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ON-STATION MORPHOLOGICAL FEATURES OF IRAQI INDIGENOUS CHICKENS

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ABSTRACT

This study was conducted to characterize Iraqi indigenous chicken breeds morphologically. Six breeds named Barred (BA), Brown (BR), Black (BL), White (WH), white neck-naked (WH-NA), and Brown neck-naked (BR-NA), reared on-station were studied. Data on morphological properties were collected from 300 females and 150 males at 33 weeks of age randomly chosen from the base population. Descriptive statistics, frequency, and cross-tabulation were used to analyze the qualitative morphological variables. A two-way analysis of variance was conducted to analyze the effect of breed and sex on quantitative measurements. All chickens (100%) exhibited normal feather morphology and no silky or curly (frizzle) was observed. The distribution of the plumage is mainly characteristic normal, four breeds were shown normal and two breeds were characteristics as naked-neck, (66.7% normal and 33.3% naked-neck). The white, black, and barred breeds showed similarities between hens and roosters except for the male brown breed where colors are combined with other feather colors, mainly on wings, back, and tail. Skin color was mainly white and occurred in five breeds (P=100 percent) except brown naked-neck appeared in 66.7% of the population as red skin color. Males and females of BA chickens exhibited significantly higher body circumference, body length, shank length, neck length, and wingspan compared to other breeds. The lowest body characteristics were shown in WH, WH-NA, and BR-NA. The average BW of adultmales and females varied significantly among the populations. Females of BA populations

INTRODUCTION

Indigenous chickens in Iraq (2، 3، 6، 7، 29، 33) and in many developing countries (14; 26; 19) are well adapted to harsh local environment conditions which can be used as reservoirs of useful genes contributed in conservation (23، 32) and small scale production systems. The indigenous breeds have common morphological features variations especially in rural and backyards,ranging from plumage color and distribution, skin color, and shank color to comb type and body shape (27،38).\The current population of Iraqi indigenous chickens (IIC) was propagat-

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ed from local markets in 2008. They were guaranteed in a poultry research unit at the office of agricultural research of the ministry of agriculture. After that, six breeds were screened based on feather colors and distributions; white, black, brown, barred, white neck-naked, and brown neck-naked. The existence of phenotypic variation in indigenous chickens besides good adaptation to a harsh local environment may be a good choice to conserve these kinds of chickens. The qualitative morphological traits have a big impact on fancier acceptance in different geographic markets around the world (24, 35).

In Iraq, local chickens were raised to provide fresh eggs as a first choice in some households and a second choice is a plumage color, comb type, feather-legged, and some other desired properties. Bodyweight (BW) and egg production (EP) traits are important economic traits for livelihood farmers. In general, the low BW of males or females of IIC besides low EP may deny the adoption at the commercial level but these genotypes may be needed for further improvement and for unforeseen shifts in the environment or in demand.The information, documentation, distribution, and characterization for IIC are rare and not listed in the Domestic Animal Diversity Information System of the FAO (17). Therefore, the identification and characterization of valuable morphological features of IIC have a great impact on the preservation and conservation of chicken resources in rural or in captured. Weigend and Romanov, (39) reported that the information on chicken population, adaptation to a specific environment, possession of traits of current or future value, and sociocultural importance are essential inputs to decisions on conservation and utilization. In many developing countries, the documentation of morphological features of indigenous/native chickens was investigated widely (12, 14, 18, 21, 25, 27, 38). Morphological traits were considered as a useful criterion in describing differences between indigenous chicken populations in different regions globally or locally due to these traits as well as the quantitative and adaptive traits have important economic value in fowl (14). To date the paucity of information on Iraqi indigenous chicken's morphological characterization and quantitatively traits is remaining undocumented in a wide range. The current study was conducted on the on-station level to assess the morphological and quantitative variation of the adult Iraqi indigenous chicken populations and contribute to enriching the scarce information on the indigenous chicken genetic resources database in Iraq.

