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PHENOTYPIC DIVERSITY AMONG INDIGENOUS COCKFIGHTING (*ASEEL*) CHICKENS FROM PAKISTAN

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ABSTRACT

Cockfighting chickens are popular in Pakistan for their fighting behavior, good quality meat and as an attractive household bird. In this study, a total of 195 cockfighting chickens were evaluated for their morphological data during August 2013 to September 2014. Morphological data of cockfighting chickens were obtained from six regions of Pakistan including Sindh, Punjab, Khyber Pakhtunkhwa, Gilgit Baltistan, Federally Administrated Tribal Areas and Azad Jammu and Kashmir. The data were analysed statistically using ANOVA test. *Aseel* chicken varieties in this study were characterized by red, black, white, and wheaten plumage; yellow and brown shank; yellow beak with black patches; small earlobes; pea comb; yellow eye color and minimal wattles. Great diversity with respect to plumage was witnessed among these varieties. Mianwali *Aseel* showed significantly lower ($p \leq 0.05$) estimates of mean body weight and body circumference than all other studied varieties. Contrastingly, Kulung and Sindhi varieties showed significantly higher estimates ($p \leq 0.05$) of mean body weight compared to Mianwali, Mushka, Lakha, Java and Peshawari. Mean breast widths, keel lengths, pelvis lengths and body circumferences did not showed any significant difference ($p \geq 0.05$) among the studied varieties. Interestingly, Mianwali *Aseel* showed significantly higher estimates of mean drum length than Mushka, Sindhi, Kulung and Peshawari *Aseels*. Thus, we observed great phenotypic diversity among Pakistani cockfighting chickens.

Keywords: *Aseel* Chickens, cockfighting, Pakistan, Phenotypic diversity.

INTRODUCTION

Cockfighting chickens (*Aseel*), being native to Pakistan, are thought to have evolved from the red jungle fowl, *Gallus gallus murghi* through both natural as well as artificial selection (Branckaert *et al.,* 2000). In Pakistan, *Aseel* chickens are distinctive from other domestic chickens (*Desi*) in their behavior, morphology and their adaptability to tropical and subtropical climatic conditions (Bhatti *et al.,* 1991; Usman *et al.,* 2014a; Usman *et al.,* 2014b). *Aseel* chickens, in particular, have heavier body weights and broader stature of breast which may be helpful to address the increasing demand of chicken meat (Ahmad *et al.,* 2014, Fig. 2). The number of distinct cockfighting varieties in Pakistan is unclear with 4 to 7 varieties recognized so far (Babar *et al.,* 2012; Ahmad *et al.,* 2014). Common traits of all the cockfighting or game bird varieties are hard skull and solid beak, a muscular neck, minimal wattles and a neat, small pea comb. These features have been developed to suit them for their original purpose of cockfighting. Another breed characteristic is the yellow eye color, often with some visible red blood vessels. The broad body shape across the shoulders and shallow from the back down to the breast is also a distinctive feature of cockfighting chickens. Moreover, *Aseel* chickens have muscular legs and scaly shanks with yellow and black coloration (Scrivener, 2009). Likewise, variation in body weight of cockfighting chickens has been noticed among different varieties. For instance, Lakha (3.0-3.8 Kg), Mushka (3.0-3.5 Kg), Mianwali (2.5-3.0 Kg) and Peshawari (2.8-3.2 Kg) (Babar *et al.,* 2012). Proper management of these chickens may not only help in their conservation but will also contribute to a low input and low cost poultry production (Usman *et al.,* 2014b).

Chickens, being a staple food, are very important in Pakistan and contribute significantly into the overall grass domestic products (GDP) of the country. Additionally, Pakistan is rich in cockfighting chickens probably due to the factors like their adaptability, fighting behavior, good quality meat and as an important game bird. Unfortunately, population of these chickens is rapidly declining due the factors like lack of proper management, excessive exploitation through fighting, poor legislation and reduced public awareness. To this end, we are the first to explore the phenotypic diversity of cockfighting chicken varieties in Pakistan. In addition to filling a gap in the literature, this study would be a baseline for future research in the area.

