

# ASEEL CHICKEN - A PREFERABLE CHOICE FOR COST-EFFECTIVE AND SUSTAINABLE PRODUCTION OF MEAT-TYPE POULTRY IN THE TROPICS

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**ABSTRACT:** Among the native chicken breeds of Indo-Pak subcontinent Aseel is the most popular and important one which is also a major source of revenue for rural household. It is the oldest Asian game fowl and principle ancestor of Indian Game. The superiority of Aseel on other indigenous breeds is due to its hardiness, resemblance to Cornish and larger body size. Additionally, it is famous in Asian subcontinent due to its vigor, aggressiveness, greater robustness and disease resistance. Owing to its adaptability to survive in inclement climatic conditions it could be a better option for raising poultry in the tropical and sub-tropical parts of the world. However, it is suggested that molecular techniques could be used, in this post-genomics era, to genetically improve this breed for various quantitative traits to make it more valuable and cost-effective. This review highlights the importance of Aseel and summarizes the available body of literature on its production performance, genetic improvement, and usage for the more profitable and sustainable production of rural poultry, especially in the developing world.

**Key word:** Aseel chicken; rural poultry; tropical conditions, meat-type poultry, free-range production

## INTRODUCTION

Indigenous chickens are an important source of animal proteins [1] and could be very helpful in combating the nutritional deficiencies and generating income for the rural masses, especially in the developing countries. Moreover, the better adaptability of native chicken breeds to the local climatic conditions [2], and greater robustness over the commercial chicken make them a preferred choice to raise them with lesser amount of capital and under the inclement conditions. However, it has also been reported that native breeds “the gold mines of genome” are important in the sense of increasing productivity of poultry and, additionally, also having the gene pool for the improvement of high yielding germplasm to enhance their disease resistance and tropical adaptability (Singh, undated). It has also been reported that the native breeds of chicken are more satisfactory to rural people as an important source of eggs and meat [3] due to higher disease resistance and low nutritional demands.

However, the need to conserve and improve poultry genetic resources has been accepted globally. Hence, the National Bureau of Animal Genetic Resources was established in India in 1984 for the conservation and characterization of animal genetic resources. Moreover, the Central Avian Research Institute (CARI) India is working on the genetic improvement of native breeds for more than 3 decades. A list of crossbreeds including Grampriya, Krishipriya, CARI-Gold and Krishna-J for egg purpose and Kroiler, Vanaraja, Giriraja and CARI-Devendra for meat production [4] has been developed in India to improve the rural poultry sector.

Likewise, by realizing the importance of native breeds, Indigenous Chicken Genetic Resource Centre (ICGRC) in Department of Poultry Production, University of Veterinary and Animal Sciences, Pakistan is working on different varieties of Aseel and Naked-neck for their conservation, improvement and utilization in the development of new breeds and to make them viable for the rural household.

However, among the native chicken breeds of Indo-Pak subcontinent Aseel is the most popular and important breed which is also a major source of revenue for rural household.

The word ‘Aseel’ is derived from Arabic which means “pure” or “thorough bred”. The Mianwali district of Punjab, currently in Pakistan, is known as its home-tract and place of origin. However, it has the great ability to survive in inclement climatic conditions and much resistance against many diseases [5]. The superiority of Aseel on other indigenous breeds is due to its hardiness, resemblance to Cornish and larger body size [6]. It is the oldest Asian game fowl and principle ancestor of Indian Game. The well-known characteristics of Aseel includes the biggest size among all Indian indigenous chickens having 28 inches length from back to toe, small wattles, aggressive nature, prominent shoulder, upright posture, thick muscular thighs, pea comb, strong legs, flavored and delicious meat[7]. Additionally, it is famous in Asian subcontinent due to its game-type behavior, vigor, aggressiveness [6-8], greater robustness and disease resistance.