MATERIALS AND METHODS

Study site

Indoor (on-station management)

A sample of the Iraqi indigenous chicken population that rose in the Poultry Research Station at the Office of Agricultural Research /Ministry of Agriculture was used. The poultry farm is located at Longitude 33˚, 312, 313'E and Latitude 44˚, 202, 868'N. Six breeds of IIC namely, Barred (BA) Figure 1, Brown (BR) Figure 2, Black (BL) Figure 3, White (WH) Figure 4, White naked neck (WH-NA) (Figure 5) and Brown naked neck (BR-NA) (Figure 6), were developed after many generations of multiplication, purification and screening for plumage color and some morphological features. All these breeds were previously reared in rural and backyard for long time where the local breeder cannot provide ideal management and husbandry. The expose birds to harsh environment at farmer or livelihood level could enhance adaptation and switch on or stimulate many genes related with heat or disease resistance. The current population was descending from those chickens that have good adaptation to extreme Iraqi weath-

er. The birds of the different breeds represent the seventh generation of the foundation population reared randomly. A total of 300 females and 150 males at 33 weeks of age were randomly chosen from the base population and tested to determine their morphological properties. This age could be considered as the adult age where the bodyweight and linear measurements tend to plateau as shown previously (14).

Figure 1. Male and females chickens of Barred

Figure 2. Male and female chickens of Brown

Figure 3. Male and female chickens of Black

Figure 4. Male and female chickens of White

Figure 5. Male and female of White naked-neck

Figure 6. Male and female of Brown naked-neck

Data collection

Morphological variations were studied based on feather distribution (presence or absence of feathers on the neck); feather morphology; colors of the body plumage, shank color; skin color; earlobe color; comb type and head and body shapes. Data on-station was recorded for a total of indigenous chickens of both sexes following the FAO descriptors for chicken genetic resources approach (16). Descriptions of comb types were based on illustrations presented by Somes (36). The body components (breast circumference, body length, shank length, neck length, wing span and body weight at 33 week of age) were measured by using graded measurement tapes for the five first traits and with digital scale for BW at nearest 1 g. All measurements were recorded for each bird by a special team

in cooperation with the genetic resource information department at the ministry of agriculture.

Statistical analysis

Descriptive statistics on qualitative morphologic were analyzed by using SPSS software (37). Frequency procedures and cross-tabulation of SPSS were used to detect the binomial and polynomial variation between different breeds and sex. All data records were presented as percentages. The Binomial Test was used to analyze the significance of the differences within the population in feather morphology, feather distribution and skin color; the Cochran Test was applied to test the differences in shank and earlobe colors. The comb type and head and body shapes ware not subjected to analysis since all chickens appeared no variation in these traits.

Two way analysis of variance through the generalized linear modeling (GLM) procedure of SAS (34) was used to analyze the quantitative data of the body components (breast circumference, body length, shank length, neck length, wing span and body weight at 33 week of age). The age of the chickens was not included in the model because data were recorded at one age (33 weeks of age). Both breed and sex were included in the model as fixed effect. Significant differences were considered at level of $P<0.05$. Means were separated by using Duncan's multiple range and multiple F tests. Correlation and regression parameters of quantitative traits were analyzed through SAS software by using Proc. Corr. and Proc. Reg. statements. Spearman correlation between quantitative traits was used. The multiple regressions were used to fit bodyweight regression on some effective bodyweight measurements.

RESULTS AND DISCUSSION

Description of the chickens

The IIC in indoor was separated according to their plumage color after propagated from local rural and markets, six breeds resulted. We named the IIC as a breed, after FAO (17) guidelines, due to showed definably and identified external characteristics could be separated by a visual appraisal from each other even reared together. On the other hand, they were reared and founded in the country for a sufficient time to be genetically adapted to the local harsh environmental conditions.

