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Indigenous Chicken Production in Iran: A Review

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Abstract: One of the sources that, provide protein in developing countries, is native chicken. So, they should be taken into consideration in poultry improvement programs. Indeed, egg and meat production of indigenous chickens in Iran have been considered by different researchers. In this study, various works have been studied for different years and investigated some results regarding laying and meat production traits of Iranian indigenous chickens, as well as their crossings with exotic breeds.

Key words: Indigenous chicken, laying, meat producing, heritability coefficient, cross breeding

INTRODUCTION

Over the past decade, poultry population has grown spectacularly throughout the world: 23% in developed and 76% in developing countries. This increase, due primarily to industrial or commercial production, has been most notable in South and East Asia, where, growth averaged 90% (Gueye, 2003). Iran poultry industry has been developing very much over the past three decades. The numbers of intensive units have been increasing at a great rate, mainly due to the introduction of new hybrid birds, better management systems, vaccination against various diseases and other disease control interventions and the latest technical advances from other countries. However, indigenous chickens still persist, mainly in rural areas, where in some places numbers are increasing (Vali, 1992). Indigenous chickens always play an important role in supplying fresh animal protein sources of food in developing countries and especially in rural areas. Utilization of animal breeding programs in order to increase genetic potential of indigenous chickens in the developing countries has been considerable (Aini, 1990; Tadelle *et al*., 1999; Edriss *et al*., 1999). According to different reports (Makarechian *et al*., 1983a, b), indigenous chicken populations are able to take valuable position in the future animal breeding programs in the world. In addition to being valuable gene pools or major source of genes (which directly or indirectly influences the production characteristics under tropical management conditions), indigenous chickens are able to improve quality of products through heterosis or morphological and physiological changes (Ansari *et al*., 1996, 1997; Tadelle *et al*., 1999).

In addition, indigenous chickens could have special importance in the expansion of animal breeding programs. The lack of attention to this question and the increasing use of imported commercial strains from developed countries raises a major threat on the future of indigenous chickens and, finally, can lead to their total disappearance (Vali, 1992; Ansari *et al*., 1997; Animesh *et al*., 1998).

Moreover, accomplishment of efficient animal breeding programs in a given domestic population requires more knowledge about the phenotypic variances and co variances and about the genetic parameters of important economic traits. Choosing the best breeding animals depends on genetic variability and on the amount of genetic relationships between traits of economic interest for each population (Edriss *et al*., 1999). Such data have been collected for indigenous chickens in Iran.

It is worth mentioning that, Iranian villagers have been providing meat and egg for their own families and other citizens for centuries, but this process has been reversing since less than three decades. Thus, most villagers now practice industrial poultry production which is located around the big cities; this process may lead to the risk of disappearance of indigenous chickens. As a result, some of the research organizations and centers began their initiated in indigenous chickens (Khosravinia *et al*., 1999).

MEASUREMENT OF PRODUCTION CHARACTERISTICS

Characteristics related to the laying performance: The number of laid eggs over a certain period of time defines the laying rate of one hen. In some cases, the weight of all laid eggs may be regarded as a laying rate too, but the correlation between the number of laid eggs and the average egg weight is often negative, so that it is better to take them into account as two separate traits (Vali, 1992).

Edriss *et al*. (1999) examined phenotypic and genetic parameters associated with laying characteristic in

indigenous chickens and their crossings with cocks of exotic breeds which were kept in Isfahan Research Centre, Isfahan, Iran. Isfahan Province is located between 31°, 26' and 34°, 30' N latitude and 49°, 30' and 55°, 50' E longitude, with an area of 106179.5 km^2. Genetic groups of their experiment were formed including:

- A random sample of a native fowl population
- Across between native fowl females and males of grand paternal parent of broiler lines from Arbor Acres
- A cross between native fowl females and males of grand maternal parent of broiler lines from Arbor Acres
- A cross between native fowl females and males of parent stock laying chickens from Hy-Line company)

The above four groups included 774 chickens. They recorded laying characteristic from the beginning of sexual maturity to the end of age of 52 weeks. The chicks were reared from birth day to 20 weeks of age in house with litter and from 20 weeks of age to the end of experiment in house with individual cages. In their research, it have been reported that, sexual maturity age in indigenous chickens, weight of the first egg, the number of eggs to the age of 52 weeks, the egg weight in the age of 52 weeks, feed intake until the age of 52 weeks and the feed coefficient until the age of 52 weeks were 157.1±0.8 days, 39.6±0.4 g, 132±2.33 eggs, 50.7±0.3 g, 24.3±0.11 kg and 3.8±0.07, respectively (Table 1).

