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PHENOTYPIC CHARACTERIZATION OF TWO INDIGENOUS CHICKEN ECOTYPES OF PAKISTAN

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ABSTRACT

Aseel and Naked-neck chickens from various regions of Pakistan were studied (n=200; 100 (40♂, 60♀) in each) for phenotypic characterization based on head appearance; comb type; wattles size; colors and patterns of feathers on neck, breast, wing-bow, wing-bar, wing-bay, saddle and tail; shank color; spurs prevalence, and number of toes. Feather colors and patterns on the neck, breast, wing-bow, wing-bar, wing-bay, saddle and tail ($P<0.000$) and shank color ($P<0.042$) differed significantly between ecotypes. Both ecotypes had plain head. All Aseels had pea-comb, no wattles, fully feathered necks, predominantly dark-brown neck feathers (35%), pale-brown breast (32%), wing-bow (33%), wing-bar (35%), wing-bay (35%), saddle (32%) and black/gray tail feathers (44%). Majority (33%) had yellow shanks. Naked-necks possessed single-comb, predominantly medium sized wattles (53%), white/off-white neck (35%) and breast feathers (43%), dark-brown wing-bow feathers (21%), off-white wing-bar (26%) and pale-brown/orange-brown wing-bay (28%), black saddle (22%) and tail feathers (57%), yellow shanks (36%). Both ecotypes had four toes and normal spurs. Among Aseels, some hens also had spurs which is a unique feature not reported in previous studies to the knowledge of the authors. Predominantly both ecotypes had plain feathers but patterns were also present.

Key words: Phenotype, Aseel, Pakistan, Conservation, Naked-neck

INTRODUCTION

Poultry products come either through commercial or backyard poultry rearing system. Under each system producers have distinct preferences for breeds, intensification, and scales of operation. Commercial systems favor production of highly productive breeds under intensive system of management whereas the backyard/rural system prefer to rear indigenous breeds under extensive production system. The indigenous breeds though are less productive but have certain attributes of economic and cultural significance (Mangesha and Tsega, 2011) and impact households' food security. Breeding for high productivity has caused loss of many commercial, research, and indigenous genetic resources (Fulton, 2006; Delany, 2006; Woelders *et al.,* 2006). Many breeds are getting extinct leaving us without having even the very basic information about their characteristics and potential benefits. In such scenario, phenotypic characterization of available breeds is vital for proper management of these resources. Iqbal *et al*. (2012) described egg-laying and egg geometry parameters of Aseel chickens and the present study was planned to phenotypically characterize the indigenous Aseel and Naked-neck chickens of Pakistan.

MATERIALS AND METHODS

The present study was conducted on Aseel and Naked-neck chickens kept at Genetic Resource Centre for Indigenous Chicken (GenReCIC), Department of Poultry Production, University of Veterinary and Animal Sciences, Ravi Campus, Pattoki. Aseel birds were collected from Mianwali, Joharabad, Khushab, and Kasur districts of Punjab, Peshawar valley in KP (formerly NWFP), and Hyderabad district of Sindh. The Naked-neck day old chicks were brought from Poultry Research Institute, Bahawalpur and reared at Genetic Resource Centre for Indigenous Chicken (GenReCIC), Department of Poultry Production, University of Veterinary and Animal Sciences, Ravi Campus, Pattoki . Data for 100 mature birds (40 males and 60 females) from each ecotype were recorded regarding various phenotypic characteristics including head shape; comb type; wattles size; shank color and feathering; types of spurs; number of toes; and feather colors and patterns on neck, breast, wing-bow, wing-bar, wing-bay, saddle and tail.Comb types and shank colors were recorded according to Cuesta (2008) and the patterns on the feathers were compared against the British Poultry Standards (Roberts, 2008). The data were analyzed by calculating percentages of the birds possessing the observed parameters and association of traits with the ecotypes was tested by applying χ^2 test using SPSS version 17.

RESULTS AND DISCUSSION

Head Appearance and Comb Types: Both ecotypes had plain head. The head feathers of the Naked-neck chickens were extended in the form of a tassel in accordance with British Poultry Standards (Roberts, 2008). All Aseel chickens had a pea-comb which is in exact accordance with British Poultry Standards (Roberts, 2008). However, Sarker *et al.* (2012) reported some cases with strawberry comb and cushion comb (Evertt, 2010) in addition to the predominant pea-comb. The Naked neck chickens showed 100 percent prevalence of single comb which is in agreement with Roberts (2008) and Faruque *et al.* (2010) reporting 100% Single-comb in Naked-neck chickens. However, Al-Rawi and Al-Athari (2002) reported 90% prevalence of Single-comb in white Naked-neck lines.