Barred (BA; Figure 1), Brown (BR; Figure 2), Black (BL; Figure 3), White (WH; Figure 4), White naked-neck (WH-NA; Figure 5) and Brown naked-neck (BR-NA; Figure 6) were frequently observed (6). But in some time due to mixing some strange feathers were observed. Table 1 shows the results of the morphometric measurements recorded in IIC captured in indoor regimen. All chickens (100%) exhibited normal feather morphology and no silky or curly (frizzle) was observed. This is, partly, as a result of culling this type of feather morphology in station unit staffs. The normal feather morphology was also predominant in Ethiopian indigenous chickens (8).

The distribution of the plumage is mainly of characteristic normal, four breeds (BA, BR, BL, and WH) were showed normal and two breeds (WH-NA and BR-NA) were characteristics as naked-neck, (66.7% normal and 33.3% naked-neck). The greater proportion of the naked-neck gene (*Na*) in current population was a result of station efforts to conserve and preserve of naked-neck chickens. In some area of world, the *Na* gene was happened in low level such 2%

in Ethiopia (14), 6% in Nigeria (20), and 3.6% in Botswana (7) due to selection against this gene. In each breed there are basic colors that predominate in the plumage of hens and roosters. The white, black, barred breeds showed similarity between hens and roosters except for the male brown breed where colors are combined with other feather colors, mainly on wings, back and tail (Figure 2) which refer to lack of homogeneity between males and females due to this breed appeared differences in color between genders. The inheritance of plumage color and pattern is the result of a series of genetically determined events.

The expression of plumage color is a polygenic trait, one in which dominance, epistasis and other gene interaction. Smyth (35) reviewed that the pigments responsible for feather color are controlled by many genes that effect on the normal production of melanin and capacity to produce both eumelanic (black) and pheomelanic (red-buff) pigments. This suggest that the various color appeared in some breed of local chickens is a result of dominating one type of pigment over the other in one hand, and the epistatic mutations and certain genetic interaction in other hand. Dana *et al,* (14) and Tadele *et al,* (38) found that the homogeneity in feather color of indigenous chickens was rare or, in some situation, absent. Fencer's habit may be a good reason for color differentiation across plumage color worldwide in developing countries. Skin color was mainly white and occurred in five breeds (P=100 percent) except Brown naked-neck appeared 66.7% of population as a red skin color. This result confirms previous results recorded on the IIC (7). The reason of dominant frequency of white color in 94.4% compared with 5.60% of red color is a result of gene expression where red color that showed in BR-WN is a breed characteristic. At station level, the yellow color of skin was not recorded compared with white color which may be either due to feeding regime that lowers in corn introducing in diet or the measurements were collected from hens at production phase where pigment responsible for yellow color was depleted to maintain the yolk color. Dana et al, (14) found that the yellow skin was a greater in some Ethiopian IC. However, the yellow skin color was expressed in scavenging birds that eat more ingredients pigmentations that founded in alfalfa or in leftovers. On the other hands, the red skin color was noticed in naked-neck or featherless chickens. Shank color tends to be white in general compared with black color. Five breeds exhibited 100% white shank color whereas; the black chicken breed exhibited 100% black color. The shank color across all breed showed significant chi-square test (X^2 =0.001; 83.3 percent for white *vs.* 16.7 percent for black). Al-Rawi and Al-Athari (7) was also found diverse shank color between IIC and the yellow color was predominantly. The variation in shank color was mainly founded in rural area and backyard as reported by Liyanage *et al,* (25) and Maharani *et al,* (27).

The earlobe color was white in WH and WH-NA chicken population but varied from white (66.7 percent) to red (33.3 percent). Earlobe color varied between white and red or in combination between those in varied indigenous chicken's population in different countries (12; 18; 25; 27; 30). The feather color was varied from one-color (66.7 percent) to multi-color (33.3 percent). The morphology and distribution of feathers in most birds is normal, with uniform distribution throughout the body, although specimens with different plumage patterns can be found (Table1).The differences between sexes with respect to morphological properties were presented in Table 2. Normal Feather morphology and distribution was predominant in hens and roosters. White skin color, white shank

color, white earlobe color and one-color were observed frequently in hens and roosters over the red or multi colors.