It has been reported that cross of Malay and Red Aseel with Black Breasted Red Game and finally the cross of subsequent progeny with white Malay lead to the development of white Cornish, one of the parents of modern day broiler[7]. It reflects its potential to be developed as a commercially acceptable meat-type bird. Moreover, this inhabitant breed of Pakistan is well-acclimatized to tropical and sub-tropical environmental condition due to its centuries-old adaptation. It is also suggested that it must be evaluated for its genetic potential regarding traits of economic importance and strategies must be devised to develop indigenous breeds and strains for the commercial poultry industry.

### Varieties of Aseel

There are five common varieties of native Aseel in Pakistan and are categorized depending upon their geographical prevalence and their physical characteristics i.e. Lakha (mottled) from the central Punjab having reddish brown plumage with brown egg shell color, Mushki from Khushab, Sargodha, Bhakkar and Fatehjang having black plumage, Peshawari from Peshawar, Nowshehra, and Mardan region having wheaten colored plumage and Mianwali variety from Mianwali, Kalabagh and Sargodha region having dark

brown plumage color [9]. Similarly, a Sindhi variety of Aseel chicken is also found in Pakistan which is inhabitant of Sindh province, as indicated by its name. Birds of this variety are have a muscular and compact body, wide shoulders, short and hard feathers, droopy tail, large and highly curved beak, pea comb and no wattles. In a microsatellite marker based genetic diversity study it was observed that the highest genetic distance exist between Mushki and Peshawari variety of Aseel whereas, least genetic distance was found between Mushki and Lakha variety [9]. In addition to these varieties Java (black and white) and Lassani variety of aseel are also found in Pakistan. The well-known varieties of Aseel in India are Kulang, Kava, Khager, Madras, and Peela, etc[10]. Peela aseel is a heavier (meat-type) variety with yellow to brown feather and long shanks. Similary, Madras aseel is also big and heavy and famous for fighting whereas, Kava and Khager varieties are black in color. Furthermore, the Reza variety of Aseel is the world most popular variety and known for its bigger size and beautiful appearance.

#### **Production Performance of Aseel chicken**

It has been reported that the poor productivity of this breed of chicken might be attributed, at least partly, to the poor management and feeding system instead of inherent low productivity [11]. Previous work on Aseel revealed that Mushki variety perform better in terms of egg production, egg weight, egg mass and FCR/dozen eggs whereas Peshawari variety showed significantly higher feed intake compared with Lakha, Mianwali and Mushki Aseel[12]. In another study, [13] reported significantly higher productive efficiency of Mushki Aseel followed by Lakha, Mianwali and Peshawari varieties. Furthermore, explaining the effect of molting on Aseel it has been reported that the overall production performance remained better in post-molt production phase compared with that of pre-molt[12].

#### **Body weight**

As far as the body weight of Aseel is concerned, [14]reported the body weight at 0, 1, 2, 3, and 4 weeks of age as  $29\pm 0.05$ ,  $40\pm 0.05$ ,  $55\pm 0.06$ ,  $76\pm 0.06$  and  $107\pm 0.11$  gm respectively; whereas, the body weight of day-old Aseel chicks has also been reported as  $33\pm 0.30$ gm [15]. The body weight of Nicobari fowl at the age of 4 weeks under intensive system ( $74\pm 2.32$  g) and backyard ( $53\pm 1.41$  g) is reported by [16]. Moreover, the body weight of Aseel at the age of 6, 8, 10, and 12 weeks is reported as  $161\pm 0.19$ ,  $234\pm 0.14$ , and  $317\pm 0.18$  and  $408\pm 0.22$  gm respectively[14]. At 10<sup>th</sup> week, Singh, Mohan, Verma, Mandal and Singh [15] observed 552 g body weight of Aseel breed. At 40 weeks of age, the body weight of Aseel is reported to be 1853 g [17]. The body weight of Aseel at 6, 7, 8 and 9 months of age is reported to be  $1133\pm 1.52$ ,  $1244\pm 3.12$ ,  $1551\pm 7.78$  and  $1743\pm 3.40$  g respectively which is found to be higher than Kadaknath[14]. At 10, 11 and 12 months of age, body weight of Aseel is found to be  $1964\pm 12.25$ ,  $2249\pm 11.28$  and  $2590\pm 17.18$  g respectively whereas weekly body weight gain from 0-52 weeks is found to be  $53\pm 1.35$  g [14]. Ahmed et al., (2013) worked on the production performance of Peshawari variety of Aseel and found significant differences

