PRE AND POST-MOULT PRODUCTIVE EFFICIENCY IN FOUR VARIETIES OF INDIGENOUS ASEEL CHICKEN DURING DIFFERENT PRODUCTION CYCLES


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ABSTRACT

The objective of current study was to assess the effect of moulting on productive efficiency in Aseel chickens at different phases of age. A total of 168 hens, 42 from each of four varieties (Mushki, Lakha, Mianwali and Peshawari) divided into 3 age groups, young (50-67 weeks), medium (80-97 weeks) and old (115-132 weeks) were maintained in cages during pre and post-moult phases. The data thus collected during both the phases were subjected to analysis of variance in Randomized Complete Block Design. The results showed that overall productive efficiency remained better in post-moult as compared to pre-moult phase. Mushki showed significantly higher egg production, egg mass, egg weight, and better FCR/dozen eggs. Feed intake was higher in Peshawari variety while, body weight and FCR/Kg egg mass showed non-significant differences. The birds of younger age showed significantly higher feed intake, egg mass, egg production, and better FCR/dozen eggs, while, egg weight and FCR/kg egg mass were not affected by age. Older birds showed significantly higher body weight.

Key word: Aseel Chicken, Production performance, Pre-moult, Post-moult, Variety

INTRODUCTION

Poultry production has been playing an important role in bridging the gap between supply and demand of animal protein for human needs. The rural poultry is also contributing a major part in this regard. In most of the Asian countries, rural population has been engaged to rear local poultry breed like Aseel. Aseels are considered to be the ancestors of the Cornish breed (Bhatti, 1991), and the male line of modern day broilers has been developed from Cornish indicating great inherent potential of Aseel (Platt, 1925). Many varieties of Aseel are being locally maintained in rural areas of Pakistan mainly for cock fighting (GOP, 2003).

Almost all the varieties of Aseel are characterized with heavy body weight and poor egg production potential thus leading to low progeny size due to erratic ovulation, short or erratic clutches and broodiness. The productive potential of these birds have not been fully exploited yet and modern techniques used to improve the performance has not been tested on Aseel chickens. Moulting is a technique, employed commercially to cease egg production in laying and breeding hens in order to recycle them for another season of egg production. After the moulting, egg production and quality may improve significantly compared to pre-moult period. Induced moulting has been reported to improve egg production and other performance parameters (Usman et al. 2013; Akram,998; Lee, 1982, Increasing age of birds has been associated with decreased production (Bogdanova et al. 2006; Cloete et al. 2004, 2006; Lambrechts, 2004; Ipek and Saham, 2004; Hipfner et al. 2003; Williams and Christians, 2003). Egg weight is reported to increase with advancing age of hens (Johnston and Gous, 2007; Rizzi and Chiericato, 2005; Danilov, 2000; Joyner et al. 1987). Contrarily, Zemková et al. (2007) reported that egg weight was not significantly influenced by age. Higher feed intake was observed in older hens than in young birds (Mehta et al. 1986). However, Yasmeen et al. (2008) did not find effect of age on feed intake, whereas, the feed efficiency was decreased. Contrarily, Vargas et al. (2009) indicated that FCR was not influenced by age in breeders. Egg mass was increased with the advancing age of pullets (El-Aggoury et al. 1989). However, no concrete evidence is available regarding effect of moulting during different periods of age on productive performance of indigenous Aseel chicken.

Keeping in view the significance of Aseel chicken in our rural economy, the present study was undertaken to evaluate the effects of moulting on productive efficiency in four varieties of indigenous Aseel chicken in three different age groups.

MATERIALS AND METHODS

One hundred and sixty eight (168) Aseel hens of three age groups i.e. younger (50 to 67 weeks), medium
(80 to 97 weeks) and older birds (115 to 132 weeks) from four varieties of native Aseel i.e. Lakha, Mushki, Peshawari and Mianwali were selected. There were forty two (42) hens from each variety with fourteen (14) birds in each age group. These were randomly maintained in cages for 16 weeks to evaluate their pre-moult productive performance, including feed intake, body weight, egg production, feed conversion ratio (FCR)/ dozen eggs, egg weight, egg mass and feed conversion ratio (FCR)/ kg egg mass. The hens were then induced moulting with the help of fasting and feed restriction (Akram, 1998) and all parameters of productive performance were recorded during Post-moulting period of 16 weeks. The experimental birds were fed a balanced ration, formulated according to NRC (1994) standards and recommendations made by Summers and Leeson (2005) for broiler breeder 1 and breeder 2 diets.