The predominant certain features, in general, white color, in these breeds may be as a result of selecting and adopting birds from station staff toward this color. The description analysis of feather color showed different plumage patterns across breeds ranged from the white, white and grey, white and black, red and black, black and brown reddish, black, black and grey to brown colors and white color was predominant (Table 3). A comparison of proportions of plumage patterns showed significant Chi-square test. In Moroccan Beldi (9) and Jordanian indigenous chickens (1) a wide phenotypic variation in plumage color ranging from many colors, black, brown, grey to white was characterized. Depending upon region, breed and sex in different countries, the white plumage color was also predominant in Ghanaian chickens (10) whereas, the brown color was commonly happened in Ethiopian (30) and Nigerian (13) chickens. Comb type in the IIC in on-station was completely single and no other comb-type was exhibited with, therefore no analysis was carried out. The single comb would be beneficial for heat dissipation through the process of vasodilatation, especially in the summer season where high ambient temperatures in Iraq are common phenomena. In many tropical countries, the single comb was also predominant and frequent noticed compared with other comb types (8,9,14,22,27).

Table 1: Distributions and morphological of feather and color of skin, shank and earlobe of various breeds of Iraqi indigenous chickens (IIC) population

traits	BA	BR	BL	WH	WH-NA	BR-NA	Total	Chi-square	Significant.	
Feather morphology (%)										
Normal	100	100	100	100	100	10	100	--	Non	
Silky	0.00	0.00	0.00	0.00	0.00	0.00	0.00			
Feather distribution (%)										
Normal	100	100	100	100	0.00	0.00	66.7	450.0	0.001	
Naked neck	0.00	0.00	0.00	0.00	100	100	33.3			
Skin color (%)										
White	100	100	100	100	100	66.7	94.4	355.6	0.001	
Red	0.00	0.00	0.00	0.00	0.00	33.3	5.60			
Shank color (%)										
White	100	100	0.00	100	100	100	83.3	200.0	0.001	
Black	0.00	0.00	100	0.00	0.00	0.00	16.7			
Earlobe color (%)										
White	66.7	66.7	66.7	100	100	66.7	61.1	22.2	0.001	
Red	33.3	33.3	33.3	0.00	0.00	33.3	38.9			
Feather color (%)										
One-color	66.7	66.7	66.7	100	100	66.7	61.1	22.2	0.001	
Multicolor	33.3	33.3	33.3	0.00	0.00	33.3	38.9			

Table 2: Distributions and morphological of feather and color of skin, shank and earlobe of males and females of Iraqi indigenous chickens (IIC) population

traits	Male	female	Total	Chi-square	Significant
Feather morphology (%)					
Normal	**100**	**100**	**100**	**--**	**Non**
Silky	**0.00**	**0.00**	**0.00**		
Feather distribution (%)					
Normal	**66.7**	**66.7**	**66.7**	**50.0**	**0.001**
Naked neck	**33.3**	**33.3**	**33.3**		
Skin color (%)					
White	**94.4**	**94.4**	**94.4**	**355.6**	**0.001**
Red	**5.60**	**5.60**	**5.60**		
Shank color (%)					
White	**83.3**	**83.3**	**83.3**	**200.0**	**0.001**
Black	**16.7**	**16.7**	**16.7**		
Earlobe color (%)					
White	**66.7**	**66.7**	**61.1**	**22.2**	**0.001**
Red	**33.3**	**33.3**	**38.9**		
Feather color (%)					
One-color	**66.7**	**66.7**	**61.1**	**22.2**	**0.001**
Multi-color	**33.3**	**33.3**	**38.9**		

Table 3. Polynomial test of feather color across breed of Iraqi indigenous chicken (IIC) population

Color category	Frequency (%)
White	**33.3**
White and grey	**0.2**
White and black	**5.1**
Red and black	**16.7**
Black and brown reddish	**5.6**
Black	**16.7**
Black and grey	**11.1**
Brown	**11.1**
Chi-square	**1800**
Significance	**0.001**

Quantitative Measurements

The quantitative traits of males and females of six breeds of IIC were presented in table 4. The effect of breed, sex, and their interaction on all studied traits was highly significant (P<0.0001). Males and females of barred chickens exhibited significant BC compared to another breed. BOL, SL, NL, WS, and BW of barred males were significantly greater than other breed males. The lowest body characteristics were shown in WH, WH-NA, and BR-NA. The average BW of adult males and females varied significantly among the populations. Females of BA populations were significantly heavier than those in WH, WH-NA, and BR-NA populations and non-significant differences from BR and BL, whereas, there were non-significant differences between the final five breeds (Table 4).