in body weight at 0, 1, 2 and 3 weeks of age and also reported the highest body weight ( $1819.43 \pm 31.34$ ) in the third production cycle compared with that of second and first production cycle which was  $1607.71 \pm 43.88$ ,  $1534.43 \pm 30.22$  respectively.

In a study on the Pakistani varieties of Aseel chicken Babar, Nadeem, Hussain, Wajid, Shah, Iqbal, Sarfraz and Akram [9] reported that the body weight of Lakha, Mushki, Mianwali, Peshwari, and Sindhi varieties of Aseel ranges between 3-3.8, 3-3.5, 2.5-3.0, 2.8-3.2, 4-7 Kg respectively for males; whereas, the female chicken of these varieties, in the same order, were found 2.5-3.2, 2.5-3.0, 2.0-2.2, 2.2-2.5, 3-4.5 kg heavier [9]. Likewise, the body weight of Indian Aseel at the age of 4, 8, 12 and 16 weeks of age has been reported to be  $65.1 \pm 1.04$ ,  $154 \pm 2.39$ ,  $393 \pm 8.52$ ,  $796 \pm 13.12$  and  $1218 \pm 19.0$  respectively[18]. However, [19] have reported that the standard body weight of Aseel ranges from 3-5 kg for cocks and 2-4 kg for hens.

#### **Egg weight**

[20] studied various reproductive and productive traits of Aseel birds under field condition and reported an average egg weight of Aseel as 41 gm, which is similar to the Kadaknath birds. Evaluating the performance of Aseel at different ages, Ahmad, Muhammad, Hussain, Iqbal, Usman, Rehman and Hussnain [21] reported the egg weight of Peshawari Aseel in 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> production cycle to be  $45.53 \pm 2.15$ ,  $44.13 \pm 2.03$  and  $42.67 \pm 2.82$  gm respectively. However, [12] reported that younger birds showed significantly higher feed intake, egg production, egg mass and FCR/dozen eggs as compared to older birds. Likewise, Ahmad et al., (2013b) reported the average egg weight of 45 g from Mushki Aseel, whereas, Singh, Singh, Singh and Kumar [20] reported 47 g weight of Aseel egg. Similarly, in another study Usman, Basheer, Akram and Zahoor [13] reported that the egg weight of Peshawari Aseel ( $55.65$ ) was significantly higher compared with Lakha ( $54.03\pm 0.7$ ), Mushki ( $53.7\pm 0.96$ ) and Mianwali ( $51.62\pm 0.53$ ) Aseel.

According to Iqbal, Akram, Sahota, Javed, Hussain, Sarfraz and Mehmood [22] the average egg weight for Lakha, Peshawari, Mushki and Mianwali varieties of Aseel is reported to be  $41.8 \pm 2.0$  g,  $41.2 \pm 2.4$  g,  $43.5 \pm 4.3$  g,  $45.9 \pm 1.2$  g respectively which are in contradiction to the findings of Central Avian Research Institute (CARI) where an egg weight of 52 gm for Aseel has been reported ([www.icar.org/cari/native.html](http://www.icar.org/cari/native.html)). Moreover, an egg weight of  $42.57\pm 0.30$ ,  $44.65\pm 0.29$ ,  $45.84\pm 0.27$ , and  $47.57\pm 0.34$  gm for Aseel chicken at 28, 32, 36, and 40 week of age was observed by [23].

