The Journal of Animal & Plant Sciences, 28(1): 2018, Page: 33-37
ISSN: 1018-7081

COMPARATIVE PRODUCTION PERFORMANCE OF FOUR DIFFERENT NAKED NECK CHICKEN PHENOTYPES IN PAKISTAN

M. Shafiq[1,*], A. Mahmud[1], J. Hussain[1], A. Basheer[2], S. Mehmood[1], M. T. Khan[1], S. Ahmad[1] and M. Asif[3]

[1]Department of Poultry Production,[2]Department of Livestock Production, University of Veterinary and Animal Sciences, Lahore-Pakistan,[3]Poultry Research Institute, Rawalpindi, Pakistan
[*]Corresponding Author: mshafiquaf@gmail.com

ABSTRACT

A study was conducted to evaluate the production performance in four different phenotypes of naked neck chicken. In total, 300 females (20 weeks old) from four different phenotypes (black, white black, light brown and dark brown), 75 from each, were randomly assigned to four experimental groups arranged in a Completely Randomized Design (CRD). Each treatment was replicated 5 times with 15 birds in each. Feed intake, body weight, egg production, egg weight, egg mass, FCR/dozen eggs, FCR/kg egg mass and livability were evaluated. The data were analyzed using ANOVA technique. The result indicated significantly ($P \leq 0.05$) higher feed intake in white black phenotype, heavier body weight in light brown and dark brown phenotypes whereas, egg production, egg mass, FCR/dozen eggs and FCR/kg egg mass were found to be better in light brown phenotype. Egg weight remained higher in black, light brown and dark brown phenotypes. In conclusion, light brown phenotype demonstrated overall better production performance as compared to others.

Key words: Production performance, Naked-neck, Phenotype, Livability.

INTRODUCTION

The farmers doing poultry farming under semi intensive conditions prefer to keep chicken breeds that can produce sufficient eggs, survive under semi-intensive conditions and having better profitability. Local or indigenous chickens are generally referred as a pool of heterogeneous individuals. They are found in several ecotypes and phenotypes, with varying performance (Msoffe, 2003; Fayeye *et al*., 2005). Globally, indigenous chicken is considered very important because of their characteristics such as better sturdiness, disease resistance and adaptability to the local climatic conditions (Khan, 2015). In many developing countries, indigenous chicken genotypes encompass between 80 and 90 % of total poultry population (Sonaiya and Swan, 2004). Additionally, local breeds contain genes and alleles pertinent to their adaptation in a particular environment (Romanov *et al*., 1996). Village chickens play significant role in poverty alleviation (Khan, 2015). Rural poultry farmers sell chicken and eggs to meet their needs (Halima, 2007). It is further strengthened by the fact that meat and eggs of indigenous chicken are preferred over exotic chickens (Dessie and Ogle, 2001).

Naked-Neck chicken is one of the most prominent indigenous breeds of poultry found in Pakistan. It is well adapted to the harsh tropical environment and poor nutritional setups with excellent resistance against certain diseases (Mwacharo *et al*., 2007). It is superior to indigenous full-feathered in terms of growth rate, egg production, egg quality and meat yield traits and can produce double the standard number of eggs under improved nutrition and management conditions (Islam and Nishibori, 2009). Additionally, the Naked-Neck chicken has a good heat dissipation mechanism. Reduced feathering intensity and feather structure can increase heat loss, and so indirectly improve feed efficiency and overall productivity (Rauen *et al.,* 1985). Peters (2000) attributed this superior performance of the Naked Neck chicken to the thermoregulatory roles of the genes they possess. Furthermore, the Na gene reduces mortality due to heat stress; hence these birds can thrive better under adverse environments (Dessie and Ogle, 2001).

In Pakistan, Naked-Neck chickens have great variation in their phenotypes. They are characterized on the basis of their plumage color such as black, white black, light brown and dark brown. There is scarcity of information on production performance in different phenotypes of Naked-Neck birds. The present study was, therefore, designed to explore the production performance in four phenotypes of Naked-Neck chicken (black, white black, light brown and dark brown).

MATERIALS AND METHODS

The study was conducted at Indigenous Chicken Genetic Resource Centre (ICGRC) for a duration of 22 weeks. Three hundred females (20 weeks old) from four different phenotypes of Naked-Neck chickens (Black, White black, light brown and Dark brown birds), 75 from each, were randomly selected from the stock maintained at the Breeding Unit of the Farm at ICGRC. These birds were placed in 20 deep litter pens with 20 hens in each pen. Same managerial conditions were applied. Vaccination was carried out according to the local area standards. The birds were fed iso-caloric and iso-nitrogenous layer feed from 20 weeks of age till end of the experiment (42 weeks; Table 1).

