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Review

Comparison of some genetic parameters and economic traits of Iraqi local chicken with other breeds

Authors:
Eman H. AL-Anbari

Institution:
Department of Animal Production, University of Baghdad, Iraq.

Corresponding author:
Eman H. AL-Anbari

ABSTRACT:

Iraqi local chicken's phenotypic characters makes it close to its grandparents or to their ancestor, the Reed Jungle Fowl (RJF). It can't be classified as layer or broiler chicken; but it's high immunity compared with other breed in Iraq makes it easy to be used in selection programs to improve its production ability and performances. On the other hand this local chickens are adapted to weather condition in Iraq such as very hot climate in long summer months and very cold weather in winter, making it indigenous local chicken in Iraq which is why it must be genetically maintained as Iraqi national wealth and to be conserved. It is easy now a days with the revolution of molecular genetic techniques besides the Mandolin classical breeding concept and many of genetic parameters can be used to improve the performance of Iraqi local chicken with the retention of the identity of Iraqi local domestication chicken.

Keywords:

Iraqi local chicken, Productive traits, Genetic variation, Genetic parameters.

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INTRODUCTION

Chicken industry is one of the main industry for many economic benefits of the country because of its advantages in presenting the speed of capital cycle and contributing to the consumer needs for food. Hence, researchers focus on improving production of chicken breeds by following special strategies producing commercial specific breeds (North, 1984). Production traits and quality egg traits are the important economic aspects which can be improved genetically by selection (Francesch *et al*., 1997). To improve any breed we need to estimate genetic parameter such as heritability, correlation and reputability for economic traits in order to be developed by suitable plan for genetic improvement established on right scientific basis. There are two ways breeders can change genotypes of their flocks. One of them is selection (by choosing suitable individuals in each flock to be parents for the next generation), and second one is the meeting methods. The main problem ahead the farmers and breeders is which bird is the good one to be used and how to choose the best one, etc., Breeders usually depend on phenotypic traits to select birds, but that may leads to select birds with a good appearance as evidence of its genetic susceptibility while in fact that may not be genetically good which may cause deterioration of grade in its offsprings.

Direct selection of individual according to its phenotypic identity with the genotype (genetic marker) is more efficient than from using traditional selection and that could be made easy by estimating the relation between Quantitative Traits Loci (QTL) with genetic markers (Dekkers and Hospital, 2002). So chicken breeder is recommended to estimate the breeding value of their birds to be used in genetic evaluations (Cassell, 1992, 2001). Genetic evaluation is known as the outcome analysis of animal performance (productive traits) and information of its progeny to determine its breeding value (Conlin and Steuernagel, 1993). Breeder needs to know the breeding value of their birds to be used while selecting any traits (Jalal and Hassan, 1984). One methods used in this field is the Best Linear Unbiased Prediction (BLUP). Hagger (1994) mentioned that the genetic characteristics of the flocks usually depends on the genetic variation and its percentage to the total variation (the whole variant). Hence, the genetic indicators of breeds must be determined and then the appropriate strategies developed in order to achieve the goal set ahead. Many studies took place to evaluate birds genetically according to the numbers of quantitative productive traits and qualitative egg traits for use in breeding programs (Lo *et al.*, 1997; Hartmann *et al.*, 2003; Aktaruzzaman, 2004). In this review, a comparison on some productive parameters for egg production between Iraqi local chickens with other adapted layer breeds of Iraq was done.

Productive traits and egg quality

Body weight at sexual maturity

Chicken breeds differ on body weight at sexual maturity, as studied by AL-Rawi (1969), AL-Jebouri (1970), Ahmad (1988) and AL-Shaheen (1998) who agreed that this traits for local chicken was less significant than from both leghorn and new Hampshire chicken at the same age. Many researchers mentioned that body weight at sexual maturity for local chicken ranged between 1290 -1391. Aktaruzzaman (2004) reported that this trait differ significantly ($P>0.01$) between chicken species such as Rhode Island Red (RIR) and Fayoumi (Fa) and Hilly (Hi) and with their crosses RIR*Fa, Fa*Hi and RIR*Hi. AL-Anbari (2007) studied three chicken groups *viz*., the first was leghorn reared in cages the second and third was Leghorn and local chicken reared separately on flour for determination of their body weight at sexual maturity. The results indicated that traits was highly significant for first group with 1390 g and 1335.34 g for the second while it was ($P<0.05$) significantly lower for the third group, the local breed with 1240.24 g only.