**Experimental plan:** The experimental plan of the study has been presented in Table 1

**Table 1. Experimental plan**

<table>
<thead>
<tr>
<th>Aseel variety</th>
<th>Age groups</th>
<th>Number of birds (replicates)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lakha</td>
<td>Younger (50-67 weeks)</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Medium (80-97 weeks)</td>
<td>14</td>
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<td></td>
<td>Older (115-132 weeks)</td>
<td>14</td>
</tr>
<tr>
<td>Mianwali</td>
<td>Younger (50-67 weeks)</td>
<td>14</td>
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<tr>
<td></td>
<td>Medium (80-97 weeks)</td>
<td>14</td>
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<tr>
<td></td>
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<td>14</td>
</tr>
<tr>
<td>Mushki</td>
<td>Younger (50-67 weeks)</td>
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<tr>
<td></td>
<td>Medium (80-97 weeks)</td>
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<tr>
<td></td>
<td>Older (115-132 weeks)</td>
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</tr>
<tr>
<td>Peshawari</td>
<td>Younger (50-67 weeks)</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Medium (80-97 weeks)</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Older (115-132 weeks)</td>
<td>14</td>
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</tbody>
</table>

**Statistical analysis:** The data thus collected were subjected to Analysis of Variance (ANOVA) in Randomized Complete Block Design using SAS 9.1. Comparison among treatment 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 following model:

\[
Y_{ijk} = \mu + M_i + A_j + V_k + E_{ijk}
\]

Where

- \(Y_{ijk}\) = dependent variable (feed intake, body weight, egg production, egg weight, egg mass);
- \(\mu\) = overall population mean;
- \(M_i\) = fixed effect of \(i^{th}\) moulting (i = premoult, 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**

**Feed Intake (kg):** In the present study, significantly higher feed intake (8.505±0.065 kg /16 weeks) during post-moulting relative to pre-moult period (7.743±0.069 kg) was observed in Aseel chickens. This could be attributed to higher post-moult body weight, greater egg weight and better egg production which might have increased feed requirement of birds resulting in higher feed intake. In post-moulting birds, higher body weight (Hurwitz et al. 1998), greater egg weight and better egg production (Lourens et al. 2006; Ahmad et al. 1995) have been reported which consequently require more feed. The similar findings indicating higher feed intake during post-moulting relative to non-moulting birds have also been reported (Hurwitz et al. 1998). The maximum feed intake was observed in Mushki (8.28± 0.082 kg) variety. The increased feed intake has been associated with production traits (Hurwitz et al. 1998) and Mushki variety had higher egg mass production which might explain the increased feed intake in this variety in line with current findings.

Bell and Weaver (2005) observed that feed intake varied in different varieties and strains. The similar findings have also been reported in another study showing great variability in feed intake in different strains (Reddy et al. 2008). However, Hurwitz et al. (1998) did not find difference in feed intake among different strains.

In this study, older birds (age = 115-132 weeks) had significantly higher feed intake (8.317± 0.090 kg). Higher body weight with advancing age might be the reason of increased feed intake in older birds (Hurwitz et al. 1998). The feed intake of aged birds was reported to be higher than in young birds (Mehta et al. 1986).

**Body weight (g):** Results of the current study showed significantly higher body weight (2188± 26 g / 16 weeks) in post-moult phase than that of pre-moult, where body weight was 2039 ± 25g (Table 2). Higher body weight in post-moult birds has been reported earlier (Hurwitz et al. 1998). Similarly, increase in body weight of all the experimental hens after moulting has been observed by Mazzuco et al. (2005). The increase in body weight due to advancement of age appeared to be a natural phenomenon. Similar findings indicating improvement in body weight due to moulting and increasing age have been reported (Hassan et al., 2008). However, Ocak et al. (2004) did not find any difference between pre and post molt body weight.

The highest body weight was recorded in older birds (2382± 15 g, mean ± S.E) followed by medium and younger (P<0.05) (Table 2). Higher body weight has been observed previously in aged birds (Akram 1998; Aslam et al. 2012). In current study, no difference in body weight among different varieties of Aseel has been observed (Table 2).

**Egg Production (percent):** In this study, significantly higher egg production percent was observed in post-moult phase (14.5± 0.63%) than in pre-moult (12.8 % ± 0.7) which could be attributed to loss in body fat deposits in the ovary (Table 2). High egg production after moulting has been reported in previous studies (Berry, 2003, Christmas et al. 1985).