Wattles: Aseel chickens did not possess any wattles which is in accordance with British Poultry Standards (Roberts, 2008), however Sarker *et al.* (2012) reported absence of wattles in the females while 77.19% males had wattles in Aseel. In the present study, most of the naked-neck chickens had medium sized wattles (53%) followed by small (36%), large (9%) and very small (2%). These findings are substantiated by Roberts (2008) who depicted medium sized wattles in Transylvanian naked neck chickens. Six percent of the Naked-neck chickens in this study had featherless necks indicating the presence of homozygous (NaNa) genotype.

Plumage Colors and Patterns: The results of present study regarding plumage colors in both Aseel and naked-neck ecotypes are given below along with detailed discussion on plumage colors of Aseel chicken. Information on colors and patterns of various body parts of Naked-neck could not be found in available literature. However, Faruque *et al.* (2010) reported overall plumage colors in Naked-neck chickens such as black (10%), black brownish (60%), red brownish (20%) and brown (5%). Similarly, Uddin *et al.* (2011) reported black, red and mixed colors. Both studies do not give details about patterns and colors on different body parts. The present study is more explanatory in this regard than the previous ones.

Neck: Among Aseel chickens 35% had dark-brown neck feathers with some bird having black feathers near head. The greenish- or brownish-black (27%) and black/grey (19%) were the other frequently observed colors. However, Sarker *et al.* (2012) reported predominantly red neck feather color along with greenish or brownish-black and black/grey.The Aseel chickens predominantly had plain neck-feathers (53%) followed by laced (19%), tipped (17%), and spangled (8%) patterns. Naked-neck chickens had primarily off-white/white (35%) neck feathers, followed by dark-brown (23%) and black (10%). Mostly (77%) Naked-neck chickens had plain neck feathers, followed by penciled (8%). The details of other colors and patterns in both ecotypes are given in Table 1. The ecotypes differed significantly in neck feather colors ($P<0.000$) and feather patterns ($P<0.000$).

Breast: Aseel chickens mostly had pale-brown/orange-brown or golden (32%) breast feathers followed by greenish/brownish-black (25%) and dark-brown (20%). which is similar to the findings of Sarker et el., (2012) who reported pale-brown color mostly prevalent in females whereas black breast feathers predominant in males. Majority of birds (48%) had plain breast feathers whereas a noticeable number had laced (10%) and penciled (7%) breast feathers. Naked-neck chickens mainly possessed white/off-white (43%) breast feathers, followed by pale-brown/orange brown or golden (19%) and black (17%). Majority (77%) had plain breast feathers and 11% had laced pattern (Table 1). The ecotypes were significantly different in breast feather colors ($P<0.000$) and patterns ($P<0.000$)

Wing-bow: Farely most of the Aseels (33%) had pale-brown/orange-brown or golden wing-bow feathers followed by brownish-black/greenish-black (26%) and dark-brown (20%) which is similar finding to that reported by Sarker *et al.* (2012) stating mainly pale-brown wing bow color in females but black in males. Majority of Aseel chickens (41%) had plain wing-bows followed by penciled (8%) and laced (8%) patterns. Naked-neck chickens had mainly pale-brown/orange-brown or golden (15.5%) followed by dark-brown (10.5%) and off-white/white (9.5%) wing-bow feathers. Majority (72%) of Nacked Neck had plain wing-bows whereas penciled (8%) was the only well-defined pattern observed. More colors and patterns are listed in Table 2. The ecotypes differed significantly in wing-bow feather colors ($P<0.000$) and patterns ($P<0.000$)

Wing-bar: Significant differences were observed in wing-bar feather colors ($P<0.000$) as well as patterns ($P<0.000$) of the ecotypes. Thirty five percent Aseel chickens had pale-brown/orange-brown or golden wing-bar feather colors followed by greenish-black or brownish-black (28%) and dark-brown or dark reddish brown (21%) which is supported by the findings of Sarker *et al.* (2012) who reported pale-brown color in females but red among the males. Majority (45%) had plain wing-bar feathers followed by irregular (44%) and penciled (8%) patterns.