#### **Egg production**

For the period of 22-44 weeks, the hen-day and hen-housed egg production of Aseel is reported to be 54.35% and 53.89% respectively [24]. Furthermore, Haunshi, Padhi, Niranjana, Rajkumar, Shanmugam and Chatterjee [24] observed that peak daily hen-day egg production in Aseel could be up to 67.57% at the age of 31<sup>st</sup> week. However, [25] reported a total egg production of 160 eggs during a production period of 23 to 78 weeks in Aseel.

Differences in egg production of different breeds were also explained by [26] revealing the better egg production in exotic breed (Rhode Island Red) compared with the native ones. A number of scientists have reported the Aseel chicken as poor egg producer [7, 27, 28]. However, after genetic improvement, India has developed two breeds namely CARI-Shayama and CARI-Nirbheek from Aseel [29] and reported the egg production of 92 eggs per annum with an average egg weight of 52 grams ([www.icar.org/cari/native.html](http://www.icar.org/cari/native.html)) whereas, 33 egg per annum [30] and 33.17 eggs per annum [20] has been indicated from unimproved Aseel chicken showing a substantial room for genetic improvement. Peak daily hen day egg production is reported to be 67.57 % in Aseel at 31<sup>st</sup> week and 75.56 % in Kadaknath at 35<sup>th</sup> week of age [24]. The total egg production of Aseel is reported to be 160 eggs during the production period of 23-78 weeks in Aseel [25]. Yoshimura, Olira, Heryanto and Zheng [31] reported the estimated egg number of 50-55 eggs/annum from Bangladeshi Aseel chicken. Haunshi, Padhi, Niranjana, Rajkumar, Shanmugam and Chatterjee [24] reported that the egg persistency is better during initial production phase (24 to 36 weeks) of Aseel whereas the egg persistency during later phase (40 to 44 weeks) of production is higher in Kadaknath breed. The persistency starts declining at 40 weeks of age in Aseel and continued to increase even after 40 weeks of age in Kadaknath breed. The similar trend of egg production has been observed in Aseel and Kadaknath revealing the higher egg production of Aseel during initial production phase and relatively higher egg production of Kadaknath during later phase of production. Usman, Basheer, Akram and Zahoor [13] observed significantly higher egg production of Mushki Aseel (34.08±0.73) than Lakha (31.43±0.76), Mianwali (29.59±0.75) and Peshawari (28.70±0.58) varieties of Aseel. [32] reported the annual egg production of 48 eggs from the Mushki Aseel which is in contradiction with the findings of [33] who reported 92 eggs per annum from Aseel. It has been reported that the eggs in a clutch for Peshawari, Mushki, Lakha and Mianwali varieties of Aseel to be 3.4 ± 0.7, 3.3 ± 0.6, 2.5 ± 1.3 and 1.8 ± 0.7 respectively [22]. Ahmad, Muhammad, Hussain, Iqbal, Usman, Rehman and Hussain [21] found that the egg number and egg mass remained significantly higher in second production cycle as compared to first and third production cycle of Peshawari Aseel. He reported the average annual egg production of Peshawari Aseel to be 53 eggs/ annum. Age of sexual maturity of Aseel (174±0.9) has been reported to be significantly higher than that of Kadaknath (181±1.2) [24] which is also comparable to the findings of [25].

#### Feed intake

[25] who found that feed intake in the Aseel chicken increases with age until 21 weeks of age, weekly feed intake per bird in 1, 2, 3, 4 and 5 months old Aseel was 124, 300, 540, 650 and 750 grams respectively. [21] reported that the cumulative feed intake remained better in second production cycle than first and third production cycle of Peshawari Aseel. It has been reported that feed intake and nutrients intake was significantly higher in 2<sup>nd</sup> production cycle followed by 3<sup>rd</sup> and 1<sup>st</sup> production cycle of Mushki Aseel

[21] He observed 450, 610 and 525 g of feed intake per bird at 40, 70 and 100 weeks of age in respectively. However Gupta, Singh, Singh and Gurung [33] reported the feed intake as 124, 300, 540, 650 and 750 g at 1, 2, 3, 4 and 5 months of age. Iqbal, Akram, Sahota, Javed, Hussain, Sarfraz and Mehmood [22] reported 81.8 ± 10.9 g, 59.1 ± 15.0 g, 77.5 ± 13.5 g and 68.5 ± 7.5 g daily feed intake per bird for Peshawari, Mianwali, Lakha and Mushki varieties of Aseel respectively. Ahmad et al., (2013a) reported non-significant differences in FCR/ kg egg mass and FCR/dozen eggs of among first, second and third production cycle of Peshawari Aseel.