Age at sexual maturity is considered as an important economic trait because the main goal of rearing layer chickens is to produce eggs. So, age at sexual maturity must be adjusted for flocks to produce eggs at appropriate age. Many researchers concluded that age at sexual maturity is affected by several factors such as heredity and other environmental parameters such as temperature, light and nutrition (Freeman and Booman, 1975), or other polygenic factors that has a relation with the development of reproductive system and sexual maturity. (Uemoto *et al*., 2009). AL-Rawi, (1969) pointed out that Iraqi local chicken mature easily compared with white Leghorn or new Hampshire and differ significantly and the age at sexual maturity was 177,188 and 199 day for local, leghorn and Hampshire respectively but that was contrary to AL-Jebouri (1970), who explained that age at sexual maturity for white leghorn was three weeks earlier than the age of sexual maturity for Iraqi chicken and four weeks earlier than new Hampshire as it reached sexual maturity at 112.5, 183.7 and 189.6 day for leghorn, local and new Hampshire respectively. Soller *et al*., (1984) mentioned that age at sexual maturity for white leghorn was 165.4 day while it was 203.22 for local Dizzy Indian chicken. AL-Inee *et al*., (1986) compared this trait between local chicken, leghorn and New Hampshire and it ranged between 143, 158 and 157 days, while Abdullah *et al*. (1986) found out that normal age at sexual maturity was 133 for local chicken and 136 days for Neck chicken and was 159 and 176 day for all of leghorn and new Hampshire respectively with significant difference at ($P<0.01$). Suhayl (1987) pointed out that average of sexual maturity for local chicken ranged between 119-124 days, while it was 167-171 day when egg production reached 50%. Ahmed (1988) mentioned that female local chicken with single comb was significantly earlier compared with leghorn and New Hampshire for this traits.

First egg weight

Many researchers encouraged on this trait as it is with direct effect on weight of first egg and egg mass (Hutt, 1949). This trait was affected with environment, average body weight and age at sexual maturity beside other factors (Pentedo *et al*., 1971). Average weight of first egg for local chicken was 34 g, (Ahmed, 1988) or 38 g (AL-Rawi, 1969) and for leghorn was 37 g and 40 g for the same researchers respectively. Dattavio *et al*. (2001) pointed out that the mean weight of first egg was 49.4, 29.9 and 42.5 g for leghorn, Fayoumi and Rhode Island respectively. AL-Anbari (2010) found that weights of first egg for local Iraqi chicken was significantly lower as 36.82 g. ($P>0.05$) than leghorn whether it was ground rearing (44.68 g) or in cages (43.11 g).

Average weight of first egg

This trait is considered as one of the important quantitative trait because costumer prefers egg with high weight. Many genetic and monogenetic factor affects this trait (Hutt, 1949). Amer and AL-Rawi (1972) found that average egg weight at 100 days of production was 54.52, 54.50 and 51.73 g for leghorn, new-Hampshire and local Iraqi chicken respectively. AL-Soudi and AL-Jebouri. (1979) found a highly significant difference ($P>0.01$) between local chicken. Leghorn and new Hampshire also. Pandey *et al*. (1984) and Dayon *et al*. (1986) found a significant difference on egg weight between species and breed. AL-Inee *et al*. (1986) mentioned a highly significant difference in the mean of egg weight for Iraqi local chicken when compared with some imported breeds and local chicken recorded less values when calculating egg after 100 days of production period. Abdullah *et al*. (1986) found out the average egg weight was 39.4, 45.2, 55.8, 54.4 g for domestic Iraqi chicken Iraqi local naked chicken, leghorn and New Hampshire with high significance. Chen and Tixier -Boichard (2003) found that average egg weight was 50.6 and 55.6 at 26-29 weeks and at 50-54 weeks age respectively, on leghorn. Sterling *et al*. (2003) mentioned that for commercial layer white leghorn chicken of 203 flocks, the average egg weight was 60.15 g. Luquetti *et al*. (2004) found that egg weights increased