Naked-neck chickens also had mainly pale-brown/orange brown or golden (29%) wing-bar feathers followed by off-white (26%) and dark-brown (20%). Majority (77%) had plain wing-bar feathers. Well-defined patterns were laced and penciled (Table 2).

Wing-bay: Both the ecotypes differed significantly in wing-bay feather colors ($P<0.000$) and patterns

(P<0.000). Aseels had mainly pale-brown/orange-brown or golden wing-bay feather colors (35%) followed by greenish-black or brownish-black (28%) which is supported by results of Sarker *et al.* (2012) reporting pale-brown color in females but black wing bay in males. Majority of the chickens had plain wing-bay feathers (43%), followed by various combinations of tipped and ticked (Table 3).

Naked-neck chickens had predominantly pale-brown/orange-brown (28%) or golden wing-bay feathers, followed by white/off-white (24%). Majority (60%) of the Naked-neck chickens had plain wing-bay feathers whereas 11 percent had barred pattern (Table 3).

Saddle: Both ecotypes differed significantly in saddle feather colors (P<0.000) and patterns (P<0.000).Saddle feathers were mostly pale-brown (32%) in Aseel chickens followed by greenish-black/brownish-black (26%) and black/gray (19%). Sarker *et al.* (2012) reported similar patterns (pale-brown saddle feathers) in females and red in males. Thirty seven of birds had plain saddle feathers whereas another 37% had combinations of ticked and tipped. Penciled (11%) and laced (8%) patterns were also present (Table 3).

Mostly, Naked-neck chickens possessed dark-brown or dark reddish-brown saddle feathers (31%), followed by black/gray (22%) and off-white (16%). Majority (73%) had plain saddle feathers. Well-defined patterns were laced and barred (Table 3).

Tail: Both ecotypes differed significantly in tail feather colors (P<0.000) and patterns (P<0.000). The Aseel chickens had mainly black/gray tails (44%) followed by greenish-black/brownish-black (25%) and dark-brown (20%) which is according to the findings of Sarker *et al.* (2012) who also reported predominantly black tail feather color in Aseel chickens.One half of the chickens had plain tails. Tipped was the only well-defined pattern observed in 14 percent birds (Table 4).

Naked-neck chickens had predominantly black tails (57%), followed by multicolored (18%) and pale-brown/orange-brown or golden (9%). Majority (67%) had plain tail feathers, followed by irregular patterns (Table 4).

Shank Colors: Both ecotypes had mainly yellow shanks (33% in Aseel and 36% in Naked-neck), followed by green (23%), gray (19%), white (15%) and either black, black from front and yellow from back or black from front and white from back (7%) in Aseel and white (15%), gray (14%), either black or black from front and yellow from back or black from front and white from back (13%), gray from front and white from back (11%) and green (11%) in Naked-neck. A few naked-neck chickens had black shanks from front and yellow from back.Both ecotypes significantly differed in shank colors (P<0.042). Faruque *et al.* (2010) reported similar observations i.e. yellow shanks (45%) followed by white, black and green in naked neck chickens of Bangladesh whereas Sarker *et al.* (2012) observed all the birds had yellowish shank color in Aseel chickens of Bangladesh. Our study shows greater variation in shank colors. We also observed some birds with black shanks from front and yellow from back which is a unique finding not reported in any of the previous studies in our knowledge.

Table 1. Neck and breast feather colors and patterns (%)

Color	Neck		Breast	
	Aseel	**Naked-neck**	**Aseel**	**Naked-neck**
Dark-brown	35.0	23.0	20.0	13.0
Greenish-black/Brownish-black	27.0	5.0	25.0	8.0
Black/Gray	19.0	10.0	19.0	17.0
No feathers	----	6.0	----	----
Off-white/White	2.0	35.0	4.0	43.0
Pale-brown/Golden/ Orange-brown	17.0	21.0	32.0	19.0
Pattern				
Laced	19.0	3.0	10.0	11.0
No feathers	----	6.0	----	----
Penciled	3.0	8.0	7.0	5.0
Plain	53.0	77.0	48.0	77.0
Spangled	8.0	2.0	----	----
Tipped	17.0	4.0	15.0	----
Barred	----	----	6.0	4.0
Mottled/Speckled	----	----	6.0	----
No definite pattern	----	----	8.0	3.0

Spurs: All the male birds of both ecotypes possessed normal spurs. However, the difference in prevalence of spur in ecotypes was non-significant (P<0.316). Presence of spurs in some Aseel hens was also observed which is contrary to that reported by Sarker *et al.* (2012) who reported the presence of spur only in the male Aseel chickens and none of the other studies in our knowledge had report the presence of spur in female birds.