MATERIALS AND METHODS

In the current study, only adult cockfighting chickens of both genders (aged ≥6 months) were randomly selected from six regions of Pakistan including Sindh, Punjab, Khyber Pakhtunkhwa, Gilgit Baltistan (GB), Federally Administrated Tribal Areas (FATA) and Azad Jammu and Kashmir (AJK). A total of 195 samples of seven *Aseel* chicken varieties (Mianwali = 27; Mushka = 32; Lakha = 19; Java = 21; Peshawari = 24; Kulung = 31 and Sindhi = 41) were recorded (Fig. 1). The qualitative traits included plumage color, shank color, beak color, eye color, wattle size, earlobe size and comb type as described by Cabarles *et al.,* (2012). Quantitative traits, on the other hand, comprised body weight, wing lengths, back lengths, breast widths, keel lengths, pelvis widths, drum lengths, shank circumference and shank lengths (Sarker *et al.,* 2012; Bett *et al.,* 2014). Body weights of the studied chickens were measured using scale balance whereas body measurements were recorded using measuring tape. All phenotypic data of the studied varieties were collected and grouped separately for the statistical analyses. One way ANOVA test and correlation among different variables were calculated using SAS software (Allison, 2010).

RESULTS AND DISCUSSION

Qualitative Traits: The plumage coloration of chickens has gained significant attention in developing countries like Pakistan probably due to its impact on market value and supply chain. Thus, the influence of plumage coloration on the breeding strategies of chickens has been largely anticipated (Dana *et al.,* 2010; Bett *et al.,* 2012). The most distinguishing plumage colors observed in this study include red, black, white and wheaten. Generally, plumage color was more diverse among Sindhi *Aseels* compared to other studied cockfighting chickens. Collectively, plumage color diversity was significantly higher among male compared to female chickens ($p \leq 0.05$). The observed plumage diversity among male chickens could partly be attributed to the factors like genetic admixture, climatic conditions and varied breeding strategies (Crawford, 1990). Several previous studies conducted in different countries like Bangladesh, Pakistan, Sri Lanka, Philippine and Ethiopia have also confirmed such plumage diversity among chickens (Faruque *et al.,* 2010; Melesse and Negesse, 2011; Bett *et al.,* 2014; Iqbal *et al.,* 2015; Liyanage *et al.,* 2015). Similarly, analyzing the data with respect to shank color, wattle size and beak color revealed more diversity among male chickens compared to their female counterparts. Contrastingly, male and female chickens showed least diversity with respect to their ear lobe size, comb type, and eye color. Altogether, *Aseel* chickens observed in this study were predominantly characterized by yellow beak color, yellow eye color, minimal wattle, small sized ear lobe and pea typed comb (Tables 1 & 2). Arguably, traits like yellow color, pea-typed comb, minimal wattle and small-size ear lobes may have specifically adopted by the cockfighting chickens. This is in close lines with several previous studies (Everett, 2010; Sarker *et al.,* 2012; Bett *et al.,* 2014; Iqbal *et al.,* 2015; Liyanage *et al.,* 2015).

Quantitative Traits: The quantitative traits observed in this study have been shown in Table 3. Overall, body weight of cockfighting chickens observed in this study ranged from 2 to 5.8 Kg which is supported by previous studies (Babar *et al.,* 2012; Usman *et al.,* 2014b). The mean body weights of Sindhi and Kulung varieties were significantly higher ($p \leq 0.05$) than the mean body weights of all other studied varieties. The collective body circumference of studied chickens ranged from 250 to 279 mm. The mean body circumference of Mianwali *Aseels* (262.4±5.2) was significantly smaller ($p \leq 0.05$) compared to the mean body circumference of all studied varieties (Table 3).