The BW ranges for males were 1572 g in WH-NA to 2065 g in BA and for females ranging from 1291 g in BR-NA to 1580 g in BA. This result is, partially, in the ranges reported earlier by Al-Rawi and Al-Athari (7) for the same Iraqi indigenous chickens. The current population of IIC was reared randomly without any selection program. Therefore, the higher adult BW for IIC in the present population may be a result of improvement in non-genetic factors such as feed, husbandry, and hygiene that were introduced in higher levels than in rural or backyards. Roosters (males) achieved greater breast circumference (BC), body

length (BOL), shank length (SHL), neck length (NL), wingspan (WS), and BW than hens (females) in all breeds and as the main effects. The dimorphism between males and females of IIC Where males have higher BW was showed in Jordanian (1), Ethiopian (9, 38), and Indonesian (27) indigenous chickens. The sex-linked genes effected growth was not showed in the current population, no dwarf gene was detected. All breeds appeared normal in phenotype.

In both sexes as breed as a main effect, The BC breed was greater in BA followed by BR, BL, WH, WH-NA, and BR-NA ranging from 28.16 to 24.71 cm. The BOL was higher in BA and BL followed by WH, BR-NA, BR, and WH-NA ranging from 60.42 to 56.00 cm. The SL, NL, and WS were greater in BA than other breeds. The SHL was higher ($p<0.0001$) in BA and WH breed, and the lowest in WH-NA ranging from 10.4 to 9.03 cm. Neck lengths was superior in BA breed and inferior in WH-NA breed. The highest WS were shown in BA (37.09 cm) and the lowest were in WH-NA (33.01 cm). BW was varied between breeds ranging from 1245 g in BR-NA g to 1741 g in BA breeds. However, the ranges in this study were much higher than those reported by Halima et al. (22) for seven indigenous populations of chickens in north Ethiopia and Dana et al. (14) in various chicken breeds in five districts of Ethiopia, and Tadele et al. (38) in different breeds in Kaffa zone, southwestern Ethiopia. But lower than those reported by Maharani et al. (27) who showed the difference in body measurement was different between breeds of local Indonesian chickens where BW was ranged from 1650 g to 3550 g for males and from 1310 g to 3080 g for females. The higher body weight and linear traits of BA breeds might be a suitable for meat production rather than for egg as shown previously from some scholar (4). The difference between breeds and strains of chickens in growth was documented in several early studies that estimate more than 15 genes determining growth rate (4) besides non-genetic factors.

Mean body weight and body measurements in the current study were superior of results obtained on indigenous chickens on Ethiopian (31, 38), and Nigerian (13) indigenous chickens and lower or close to those reported for Ghanaian (11); Ethiopian (14, 28), and Indonesian (27) local chickens.

Highly significant ($P<0.0001$) correlation between body traits was shown (Table 5). The overall Spearman correlation was ranging from 0.308 between breast circumference (BC) and neck length to 0.69 between BC and BW. The correlation between these traits on breed basis was also strong and positive but the values were varied according to the breed. This positive significant correlation revealed a strong association between BW and others body traits (BOL, SHL, NL, and WS) which revealed that the selection for any of body measurement will cause improvement in other traits. Dorji and Sunar (15), Tadele et al, (38) and Otecko et. al. (32) were also showed this positive and strong relationship between BW and linear body traits. Table 6 shows that the effect of body weight regression on body measurement was highly significant ($p<0.0001$). The best prediction (R^2) for assessing BW at adults was noticed in the BA breed (0.69) and the lowest was in the WH-NA breed (0.23). The highest R^2 for most breeds provides the best tool to predict body weight through regression equations without needing to measure body weight *per se*. This equation is considered a useful tool to predict BW when scales were not available on the farms and could use the tape measure to estimate body weight reliably.