Table 1. Average egg weight on different breeds of chickens

S. No	Egg weight (g)	Number of observation	Breed	Studied country	Resources
1	46	1050	Local chicken	Iraq	AL-Ethawey (1988)
2	43.19	4500	Local chicken	Iraq	Ahmad (1988)
	47.07	1700	Leghorn		
	47.27	1140	New hamp.		
3	51.54	300	Five lines of leghorn	India	Johari *et al*. (1989)
	51.83				
	53.61				
	52.0				
	56.1				
4	55.43	2324	PN		Fracesch *et al*. (1997)
	56.79	2444	PL		
	56.91	2130	ER		
5	65.2	--	ISA	Germany	Preisinger (1998)
	65.4	--	Lehmann		
	65.6	--	Hisex		
	65.1	--	Tetra		
	64.1	--	Dekalb		
6	56.35	20	Plymouth rock	Bangladesh	Barja *et al*. (1998)
	58.35	20	Leghorn		
	55.95	20	Rhode Island		
	53.60	20	White York		
7	62.2	121	ISA	Koryi	Suk and Park (2001)
	52.6	123	Local koryi chicken		
8	47.62	170	Local chicken	Iraq	AL-Rawi (2003)
9	52.45	14	Rhode Island	Bangladesh	Yeasmin (2003)
	44.86	14	Leghorn		
	44.12	14	Fayoumi		
	37.76	14	Normal deshi		
	37.10	14	Dwarf deshi		
10	43.80	-----	Rhode Island *Hilly	Bangladesh	Aktaruzzaman *et al*. (2004)
	41.95	---	Fayomi*Hilly		
	45.88	----	Sonali		
	55.38	----	Nera		
11	60.50	400	Babcock 300	Turkish	Bamacioglu and Ergul (2005)

significantly (P>0.05) at 38.3, 64.6 and 68.2 g at the age of 35, 45 and 60 weeks respectively. AL-Anbari (2007) mentioned that average egg weight for 100 production days for local Iraqi chicken reached 47.56 g which was significantly lower (P>0.05) than for leghorn reared on ground system with 54.65 g or leghorn reared in cages with 54.87 g for the same treats trait. The lowest production for local chicken was because of heat stress condition (Wang *et al*., 2017).

Egg Mass (EM)

This trait is obtained from the egg weight and the number of eggs produced. Many factors affect these two qualities. Ahmad (1988) mentioned that egg mass during first 100 production days for Iraqi chicken, leghorn and new Hampshire was 2.916, 3.138 and 2.349 kg respectively, while AI-Tikriti (1988) mentioned that this trait was 6.49 kg and 5.16 kg during one productive year for Fayoumi and local Egyptian chicken respectively. Sterling *et al*. (2003) studies leghorn white flock and found that this trait recorded 51.33 kg/day and there was a significant difference among light, medium and heavy breed for the same flock. AL-Anbari (2007) pointed out that this trait was 4158.98 g for leghorn in cages, 3845.40 g for ground leghorn and was reduced significantly for local with 2541.99 g.

Estimation of some genetic parameters

The Heritability

Weight at sexual maturity

The heritability for this traits for leghorn from parental variation was 0.32, 0.49 (Soller *et al*., 1984; Zanella *et al*., 1988). Al-Tikriti *et al*. (1999) on their study on local Iraqi brown chicken reported 0.59 from maternal variation. AL-Rawi (2001) on local barred chicken reported 0.32, 0.38 and 0.35 and 0.29, 0.45 and 0.37 for first and second generation respectively.