Moreover, the overall wing length of studied chickens ranged from 165 to 175 mm. The mean wing length of Sindhi chickens showed significantly higher difference ($p \leq 0.05$) when compared with Mianwali chickens (170.5±1.2 and 167.7±0.9, respectively). The overall back length of the studied chickens ranged from 575 to 583 mm. No significant difference ($p \geq 0.05$) in back lengths was observed among all studied varieties. Likewise, the collective breast width of all the studied chicken varieties ranged from 75 to 96 mm. The mean breast width of the Mushka *Aseel* variety was significantly higher ($p \leq 0.05$) than all other varieties. Overall, the keel length of the studied chickens ranged from 78 to 98 mm. The mean keel length of Sindhi *Aseel* (89.0±5.0) was significantly smaller ($p \leq 0.05$) than other cockfighting chickens. The collective pelvis width of all chickens observed in this study ranged from 20 to 24 mm. The mean pelvis width of Mushka *Aseel* varied significantly ($p \leq 0.05$) from the other varieties. The overall drum length of studied chickens ranged from 123 to 133 mm. Mean drum length of Mianwali *Aseel* (126.2±2.2) was significantly different ($p \leq 0.05$) from the mean drum lengths of Mushka (124.6±0.1), Peshawari (125.3±1.4), Kulung (124.9±0.9) and Sindhi (124.9±0.8). The shank circumference of all studied chickens ranged from 87 to 97 mm which showed no significant difference ($p \geq 0.05$) among the studied chickens. The overall shank length of studied chicken varieties ranged from 82 to 88 mm. The mean shank length of Mianwali (85.2±2.4), Mushka (85.2±2.4), Lakha (85.1±2.6) and Java (84.9±1.9) were significantly different ($p \leq 0.05$) from Peshawari (83.7±0.7), Kulung (83.5±0.2) and Sindhi varieties (83.4±0.1) (Table 3). Among the quantitative characteristics studied, body weight, body

circumference, wing length, back length, breast width, keel length, pelvis width, drum length, shank circumference and shank length of cockfighting chickens showed marked variations across the country which is in close agreement with several prior studies reported (Islam and Nishibori, 2009; Sanjeewa *et al.*, 2011; Bett *et al.*, 2014). Contrastingly however, our findings did not agreed with other studies conducted in Sri Lanka, Vietnam and two districts of Pakistan (Bahawalpur and Faisalabad) (Bett *et al.*, 2014).

Furthermore, body weight was observed to show strong correlation with the body circumference (0.91), breast width (0.56) and pelvis width (0.68). Positive correlation was also found between body circumference and breast width (0.41), wing length and pelvis width (0.45), wing length and breast width (0.60), body length and shank circumference (0.46), breast width and pelvis width (0.76), breast width and keel length (0.42) and keel length and pelvis width (0.45) (Table 4).

Among the qualitative traits, the studied chickens were mainly characterized by yellow beak color, yellow eye color, minimal wattle, small sized ear lobe and pea typed comb. Among the quantitative traits, on the other hand, body weight, body circumference, wing length, back length, breast width, keel length, pelvis width, drum length, shank circumference and shank length were observed to show huge diversity among the studied chickens. Our results further suggest positive correlation between body weight and other body measurements including body circumference, breast width, and pelvis width. Thus, we observed great phenotypic diversity among Pakistani *Aseel* chickens which would provide a baseline for future research in this field.

Table 1. Qualitative diversity among male *Aseel* chickens of Pakistan (Percentages)