Effect of variety on egg production percent has been observed in present study (Table 2). The highest egg production (15.73± 0.9) was observed in Peshawari followed by that of Mushki, Mianwali and Lakha (10.63± 0.9) varieties of Aseel, which could be attributed to variety or strain variation. Significant effect of strain on egg production percent due to moulting has also been reported by Hurwitz et al. (1998). Modern strains of laying hens produce more egg, than in the past (Korver et al. 2004).

Egg production significantly decreased with age (Table 2). Younger birds had the highest egg production (15.5± 0.8) as compared to older birds (12.8± 0.75). Current finding are in line with those of previous studies indicating decrease in egg production with increasing age (Buhr and Cunningham, 1994; Verheyen and Decuypere, 1986)

**Egg weight (g):** Moult significantly influenced egg weight (Table 2). Egg weight was higher (46.885± 0.547 g, mean ± SE) during post-moult as compared to pre-moult phase (41.776 g ± 0.382) which could be attributed to increase in the oviduct size and enhancement of ovarian functions (Ocak et al. 2004). Improvement in egg size after moulting with a higher percentage of large size eggs have been reported in earlier studies (Ahmad et al. 1995; Cleaver et al. 1986; McDaniel, 1985).

Egg weight significantly varied among Aseel varieties (Table 2). The highest egg weight was recorded in Mushki (45.199± 0.799g) and Lakha (45.076± 0.837g) hens and the lowest in Peshawari variety (42.893± 0.638g) which could be due to their higher body weights. The effect of strain could be explained due to differences in egg weight and egg components (Joseph and Moran, 2005).

In present study, the age of birds did not show any effect on egg weight (Table 2). Non-significant effect of age on egg weight has previously been reported (Zemková et al. 2007). In contrast to current findings, advancement of hen’s age has been associated with egg weight (Abudabos, 2010; Abanikannda and Leigh, 2007; Johnston and Gous, 2007). Smaller egg size of Aseel chicken with less egg variability might be the reason showing no effect of age on egg weight.

**Egg mass (g):** The current findings showed significantly (P< 0.05) higher egg mass during post-moult (763.155± 33.316 g , mean ± SE) as compared to pre-moult phase (600.731± 35.288g) as shown in Table 2. The higher egg mass could be attributed to higher egg production (Yousf and Ahmad, 2006; Hassan et al. 2008; Aygun and Olgun, 2010). The similar findings were reported by Bar et al. (2001) who observed higher egg production and egg mass in moulted hens than those of non-moulted.

The effect of variety on egg mass indicated that Mushki variety had significantly higher (802.066± 50.384 g) egg mass than Lakha (551.589± 45.199g) which could be attributed to normal physiological response of these birds to produce greater number of eggs as a result of higher feed intake.

Significantly higher egg mass was observed in younger birds (764.487± 38.933 g) followed by that of medium (643.426± 39.957 g) and older birds(637.916± 48.915 g) which could be attributed to decrease in egg production with increasing age (Seeland et al. 1995; Summers and Leeson, 1983; Weatherup and Foster, 1980).

**Feed conversion ratio (feed/ kg egg mass):** In the present study, significantly better feed conversion ratio per kg of egg mass (FCR/Kg egg mass) was observed during post-moult (15.946± 1.339) than in pre-moult.
phase (19.753 ± 1.940) which could be attributed to higher egg production in post-moult phase (Table 2). The similar findings have been reported (Christmas et al. 1985). In line with current findings, Lee (1982) observed higher feed consumption, egg production and better FCR in moulted hens as compared to non-moulted birds. However, some studies indicated non-significant differences in feed consumption and feed conversion ratio during post-moult laying periods (Ogun and Aksoy, 1991; Soldevila and Siberio, 1987).

The FCR/Kg of egg mass significantly differed among Aseel varieties (Table 2). The Mushki had better FCR (14.881± 2.427), while poor FCR was observed in Lakha variety (21.666± 2.416). These results are in agreement with those of Bell and Weaver (2005).

The age of birds had significant effect on FCR/kg of egg mass (Table 2). The younger birds had better FCR/kg mass (14.800± 1.538) than medium (18.544± 2.282), and older age birds (20.205± 2.221) which might be due to decrease in egg production with advancement of age (Verheyen and Decuyper, 1986). These results are in agreement with those of Yasmeen et al. (2008) who reported improvement in FCR with the decreasing age. Haq et al. (1997) also indicated better FCR in layers during their first production cycle than in the second. Contrarily, Vargas et al. (2009) in another study reported that age of the breeders did not influence feed conversion ratio.