Table4: Influence of genotype and sex and their interaction on the bodymeasurements of indigenous Iraqi chickens (IIC) population

Breed[1]	Sex	BC (cm)	BOL (cm)	SHL (cm)	NL (cm)	WS (cm)	BW (g)
BA	Male	30.25±0.45^{a}	66.04±0.82^{a}	11.76±0.23^{a}	13.04±0.12^{a}	40.40±0.44^{a}	2065±49.5^{a}
	Female	27.14±0.26^{b}	57.77±0.41^{d}	9.72±0.17^{cd}	12.68±0.45^{ab}	35.44±0.30^{cd}	1580±35.53^{cd}
BR	Male	28.29±041^{b}	61.92±0.44v^{c}	10.44±0.23^{b}	11.16±0.32^{c}	36.20±0.39^{c}	1705±57.44^{c}
	Female	27.04±0.25^{c}	54.54±0.42^{f}	9.62±0.20^{cd}	11.12±0.38^{c}	34.00±0.34^{ef}	1476±32.90^{ef}
BL	Male	28.83±0.45^{b}	64.04±0.71^{b}	9.88±0.24^{bc}	12.48±0.14^{ab}	36.20±0.41^{c}	1873±43.75^{b}
	Female	26.36±0.24^{cd}	57.06±0.38^{de}	9.72±0.18^{cd}	11.78±0.33^{bc}	34.16±0.41^{ef}	1480±28.54^{ef}
WH	Male	28.48±0.43^{b}	63.92±0.72^{b}	10.28±0.29^{bc}	12.32±0.16^{ab}	37.28±0.44^{b}	1662±48.54^{cd}
	Female	24.49±0.24^{e}	55.46±0.31^{ef}	9.90±0.15^{bc}	11.96±0.25^{bc}	33.18±0.25^{f}	1380±40.40^{fg}
WH-NA	Male	27.12±0.32^{c}	60.33±0.91^{c}	10.00±0.38^{bc}	11.24±0.39^{c}	35.32±0.32^{cd}	1572±24.34^{de}
	Female	25.59±0.22^{d}	53.92±0.73^{f}	8.54±0.14^{e}	8.72±0.24^{d}	31.28±0.26^{g}	1376±33.81^{fg}
BR-NA	Male	27.12±0.46^{c}	60.77±0.77^{c}	10.00±0.20^{bc}	11.96±0.15^{bc}	34.76±0.47^{de}	1692±48.31^{cd}
	Female	23.50±0.34^{f}	56.66±0.60^{de}	9.16±0.10^{d}	11.08±0.10^{c}	32.14±0.20^{g}	1291±34.22^{g}
Main effect							
Breed							
BA		28.16±0.28^{a}	60.42±0.61^{a}	10.47±0.18^{a}	12.80±0.30^{a}	37.09±0.37^{a}	1741±39.12^{a}
BR		27.45±0.22^{b}	57.00±0.51^{cd}	9.89±0.16^{b}	11.13±0.27^{c}	34.73±0.29^{b}	1552±31.48^{b}
BL		27.16±0.25^{b}	59.39±0.51^{a}	9.77±0.15^{bc}	12.01±0.23^{b}	34.84±0.32^{b}	1611±32.11^{b}
WH		25.84±0.31^{c}	58.28±0.56^{b}	10.03±0.14^{ab}	12.08±0.16^{b}	34.55±0.31^{b}	1474±34.86^{c}
WH-NA		26.11±0.20^{c}	56.00±0.52^{d}	9.03±0.18^{d}	9.56±0.25^{d}	32.63±0.30^{c}	1441±26.16^{c}
BR-NA		24.71±0.34^{d}	58.03±0.52^{bc}	9.44±0.11^{c}	11.37±0.09^{b}	33.01±0.25^{c}	1245±35.41^{c}
Sex							
Male		28.33±0.19^{a}	62.85±0.34^{a}	10.39±0.12^{a}	12.03±0.11^{a}	36.69±0.22^{a}	1762±22.91^{a}
Female		25.69±0.13^{b}	55.86±0.19^{b}	9.44±0.07^{b}	11.22±0.14^{b}	33.37±0.14^{b}	1430±14.93^{b}
Factor		P-value					
Breed (E)		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Sex (S)		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
E×S		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