	Java	Mushka	Kulung	Lakha	Mianwali	Peshawari	Sindhi	Overall
Plumage								
Red	-	11	4	-	-	-	11	3.7
Black	-	33	-	-	-	5	-	5.4
Red and black	-	50	32	-	-	5	34	17.3
Black and white	88	-	4	-	-	-	-	13.2
Black white red	12	6	4	-	-	-	-	3.1
Red brown	-	-	-	59	30	-	-	12.7
Dark brown	-	-	-	-	70	-	-	10.0
White brown	-	-	-	41	-	-	-	5.9
Wheaten	-	-	-	-	-	90	-	12.8
Golden white	-	-	-	-	-	-	4	0.5
Golden yellow and brown	-	-	52	-	-	-	-	7.4
Golden white and brown	-	-	4	-	-	-	-	0.6
Golden yellow and black	-	-	-	-	-	-	38	5.4
Golden yellow and red	-	-	-	-	-	-	11	1.5
Golden yellow, white and black	-	-	-	-	-	-	4	0.5
Shank color								
Yellow	24	44	21	65	25	25	3	29.6
Brown	-	-	79	-	45	-	-	17.7
Light brown	-	-	-	-	-	75	86	23.0
Black Brown	77	56	-	35	30	-	10	29.7
Wattles size								
Absent	77	50	79	100	70	90	97	80.3
Medium	24	50	21	-	30	10	-	19.2
Large	-	-	-	-	-	-	3	0.5
Beak color								
Black	19	5	4		30	5	21	12.0
Yellow	13	47	79	65	70	10	-	40.5
Black yellow	-	47	17	35	-	85	79	37.7
Black white	69	-	-	-	-	-	-	9.9
Ear lobe size								
Small	18	72	66	100	-	100	100	65.2
Medium	83	28	33	-	45	-	-	26.9
Large	-	-	-	-	55	-	-	7.9
Comb type								

Pea	94	100	100	100	100	85	100	97.0
Buttercup comb	-	-	-	-	-	5	-	1.0
Strawberry	-	-	-	-	-	10	-	1.0
Single	6	-	-	-	-	-	-	1.0
Eye color								
Yellow	77	89	100	100	100	100	86	93.1
White	24	11	-	-	-	-	10	6.4
Red	-	-	-	-	-	-	3	0.5

Table 2. Qualitative diversity among female *Aseel* chickens of Pakistan (Percentages)

	Java	**Mushka**	**Kulung**	**Lakha**	**Mianwali**	**Peshawari**	**Sindhi**	**Overall**
Plumage								
Red	50	29	-	-	-	-	33	16.0
Black	50	14	29	-	-	-	17	15.6
Red and black	-	43	57	-	-	50	33	26.2
Black and white	-	-	14	-	-	-	-	2.0
Black white red	-	14	-	-	-	-	-	2.0
Red brown	-	-	-	100	71	-	-	24.5
Dark brown	-	-	-	-	29	-	-	4.1
Wheaten	-	-	-	-	-	50	-	7.1
Golden white	-	-	-	-	-	-	17	2.4
Shank color								
Yellow	-	71	14	-	71	50	17	37.3
Black	-	-	-	-	29	-	50	13.1
Brown	-	-	86	100	-	-	-	31.0
Light brown	100	-	-	-	-	50	33	13.9
Black Brown	-	29	-	-	-	-	-	4.8
Wattles size								
Absent	100	79	100	100	100	100	100	97.0
Medium	-	21	-	-	-	-	-	3.0
Beak color								
Black	50	14	-	-	71	-	50	26.5
Yellow	-	36	-	-	-	-	-	5.1
Black yellow	-	50	100	100	29	100	50	61.2
Black white	50	-	-	-	-	-	-	7.1
Ear lobe size								
Small	50	79	100	100	29	100	100	80.0
Medium	50	21	-	-	71	-	-	20.0
Comb type								
Pea	100	93	100	100	100	50	100	92.0
Buttercup comb	-	-	-	-	-	50	-	7.0
Single	-	7	-	-	-	-	-	1.0
Eye color								
Yellow	96	100	80	100	100	100	100	97.0
White	4	-	20	-	-	-	-	3.0

Table 3. Quantitative body morphometric measurements of *Aseel* chickens of Pakistan (Mean±SD).