Weight of first egg

AL-Tikriti *et al*. (1999) estimated the ‘h^2’ for this traits from parental variation and was found to be 0.25, while AL-Rawi (2001) mentioned that the ‘h^2’ for this trait from both parental and maternal variant and covariance for first (0.24, 0.28 and 0.26) and second generation (0.26, 0.32 and 0.29) respectively.

Average Egg Weight (AEW)

The ‘h^2’ for this trait was ranged between 0.50 and 0.66 (Chaudhary *et al*., 1986) and was 0.50 from maternal variance for this character (Cywa-Benko and Wezyk, 1988). AL-Tikriti *et al*. (1999) estimated this trait for local brown chicken from all of parental and maternal variant and the covariance was 0.34, 0.76 and 0.55 respectively, while AL-Rawi, (2001) found that the h^2 from parental and maternal variant and covariance for first (0.24, 0.31 and 0.27) and second generation (0.24, 0.34 and 0.23) respectively. Table 3 shows the value of h^2 of AEW for different breeds.

Egg Production (EP)

The ‘h^2’ when estimated by Restricted Maximum Likelihood (REML) was 0.29 in laying hens (Hagger, 1994). Preisinger and Savas (1997) found that the h^2 ranged between 0.10 and 0.15 during the first five months of egg production and ranged between 0.20 and 0.64 after that (Francesch *et al*., 1997). AL-Tikriti *et al*. (1999), mentioned that the h^2 for EP in local brown chicken was 0.28 from parent variation and 0.66 for cove variation too. AL-Rawi (2003) mentioned that the h^2 from all of parental and maternal variance and covariance at first 0.17, 0.24, and 0.20 and at second generation was 0.20, 0.25 and 0.23 respectively (Table 4).

Egg Mass (EM)

The ‘h^2’ for this trait was calculated from parental variance and ranged between 0.09-0.59, (Zanella *et al*., 1988). AL-Tikriti *et al*. (1999) mentioned that the ‘h^2’ for this trait on local brown chicken when estimated from maternal variance was higher than when estimated from parental variance and it reached 0.64 and 0.37 respectively. AL-Rawi (2003) on his study on local barred chicken the ‘h^2’ for this trait from components of parental and maternal variance and contrast components was

Table 2. Average Egg Mass (AEM) for different breeds

S. No	AEM	Number of observation	Breed	Town	References
1	19.19[1]	--	Lohmann	Germany	Preisinger (1998)
	18.60[1]	--	Hisex		
	18.29[1]	--	Dekalb		
	18.42[1]	--	Shaver		
	17.81[1]	--	Babcock		
2	37.20[2]	14	Rhode Island	Bangalidish	Yeasmin *et al*. (2003)
	33.25[2]	14	Leghorn		
	31.93[2]	14	Fayoumi		
	16.74[2]	14	Normal Deshi		
	16.06[2]	14	Dwarf Deshi		

(1) AEM as Kg/H.H (2) AEM as g/bird/day

0.25, 0.31, 0.28 and 0.34, 0.42, 0.38 for first and second generation respectively.

Egg Quality Traits (EQT)

Qualities of eggs are considered important economic factors. Dowson *et al.* (1954) mentioned that continuous selection can improve this trait, beside most of quality egg trait have medium to higher inheritance ability and this make it easy to be used in selection programs (Aktaruzzaman, 2004).

Egg Shape Index (ESI)

Johari and Singh (1966), mentioned that the h^2 for ESI of Turkish chickens was 77.92 from 2040 observations by crossing between Hisex* Brown chicken. Anderson *et al*. (2004) estimated this trait in the breeds of commercial selection leghorn with single comb in line CS5* and found 71.54, 72.48 and 73.59, 74.76 at all of CS7*, CS10* and CC5* line respectively in USA.

