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RESEARCH ARTICLE

COMPARATIVE STUDY OF GROWTH AND ECONOMIC PERFORMANCE OF FAYOUMI, RHODE ISLAND RED AND THEIR RECIPROCAL CROSSBRED CHICKENS

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ABSTRACT

This paper was conducted to evaluate the economic and productive efficiency of two layer breeds and their crossing in Egypt. The first breed is indigenous Fayoumi, and the second is exotic Rhode Island Red (RIR). Both breeds have their different performances, and each breed was preferred over the other for some particular traits. By crossing the two breeds, the crossbreds could benefit from the strengths of the purebreds. The economic efficiency measures are used to determine the economic value for various traits and to compare the performance of purebreds and crossbreds. 480 chicks were divided into 4 groups consisting of Fayoumi, Rhode Island Red (RIR), Rhode Island Red × Fayoumi crossbred and Fayoumi × Rhode Island Red crossbred. Each genotype was divided into 3 replicates, all housed in a litter floor house up to 28 weeks of age. Economic and productive efficiency measures were calculated. On the basis of our results, it would be concluded that, RIR purebred showed the highest body weight, average daily gain and relative growth rate at 0-8th, 8th-20th, 20th-28th weeks of age. Net profit was significantly higher ($P < 0.05$) for Fayoumi × RIR crossbred (L.E/chicken 27.37), followed by RIR purebred (L.E/chicken 26), then Fayoumi purebred (L.E/chicken 24.48) and the lowest was RIR×Fayoumi crossbred (L.E/chicken 20.6).

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INTRODUCTION

The sector of poultry production takes an important place among the sectors of livestock production as it is one of the main sources of animal protein in Egypt in general. Poultry production sector has an effective contribution in the value of livestock production in Egypt. It is worth about 22.5 billion pounds, represented in poultry meat and eggs: the value of poultry meat is about 16.5 billion pounds, and the value of the eggs is about 6 billion pounds (Wahed 2014). Production of both eggs and chicken meat has certainly assisted in reducing the gap in the supplies of animal protein for human consumption (Regassa *et al*., 2013). Genetic improvement of important economic traits would increase the production efficiency of native fowl and the profitability of these birds (Kiani-Manesh, 2000). Crossing between chicken strains improved the production traits such as body weight at sexual maturity, egg number, egg weight and egg mass compared with those for pure strains (Amin, 2008).

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The advantage of the crossing between local breeds and exotic breeds is that local breed has the ability to adapt to the local conditions, but their productive characteristics are low, while the exotic breeds have usually a low ability adapting and high productive performance (Ketelaars, 2005). Fayoumi is an Egyptian breed developed for egg production and known to be adapted to tropical environment (Barua *et al*., 1998), reported to be a hardy breed and particularly well suited to hot climates (Heinrichs, 2007). They are also very good foragers, and if left to their own devices on a free range basis, they can fend for themselves in a nearly feral manner. Fayoumi hens are good layers of small white eggs. The breed is fast to mature, with hens laying by four and half months (Ekarius, 2007). On the other hand, RIR is an exotic American breed characterized by high productivity and hardiness (Gueye, 1998). Moreover, costs of production and returns are the two major concerns in poultry sector. The problems of how much the bird costs and how much it gains are becoming the most important formula in poultry economics. So, poultry enterprises can be made more profitable if critical standard limits for cost of production are determined and given close attention (Romero *et al*., 2010). Therefore, the objective of this study is to evaluate the effect of crossing Fayoumi and Rhode Island Red (RIR) on growth performance and egg production by making comparative economic analysis to detect costs of production and returns from egg sales, hen sales and litter sales, and to evaluate the net profit for each genotype.