Vali (1992) evaluated some traits for three genetic groups of indigenous chicken of Iran. Three groups including: Naked-necked, Marandy, Public (compound of different genetic groups). He reported the average of laying in the weeks of 22 to 37, sexual maturity age and average of eggs weight in three groups, which they have been shown in Table 2.

Makarechian *et al.* (1983a) reported that the average of egg weight of indigenous chickens of South of Iran, based on their genetic potential was in the range of 47.6-49.4 g. In this same report percent egg productions of survived pullets were 48.4 and 50.1 in the first and the second years of the experiment, respectively. The hen-housed and hen-day production averages of the pullets were also shown in Table 3. The correlation coefficient between body weight and egg production in the first year of the study was −0.13. The average body weight of the pullets in the first year was 1.71 kg with a SD of 250 g (ranged from 1.1 to 2.5 kg) when they were approximately 300 days old. Some of the results have been shown in Table 3.

Mirhoseini (1990) compared in his research, the genetic potential of indigenous chicken under semi-industrial and rural conditions (The location of this experiment was in Gilan Province in South West of Caspian Sea, in Iran).

Results related to his research have been shown in Table 4. Rural conditions were included: food which was fed to the chicks, was mostly the remainder of waste food from rural people, the remainder of soaked wheat dried

Table 1: Least squares means and SE for laying characteristics in indigenous chicken and their crossing with exotic breed and compound in formation of all groups

Characteristics	Indigenous chickens	Cross-breed for meat (A)	Cross-breed for meat (D)	Cross-breed for laying	Compound information*
Maturity age (day)	157.10±0.8^a	151.20±0.9^b	152.90±0.8^b	156.80±0.9^a	154.50±0.4
Weight of first egg (day)	39.60±0.4^a	39.60±0.5^a	39.70±0.4^a	39.60±0.5^a	39.60±0.2
No. of eggs at 34 weeks	53.30±1.1^c	56.50±1.2^b	57.20±1.1^b	60.60±1.1^a	56.90±0.6
No. of eggs from 35 to 52 weeks	19.00±1.7^d	80.20±1.9^c	85.30±1.7^b	99.30±1.8^a	85.90±0.9
No. of egg from maturity age to 52 weeks	132.00±2.33^c	1370.00±2.52^c	143.00±2.3^b	160.00±2.4^a	142.80±1.2
Egg weight from maturity age to 34 weeks (g)	46.60±0.3^c	49.20±0.4^a	49.40±0.3^a	48.20±0.4^b	48.30±0.17
Egg weight from 35 to 52 weeks (g)	53.60±0.3^c	57.90±0.4^a	58.20±0.3^a	55.70±0.4^b	56.30±0.17
Egg weight from maturity age to 52 weeks (g)	50.70±0.07^c	54.30±0.4^a	54.60±0.3^a	52.80±0.3^b	53.20±0.17
Feed consumption from maturity age to 34 weeks (kg)	8.98±0.07^b	10.17±0.07^a	10.32±0.07^b	1.87±0.07^c	9.32±0.035
Feed consumption from 35 to 52 weeks (kg)	15.22±0.07^b	15.83±0.07^a	15.97±0.07^b	15.28±0.07^b	15.58±0.03
Feed consumption from maturity age to 52 weeks (kg)	24.30±0.11^c	26.00±0.12^b	26.30±0.11^a	23.10±0.12^d	24.90±0.06
Feed conversion at 34 weeks	3.88±0.09^a	3.98±0.10^a	3.90±0.09^b	2.78±0.10^b	3.64±0.05
Feed conversion from 35 to 52 weeks	3.99±0.11^a	3.62±0.12^a	3.67±0.11^b	2.86±0.12^c	3.48±0.06
Feed conversion maturity age to 52 weeks	3.80±0.07^a	3.68±0.07^{ab}	3.52±0.07^b	2.80±0.07^c	3.45±0.03