B-Hu unit

Ahmed (1988) estimated this traits in Iraqi local chicken, leghorn and new Hampshire with an average of 84.00, 85.83 and 86.70 for these breed respectively. In Bangladesh Aktaruzzaman (2004) found this trait was 77.99 for crossing of Rhode island *Hilly while it was 77.45 for Fayoumi* Hilly and 75.78 for Somali breed and the highest one was 86.25 for Nera breed. Results of Katoch *et al*. (2011) showed that high value of Hu unit supported evaluation of the fresh egg and ages of the laying hens which correlated with the result of Pradeepta *et al*. (2015) whose study revealed that there were a high correlation coefficient between fresh egg characters appropriate to hens age and Hu Unit in white Leghorn in India.

Second: the genetic and phenotypic correlation

The genetic correlation means that bout traits could translate across generation together or in opposite direction, for the first one could be the positive genetic correlation while the second one could be the negative genetic correlation and the last phenomena of multiple effect of gene could pleiotropy and it is explained as the effect of gene on two traits or more causing segregation when synchronous variation occurs. It belongs to the shortage of crossing over between genes (linkage) which effect in bout traits located on the same chromosomes. The environment correlation means to the correlation between environmental deviation and non-additive genetic deviation (Falconer, 1989 and 1997). Bourdon (1997) explained it as the measure to the relation between effect of environment on one trait and oth-

Table 3. The ‘h^2’ for AEW in different breeds

S. No	h^2	of Number observation	Estimation	Breed	Country	References
1	0.51	232	Sir. Model	Leghorn	Indi	Sivasamy *et al*. (1976)
2	0.59	2324	Multivariate Animal Model	PN	Spin	Francesch *et al*. (1997)
	0.48	2444		PL		
	0.50	2130		RE		
3	0.63	920	REML	Brown dwarf chicken	Chin	Zhang *et al*. (2005)

ers. The phenotypic correlation represents the degree of relationship between the phenotypic values of two traits and that may determine the individuals in a population. The importance of genetic and phenotypic correlation in selection especially when used to select for more traits (Selection Index) is because correlation specify the expected deterioration or improvement of each trait when selected over the other one (Cassel, 2001).

The correlation between age and body weight at sexual maturity

Chaudhary *et al*. (1986) mentioned that the genetic correlation between these traits in Iskandari chicken was positive and significant with a value of 0.61. In Iraqi local chicken as Amer (1965) and AL-Rawi (1969) found that the correlation between these traits was positive and significant which ranged as 0.39 – 0.48, while AL-Jebouri (1970) mentioned that the correlation for both traits was positive and not significant in local chicken with 0.89. AL-Tikriti (1988) found the correlation for these traits in Egyptian chicken which differed according to the breed and was significantly positive (0.74) in Fayoumi chicken and was significantly negative -0.71 in Balady chicken. In local Iraqi chicken, Ismail (1997) pointed out that the phenotypic and genetic correlation between these traits was negatively significant at 0.24.

The correlation between body weight at sexual maturity and egg production characters

AL-Jebouri (1970) pointed out that the genetic correlation between body weight and egg production were different as the breed differs, since the correlation was highly significant between both traits on new Hampshire chicken but was not significant in leghorn and local chicken with 0.32, 0.09 and 0.09 respectively. Chaudhary *et al*. (1986) mentioned that there is a negative significant genetic correlation between body weight at sexual maturity and egg production but was positive on the genetic correlation between body weight at sexual maturity and egg numbers (0.34), egg weight (0.42) and egg mass (0.32) in leghorn chicken. Hagger (1194) found out the coefficient of correlation for body weight with egg numbers 0.36 and 0.29 with egg weight. The coefficient for genetic and phenotypic correlation with body weight at hatching was -0.152 and -0.1316 with egg production (Ismail, 1997; AL-Anbari, 2010; Poggenpoel, 1986).