Table 1. Nutrient composition.

Nutrients	Laying phase (22-42 weeks)
CP (%)	15
ME(kcal/kg)	2750
Ca (%)	1.30
Av. P (%)	0.40
Lysine (%)	0.7
Methionine (%)	0.3
Na (%)	0.16

NRC (1994); CP, Crude Protein; ME, Metaboliseable energy; Ca, Calcium; Av. P, available phosphorus; Na, Sodium

The feed and water were supplied *ad libitum* through trough feeder and nipple drinking system, respectively.

Egg number and weight (g) were recorded daily. Feed intake (g) was recorded weekly, while egg production (%), average egg weight (g), egg mass (g) and feed conversion ratios (FCR/dozen eggs and FCR/kg egg mass) were also calculated. Mortality was recorded on daily basis and livability was calculated after subtracting the mortality from total numbers of bird in an experimental unit, presented in the form of percentage.

Data Analysis; Data were analyzed through one-way ANOVA technique by using GLM procedure of SAS (SAS Institute Inc., 2002-03) assuming the following mathematical model:

$$Y_{ij} = \mu + \tau_i + \varepsilon_{ij}$$

Where,

Y_{ij} = Observation of dependent variable recorded on i^{th} treatment

μ = Population Mean

τ_i = Effect of i^{th} treatment (i = Black, White black, Light brown and dark brown varieties of Naked Neck chicken)

ε_{ij} = Residual effect of j^{th} observation on i^{th} treatment NID $\sim 0, \sigma^2$

Comparison among treatment means was done through Duncan's Multiple Range (DMR) test (Duncan, 1955) at 5% probability level.

RESULTS AND DISCUSSION

Feed Intake: Different phenotypes showed variations in feed intake. White black phenotype females consumed more feed than the rest of the varieties (Table 2). Normally, feed consumption is considered a heritable characteristic (Akhtar *et al.*, 2007). However, a probable explanation for more feed consumption in white black might be their activeness, where a large portion of feed might have been consumed in their physical activities. Similarly, it is reported that feed intake varies in different breeds (Akhtar *et al.*, 2007), varieties (Bell and Weaver, 2005; Jatoi *et al.*, 2014; Khan, 2015) and strains (Jaroni *et al.*, 1999; Venkata *et al.,* 2008) due to their genetic differences, body frame structure and production traits (Hurwitz *et al.,* 1998). Hagan and Adjei (2012), likewise, claimed difference in feed intake among different breeds depicting breed or genotype effect on feed intake (Graces *et al.*, 2001; Younis and Galal, 2006). Variation in daily feed intake has already been described in different varieties of native Aseel (Iqbal *et al.*, 2012; Ahmad *et al.*, 2014).

Body Weight: Different phenotypes had pronounced effect on body weight. Significantly higher ($P \leq 0.05$) body weight was observed in light and dark brown phenotypes as compared to those of black and white black (Table 2). Difference in body weight among phenotypes may be attributed to the genetic difference (Bell and Weaver, 2005), frame structure and production traits (Hurwitz *et al.*, 1998). Similarly, Khan (2015) submitted that genotype is one of the major factors which cause variation in body weight. Significant breed (Thakur *et al.,* 2006) or variety (Khan, 2015) difference for body weight has already been reported in literature strengthening the results of the present study (Ahmad, 2014).

Egg Production: Egg production was significantly differed ($P \leq 0.05$) among different phenotypes. Light brown phenotype demonstrated remarkably higher egg production followed by dark brown, black and white black (Table 2). It is quite possible that light brown phenotype might have better genetic potential for egg production as it is reported that egg production mainly depends on genetic makeup (Akhtar *et al.*, 2007). It is also possible that light brown phenotype might have coped with stress conditions (high temperature) more efficiently than other phenotypes but it needs further validation. Similarly, a study conducted on Naked-Neck and normal plumage hens showed variation in egg production with higher egg production in Naked-Neck hens than those of normal plumage (Juarez and Fraga, 1999). In agreement with the current findings, Adomako (2009) also claimed variation in egg production due to difference in genotype. Similarly, breed (Ipek and Sahan, 2004; Galal *et al.*, 2007) variety (Usman *et al.*, 2013) strain (Hanan, 2010) or genotype effect (Ahmad *et al.*, 2014) on egg production has already been reported in literature concluding that genotype is the major cause of variation in egg production (Akhtar *et al.,* 2007).