[a-g] Mean within same column for within same factor with no common superscripts differ significantly (P<0.05).

[1] Breed: BA=Barred; BR=Brown; BL=Black; WH=White; WH-NA=White naked-neck; BR-NA=Brown naked-neck.

BC= Breast circumference; BOL=Body length; SHL=Shank length; NL= Neck length; WS= Wing span; BW=bodyweight.

Table 5: The Spearman correlation coefficient between body measurements in different IIC breed

Variable[1]	Overall					
	BOL	SHL	NL	WS	BW	
BC	0.560****	0.460****	0.308****	0.575****	0.690****	
BOL		0.615****	0.470****	0.633***	0.650****	
SHL			0.384****	0.584***	0.532****	
NL				0.423****	0.439****	
WS					0.566****	
BA breed[2]						
BC	0.663****	0.299**	0.182ns	0.284**	0.594****	
BOL		0.759****	0.759***	0.804****	0.775****	
SHL			0.322**	0.779****	0.745****	
NL				0.248*	0.357***	
WS					0.696****	
BR breed						
BC	0.417***	0.709****	0.202ns		0.634****	0.624****
BOL		0.680****	0.251*		0.569****	0.489****
SHL			0.220*		0.393***	0.447****
NL					0.111ns	0.216*
WS						0.488****
BL breed						
BC	0.491****	0.281**	0.250*		0.334**	0.673****
BOL		0.542****	0.474****		0.534****	0.627****
SHL			0.223*		0.378***	0.400***
NL					0.286**	0.469****
WS						0.281**
WH breed						
BC	0.758****		0.538****	0.333**	0.694****	0.721****
BOL			0.443****	0.258*	0.628****	0.668****
SHL				0.345***	0.531****	0.509****
NL					0.402***	0.384***
WS						0.617****
WH-NA breed						
BC	0.453****		0.355***	0.273*	0.351***	0.607****
BOL			0.592****	0.556****	0.591****	0.663****
SHL				0.249*	0.702****	0.494****
NL					0.422***	0.375***
WS						0.539****
BR-NA breed						
BC	0.622****		0.551****	0.395***	0.657****	0.790****
BOL			0.615****	0.559****	0.610****	0.656****
SHL				0.561****	0.525****	0.635****
NL					0.516****	0.577****
WS						0.594****

[1] BC= Breast circumference; BOL=Body length; SHL=Shank length; NL= Neck length; WS= Wing span; BW=bodyweight.
[2]Breed: BA=Barred; BR=Brown; BL=Black; WH=White; WH-NA=White naked-neck; BR-NA=Brown naked-neck.
ns=No significant; *P<0.05; **P<0.01; ***P<0.0001; ****P<0.0001.

Table 6: Stepwise multiple regression equation of predicted body weight (Y) in both sexes of IIC

