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COMPARATIVE ANALYSIS FOR PRODUCTION TRAITS OF LOCAL CHICKEN AND ISA BROWN IN KGR-IRAQ

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ABSTRACT

The research work has been constructed at Sulaimani Research Station–Director of Agricultural Research to study the effect of three lines of local chickens: Pure black (line 1), Black with brown Neck (line 2), White (line 3) and Isa Brown (line 4) at four periods (19-32, 33-43, 44-60 and 61-75 weeks) on egg production traits. The age at first day of egg production, first week of production, sexual maturity, when reach to 50% and peak egg production and long duration of peak egg production were recorded. In addition to estimate the egg/hen/all periods, egg/hen/week, egg/ hen/ all period% and hen day egg production%. No significant difference between lines on age at first day of egg production, first week of production, sexual maturity and reach to peak production. Line 2 significantly ($p<0.05$) reach to 50% before other lines about 8-21 weeks. Moreover, line 3 significantly ($p<0.05$) has the shorter duration of egg production compared with other lines. Hen day egg production% at age at sexual maturity, at 50% production and throughout long duration of production did not significantly differed between lines. Peak production% of line 2 was significantly ($p<0.05$) higher than other lines. Egg weight was significantly ($p<0.05$) higher in line 4 compared with lines 1,2 and 3, but did not significantly differed with line 3 in egg/ hen/ all periods and egg/ hen/ week. As for percentage of egg production, line 2 was significantly ($p<0.05$) higher in percentages (33.20 and 34.30%) for egg/ hen/ periods% and Hen Day Production%, respectively. As the age increased the egg weight was increased, while egg/ hen/ period, egg/ hen/ week and percentage of egg production were significantly ($p<0.05$) higher at period 3.

Key words: *Local chickens, egg production, egg weight, age at production.*

INTRODUCTION

Over the years, the chicken is considered one of the important sources for the provision of animal protein through meat and eggs. In addition it emerged as a biological model to resolve more problems related to diseases (Bacon *et al.,* 2000), nutrition and genetics (Haeslar *et al.,* 2004). In the last period many countries resolved food security problems faced by the partial depending on egg production at the rural level (Usman *et al.,* 2014), due to its flavor compared with the strains and various commercial hybrids that have in abundance on the first production and egg weight. But, regardless of the small size of the domestic chicken eggs and the lack of production are such that enjoys other specifications and is immune against disease, environmental adaptation and in addition to that a lot of customers bought eggs at a price more expensive than the price of commercial chicken eggs.

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Although studies on the local chickens in Kurdistan Region were started in the few years ago, and some researchers (Hermiz *et al.,* 2012; Hermizand Ali, 2012; Abas *et al.,* 2014 and Abdulla *et al.,* 2016) used same lines in their studies, more researches are needed to increase knowledge about its performance and economic utilization. Generally more developing countries of the world now turn to the local rating their chickens by studying the chemical and physical properties of the egg, as well as the economics of production. Moreover, several researchers were studying the performance of local chicken lines, strains and breeds (Rahman *et al.,* 1997; Adedokun and Sonaiya, 2002; Khan, 2004; Sunder *et al.,* 2005 and Tixier-Boichard *et al.,* 2006).

Production differences between these genetic lines for egg production traits, age at first egg and egg weight until now are not well known. The aim of this study was to estimate the differences between these genetic lines for egg production traits, such as age at first egg, peak production, and egg weight at different periods.

MATERIALS AND METHODS

The present study was conducted at Animal Production Division of Agricultural Research Center in Sulaimani, Ministry of Agriculture and water recourse, KGR, Iraq. The research was designed to compare the egg production egg weight, age at first egg production and egg production between three lines of local chicken and ISA brown under the semi open system of production. Three lines of local chicken (generation 11) were identified according to the color of feather as Pure black (line 1), Black with brown Neck (line 2), White (line 3) and Isa Brown (line 4).

Experimental periods initiated at week (19) continue to week (75) age old, were classified to 4 periods: period 1(19-32), period 2 (33-43), period 3 (44-60) and period 4 (61-75). Age at first egg (day and week), reach to sexual maturity (5% egg production), reach to (50%) egg production and reach to peak production were recorded.