Trait	Sex	Mianwali (N = 27)	Mushka (N = 32)	Lakha (N = 19)	Java (N = 21)	Peshawari (N = 24)	Kulung (N = 31)	Sindhi (N = 41)	Range
Body weight (Kg)	**M**	2.8 ± 0.1	3.3 ± 0.2	3.5 ± 0.2	3.5 ± 0.2	3.0 ± 0.2	4.5 ± 0.6	4.5 ± 0.7	
	F	2.0 ± 0.1	2.7 ± 0.2	2.7 ± 0.1	2.6 ± 0.2	2.4 ± 0.1	3.3 ± 0.2	3.9 ± 0.8	
	Overall	**2.5 ± 0.5^{a}**	**3.0 ± 0.4^{b}**	**3.1 ± 0.6^{b}**	**3.1 ± 0.6^{b}**	**2.7 ± 0.5^{ab}**	**3.9 ± 0.9^{bc}**	**4.2 ± 0.5^{bc}**	2-5.8
Body circumference (mm)	**M**	266.0 ± 7.2	274.4 ± 3.2	271.6 ± 1.2	272.0 ± 1.6	272.1 ± 1.6	272.8 ± 1.3	272.3 ± 1.4	
	F	258.7 ± 2.2	259.2 ± 1.9	267.5 ± 1.5	267.5 ± 1.1	267.0 ± 1.2	266.1 ± 0.3	266.3 ± 1.1	
	Overall	**262.4±5.2^{a}**	**266.8±10.7^{b}**	**269.5±2.9 ^{b}**	**269.8±3.2^{b}**	**269.6±3.6^{b}**	**269.5±4.7^{bc}**	**269.3±4.2^{b}**	250-279
Wing length (mm)	**M**	168.6 ± 1.8	170.9 ± 2.5	168.0 ± 2.3	169.3 ± 1.8	169.4 ± 1.2	170.2 ± 1.0	170.3 ± 0.8	
	F	167.3 ± 1.5	167.2 ± 1.4	167.5 ± 0.5	167.0 ± 0.7	167.5 ± 0.5	167.4 ± 0.5	168.7 ± 1.7	
	Overall	**167.7±0.9^{a}**	**169.1±2.6^{a}**	**167.8±0.4^{a}**	**168.2±1.6^{a}**	**168.4±1.3^{a}**	**168.8±1.9^{a}**	**170.5±1.2^{ab}**	165-175
Back length (mm)	**M**	579.6 ± 2.1	578.0 ± 1.6	579.1 ± 2.0	579.4 ± 2.1	578.9 ± 1.4	578.6 ± 1.2	579.1 ± 1.4	
	F	577.9 ± 1.0	577.4 ± 1.4	579.0 ± 1.0	576.8 ± 0.8	576.3 ± 0.4	576.0 ± 0.0	578.1 ± 2.1	
	Overall	**578.4±1.6^{a}**	**577.7±0.5^{a}**	**579.1±0.1^{a}**	**578.1±1.9^{a}**	**577.6±1.9^{a}**	**577.3±1.8^{a}**	**578.6±0.7^{a}**	575-583
Breast width (mm)	**M**	77.3 ± 0.9	93.8 ± 1.3	77.1 ± 1.0	77.5 ± 1.0	77.6 ± 0.9	77.4 ± 0.9	77.2 ± 1.0	
	F	76.6 ± 0.9	94.1 ± 0.8	77.0 ± 1.0	76.8 ± 1.5	77.0 ± 2.0	76.7 ± 2.0	76.7 ± 1.8	
	Overall	**76.9±0.5^{a}**	**94.0±0.2^{b}**	**77.1±0.1^{a}**	**77.1±0.5^{a}**	**77.3±0.4^{a}**	**77.1±0.5^{a}**	**76.9±0.4^{a}**	75-96
Keel length (mm)	**M**	96.7 ± 0.6	96.8 ± 0.5	96.7 ± 0.7	96.9 ± 0.7	97.1 ± 0.7	97.2 ± 0.6	85.5 ± 8.8	
	F	95.8 ± 0.6	93.1 ± 0.8	96.5 ± 0.5	95.5 ± 0.5	95.5 ± 0.5	95.4 ± 0.5	92.6 ± 6.6	
	Overall	**96.3±0.6^{a}**	**95.0±2.7^{a}**	**96.6±0.2^{a}**	**96.2±1.0^{a}**	**96.3±1.1^{a}**	**96.3±1.3^{a}**	**89.0±5.0^{b}**	78-98
Pelvis width (mm)	**M**	20.8 ± 0.6	22.6 ± 0.8	20.8 ± 0.6	20.7 ± 0.4	20.6 ± 0.5	20.6 ± 0.5	20.6 ± 0.5	
	F	20.7 ± 0.5	20.6 ± 0.5	20.5 ± 0.5	20.5 ± 0.5	20.5 ± 0.5	20.4 ± 0.5	20.6 ± 0.5	
	Overall	**20.8±0.1^{a}**	**21.6±1.4^{b}**	**20.7±0.3^{a}**	**20.6±0.1^{a}**	**20.6±0.1^{a}**	**20.5±0.1^{a}**	**20.6±0.0^{a}**	20-24
Drum length (mm)	**M**	124.6 ± 1.1	124.5 ± 0.5	124.7 ± 0.7	124.4 ± 0.7	124.3 ± 0.7	124.3 ± 0.8	124.3 ± 0.8	
	F	127.7 ± 3.1	124.6 ± 0.5	124.5 ± 0.5	126.5 ± 1.1	126.3 ± 1.1	125.6 ± 0.5	125.5 ± 0.5	
	Overall	**126.2±2.2^{a}**	**124.6±0.1^{b}**	**124.6±0.2^{ab}**	**125.5±1.5^{ab}**	**125.3±1.4^{b}**	**124.9±0.9^{b}**	**124.9±0.8^{b}**	123-133
Shank circumference (mm)	**M**	88.5 ± 1.1	88.3 ± 1.2	89.0 ± 0.9	88.4 ± 1.1	88.6 ± 1.2	88.8 ± 1.1	88.8 ± 1.1	
	F	95.7 ± 0.9	95.1 ± 1.4	89.5 ± 0.5	95.0 ± 1.2	91.8 ± 2.9	92.0 ± 3.5	91.3 ± 3.3	
	Overall	**92.1±5.1^{a}**	**91.7±4.8 ^{a}**	**89.3±0.4^{a}**	**91.7±4.7^{a}**	**90.2±2.2^{a}**	**90.4±2.3^{a}**	**90.0±1.8 ^{a}**	87-97
Shank length (mm)	**M**	83.5 ± 0.6	83.4 ± 0.7	83.3 ± 0.7	83.5 ± 0.6	83.2 ± 0.8	83.3 ± 0.9	83.3 ± 0.8	
	F	86.8 ± 0.8	86.9 ± 0.8	87.0 ± 0.0	86.2 ± 0.4	84.2 ± 1.1	83.6 ± 0.5	83.5 ± 0.6	
	Overall	**85.2±2.4^{a}**	**85.2±2.4^{ab}**	**85.1±2.6^{a}**	**84.9±1.9^{a}**	**83.7±0.7^{c}**	**83.5±0.2^{c}**	**83.4±0.1^{c}**	82-88