MATERIAL AND METHODS

Management of birds

Housing

The present study was carried out at Poultry Research Farm belonging to the Department of Animal Wealth Development, Faculty of Veterinary Medicine, Benha University, Egypt, from July 2012 to January 2013. A total of 480 unsexed day-old-chicks, were divided into four experimental groups (Fayoumi purebred, Rhode Island Red purebred, RIR male × Fayoumi female: RF and Fayoumi male × RIR female: FR). Each genotype was divided into 3 replicates (40 chicks/replicate), and they were wing-banded for their identification. Body weight was recorded individually, and the birds of each breed were housed in a litter floor house up to 28 weeks of age. The stocking density was 10 birds /m^2. All chicks were medicated similarly and regularly and they were subjected to the same managerial, hygienic and climatic conditions. Feeding and watering were provided ad libitum. All the chicks were reared under standard temperatures that were controlled by gas heaters (33-35°C at chick arrival for 1 week, followed by a reduction of 3°C/week until the temperature reached 18-20°C at 6 weeks of age).

Vaccination programs

Live attenuated Newcastle Disease virus vaccine: Hatched chicks received the live attenuated Newcastle Disease virus vaccine B_1 strain and Lasota strain at the 7th and 22nd day of age via drinking water.

Live attenuated Infectious Bursal Disease virus vaccine: Hatched chicks received the live attenuated Infectious Bursal Disease virus vaccine at age 13th day in drinking water.

Inactivated Reassortant Avian Influenza virus vaccine: Chicks received the Inactivated Reassortant Avian Influenza virus vaccine (H5N1 sub type, Re-1strain) inoculated subcutaneous in the neck by dose 0.3 ml at age 18th and 70th day. The immunity is active 14 days after administration, and chickens immunity period is 6 months.

Lighting program

Artificial Lighting program was used 24 hours in the first week, then 13 hours till 18th week of age. Lighting hours were increased daily by 30 minutes per week up to 17 hours light per day.

Feeding management

During brooding period: The formula of starter ration according to AL KAHIRA FEEDS Company was:

- Metabolizable energy2950(K. cal/kg).
- Crude protein21%
- Crude fiber 2.6%

During growing period (pre-lay): The formula of growing ration according to AL ASEMA FEEDS Company was:

- Metabolizable energy2800(K. cal/kg).
- Crude protein16%
- Crude fiber 3.02%
- Ca 2.25 %
- Available Phosphorus. 0.44 %

During egg laying period: Commercial laying ration formula according to AL ASEMA FEEDS Company was:

- Metabolizable energy 2700(K. cal/kg).
- Crude protein 18%
- Crude fiber 3.02%
- Ca 3.8%
- Available Phosphorus. 0.44%

Egg collection

Eggs were collected immediately after they were laid; total number of eggs per each genotype per week for 12 weeks was calculated.

Studied traits

Productive efficiency measurements

Growth traits

Body weight: At the beginning of the experiment (at one day old), the chicks were individually weighted to the nearest gm., and then they were weighed weekly till the end of the experiment.

Average daily gain (ADG): It is the weight gain related to the number of days calculated.

Relative growth rate (RGR)*:* RGR (expressed in percentage) was calculated every week according to (Crampton and Lioyd, 1959) using the following formula:

$$RGR = (W2-W1)100 / 1/2\ (W2+W1)$$

Where: W1 = body weight at the beginning of week or period.
W2 = body weight at the end of week or period.

Egg production traits

Egg production traits were calculated as the number of eggs produced by the number of chickens alive in a particular period (North, 1978).

HDEP = (Number of eggs produced/Number of hens alive) × 100.

Feed intake

The daily feed intake was calculated by the difference between the offered feed weight and the remained part. The total feed consumption per day was divided by the number of birds of each group to obtain the average daily feed consumption per bird per group.

Economic efficiency measurements: The most important economic efficiency parameters investigated in this study are described below.

Cost parameters: Cost parameters were classified according to the methods indicated by (Eman, 2011) and (Omar, 2003).

Total variable cost (TVC): This variable includes the feed costs, veterinary management (drug, vaccines and veterinary supervision) and other variable costs as costs related to production cited by (Shewita *et al*., 2010)

Total fixed cost (TFC): In this study, each chick in each genotype had the same price and received the same labor, water and electricity. In addition, building and equipment depreciation values were fixed for all chicks. Hence, all of these parameters were considered fixed costs for each chick used in this study (Sara, 2007).

Total cost (TC): TC was calculated as sum of TFC and TVC for the three months of the experimental production period.

Return parameters: Return items were calculated, of which the most important items included total egg sales value, total hen sales value at end of production period and litter sales value.