Feed conversion ratio (feed/ per dozen eggs): In the present study, feed conversion ratio (feed/dozen eggs) was significantly better during post-moult phase (7.4± 0.41) as compared to pre-moult (10.3± 1.01) which could be attributed to higher feed intake leading to better egg production and FCR during post moult period. The similar findings have also been reported (Berry, 2003; Hurwitz et al. 1998; Christmas et al. 1985).

The results indicated that Peshawari variety had significantly better FCR per dozen eggs (7.2± 1.04) than Lakha (10.66± 1.15) that could be due to the higher egg production in Peshawari variety than in Lakha as mentioned earlier.

The results of the present study showed significant effect of age on FCR/dozen eggs (Table 2). The younger birds had better FCR (7.27± 0.78) than exhibited by medium (9.06± 1.01), and old age birds (10.09±1.06). These results are in line with the findings of Yasmeen et al. (2008) who reported improvement in FCR with the decreasing age. Similarly, Haq et al. (1997) also observed better FCR in layers during their first production cycle than in the second.

Table 2. Pre and post moult production performance in four varieties of Aseel at three different ages.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Feed intake (kg)</th>
<th>Body weight (gm)</th>
<th>Egg production %</th>
<th>Egg weight (gm)</th>
<th>Egg mass (kg)</th>
<th>FCR per Dozen</th>
<th>FCR/Kg egg mass</th>
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<tbody>
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<td></td>
<td></td>
</tr>
<tr>
<td>Pre-Moult</td>
<td>7.743± 0.069b</td>
<td>2039± 25b</td>
<td>12.8± 0.7b</td>
<td>41.776± 0.382b</td>
<td>600.731± 35.288b</td>
<td>10.3± 1.01a</td>
<td>19.753± 1.940b</td>
</tr>
<tr>
<td>Post-Moult</td>
<td>8.505± 0.065a</td>
<td>2188± 26a</td>
<td>14.5± 0.63a</td>
<td>46.885± 0.547a</td>
<td>763.155± 33.316a</td>
<td>7.4± 0.41b</td>
<td>15.946± 1.339b</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Varieties</th>
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</thead>
<tbody>
<tr>
<td>Lakha</td>
<td>7.956± 0.109b</td>
<td>2133± 39</td>
<td>10.63± 0.9b</td>
<td>45.076± 0.837a</td>
<td>551.589± 45.199c</td>
<td>10.66± 1.15a</td>
<td>21.666± 2.416a</td>
</tr>
<tr>
<td>Mianwali</td>
<td>8.109± 0.105ab</td>
<td>2081± 35</td>
<td>13.18± 0.7a</td>
<td>44.152± 0.781ab</td>
<td>643.141± 50.294bc</td>
<td>9.83± 1.19ab</td>
<td>19.453± 2.293ab</td>
</tr>
<tr>
<td>Mushki</td>
<td>8.286± 0.082a</td>
<td>2077± 41</td>
<td>15.09± 1.1a</td>
<td>45.199± 0.799a</td>
<td>802.066± 50.384a</td>
<td>7.55± 10.3b</td>
<td>14.881± 2.427b</td>
</tr>
<tr>
<td>Peshawari</td>
<td>8.143± 0.141ab</td>
<td>2163± 38</td>
<td>15.73± 0.9a</td>
<td>42.893± 0.638b</td>
<td>730.975± 46.971ab</td>
<td>7.2± 1.04ab</td>
<td>15.398± 2.257ab</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age groups</th>
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</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>8.034± 0.091b</td>
<td>1842± 14c</td>
<td>15.5± 0.8a</td>
<td>44.186± 0.670a</td>
<td>764.487± 38.933b</td>
<td>7.27± 0.78b</td>
<td>14.800± 1.538b</td>
</tr>
<tr>
<td>2nd</td>
<td>8.021± 0.104b</td>
<td>2117± 15b</td>
<td>12.6± 0.9b</td>
<td>44.499± 0.610a</td>
<td>643.426± 39.957b</td>
<td>9.06± 1.01ab</td>
<td>18.544± 2.282ab</td>
</tr>
<tr>
<td>3rd</td>
<td>8.317± 0.090a</td>
<td>2382± 15a</td>
<td>12.8± 0.75b</td>
<td>44.305± 0.736a</td>
<td>637.916± 48.915b</td>
<td>10.09± 1.06a</td>
<td>20.205± 2.221a</td>
</tr>
</tbody>
</table>

Means with unlike superscripts in a column are different significantly (P<0.05)
Conclusions: Based on the findings of this study, it may be stated that overall productive efficiency was improved in Assel chickens during the post moult phase with better productive performance in Mushki than in other varieties. The higher egg mass and better FCR were recorded in younger birds; whereas, the age did not influence egg weight in Assel chickens.

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