Edriss *et al.* (1999), *Except the compound information column. $^{a-d}$Means within each row with different superscripts are significantly different ($p<0.05$)

Table 2: Laying and sexual maturity age and the average of egg weight in the indigenous chickens

Genetic groups	Observation	The average of laying in percent in weeks of 22 to 37	Observation	Sexual maturity age (week)	Observation	Average of eggs weight (g)
Naked-necked	130	32±1.9^a	130	23	193	44.9±0.7^a
Marandy	230	25±2.4^b	230	25	326	44.4±0.6^b
Public	550	29±1.5^a	550	22	553	43.4±0.8^b

Vali (1992), ^{a,b}Means within columns with different superscripts are significantly different ($p<0.05$)

Table 3: Some productive characteristics of the native pullets in the two tests[1]

Measurement	Test one	Test two
Average mortality per month (%)	2.30	1.20
Average egg production[2] (%)	48.40	50.10
SD[3] egg production (%)	16.20	18.60
Egg production, hen-housed (%)	45.20	48.60
Egg production, hen-day (%)	47.10	49.60
Egg production, minimum (%)	9.40	2.80
Egg production, maximum (%)	77.60	74.80
Average number of clutches/month	5.96	6.33
Average clutch size (eggs)	2.56	2.42
SD clutch size (eggs)	0.95	0.82
Average egg weight (g)	49.40	47.60
SD egg weight (g)	3.40	3.70

Makarechian *et al.* (1983a). [1]Test periods were 107 days and 96 pullets were caged in each test, [2]Survivors egg production, [3]SD

Table 4: Comparison of genetic potential of indigenous chickens under semi-industrial and rural conditions

Characteristics	Rural conditions	Station conditions
Maturity age (day)	185.0	153.00
Production pick and percent of laying (weeks)	61.9	69.40
Egg weight at 30 weeks of age (g)	46.7	45.13
Egg weight at 32 weeks of age (g)	46.8	45.73

Mirhoseini (1990)

bread and browsing of checks in rural environment which were feeding different things (included: seeds, grass, insects larva and etc.). In rural conditions, sanitation were not done as well as vaccination. The station conditions similar that of native chickens' stations (their feeds, sanitations, vaccinations and nutrient requirements were similar to laying light weight).

Farid *et al.* (1987, 1990) declared in their report that the average of egg weight, fertility and hatchability rates of indigenous chickens of South of Iran, were 44.02 g, 66.9 and 66.5%, respectively.

First egg usually get in the flock is considered as the beginning of lay. After the first egg, when laying in the flock reaches into 5% (based hen-day), represents sexual maturity age. Sexual maturity age of chiken differs in the various reports. So that, sexual maturity age for indigenous chickens were 157.1±0.8 days (Table 1) and for three genetic groups of indigenous chickens such as Naked-necked, Marandy and Public sexual maturity age were 23, 25 and 22 weeks, respectively (Table 2) and as it can be seen from Table 4, under stationary and rural conditions, it was 185 and 153 days, respectively.

Edriss *et al.* (1999) examined heritability coefficient of laying characteristics of indigenous chickens of Iran. According to their report in order to evaluate heritability coefficient and phenotypic and genetic correlation of laying characteristics, Harvey software has been used. Phenotypic and genetic parameters have been estimated by using of sir variance component (co-variance), 22 sire and 616 dams (Table 5).

Table 5: Heritability coefficients (±SE[1]) of laying characteristics in indigenous chickens

Characteristics	Heritability coefficients (±SE)
Maturity age (days)	0.26±0.20
Weight of first egg (day)	0.13±0.17
No. of eggs at 34 weeks of age	0.86±0.31
No. of eggs from 35 to 52 weeks	0.63±0.27
No. of eggs from maturity age to 52 weeks	0.75±0.29
Egg weight from maturity age to 34 weeks (g)	0.80±0.30
Egg weight from 35 to 52 weeks (g)	0.66±0.26
Egg weight from maturity age to 52 weeks (g)	0.75±0.29
Feed consumption from maturity age to 34 weeks (kg)	0.28±0.21
Feed consumption from 35 to 52 weeks (kg)	0.22±0.20
Feed consumption from maturity age to 52 weeks (kg)	0.24±0.20
Feed conversion at 34 weeks of age	0.45±0.24
Feed conversion from 35 to 52 weeks	0.26±0.20
Feed conversion maturity age to 52 weeks	0.25±0.20