Breed	Adjust R^2	Regression Equation	P-value
Overall	0.55	Y=-1391.3+51.5(BC)+16.2(BLO)+22.3(SL)+9.3(NL)+5.2(WS)	0.0001
BA	0.69	Y=-1660.0+12.1(BC)+29.8(BLO)+49.2(SL)+9.8(NL)+9.9(WS)	0.0001
BR	0.44	Y=-1550.9+61.5(BC)+ 6.5(BLO)+16.0(SL)+5.9(NL)+20.9(WS)	0.0001
BL	0.63	Y=-1596.3+56.9(BC)+32.4(BLO)+15.6(SL)+7.0(NL) - 16.6(WS)	0.0001
WH	0.33	Y=-1035.4+34.8(BC)+10.2(BLO)+23.6(SL)+22.1(NL)+11.1(WS)	0.0001
WH-NA	0.23	Y=-667.3+55.5(BC)+10.9(BLO) -0.92(SL) - 13.2(NL)+5.8(WS)	0.0003
BR-NA	0.66	Y=-1683.2+57.7(BC)+ 6.7(BLO)+48.5(SL)+81.3(NL) - 10.5(WS)	0.0001

[1] **Breed: BA=Barred; BR=Brown; BL=Black; WH=White; WH-NA=White naked-neck; BR-NA=Brown naked-neck.**

CONCLUSION

The current study found that the IIC can be distinguished from each other phenotypically. The six breeds exhibited definable characteristics especially plumage color and feather distribution. The normal feather morphology and single comb are predominant in all breeds. Skin color, shank color, and earlobe color tend to be white in general. Bodyweight and linear body measurements exhibited reasonable variations between breeds indicating that these breeds may be used in different aspects of production (meat or egg). The higher body weight and measurements in the current study could be associated with the ideal husbandry practices provided for birds. On the other hand, the variations between breeds may provide valuable information for designing selection programs that participate in improving local Iraqi chickens through quantitative genetic approaches.

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الوصف المظهري للدجاج المحلي العراقي المربى في المحطة البحثية

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الملخص

أجريت هذه الدراسة لتوصيف سلالات الدجاج العراقية المحلية شكليا، إذ تمت دراسة ست سلالات من الدجاج المحلي البني، الابيض، الاسود، المخطط، عاري الرقبة الابيض وعاري الرقبة البني. تم جمع البيانات الخاصة بالخصائص الشكلية والمظهرية فردياً من 300 انثى و150 ذكرًا بعمر 33 أسبوعًا تم اختيارها عشوائيًا من عشيرة الاساس. استخدم الإحصاء الوصفي، والتكرارات، والجدولة المتقاطعة لتحليل المتغيرات الشكلية والنوعية. تم إجراء تحليل التباين ثنائي الاتجاه لدراسة تأثير السلالة والجنس في القياسات الكمية. أظهر جميع الدجاج كافة (100٪) شكل طبيعي للريش ولم يلاحظ النمط المجعد والحريري. كان توزيع الريش طبيعياً بشكل أساس، إذ تبين أن أربع سلالات طبيعية وسلالتين عاريتي الرقبة (66.7٪ طبيعي و33.3٪ عاري العنق). أظهرت السلالات البيضاء والسوداء والمخطط تشابهًا بين الاناث والذكور باستثناء الذكور البنية إذ لوحظ تنوع ألوان الريش، خاصة على الأجنحة والظهر والذيل. كان لون الجلد الأبيض هو السائد في خمس سلالات عدا الدجاج العاري البني الذي اظهر 66.7٪ من الافراد بلون جلد أحمر. أظهرت ذكور وإناث الدجاج المخطط أعلى محيطاً للجسم، وطول الجسم، وطول الساق، وطول العنق، وطول الجناح مقارنة بالسلالات الأخرى. تم تسجيل أدنى خصائص للجسم في سلالتي البني والابيض عاريتي الرقبة. اختلف متوسط وزن الجسم للذكور والإناث بشكل كبير بين سلالات الدجاج المختلفة. كانت إناث سلالة المخطط أثقل بكثير من طيور سلالات الدجاج عاري الرقبة الابيض والبني غير انها لم تكن معنوية عن سلالتي البني والاسود، بينما كانت هناك اختلافات غير معنوية بين السلالات الخمس الأخيرة. يمكن الاستنتاج بان سلالات الدجاج المحلي تمتلك سمات فريدة من نوعها وخصائص النمط الظاهري التي يمكن أن تكون معيارًا مفيدًا لصونها واكثارها في التربية الريفية والمنزلية.

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