48±0.64 <sup>b</sup>	56.80±0.68 <sup>b</sup>	81.31±0.88 <sup>a</sup>
Mushki	5.15±0.03 <sup>a</sup>	3.95±0.03 <sup>b</sup>	41.96±1.07 <sup>a</sup>	62.30±1.04 <sup>a</sup>	77.13±0.68 <sup>b</sup>
Peshawari	4.96±0.03 <sup>b</sup>	3.92±0.03 <sup>b</sup>	36.96±0.78 <sup>b</sup>	57.26±0.82 <sup>b</sup>	82.06±0.69 <sup>a</sup>
<b>Age groups</b>					
1 <sup>st</sup>	4.91±0.02 <sup>c</sup>	3.95±0.01 <sup>b</sup>	38.07±0.75	58.40±0.78	78.59±0.65
2 <sup>nd</sup>	5.1± 0.02 <sup>b</sup>	4.01±0.02 <sup>a</sup>	39.43±0.80	59.79±0.80	79.20±0.69
3 <sup>rd</sup>	5.17±0.01 <sup>a</sup>	4.02±0.01 <sup>a</sup>	40.13±0.76	60.51±0.76	80.12±0.67

Different alphabets on means show significant differences (p<0.05)

**Conclusions:** The findings of the present study suggest that overall egg geometry remained better in post-moult phase than in the pre-moult. Lakha exhibited the best overall egg geometry followed by Mushki, Mianwali and Peshawari varieties of Aseel. Regarding age groups, older birds showed overall better egg geometry.

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