Total returns (TR): Total returns = Litter sales + Egg sales + Hen sales.

Net profit (NP): Net profit = Total returns – Total costs

Statistical analysis

Differences between study groups were analyzed by Analysis of Variance (ANOVA) and Duncan's multiple comparison post hoc test (Duncan, 1955). Statistical analysis was performed using the statistical software package SPSS for Windows (version 20.0; SPSS Inc., Chicago, IL, USA). Statistical significance between mean values was set at $P< 0.05$. Data are reported as means and standard error of mean (SEM).

RESULTS

Effect of genotype on growth traits

Table (1) showed significant differences ($p \leq 0.05$) in body weights, ADG and RGR at different ages studied between Purebred RIR and Purebred Fayoumi, but there were non-significant differences between RIR x Fayoumi crossbred and their reciprocal crossbred.

Table 1. Least square means ± standard errors (LSM ± SE) of day-old weight, body weight, average daily gain (ADG), relative growth rate (RGR%), for Fayoumi, RIR, their crossbred and reciprocal crossbred

Parameters	Age (week)	RF	RR	FF	FR
Day-old wg (g/b)	-	$25.75^{b}\pm0.30$	$29.17^{a}\pm0.26$	$26.00^{b}\pm0.19$	$29.86^{a}\pm0.30$
Body wg (g/b)	0-8	$623.50^{b}\pm7.52$	$693.86^{a}\pm12.55$	$564.74^{c}\pm8.06$	$632.11^{b}\pm11.44$
	8-20	$1365.95^{b}\pm20.18$	$1579.42^{a}\pm26.15$	$1197.14^{c}\pm17.09$	$1410.40^{b}\pm24.74$
	20-28	$1573.54^{b}\pm24.44$	$1928.16^{a}\pm23.89$	$1376.47^{c}\pm21.37$	$1632.60^{b}\pm37.61$
ADG (g/b)	0-8	$8.63^{b}\pm0.41$	$13.41^{a}\pm0.68$	$7.60^{b}\pm0.40$	$8.48^{b}\pm0.66$
	8-20	$12.87^{b}\pm0.42$	$16.78^{a}\pm0.45$	$11.29^{c}\pm0.32$	$12.98^{b}\pm0.55$
	20-28	$1.66^{b}\pm0.16$	$3.17^{a}\pm0.24$	$1.83^{b}\pm0.16$	$2.16^{b}\pm0.23$
RGR	0-8	$10.15^{b}\pm0.45$	$14.29^{a}\pm0.75$	$9.85^{b}\pm0.50$	$9.73^{b}\pm0.70$
	8-20	$32.87^{b}\pm0.97$	$37.96^{a}\pm0.81$	$33.04^{b}\pm0.86$	$31.66^{b}\pm1.15$
	20-28	$3.19^{b}\pm0.33$	$5.29^{a}\pm0.40$	$4.17^{b}\pm0.37$	$3.90^{b}\pm0.42$

FF: Fayoumi × Fayoumi. RR: Rhode Island Red ×Rhode Island Red.
FR: Fayoumi × Rhode Island Red. RF: Rhode Island Red × Fayoumi.
Day-old wg (g/b): Day-old weight (gram /bird).
The mean values with different superscript letter within the same row are differing significantly at ($P \leq 0.05$).

Table 2. Effect of crossing on total fixed costs (TFC) Parameters during egg production period (3 months) (L.E / Chicken)

Genotypes	Equipment (L.E)	Building and labor (L.E)	Water and Electricity (L.E)	Chick Cost (L.E)	TFC (L.E)
RF	0.70	2.12	1.08	4.20	8.1
RR	0.70	2.12	1.08	4.20	8.1
FF	0.70	2.12	1.08	4.20	8.1
FR	0.70	2.12	1.08	4.20	8.1

L.E: Egyptian Pound.
Data expressed as mean.