Edriss *et al.* (1999). [1]Standard error

According to the report of Edriss *et al.* (1999) phenotypic and genetic correlations of laying traits had been positive and very significant ($p<0.01$) among various periods. This means that phenotypic (rp) and genetic (rg) correlation of laying in the first and second phase had been often positive and significant ($p<0.01$) in indigenous chickens, cross-breed for meat (A) and cross-breed for laying. Whereas, for the cross-breed for meat (D) had been positive and had been significant only for the phenotypic correlation ($p<0.01$). As a whole, in their study there were different laying correlation between the first and second phase during the whole period and regarding to its genetic group, its range vary from 0.51 to almost 1 (Table 6).

Relevant characteristic with production meat: Most of the time, indigenous chickens are used as dual purpose chickens. In terms of adult body weight indigenous chickens divided into three weight groups such as: light (dwarf), medium (normal), heavy in which full-grown weight mean in this group has been reported 800, 1400 and 2000 g, respectively (Tadelle *et al.*, 1999; Ansari *et al.*, 1996).

Makarechian *et al.* (1983b) evaluated productive characteristics and genetic potential of indigenous chickens of Fars in Iran for meat production. Fars province in southern Iran is located between 27°, 3' and 31°, 42' N latitude and 50°, 37' and 55°, 38' E longitude, with an area of 133,300 km^2. Reported that location had significant effect on the average body weight at 25 days of age ($p<0.01$). Sex did not have a significant effect on the average weight of chicks at 25 days of age. Location and sex had significant effect on the average weight of the chicken at 105 days of age and their gain from 25 to 105 days of age ($p<0.01$), but their interaction was not significant (Table 7).

Table 6: Phenotypic and genetic correlation (±SE[1]) coefficients between the number of eggs from sexual maturity to 34 weeks of age (period 1), the number of eggs from 35 to 52 weeks of age (period 2) and the whole period (from sexual maturity to 52 weeks) for indigenous chickens, their crossings with exotic breeds

Periods	Rg[2]±SE with period 2	Rp[3] with period 2	Rg±SE with whole period	Rp with whole period
(1) (Sexual maturity to 34 weeks of age)				
Indigenous chickens	0.42±0.28**	0.31**	0.77±0.14**	0.68**
Cross-breed for meat (A)		0.34**	0.51±0.36**	0.76**
Cross-breed for meat (D)		0.32**	1.0<	0.72**
Cross-breed for meat laying		0.23**	1.0<	0.69**
(2) (From 35 to 52 weeks of age)				
Indigenous chickens			0.90±0.06**	0.91**
Cross-breed for meat (A)				0.87**
Cross-breed for meat (D)				0.89**
Cross-breed for meat laying				0.86**

Edriss *et al.* (1999) [1]SE: Standard Error; **Very significant correlation, [2]Rg: Genetics correlation coefficients, [3]Rp: Phenotypic correlation coefficients

Table 7: Means and standard errors of weight at 25 and 105 days of age and average daily gain

Variables	No. of chickens	Mean weight at 25 days (g)	Mean weight at 105 days (g)	Mean daily gain from 25 to 105 days (g)
Location				
Lar				
88	112.5±3.0[cd]	730.3±18.5[a]	7.6±0.2[c]	
Firouz_Abad-1	97	106.4±2.8[c]	867.7±17.6[bc]	9.5±0.2[a]
Firouz_Abad-2	234	158.1±1.8[a]	889.0±11.3[c]	9.1±0.1[ab]
Shiraz	73	122.1±3.2[a]	806.6±20.3	8.6±0.2[b]
Mammassani	109	137.0±2.7[b]	911.5±16.6	9.7±0.2[a]
Sex				
Pullet	307	132.7±1.6[b]	777.6±9.9[b]	8.1±0.1[b]
Cockerels	294	137.1±1.6[a]	935.7±10.1[a]	10.0±0.1[a]
Total	601	134.9±1.1	854.9±7.1	9.0±0.1