Egg Weight: Phenotypes had significant ($P \leq 0.05$) effect on egg weight. Hens of dark brown, light brown and black phenotypes laid heavier eggs than those of white black phenotype (Table 2). In the current study, dark brown and light brown phenotypes had higher body weight that might have led to increased egg weight as it is reported that egg weight and body weight have positive correlation (Khan, 2015). Similar variations in egg weight among different poultry breeds (Khawaja *et al*., 2012) varieties (Khan, 2015; Rehman, 2016), strains (Aboul-Hassan, 2001) and genotypes (Islam and Dutta, 2010; Ahmad *et al*., 2014) have been reported.

Egg Mass: Egg mass was found to be varying in different phenotypes. Light brown hens produced significantly ($P \leq 0.05$) higher egg mass followed by those of black, dark brown and then white black (Table 3). In the current study, light brown phenotype produced higher number of eggs that might have resulted in enhanced egg mass (Aygun and Olgun, 2010), since egg mass is the product of egg no and egg weight. Like the current findings, variations in eggs mass were observed among different varieties (Ahmad *et al*., 2014), phenotypes (Galal *et al.,* 2007) and genotypes (Khawaja *et al*., 2012) of poultry.

FCR/dozen, FCR/kg egg mass and Livability: Different phenotypes showed significant ($P \leq 0.05$) difference in FCR/dozen and per kg egg mass. Light brown hens exhibited improved FCR/dozen and egg mass followed by those of black, dark brown and then white black (Table 3). The better FCR/dozen and egg mass in light brown phenotype might be attributed to its increased egg production and comparatively less feed intake. Similar differences in FCR/dozen and egg mass have already been reported among different breeds (Akhtar *et al*., 2007) or genotypes (Galal *et al*., 2007). A recent study on Aseel hens also showed variations in FCR/dozen and per kg egg mass eggs with improved FCR in Peshawari hens compared with those of Lakha, Mushki and Mianwali (Khan, 2015) highlighting genotype effect on FCR/dozen and per kg egg mass (Ahmad *et al*., 2014). Livability was not influenced by different phenotypes ($P \leq 0.05$).

Table 2. Cumulative feed intake (CFI), final body weight (FBW), egg production (EP) and daily average egg weight (DAEW) in four phenotypes of naked neck layers.

Phenotypes	Parameters			
	CFI (kg/bird)	**FBW (g/bird)**	**EP%**	**DAEW (g/bird)**
Black	12.80 ± 0.05^{b}	1287.00 ± 11.35^{b}	52.07 ± 1.03^{b}	41.64 ± 0.14^{a}
White black	13.09 ± 0.05^{a}	1273.00 ± 13.28^{b}	40.51 ± 0.83^{c}	39.00 ± 0.18^{b}
Light brown	12.78 ± 0.02^{b}	1345.00 ± 18.09^{a}	56.23 ± 0.75^{a}	41.69 ± 0.32^{a}
Dark brown	12.88 ± 0.02^{b}	1368.00 ± 16.77^{a}	51.68 ± 0.78^{b}	41.22 ± 0.28^{a}
P-value	0.0002	0.0010	<.0001	<.0001

$^{a\text{-}c}$Superscripts on different means within column show significant difference ($P \leq 0.05$)

Table 3. Cumulative egg mass (CEM), FCR/dozen eggs, FCR /kg egg mass and livability% in four different phenotypes of naked neck layers.

Phenotypes	Parameters			
	CEM (kg/bird)	**FCR/dozen eggs**	**FCR/kg egg mass**	**Livability%**
Black	3.34 ± 0.06^{b}	1.91 ± 0.03^{b}	3.84 ± 0.08^{b}	96.00±1.63
White black	2.43 ± 0.04^{c}	2.52 ± 0.04^{a}	5.38 ± 0.07^{a}	94.66±2.49
Light brown	3.61 ± 0.06^{a}	1.77 ± 0.02^{c}	3.54 ± 0.05^{c}	96.33±1.62
Dark brown	3.28 ± 0.027^{b}	1.94 ± 0.03^{b}	3.93 ± 0.03^{b}	96.00±1.63
P-value	<.0001	<.0001	<.0001	0.7498

$^{a\text{-}c}$Superscripts on different means within column show significant difference ($P \leq 0.05$)

Conclusions: Backyard poultry farming is the business of rural farmers. Naked neck chickens are good producers in semi intensive housing but their performance is linked with its phenotypic characteristics. On the basis of above results, we concluded that light brown phenotype of Naked neck chicken gives better performance in terms of egg production, egg mass and FCR/dozen and FCR/kg egg mass compared to other phenotypes., while white black phenotype gave un-satisfactory performance. Hence, a well-planned breeding strategy is required to make backyard type poultry farming a profitable small scale entrepreneurship.