Table 3. Effect of crossing on total variable costs (TVC) and total cost (TC) parameters during egg production period (3 months) (L.E /Chicken)

Genotypes	Veterinary Management cost(L.E)	Feed intake (Kg/ Chicken)	Feed costs (L.E)	Other cost (L.E)	TVC (L.E)	TC (L.E)
RF	$9.0^{a}\pm1.30$	$7.94^{b}\pm0.44$	$18.28^{b}\pm2.18$	5.0	$32.28^{a}\pm2.33$	$40.38^{a}\pm2.11$
RR	$8.28^{b}\pm1.41$	$8.53^{a}\pm0.53$	$19.64^{a}\pm2.19$	5.0	$32.92^{a}\pm2.56$	$41.02^{a}\pm3.11$
FF	$9.36^{a}\pm1.34$	$7.24^{b}\pm0.44$	$16.66^{d}\pm2.18$	5.0	$31.02^{b}\pm2.66$	$39.12^{b}\pm4.16$
FR	$8.64^{b}\pm1.33$	$7.65^{b}\pm0.55$	$17.60^{c}\pm2.66$	5.0	$31.24^{b}\pm2.77$	$39.34^{b}\pm2.24$

Data expressed as mean ± SE (Standard error).
The mean values with different superscript letter within the same column are differ significantly at ($P \leq 0.05$)
Price of Kg / ration = 2.30 L.E

Effect of genotype on fixed, variable and total costs of production

Table (2) showed non-significant differences in total fixed costs **(**TFC) among all genotypes. Concerning TVC, there were significant differences ($p \leq 0.05$) between Purebred RIR and Purebred Fayoumi: Veterinary management cost showed significant differences ($p \leq 0.05$) among different genotypes. Regarding feed intake and feed cost, there were non significant differences ($P > 0.05$) among different genotypes. There were significant differences in TC ($p \leq 0.05$) among different genotypes also.

Effect of genotype on total return (TR) and net profit (NP):

Table (4) showed significant differences in TR and NP ($p \leq 0.05$) between Purebred RIR and Purebred Fayoumi and significant differences ($p \leq 0.05$) between RIR x Fayoumi crossbred and their reciprocal crossbred.

of age, which were 1453 and 1449g respectively (Rahman *et al*., 2004). RIR purebred showed the highest average daily gain (ADG) at different ages 0-8th, 8th-20th, 20th-28th weeks of age (Table 1) (13.41, 16.78 and 3.17 g, respectively), followed by Fayoumi x RIR crossbred (3.48, 12.98 and 2.16 g, respectively), then Fayoumi purebred (7.60, 11.29 and 1.83 g, respectively) and finally RIR × Fayoumi crossbred (8.63, 12.87 and 1.66 g, respectively).These results agreed with the observations of (Abinda *et al*., 2012) and (Muhammad *et al*., 2003). On the contrary, some authors showed that Fayoumi purebred had higher ADG rate (Hanafi and Iraqi, 2001) and (Tadelle *et al*., 2003). Concerning the study of relative growth rate (RGR%) at different ages, RIR purebred showed the highest RGR% at 0-8th, 8th-20th, 20th-28th weeks of age (14.29, 37.96 and 5.29%, respectively), and the lowest RGR% was Fayoumi x RIR crossbred (9.63, 31.66 and 3.90 %, respectively), the difference in RGR% between genotypes may be attributed to the difference in feed intake and genetic composition of these birds.

Table 4. Total returns (TR) parameters

Geno Types	Number of Sold eggs/hen	Egg sale return	Hen Weight at sale (gm)	Hen sale return (L.E)	litter sale (L.E)	Total return (L.E)	Net profit
RF	$58.38^{b} \pm 5.25$	$35.o2^{b} \pm 2.25$	$1573.54^{c} \pm 14.55$	$18.96^{c} \pm 2.66$	7	$60.98^{d} \pm 5.16$	$20.6^{d} \pm 4.17$
RR	$61.44^{ab} \pm 6.55$	$36.86^{ab} \pm 3.22$	$1928.16^{a} \pm 15.44$	$23.16^{a} \pm 3.22$	7	$67.02^{a} \pm 6.14$	$26^{b} \pm 5.11$
FF	$66.82^{a} \pm 4.45$	$40.09^{a} \pm 3.88$	$1376.47^{d} \pm 4.77$	$16.51^{d} \pm 2.44$	7	$63.6^{c} \pm 5.22$	$24.48^{c} \pm 4.11$
FR	$66.74^{a} \pm 3.66$	$40.04^{a} \pm 3.80$	$1632.60^{b} \pm 6.32$	$19.67^{b} \pm 1.44$	7	$66.71^{b} \pm 5.26$	$27.37^{a} \pm 3.71$

The mean values with different superscript letter within the same column are differ significantly at ($P \leq 0.05$)
TR: Total returns, * Price of egg sale = 0.60 piaster, * Price of Kg poultry sale = 12 L.E.