Makarechian *et al.* (1983b). [a-d]Means with different superscripts within each subclass are significant at 5% level of probability

Table 8: Compound of the average* of relevant characteristics to growth

	Age or period (week)								
	Body weight (g)					Weight gain (g)			
Variation sources	2	4	6	8	10	2-4	4-6	6-8	8-10
Total mean	142.23	362.74	685.09	1020.81	1319.45	220.51	322.38	335.72	300.70
Genetic groups									
Cross-breed	167.10[a]	431.79[a]	824.63[a]	1240.60[a]	1594.93[a]	264.68[a]	392.95[a]	415.97[a]	353.41[a]
Indigenous chickens under improved program	131.30[b]	329.24[b]	607.85[b]	893.88[b]	1180.98[b]	191.92[b]	282.55[b]	290.35[b]	287.10[b]
Control group indigenous chickens	124.30[c]	315.86[b]	598.41[b]	888.76[b]	1145.70[b]	191.49[b]	278.62[b]	286.02[b]	256.94[b]
Keeping place									
Litter	147.40	378.6	662.3[b]	980.96[b]	1272.83[b]	231.25	283.7	318.58[b]	291.88[b]
Cage	-	-	701.73[a]	1050.00[a]	1373.0[a]	-	-	348.27[a]	323.91[a]
Sex									
Male	145.22[a]	365.37[a]	698.42[a]	1072.55[a]	1367.65[a]	220.98[a]	333.11[a]	374.13[a]	295.10[a]
Female	133.35[a]	359.31[a]	652.22[b]	996.55[b]	1212.66[b]	220.53[a]	293.16[b]	344.20[b]	216.3[b]

Khosravinia *et al.* (1999). *In each column and for every source, the mean values with different superscripts are significantly different ($p<0.05$)

Lar had the highest average temperature among the four regions which were sampled and interestingly the chicks from this region were lightest at 105 days of age; it seems probable that natural selection has been a factor in keeping the average weight of the chickens down in this region as a means of increasing their resistance.

Khosravinia *et al.* (1999) examined in some parts of their study, the average of relevant characteristics to growth for recognizing major effects (genetics group, sex and keeping place) and also they compared genetic groups of indigenous chickens under improved program (indigenous chickens population that had been maintained for 2 generations and were selected for 8 week body weight) with the control group indigenous chickens (Table 8). Indigenous chickens under improved program and control group did not show any significant difference for none of the growth characteristics. Also, the comparison of the average of relevant characteristic to growth is applicable to two keeping places such as: litter place and cage (Table 8). Influence of keeping place on body weight characteristic had been significantly different in the ages of 6, 8 and 10 weeks. Also influence of

keeping place on weight gaining had been significantly different in the age of 6-8 and 8-10 weeks ($p<0.05$). For the mentioned characteristic, the chickens which were keeping in the cage were significantly different from chicken of litter. This preference was more recognized with the increasing of age. So that, 39 g difference existed in the average chickens' weight in the weeks of 6 and 101 g in the weeks of 10. They reported that it is possible that with the decrease of maintenance energy for chickens in cage, therefore more portion of intake energy applies more for growth and production. Influence of sex on body weight characteristic has been showed significant in the 6, 8 and 10 weeks of ages. And also influence of sex on weight gaining has been showed significant in the age of 4-6, 6-8 and 8-10 weeks ($p<0.05$). Influence of sex on the body weight characteristics was not significant in weeks of 2 and 4, but in all of the cases cocks proved their apparent superiority over the others. Weight gaining and weight difference of both two sexes are increased simultaneously with increasing age (Khosravinia *et al*., 1999).

Edriss *et al*. (1995) studied the genetic correlation between fasting weight and abdominal fat in two groups of indigenous chickens and they showed that genetic groups have significant ($p<0.1$) influence on fasting weight, abdominal fat weight, carcass weight and fat weight when those have been corrected based on the fasting weight. Sex was significant on fasting weight ($p<0.1$).

Khosravinia *et al*. (1999) reported the heritability coefficients for relevant characteristic to body weight (at 2, 4, 6 and 8 weeks of age) in the range of 0.44 to 0.66, that by increasing age, rates have tendency toward decrease. Evaluated heritability coefficients for weight gaining in different ages were in the range of 0.11 to 0.62 and with the average of almost 0.3, that it indicates that it is less than estimated heritability coefficient for weight in the various ages (Table 9).