#### Egg quality

As far as the egg quality is concerned, Usman, Basheer, Akram and Zahoor [13] reported that significantly higher shell % was observed in Peshawari Aseel (13.57±0.53), Albumen % in Mushki Aseel (61.83±0.49), yolk % in Mianwali Aseel (31.28±0.7), Haugh Unit score in Peshawari Aseel (81.95±1.12) and non-significant differences in yolk index among different varieties of Aseel. [34] worked on the egg quality parameters of Aseel and reported that Yolk Index was better in Mushki and Mianwali varieties of Aseel, haugh unit score in Mushki, shell thickness in Lakha, higher yolk and albumen pH in Mianwali variety whereas albumen height was better in both Lakha and Mianwali variety. Evaluating the egg quality parameters influenced by molting, [34] reported that albumen and yolk pH, albumen %, yolk index, shell thickness and haugh unit score improved in response to molting whereas albumen height was not influenced by molting. Comparing the egg quality in different production phases of Aseel, Ahmad, Muhammad, Hussain, Iqbal, Usman, Rehman and Hussain [21] reported the haugh unit score of 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> production cycle of Peshawari Aseel to be 71.93 ± 5.49, 81.99 ± 2.89 and 84.95 ± 2.18 respectively. [34] reported that haugh unit score of Aseel deteriorates with increasing age whereas, yolk index was better in the eggs of older birds. Ahmad, Muhammad, Hussain, Iqbal, Usman, Rehman and Hussain [21] observed non-significant differences in the shell %, yolk index, egg shape index, and albumen height of three production cycles of Peshawari Aseel. It was observed that the highest egg surface area and egg volume in second production cycle followed by first and third production cycles of Peshawari Aseel. Niranjana et al., (2008) who found that the Aseel has Haugh unit score ranges between 74.64 ± 0.40 and 79.42 ± 0.30. The egg surface area for Mianwali, Peshawari, Mushki and Lakha Aseel is reported to be 59.02 ± 4.76 cm<sup>2</sup>, 58.78 ± 1.22, 58.71 ± 0.58 cm<sup>2</sup> 54.61 ± 0.74 cm<sup>2</sup> respectively [22] which is less than 68.0 cm<sup>2</sup> reported by [35] for a standard chicken egg. However, higher yolk index at different ages in Aseel breed has also been reported in another study [17]. The average shape indexes were found to be 77.25 ± 1.57, 76.28 ± 2.57 and 83.87 ± 3.95 cm, this finding was very close to the [36-38] who found that the egg shape index ranges between 57 and 92 cm.

Regarding the egg geometry parameters, maximum egg length was reported to be 5.18 ± 0.06 cm for Mushki Aseel, 5.05 ± 0.09 cm for Peshawari Aseel, 5.16 ± 0.17 cm for Mianwali Aseel and 5.02 ± 0.08 cm for Lakha Aseel [22]