Egg collection was recorded daily to evaluate egg production traits at each period (Age at sexual maturity (5% egg production), reach to 50% production, peak production and long duration of egg production. Hen day production (%) was determined by the following:

Hen day production (HDP %) = [egg number/ (periods X number of hen)] X100

Egg collection daily was to determine the egg weight, egg/ hen/ for all periods and its percentage, egg/ hen/ weeks for all different lines and periods.

Statistical Analysis

The analysis of variance was carried out for all recorded data to find out the differences between groups Statistical program PASW Statistics Student Version 18 (SPSS, 2007). An ANOVA using the general linear models procedure included the main effects of genetic groups and periods on some egg production traits. Collected data were subjected to two-ways analysis of variance for egg weight and egg production traits during different periods and significant differences between means were furtherseparated using Duncan's Multiple Range Test (Duncan, 1955).

RESULTS

Although there were no significant differences between lines for the first day or week of egg production, reach to 5% production, but the differences between lines to reach 50% production peak production, and long duration of peak production were significant ($p<0.05$) (Table 1 and 2). The line 2 showed the least period (138.50 day or 19.79 week) to produce egg, followed by line 3 (140.60 day or 20.14 week), line 1 (145.60 day 20.80 week) and line 4 (167.57 day 23.44 week). Concerning to reach 5% and 50% production, line 2 had the least period (9 weeks) to reach (5.71%) and (29 weeks) to reach (50.95%) HDP%, respectively. While the HDP% of line 1 did not reach to 5% production before (week 23) which reached (7.94%) and at (week 37) reached (46.83) HDP%. As well as the exclude production of lines 3 and 4 were 46.83, 45.58 and 43.65 at week 50 and 52, respectively. Line 2 significantly ($p<0.05$) reached to peak production (63.10) egg at week 55 after the other 3 lines followed by line 1, which reach to peak production (47.62) at week 51.Line 3 had showed numerically the least period to reached peak production at week 50. Line 1, 2 and 4 significantly showed longer duration 9, 8 and 7 weeks, respectively to produce egg before and after peak production compared with line 3 that was 3 weeks. Furthermore, the long duration of line 1 was between 49- 57 weeks, line 2 was between 51-58 weeks, line 3 was between 48-56 weeks and line 4 was between 48-54 weeks with average HDP % 40.86, 50.60, 38.50 and 38.63%, respectively.

Table 1: Effect of different genetic lines of on age at first egg and age at sexual maturity (5% eggproduction).

Traits		Lines			
		1	2	3	4
First day of egg production		145.60 ±9.85	138.50 ±6.34	148.00±9.37	167.57 ±9.98
First week of production		20.80±0.41	19.79 ±0.91	21.14 ±0.3	23.86 ±0.42
Age at sexual maturity (5% egg production)	week	23 ± 1.05	19 ±1.00	20 ±1.04	25 ±1.05
	HDP %	7.94 ±0.08	5.71 ±0.07	4.76 ± 0.07	5.10 ±0.06

Table 2: Effect of different genetic lines on egg production (50%, peak and long duration of peak egg production) at different periods.

Traits		Lines			
		1	2	3	4
Reach to 50% production	week	37 ±2.48^{ab}	29 ±2.49^{a}	50 ±3.08^{b}	52 ±3.18^{b}
	HDP %	46.83 ± 5.47	50.95 ± 5.46	45.58 ± 5.24	43.65 ±5.27
Peak Production	week	51 ± 6.45	55 ± 7.89	50 ± 6.47	52 ± 6.54
	HDP %	47.62 ± 7.15^{b}	63.10±8.45^{a}	45.58±6.54^{b}	43.65 ±3.98^{b}
Long duration of peak egg production	week	9± 1.97^{a}	8 ± 1.45^{a}	3 ± 0.25^{b}	7±1.24^{a}
	HDP %	40.86 ± 3.45	50.60 ± 4.09	38.50 ± 2.00	38.63 ± 5.23

$^{a–b}$ For each means of same traits in each row with different letters differ significantly (P<0.05).