The correlation between ages at sexual maturity with egg production characters

Most studies agreed that there was a positive phenotypic correlation between age at sexual maturity and weight of first egg. AL-Rawi (1969) pointed out that the coefficient of correlation for these traits in leghorn was 0.58, 0.13 for new Hampshire and 0.67 in local Iraqi chicken. AL-Tikriti (1988) estimated these traits on Fayoumi and Balady chicken and was found to be -0.33 and -0.64 with egg mass traits in both line. Ismail (1997) found that the genetic correlation for age at sexual maturity in local Iraqi chicken was 0.141 with weight for first egg and 0.176 with average egg weight. Khawaja *et al*. (2013) pointed out that there were positive significant correlation (P>0.05) between age at first egg and other qualitative egg characters in Fayoumi and Rhode Island Red in Egypt.

Correlation between egg production characters

AL-Tikriti (1988) found a positive phenotypic correlation for egg mass with egg weight as 0.17 in fayoumi chicken. Francesch *et al.* (1997) reported the genetic correlation between number of egg production and egg weight for Penedasenca Negra, Part Liponada and Empardavesa Roja chicken as -0.22, -0.21 and -0.19 respectively while the phenotypic correlation for the same breeds were -0.18, -0.16 and -0.14 respectively and that was identical with whole general trend for correlation between both traits (Basbes *et al.*, 1992; Francesch and Iglesias, 1995). Chen and Tixier-Boichard (2003) pointed a positive correlation between number of egg production and egg weight as 0.26 and with egg mass as 0.91, while it was negative between number of egg production and shell weight with -0.26 in white leghorn and between egg weight with both egg mass as 0.12 and 0.60 as shell weight, as a whole. Wolc *et al.* (2005) noticed a significant positive genetic correlation between partial and total egg production and that could support the possibility of adoption of the egg production curve to improve this trait. Yoo *et al*. (2005) added that there are a significant negative genetic correlation between egg production (in number) and egg weight with -0.49 coefficient. Sapkota *et al*. (2017) pointed out there is a negative and non-significant correlation between egg weight and egg shape index

Third: the genetic evaluation

To analyse perinatal animal production performance of offsprings and to determine the breeding value BLUP (Conlin and Steuernagel, 1993), animal model, multiple-trait animal model, random regression model and Sire model were used. These programs make genetic evaluation significantly more accurate (Basbes *et al*., 1992). Individual genetic evaluation according to body weight at different age and characters of egg production are too important in selection programs for eggs fit for hatching or table eggs too(Wole *et al*., 2005). The animal model means the maternal, paternal and offspring synchronous evaluation to predicate individual genetic ability (Aitchison, 1993).

Henderson (1975) pointed out the possibility to get genetic regression with the amount and direction improving over years and with high quality when whole information about the parents, Dames, offspring and their relation between flock members to estimate the breeding value and the genetic variant belonging to different genetic programs, (Lindhe and Philipsson, 1988) or different ways could be used to estimate variance and covariance using animal evaluation methods (Gengler *et al*., 1999). Cassell (1992) noticed that the animal model program is the more accurate in evaluating animal performances and to estimate the breeding value because it removes all the fixed effects, and it can be used to evaluate the genetic variant and genetic ability, and as per the data size available, breeding value for any individual will be closer to its really genetic ability (Conlin and Steuernagel, 1993; Sorensen and Kennedy, 1996). Wolc *et al*. (2005) mentioned that the goal of chicken genetic breeding programs was to increase egg production and to reduce production period and both depending on the genetic variation in the flocks and latest research focused on the indirect selection to increase egg production depending on the first three months of egg production.