Toes: All the birds in both ecotypes had four toes. This is in accordance with the findings of Sarker *et al.* (2012) who also reported 4 toes among the Aseel chickens of Bangladesh and Roberts (2008) who mentioned four toes as a standard for the Transylvanian naked neck chickens.

Table 2. Wing-bow and wing-bar feather colors and patterns (%).

Color	Wing-bow		Wing-bar	
	Aseel	**Naked-neck**	**Aseel**	**Naked-neck**
Brownish-black/Greenish-black	26.0	12.0	28.0	12.0
Dark-brown/Dark reddish brown[a]	20.0	21.0	21.0	20.0
Black/Gray[b]	19.0	13.0	16.0	11.0
Multicolored	----	4.0	----	2.0
Off-white/White[c]	2.0	19.0	----	26.0
Pale-brown/Orange-brown/Golden	33.0	31.0	35.0	29.0
Pattern				
Barred	----	4.0	----	7.0
Laced	8.0	7.0	3.0	11.0
Other	7.0	9.0	44.0	4.0
Penciled	8.0	8.0	8.0	8.0
Plain	41.0	72.0	45.0	70.0
Tipped/Ticked/Both	36.0	----	----	----

[a] Dark reddish brown color was only in wing bar feathers, [b] Gray only in Aseel, [c] only off white color was present in wing-bars

Table 3. Wing-bay and saddle feather colors and patterns (%)

Color	Wing-bay		Saddle	
	Aseel	**Naked-neck**	**Aseel**	**Naked-neck**
Black/Gray	14.0	16.0	19.0	22.0
Dark-brown/Dark reddish-brown	21.0	18.0	17.0	31.0
Greenish-/Brownish-Black	28.0	12.0	26.0	3.0
Multicolored	----	2.0	----	2.0
Pale-brown/Orange-brown/Golden	35.0	28.0	----	----
White/Off-white[a]	2.0	24.0	2.0	16.0
Pale-Brown	----	----	32.0	11.0
Golden	----	----	4.0	15.0
Pattern				
Barred	----	11.0	----	8.0
Laced	5.0	6.0	8.0	9.0
Penciled	5.0	4.0	11.0	3.0
Plain	43.0	60.0	37.0	73.0
Tipped/Ticked/Both	38.0	7.0	37.0	2.0
Other	9.0	12.0	----	----
Striped/Spangled/Irregular	----	----	7.0	5.0

[a] Only off-white color was present in the saddle feathers

Table 4. Tail feather colors and patterns (%).

Color	Tail	
	Aseel	**Naked-neck**
Black/Gray[a]	44.0	57.0
Dark-brown	20.0	7.0
Greenish-/Brownish-black	25.0	4.0
Off-white	6.0	5.0
Pale-/Orange-brown/Golden	5.0	9.0
More than one color[b]	----	18.0
Pattern		
Barred	5.0	6.0
Irregular Pattern	4.0	15.0
Mottled/Speckled/Spangled/Spotted	13.0	0.0
Penciled/Laced/ticked	7.0	9.0
Tipped/Tipped+Ticked	14.0	0.0
Trickled	7.0	3.0
Plain	50.0	67.0

[a]Gray color was observed only among Aseel chickens; [b]Brown with few black feathers; off-white with black; black, white and brown; off-white with dark brown; orange brown with black

Conclusion: Aseel and Naked neck are important trans-boundary chickens found in many countries including Pakistan. The present study revealed that Aseel and Naked neck chickens native to Pakistan are significantly different from each other in all phenotypic parameters except the prevalence of spurs and head appearance. The present study describes much detailed information on Aseel and Naked neck chickens and reports many variations in colors and patterns as compared with the previous studies.Studies on phenotype, performance and consumer preference attributes should be conducted for making strategies to conserve and promote the use of these indigenous birds.

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