which are similar to the findings of Singh, Singh, Singh and Kumar [20] who reported the egg length of Aseel to be  $5.2 \pm 0.01$  cm. Iqbal, Akram, Sahota, Javed, Hussain, Sarfraz and Mehmood [22] reported the maximum egg width of Peshawari variety of Aseel ( $3.96 \pm 0.05$  cm) than that of Mianwali ( $3.90 \pm 0.13$  cm), Mushki ( $3.86 \pm 0.07$  cm) and Lakha ( $3.76 \pm 0.07$ ) varieties of Aseel. The egg width of Aseel ( $3.96 \pm 0.01$  cm) reported by Singh, Singh, Singh and Kumar [20] is remarkably similar to the egg width of Peshawari Aseel reported by Iqbal, Akram, Sahota, Javed, Hussain, Sarfraz and Mehmood [22]. The shape index of Mianwali, Mushki and Lakha varieties of Aseel reported by Iqbal, Akram, Sahota, Javed, Hussain, Sarfraz and Mehmood [22] is similar to the shape index range (70-74) of commercial layers reported by [35]. It has been reported that the shape index of Peshawari Aseel ( $78.41 \pm 0.45$ ) is better than the shape index of Mianwali ( $75.61 \pm 1.07$ ), Lakha ( $74.94 \pm 2.38$ ) and Mushki ( $74.45 \pm 1.96$ ) Aseel [22]. The previous reported shape index of Aseel ( $75.46 \pm 0.12$ ) by Singh, Singh, Singh and Kumar [20] is similar to the shape index of Mianwali Aseel reported by [22] reported the egg volume of Mushki Aseel ( $39.99 \pm 0.66$  cm<sup>3</sup>), Peshawari Aseel ( $39.99 \pm 1.22$  cm<sup>3</sup>), Lakha ( $35.87 \pm 0.76$  cm<sup>3</sup>) and Mianwali Aseel ( $40.32 \pm 4.93$  cm<sup>3</sup>) which is quite less than the egg volume of standard chicken egg (63.0 cm<sup>3</sup>) reported by [35].

[21] worked on the egg geometry parameters of Aseel and reported that egg length, egg surface area and egg volume was significantly higher in Lakha and Mushki varieties of Aseel whereas egg shape index remained better in both Peshawari and Mianwali varieties of Aseel. Ahmad, Muhammad, Hussain, Iqbal, Usman, Rehman and Hussain [21] found non-significant differences of age on the egg surface area, egg shape index and egg volume of Aseel whereas egg breadth remained lowest in younger birds as compared to older Aseel.

#### Hatching performance

[39] worked on the hatching performance of Aseel varieties and reported that Lakha, Mianwali, Mushki and Peshawari varieties of Aseel does not differ on the basis of fertility %, hatchability %, infertile %, dead germ %, and cracked egg % whereas dead in shell % was significantly higher in Lakha variety of Aseel. It has been reported that Peshawari Aseel has significantly higher hatchability % and hatch of fertile % in 1<sup>st</sup> production cycle followed by 3<sup>rd</sup> and 2<sup>nd</sup> production cycle. Hatchability % and hatch of fertile % in 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> production cycle is found to be  $53.02 \pm 0.88$ ,  $15.96 \pm 0.19$ ,  $43.18 \pm 0.62$  and  $84.20 \pm 0.87$ ,  $39.56 \pm 0.63$  and  $58.20 \pm 0.61$  respectively [21]. Rashid et al. [39] reported that hatchability % increases with increasing age while hatch of fertile % remained better in younger birds of Aseel. The fertility % is reported to be highest in 3<sup>rd</sup> production cycle ( $74.54 \pm 0.49$ ), followed by 1<sup>st</sup> ( $64.61 \pm 0.56$ ) and 2<sup>nd</sup> ( $41.58 \pm 0.55$ ) production cycles [21]. [32] observed the fertility % of 77 in Mushki Aseel which is in contradiction with the findings of [40] who observed 55% and 66 % fertility of Aseel. The hatchability of Mushki Aseel is reported to be

27% [32] whereas, 45% and 67% hatchability of Aseel has also been reported [40].

#### CONCLUSION

On the basis of available literature it can be concluded that Aseel chicken has the great potential to be improved for growth-related traits. Moreover, its larger body size, greater robustness, and disease resistance make it a better choice to be raised in the harsh climatic conditions of tropical and sub-tropical parts of the world. It is also anticipated that the production of improved Aseel could lead into the low cost and sustainable poultry production especially in the developing countries.

#### AUTHOR'S DECLARATION

The authors declare that they have no conflict of interest.

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