Egg weight of line 4 was significantly (p<0.05) heavier than line 3, which also significantly (p<0.05) heaviest than line 1 and 2 as showed in (Table 3). Egg number/ hen for all periods were significantly (p<0.05) different between lines. Line 3 and 4 significantly (p<0.05) had higher number of eggs (108.75 and 102.75) respectively, than line 2 (84.50), that also significantly (p<0.05) differed with line 1 (75.58). The egg/ hen/ week was significantly (p<0.05) higher in line 4 3.66 eggs compared with line 2 and 1 (2.85 and 2.34 eggs), respectively. Concerning egg/ hen/ all periods% and HDP%, the line 2 was significantly (p<0.05) showed the higher percentage (33.20 eggs and 34.30%), respectively (Table 3).

Table 3: Effect of different genetic lines of chicken on egg weight and egg production performance.

Traits	Lines			
	1	2	3	4
Egg weight (g)	57.45 ± 1.00^{bc}	56.58 ±0.74^{c}	60.00 ±0.62^{b}	66.25 ±0.75^{a}
Eggs/ hen for all periods	75.58 ±12.28^{c}	84.50±10.04^{b}	108.75 ±15.60^{a}	102.75 ± 17.06^{a}
Egg/ hen/ week	2.34 ±0.45^{c}	2.85 ±0.40^{bc}	3.15 ±0.50^{ab}	3.66 ±0.57^{a}
Egg/ hen/ all periods %	21.48 ± 4.10^{c}	33.20 ±3.51^{a}	25.62 ±3.96^{b}	23.35 ±4.06^{bc}
Hen Day Production%	21.95 ±4.02^{b}	34.30 ±4.02^{a}	25.89 ±3.66^{b}	22.99 ±3.41^{bc}

$^{a-c}$ For each means of same traits in each row with different letters differ significantly (P<0.05).

Results in Table 4 showed that hens at period 4 attained significantly (p<0.05) the heaviest weights compared with the other periods (1, 2 and 3). Thesignificant (p<0.05) large number and percentage of eggs/ hen for each period were obtained at period 3 (139.58) eggs and (42.56%) followed by period 2, 1 and 4 (117.58, 69.92 and 44.25) eggs and (28.82, 17.73 and 14.54%), respectively. Although there was no significant difference between period 2 and 3of egg/ hen/ week and hen day production%, there was an observed significant difference between these periods with period 1 and period 4.

Table 4: Effect of different periods on egg weight and egg production performance of genetic lines of chicken.

Traits	Periods			
	1	2	3	4
Egg weight (g)	59.92 ± 1.06^{b}	58.25 ± 1.70^{b}	59.58 ±1.62^{b}	62.53±1.43^{a}
Eggs / hen/ period	69.92 ±8.66^{c}	117.58 ±7.21^{b}	139.83 ±10.55^{a}	44.25 ±9.70^{d}
Egg/ hen/ week	2.18 ± 0.83^{b}	4.36 ±0.90^{a}	4.20 ±1.36^{a}	1.26 ±1.15^{c}
Egg/ hen/ periods %	17.73 ±3.75^{c}	28.82 ±1.88^{b}	42.56 ±2.00^{a}	14.54 ±1.77^{c}
Hen day production%	18.09 ±13.24^{b}	37.43 ±8.44^{a}	35.77±5.82^{a}	13.85 ±5.85^{c}

$^{a–c}$ For each means of same traits in each row with different letters differ significantly (P<0.05).

DISCUSSION

There was no significant difference ($p>0.05$) in the first day or week of egg production, and reach to 5% production among all the genetic lines (Table 1). These local genetic lines lay the first egg earlierthan that mentioned by Hossary and Galal (1994) there were also, found no significant differences in age at first eggs (days) between three lines of Fayoumi hens, but Tixier-Boichard *et al.* (2006) found significant differences between Fayoumi and ISA Brown chickens and their crosses in age at first egg (days). The age at first egg (days) of Fayoumi was (136) days compared with ISA Brown (127) days which isearlier than ISA Brown (167days) in this study. This finding was agreed with Rahman *et al.* (1997); Tadelle *et al.* (2000); Adedokun and Sonaiya (2002) and Khanh (2004) when they found no significant differences in age at first egg weeks between breeds. This result however did not consistent with the findings of Sunder *et al.* (2005) who observed that age at first egg (weeks) for White Leghorn was significantly earlier than local chickens. Also, Sharma (2004) found that the age at first egg (weeks) of local hens and its crosses with Indian breeds were significant. The results from these studies indicate that age at first of local chicken was later than the local genetic lines chicken in the present study.