Focus on modern study for Iraqi local chicken

Modern techniques must be used to study chicken genome apart from studying the phenotypic characters, qualitative characters or other traits dealing with numerous number of genes affecting traits, the quantitative traits in addition to relying on classical breeding concept. Hence, it became obligatory using genetic markers as a good tools to detect economical traits in the selection programs. Local Iraqi chicken were used in such a study to fixing a cellular characters including

Table 4. The h^2 for egg production in different breeds

S. No	h^2	No. of opservation	Estimation model	Breeds	Country	References
1	0.64^4 0.70^4 0.67^4	403	Sire model Sire+Dam Dam	Leghorn	India	Singh *et al*. (1972)
2	0.14^3	232	Sire model	Leghorn	India	Sivasamy *et al*. (1976)
3	0.27	2100	Regression female on Dam	Leghorn	USA	Mc Clung *et al*. (1976)
4	0.17^1	-------------	--------------	Local chicken	Egypt	Farqualy *et al*. (1989)
5	0.25^5 0.09^6 0.18^7 0.27^5 0.13^6 0.16^7		REML Univarite	Pure Line A Pure line B	Germany	Basbes *et al*. (1991)
6	0.29	8844	REML Animal model	Commercial flock	Russia	Hagger (1994)
7	0.20 0.31 0.33	2324 2444 2130	Multivarit Animal modeal	PN PL ER	Spain	Francesch *et al*. (1997)
8	0.11^2	11083	REML	Leghorn	Brazil	Grassman and Koops (2001)

Note: 1: EP for 90 days; 2: EP for 26-48 weeks; 3: EP till 40 weeks; 4: EP at first 90 days; 5: EP for 19-26 weeks; 6: EP for 16-38 weeks

Cell Cycle Progression (CCP) for local chick embryo for 12 h (AL-Anbari, 1999) and then compared with White Leghorn chicken immunologically for Amino De Amines (ADA) enzyme at different age. The results indicated that local chicken was with high values for this immunity enzyme at all age (AL-Anbari, 2010). AL -Rekabi (2015) studied the polymorphisms of Growth Hormone (GH) and its receptor (GHR) with many production traits in local chicken and found three genotypes, *viz*., the wild AA, AB hetero and BB the mutant. Polymorphisms affect (significance at P>0.05) average egg production for 100 production days and was (P>0.01) significant on body weight at sexual maturity as the studied genotypes differ with excellence for AB and BB significantly for AA genotype. To study the genetic distance between local chicken with other breed, Abdulrazaq (2015) used PCR-RAPD technique as comparative genetic diversity tools between fire groups of local chicken with different in plumage color and four groups of layer and broiler imported chickens. The results indicated a genetic similarity was stretched from 0.256 to 0.813 between all local chicken groups with other imported chicken.

Amir *et al*. (2019) studied the polymorphism of Vasoactive Intestinal Peptide (VIP) gene in third generation of local brown chicken selected for high egg production trait for 78 weeks of age using PCR-RFLP techniques. The results showed three genotypes of TT, TC and CC for VIP gene, TT genotype achieved greater egg number compared to those of CC and TC. On the same local chicken population the association between Vasoactive Intestinal Peptide Receptor (VIPR-1) gene with chicken production traits were studied. The results showed two genotypes of TT, and CC for VIPR-1gene in the current population. Results indicated significant differences in egg production from 35 to 50 weeks of age in hens with CC genotype than CC genotype (Eman and Mudher, 2019)

Alameri *et al*. (2019a) studied the polymorphisms of Neuropeptides Y (NPY) gene polymorphisms and its association with egg production traits in local brown chicken selected for high egg production in the third generation. The results showed three genotypes *viz*., TT, TC, CC for NPY gene, and the TT was superior in average body weight at sexual maturity than TC and CC genotype. In other complementary study on the same chicken population for the Gonadotropin Releasing Hormone Receptor (GnRHR) gene polymorphisms and its relation with egg production traits, two genotypes were indicated AA and AG. Only in this population, the AA genotype was highly significant in mean age at sexual maturity traits while AG genotype was significant at p>0.01 in body weight at sexual maturity and weight of first egg (Alameri *et al*., 2019b).

CONCLUSION

The genetic resources of the breeds represent different desirable characters. Hence, both the molecular and phenotypic characters must be analyzed individually for each breed and then the desirable breeds can be farmed for the economic development of the people specific to their region.

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