Edriss *et al*. (1995) reported genetic groups had significant influence on the fasting weight, abdominal fat weight, carcass weight and fat weight when corrected according to fasting weight. This significant difference between two genetic groups for fasting weight and abdominal fat weight is indication of being effective selection for body weight in the weeks of 12 in one group. In other part of their study, the genetic correlation, phenotypic correlation and also heritability coefficient were estimated (Table 10).

Their report declared that relatively large quantities of heritability coefficient of fasting weight (0.42) showed that selection could influence on these characteristics. Although, too much higher heritability of abdominal fat weight (0.7) emphasize more effective selection for this characteristics. But weak genetic correlation between two characteristics: abdominal fat and fasting weight (0.09) shows that selection against and in favour of one of these two characteristics have not so much influence on the other characteristics and could say that, effective genes of two characteristics have influence independent on opposite characteristics (Edriss *et al*., 1995).

Table 9: Estimated heritability coefficients (for whole flocks) plus their Standard Errors (SE)

Traits	Age (weeks)	Heritability coefficient and SE
Body weight	2	0.66±0.20
	4	0.65±0.20
	6	0.64±0.19
	8	0.52±0.18
	10	0.44±0.17
Weight of gain	2-4	0.62±0.19
	4-6	0.25±0.14
	6-8	0.11±0.11
	8-10	0.23±0.14
Feed consumption	4-6	0.38±0.16
	6-8	0.15±0.12
	8-10	0.41±0.16
	4-10	0.44±0.17
Feed conversation	4-6	0.30±0.14
	6-8	0.14±0.12
	8-10	N*
	4-10	0.20±0.13

Khosravinia *et al*. (1999). *Not calculated heritability

Table 10: Body weights at various ages in genetic groups of indigenous chickens

Age (week)	Sex	Naked-necked	Marandy	Public[1]	Average
		(g)			
11	Male	789.7±34.6	786.6±38.4	786.20±40.1	787.2[a]
	Female	585.3±30.2	707.3±34.8	677.00±32.4	656.2
15	Male	1071.6±32.3	1103.1±35.4	1250.30±40.2	1141.3[b]
	Female	855.3±26.7	972.0±34.6	965.00±38.0	930.8
19	Male	1416.1±30.0	1507.2±32.4	1552.00±38.0	1490.8[c]
	Female	1058.3±24.2	1143.0±30.3	1197.30±30.0	1132.9

Vali (1992). [1]Compound of different genetic groups. Means with different superscripts in each column are significantly different ($p<0.05$)

Vali (1992) presented the average of body weight in different ages for three genetic groups of indigenous chickens (Naked-necked, Marandy, Public for both of sex) in accordance with Table 10. Body weights of the Naked-necked females at ages of 11, 15 and 19 weeks were lower than other groups.

Measurement of indigenous chickens' characteristics crossing with exotic breeds: Only a few research results are available on the indigenous chickens with exotic breeds. Ansari *et al*. (1997) reported on a stock of Iranian native fowl and their crosses with improved exotic breeds to evaluate their potential for body weight traits as well as to estimate genetic and phenotypic parameters for those traits, before initiating selection experiments. Four genetic

groups were formed consisting of the native fowl and three crosses between native females with two different lines of broiler chickens and one parent stock of layer chickens. Two hatches placed 12 days apart and 4058 chickens were produced. In all genetic groups body weight (BW) was recorded at 1, 39, 67, 95 and 123 days of age in the first hatch and at 27, 83 and 111 days of age in the second hatch. Pooled heritability coefficient (sire component) of BW obtained at 1, 39, 67, 95 and 123 days of age in first hatch and at 27, 83 and 111 days of age in second hatch were estimated 0.48±0.08, 0.23±0.07, 0.24±0.06, 0.18±0.05, 0.14±0.06, 0.37±0.08, 0.20±0.05 and 0.31±0.09, respectively. Estimated of pooled genetic and phenotypic correlations of BW among early and late ages were highly significant ($p<0.01$) and positive. In native fowl and their crosses with meat-type chickens, there were relatively high genetic correlations with subsequent ages (0.39 to 1.00).