In the present study (Table 2), means showed that reaching sexual maturity (weeks) of local chickens had an earlier ages than resulting by Taha and Abd El-Ghany (2013) when they found that reaching sexual maturity of El-Salam and Mandarah was significant and they attributed their results to the genetic makeup of different lines. As well as, the Egyptian strains Mandarah and Salam reached sexual maturity significantly at an earlier age than Canadian Shaver strains (Taha *et al.,* 2012). Differences in age at sexual maturity between different lines of poultry were agreed with Udeh (2007); Niranjan *et al.* (2008); Yahaya (2009); Udeh (2010) and Udeh and Omeje (2011), but disagree with Al-Nasser *et al.* (2008) who found that there were no differences in age at sexual maturity for Lohmann LSL-Classic white and brown strains. Badreldin *et al.* (1961) reported that age at sexual maturity of Fayoumi was earlier than White Leghorn. Sexual maturity age of local Kei chickens was comparatively earlier than those reported by Halima *et al.* (2007) for local chickens and Melesse *et al.* (2011) for Ethiopian naked-neck chickens reared under intensive management conditions. Udeh and Omeje (2011) found significant age at peak production of two exotic and local chicken, and age at first egg, age at peak egg production, egg weight, hen day rate were significantly ($p<0.01$) decreased in the two exotic but not in the local chicken. Fotsa and Manjeli (2010) and Kreman (2012) found minor differences observed probably due to the conjugated effect of genetic diversities, environments, and the rearing conditions of different local hens used by these authors.

The egg weight of line 4 significantly higher than other the genetic lines, as well as line 3 attained significantly higher egg weights compared with other genetic lines (Table 3). These finding were confirmed by Hermiz *et al.* (2012) when found the same different genetic lines significantly affected egg weights, although the Black with Brown Neck attained higher egg weight followed by Isa Brown, Pure Black and White. Several studies reported significant differences in egg weights between breeds, strains and lines (Silversides and Scott, 2001; Monira *et al.,* 2003; Zita *et al.,* 2009 and Ali, 2010). Differences in egg weights between different genotypes were also recorded by Abou El-Ghar *et al.* (2009) and Yousria *et al.* (2010). Moreover, Iraqi (2002) confirmed significant effects of breed on egg quality character and disagreed with Ezzeldinand El-Labban (1989) who found non-significant breed effects on egg weight. Ansari (2000a, b) found insignificant differences in egg weight between generation 1 and 2 of the Isfahan breed.

The eggs/ hen for all periods and egg/ hen/ week were significantly higher in genetic line 3 and 4. The eggs/ hen for all periods % and Hen Day Production% were significantly higher in genetic line 2 followed by genetic line 3, 4 and 1, respectively (Table 3). Differences in these traits of local chickens were recorded by several studies. The rate of lay% of different local chickens by Sunder *et al.* (2005) was less than the results in this study. Also Tadelle *et al.* (2000) showed that the eggs/ hen/ year and rate of lay (%) for first and second year of different local chicken were less than the results in the present study.

Minh *et al.* (2004) found the hen-day egg production rate of the Tamhoang breed significantly higher than the Ri breed. Although, the number of eggs and rate of lay% egg production in 8 months of four local breeds from northern Viet Nam did not significant showed by Khanh (2004) this rate in range approximately higher than the results in this study. The eggs/ hen and rate of lay percentage of local chickens in other studies were higher in some lines and lesser than the results in present study (Benabdeljelil *et al.,* 2001; Mwalusanya *et al.,* 2001 and Njenga, 2005).