^{abc} Means within the same row with different superscripts differed significantly ($p \leq 0.05$) for different chicken varieties..

Table 4. Correlation between body measurements of *Aseel* chickens of Pakistan.

	BW	BC	WL	BL	BWi	KL	PW	DL	SC	SL
BC	0.91*									
WL	0.39	0.30								
BL	-0.01	0.00	-0.10							
BWi	0.56*	0.41*	0.60*	-0.34						
KL	0.03	-0.27	0.31	-0.26	0.42*					
PW	0.68*	0.40	0.45*	0.03	0.76*	0.45*				
DL	0.08	-0.14	-0.13	-0.07	-0.04	0.02	0.35			
SC	0.21	0.21	-0.38	0.46*	-0.21	-0.13	-0.12	-0.31		
SL	-0.03	0.11	-0.06	0.03	0.04	-0.19	0.07	0.20	-0.17	

*($p \leq 0.05$), whereas abbreviation BW (body weight), BC (body circumference), WL (wing length), BL (body length), BWi (breast width), KL (keel length), PW (pelvis width), DL (drum length), SC (shank circumference) and SL (shank length).

Figure 1. Map of Study Area. Filled circles (Black Dots) show sampling sites. No. in parenthesis shows sample size.

Figure 2. Picture showing *Aseel* chicken

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