Acknowledgements: The authors acknowledge the cooperation extended by administration of Indigenous Chicken Genetic Resource Centre, Department of Poultry Production, Ravi Campus, University of Veterinary and Animal Sciences, Lahore.

REFERENCES

Aboul-Hassan, M.A. (2001). Crossbreeding effects on some growth and egg production traits among two strains of Japanese quail. Al-Azhar J. Agric. Res., 34: 41-57.

Adomako, K. (2009). Egg production in naked-neck Creole (Nana) hens and in those with normal plumage (nana) in the region of the Mexican plateau. Ph.D. Thesis submitted to the Dept. Animal Science, Kwame Nkrumah.

Ahmad, Z., A. W. Sahota, M. Akram, A. Khalique, A. S. Jatoi, M. Shafiq, M. Usman, and U. Khan (2014). Pre and post-molt productive efficiency in four varieties of indigenous Aseel chicken during different production cycles. The J. Anim. Plant Sci., 24(5): 1276-82.

Akhtar, N., S. Mehmood, M. Hassan and F. Yasmeen (2007). Comparative Study of Production Potential and Egg Characteristics of Lyallpur Silver Black, Fayoumi and Rhode Island Red Breeds of Poultry. Pakistan Vet. J., 27(4): 184-188.

Aygun, A. and O. Olgun (2010). The effect of non- feed and feed withdrawal molting methods on molt and post molt performance in laying hens. Trends Anim. Vet. Sci., 1 (2): 45-48.

Bell, D. D. and W. D. Weaver (2005). Commercial Chicken Meat and Egg Production, 5th ed. Springer Publishers. USA. 3-19.

Dessie, T. and B. Ogle (2001). Village poultry production system in the central highlands of Ethiopia. The J. Tropic. Anim. Health and Prod., 33: 521-537.

Duncan, D. B. (1955). Multiple ranges and multiple F tests, Biometrics. 11:1-42.

Fayeye, T.R., A.B. Adeshiyan, and A.A. Olugbami (2005). Egg trait, hatchability and early growth performance of the Fulani-ecotype chicken. LRRD., 17 (8): *Ar*t ≠ 94.

Galal, A., A. M. H. Ahmed, U.M. ALI and H.H. Younis (2007). Influence of Naked- neck gene on laying performance and some hematological parameters of Dwarfing hens. Int. J. Poult. Sci., 6(11): 807-813.

Graces, A., N.H. Casey and P. Horst (2001). Productive performance of naked neck frizzle and dwarf laying hens under various natural climates and two nutritional treatments south. Afr. J. Anim. Sci., 31(3): 26-29.

Halima, H. (2007). Phenotypic and genetic characterization of indigenous chicken populations in Northwest Ethiopia. Ph.D. Thesis University of the Free State, Bloemfontein, South Africa.

Hagan J. K. and A.I. Adjei (2012). Evaluation of the growth and carcass yield characteristics of crossbred naked-neck and frizzle cockerel phenotypes reared under hot and humid environments. ARPN J. Agric. Biologic. Sci., 7 (8): 576-582.

Hanan, A.H. (2010). Variations in egg performance and plasma constituents at different ages of female Japanese quail. Egyptian Poultry Science J., 30 (2): 565- 581.

Hurwitz, S., E. Wax, Y. Nisenbaum, M. Ben-Moshe and M. Plavink (1998). The response of laying hens to induced molt as affected by strain and age. Poult. Sci., 77 (1): 22-31.

Ipek, A. and U. Sahan (2004). Effect of breeder age and breeding season on egg production and incubation in farmed ostrich. Br. Poult. Sci., 45(5): 643-647.

Iqbal, A., M. Akram, A. W. Sahota, K. Javed, J. Hussain, Z. Sarfraz and S. Mehmood (2012). Laying characteristics and egg geometry of four varieties of indigenous Aseel chicken in Pakistan. J. Anim. Plant Sci., 22(4): 848-852.