The egg weight at period 4 was significantly ($p<0.05$) higher at period 3 than other periods for all genetic lines, but eggs/ hen/ period and egg/ hen/ period% were significantly ($p<0.05$) higher at period 3 (Table 4). In addition, the gg/ hen/ week and hen day production % were significantly ($p<0.05$) higher at period 3 and 2 compared with period 1 and 4. Tahaand Abd El-Ghany (2013) found that the egg weight and egg number of local chickens increased at

different periods (90 days, 42 weeks and 65 weeks). The results in this study for egg number may attributed to the experimental periods that were longer than the total periods of the study by Taha *et al.* (2012). Several results were studying the effects of different periods on egg weight and egg production of local chickens. In central and southern parts of Senegal, Missohou *et al.* (1998) recorded that lay 60 eggs/ year (rate of lay of 16.4 percent) with an egg weight of 31 grams. Bessadok *et al.* (2003) reported that 127 eggs were obtained over a one-year laying period. Mwalusanya *et al.* (2001) that eggs/ hen/ year (31.6) and egg weight (44.1g). Msoffe (2003) found that the egg size (37-49g) for seven Tanzanian ecotypes kept under station conditions. Altamirano (2005) indicated that the rate of lay was (55.8%) and egg weight (52.6g). Melesse *et al.* (2013) also found that local Kei chickens reached their peak egg production at about 38 weeks of age.

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دراسة مقارنة الصفات الانتاجية لدجاج المحلي وايزا براون في منطقة اقليم كوردستان- العراق

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تم تطبيق هذا البحث في محطة البحوث الزراعية التابعة لدائرة الزراعة-السليمانية لتقدير تاثير ثلاثة خطوط من الدجاج المحلي: دجاج ذات الريش الاسود (الخط ١)، دجاج ذات الريش الاسود مع رقبة حمراء (الخط ٢)، ذات الريش الأبيض (الخط ٣) مع سلالة ايزا براون (خط ٤) في أربع فترات مختلفة (١-٣٢، ٣٣-٤٣،٤٤-٦٠ و٦١-٧٥) أسبوع على الصفات الانتاجية. تم تسجيل العمر عند انتاج اول بيضة (ايام واسبوع)، النضج الجنسي، والوصول الى ٥٠% وقمة انتاج البيض واطول فترة عند قمة انتاج. بالإضافة الى تقدير بيض/ دجاج/ الفترة الكلية، بيض/دجاج/اسبوع، ونسبة بيض/دجاج/ الفترة الكلية ونسبة انتاج البيض اليومي. اظهرت البيانات عدم وجود فروق معنوية بين الخطوط لكل من العمر بالأيام والأسابيع عند إنتاج لأول بيضة وعمر النضج الجنسي والوصول إلى قمة انتاج. بينما خط٢ وصل الى ٥٠% انتاج قبل الخطوط الاخرى بشكل معنوي ($p<0.05$)حوالي (٨-٢١) اسبوع. وكذلك خط٣ استمر معنويا عند قمة الإنتاج لمدة أقصر مقارنة بالخطوط الأخرى. نسبة إنتاج البيض عند عمر نضج الجنسي و ٥٠% إنتاج وطول قمة الانتاج لم تختلف بين الخطوط المختلفة بشكل معنوي. نسبة قمة إنتاج البيض لخط ٢ كانت معنويا أعلى من الخطوط الأخرى. وزن البيض كان معنويا أعلى في خط ٤ عند المقارنة مع الخطوط الثلاثة الاخرى، في حين لم يختلف عن خط ٣ فيما يخص بيض/دجاج/ الفترة الكلية وبيض/دجاج/ أسبوع. بالنسبة لإنتاج البيض، فإن خط ٢ كان لها معنويا أعلى نسبة (٣٣.٢٠ بيض و ٣٤.٣٠%) لكل من نسبة بيض/دجاج/ فترة ونسبة إنتاج البيض اليومي على التوالي. مع زيادة تقدم عمر الدجاج ازداد وزن البيض، بينما بيض/دجاج/ فترة، بيض/دجاج/ أسبوع ونسبة إنتاج البيض كان أعلى بشكل معنوي في الفترة الثالثة.