Edriss *et al.* (2000) estimated heritability coefficients of body size and carcass characteristics in improved and unimproved indigenous chickens and the results are showed in Table 12.

Edriss *et al.* (2000) used three genetic groups in the examination including: chickens generated of exotic-breed cock mating (great-grand father of Arbor Acres meat line) with indigenous chickens of Iran (group A), improved indigenous chickens and cocks which had been selected during two generations for the body weight of 8 weeks (group B), indigenous chickens and cocks which had not under pressure of artificial selection (group C or control group), during the testing period, chickens used of three diet with the same energy (starter-grower-finisher) had been include 3000 kilo calorie kg^{-1} metabolism energy and 21.6, 18.8 and 16.9% proteins respectively, during the testing period water and food were also free for chickens. In this research after the comparison, the mean has been demonstrate for different factor which the difference of breast meat characteristics was significant in the genetic group crossing with other two groups ($p<0.05$). With the comparison of the mean of carcass weight and abdominal fat weight and its percentage as compared with carcass weight in three fold genetic groups showed that genetic group (A) had higher quantities for each three characteristics and also had significant difference with the other two groups ($p<0.05$). Both (B) and (C) group had not significant difference for none of these three characteristics mentioned earlier.

Edriss *et al.* (1999) examined laying characteristics of indigenous chickens, their crossing with exotic breeds in their own report (Table 11). So that, crossing genetic groups have better performance in most of the characteristics in comparison with indigenous chickens.

Table 11: Genetic correlation, phenotypic correlation and heritability coefficient* ±SE

Characteristic	Fasting weight	Abdominal fat
Fasting weight	0.42±0.16	0.21
Abdominal fat	0.09±0.2	0.7±0.18

Edriss *et al.* (1995). *Heritability coefficients on the diagonal, genetic correlation below and phenotypic correlation above the diagonal

Table 12: Heritability coefficients in body size and carcass characteristics in improved and unimproved indigenous chickens

Traits	Age (weeks)	Improved indigenous chickens (B)	Unimproved indigenous chickens (C)
Breast width	6	0.280±0.11	0.36±0.28
Breast angle	8	0.003±0.04	0.16±0.20
Shank length	6	0.260±0.10	0.44±0.30
Shank width	10	-	1.09±0.20
Carcass weight	10	0.230±0.10	0.43±0.20
Abdomen fat weight	10	0.160±0.09	0.30±0.21
Abdomen fat percent	10	-	0.16±0.20

Edriss *et al.* (2000)

But, among four genetic groups, the weight of first egg did not show any significant difference ($p<0.05$). Sexual maturity age in crossing groups of (A) and (D) were significantly less than indigenous chickens ($p<0.05$). Whereas, for laying cross-breeds hadn't any difference with indigenous chickens. However, egg weight mean in the cross-breed for laying was more than indigenous chickens but cross-breed group for laying in comparison with cross-breed groups for meat have less mean for egg weight. for characteristics: the number of eggs, feed coefficient and food intake, cross-breed groups have better feed efficiency until the age of 52 weeks in comparison with indigenous chickens. There is not any significant difference in feed coefficient until the age of 52 weeks between cross-breed for meat (A) and indigenous chickens. But the cross-breed for meat (D) and cross-breed for laying showed significantly less feed coefficient in this same age in comparison with indigenous chickens ($p<0.05$). On the whole, results related to the performance of laying characteristics showed that cross-breed of laying group had relatively better performance in comparison with both meat cross-breed and indigenous chickens, so that cross-breed of laying with high yield and less feed intake had lower feed coefficient in comparison with cross-breed of meat groups and also cross-breed of laying have both higher feed coefficient and production for eggs in comparison with testing indigenous chickens. In the same way (Table 5), heritability coefficients of laying characteristics of egg weight, feed intake and feed coefficient has been decrease in older ages of indigenous chickens. However, heritability coefficients have not a harmonic and distinctive process in the testing crossing. Measured evaluations of heritability coefficient of weight of first egg, feed intake and feed coefficient have relatively high

standard error in all three crossing groups and this matter may be arising from low genetics variety of testing characteristics in this research (Edriss *et al*., 1999).

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