Islam, S. M. and R. K. Dutta (2010). Egg Quality Traits of Indigenous, exotic and cross bred chickens (*Gallus domesticus l.*) in Rajshahi, Bangladesh. J. Life Earth Sci., 5:63-67

Islam, M. A. and M. Nishibori (2009). Indigenous naked neck chicken: A valuable genetic resource for Bangladesh. Worlds Poultry Science J., 65(1): 125-138.

Jaroni, D., S.E. Scheideler, M. Beck and C. Wyatt (1999). The effect of dietary wheat middling's and enzyme supplementation. 1. Late egg production efficiency, egg yields and egg composition in two strains of Leghorn hens. Poult. Sci., 78(6):841- 847

Jatoi, A. S., M. Iqbal, A. W. Sahota, M. Akram, K. Javed, M. H. Jaspal, S. Mehmood, J. Hussain, T. Hameed, M. S. Khan, Y. Abbas, S. Ahmad, and H. M. Ishaq (2014). Comparative growth performance in four varieties of native Aseel chickens maintained in Pakistan. Pakistan J. Zool., 46(6):1565-1571.

Juarez, C.A. and L.M. Fraga (1999). A study of the naked neck or normal plumage genotypes on production of Criollo laying hens in the Mexican dry tropics. Cuban. J. Agric. Sci., 33 (4):165-170.

Khan, M.T. (2015). Effects of selenium-supplemented diets on production performance, hatching, egg geometry and quality traits in four varieties of indigenous Aseel. M. Phil. Thesis. Dept. Poultry Prod., UVAS, Lahore.

Khawaja, T., S. H. Khan, N. Mukhtar, M. A. Ali, T. Ahmed and A. Ghafar (2012). Comparative study of growth performance, egg production, egg characteristics and haemato-biochemical parameters of Desi, Fayoumi and Rhode Island Red chicken. J. Applied Anim. Res., 40(4): 273-283

Msoffe, P.M.M. (2003). Diversity among local chicken ecotypes in Tanzania. Ph.D. Thesis. Univ. Agri., Morogoro, Tanzania.

Mwacharo, J. M., K. Nomura, H. Hanada, Jianlin, O. Hanotte and T. Amano (2007). Genetic relationships among Kenyan and other East African indigenous chickens. J. Anim. Gen., 38(5): 485 – 490.

Peters, S.O. (2000). Genetic Variation in the Reproductive Performance of Indigenous Chicken and Growth of Pure and Half Bred Progeny, M.Phil. Thesis. Dept. Animal Breeding and Genetics. Univ. Agri., Abeokuta.

Rauen, H.W., P. Horst and A. Vallezarate. (1985) Use of major genes in poultry breeding for the tropics. Poster: *36th EAAP meeting*, Thessaloniki, 30 September- 3 October. Institute for animal production, Berlin, Federal Republic of Germany.

Reddy, V., V. K. Malathi and B.S.V. Reddy (2008). Effect of Induced Moulting in Male and Female Line Broiler Breeder Hens by Zinc Oxide and Feed Withdrawal Methods on Post Moult Performance Parameters Int. J. Poult. Sci., 7(6): 586-593.

Rehman, M.S., A. Mahmud, S. Mehmood, T.N. Pasha, K. Javed, J. Hussain, M.T. Khan (2016). Production performance of Aseel chicken under free range, semi-intensive and confinement rearing systems. The J. Anim. Plant. Sci., 26(6): 1589-1596.

Romanov, M.N., S.Wezyk, K. C.Benko and N.I.Sakhatsky (1996). Poultry genetic resources in the countries of Eastern Europe-history and current state. Poult. Avian. Biol. Rev., 7: 1-29

SAS Institute. 2002-2003. SAS/STAT User's Guide: Statistics. Version 9.1.SAS Inst. Inc., Cary, NC.

Sonaiya, E.B and S.E.J. Swan (2004). Small-scale Poultry Production. Technical guide manual. FAO (Food and Agriculture Organization of the United Nations), Rome, Italy. 1-54.

Thakur, M. S., S. N. S. Parmar and P. V. A. Pillai (2006). Studies on growth performance in Kadaknath breed of poultry. LRRD, 18: 1-9.

Usman, M., Z. Ahmad, M. Akram, J. Hussain, S, Mahmood and M. Shafiq (2013). Pre and Post molt productive performance of three age groups in four varieties of Aseel Chicken 33rd Pakistan Congress of Zoology (International). Islamabad, Pakistan. pp 355.

Younis, H. H and A. Galal (2006). Impact of dwarf (dw), rapid feathering (K+) and naked neck genes on growth and egg production of laying hen chickens. Poult. Sci., 26: 17-38.