DISCUSSION

Consumer expectations for high quality poultry products will strongly influence future production methods. This means that farmers, veterinarians, stockholders and all other partners involved in the production chain need to share more responsibilities. Cooperation amongst stakeholders will certainly be intensified. Many scholars have reported that the overall performance of crossbred chickens was found to be better than local chickens (Melesse *et al*., 2013). However, limited information is available on the comparative economic efficiency of local chickens and their crosses with exotic chicken breeds. Therefore, this study was designed to evaluate the cross breeding effect between RIR and Fayoumi breeds on productive and economic efficiency under Egyptian conditions. Regarding the study of body weight at different ages, RIR purebred showed the heaviest body weight at 0-8th, 8th-20th, 20th-28th weeks of age (693.86, 1579.42 and 1928.16 g, respectively), followed by Fayoumi x RIR crossbred (632.11, 1410.40 and 1632.60 g, respectively) then reciprocal crossbred (623.5, 1365.95 and 1573.54 g, respectively) and finally Fayoumi purebred which had the lowest body weight (564.74, 1197.14 and 1376.47 g, respectively). These results agreed with the observations of final body weights of Sonali (RIR×Fayoumi) and Fayoumi (1001 and 959 g) at 14 weeks of age with a tendency to be higher for Sonali (Azharul *et al*., 2005), (Halima *et al*., 2006) and (Melesse *et al*., 2013). This also agreed with the observations of the body weights of Fayoumi x RIR crossbred and reciprocal crossbred at 23 weeks

Decreasing of RGR% at the end of the experiment maybe attributed to the exposure of the birds to Clostridia and Coccidiosis during this period. The obtained results were in the same line of those obtained by **(**Khawaja *et al*., 2013) who found that Fayoumi purebred chickens had poorer feed utilization and poorer growth rate than RIR and the other crossbreds. The difference in growth rate of chickens is due to interplay of multiple genes, and this trait could be improved through intensive genetic selection (Bokhari and Chaudhry, 1972; Chambers, 1990). Contradicted results were obtained by *(*Aly and Nazla, 2005*)* who recorded that strain crosses were superior in growth rate over their parents. (Taha *et al*., 2012) observed that there were no differences between four strains for overall RGR (El-Salam, Dokki-4, Inshas and Mandarah). TFC (Table 2) included the price of equipment and building depreciation (L.E 0.70 /chicken and L.E 2.12/chicken, respectively), water and electricity were (L.E 1.08/chicken), and chick cost was (L.E 4.20). In our study, the TFC was (L.E 8.1) per chicken in each genotype because each chick in each genotype was the same price, and received the same labor, water and electricity. In addition, building and equipment depreciation amount was fixed for all chicks. Hence, all of these parameters were considered fixed costs for each chick used in this study (Sara, 2007). Concerning TVC (Table 3), veterinary management costs were the highest for Fayoumi purebred (L.E/chicken 9.36) and the lowest for RIR purebred (L.E 8.28). RIR purebred had the highest feed intake during egg production period (8.53 Kg/chicken), followed by RIR×Fayoumi crossbred (7.94 Kg /chicken), then reciprocal crossbred (7.65 Kg /chicken) and the lowest was Fayoumi purebred (7.24 Kg /chicken). Regarding feed cost, RIR purebred showed the highest feed cost during the production period (L.E 19.64 /chicken), followed by RIR×Fayoumi crossbred (L.E 18.28 /chicken), then reciprocal crossbred (L.E 17.60 /chicken) and the lowest feed cost was for Fayoumi purebred (L.E 16.66 /chicken).

So RIR purebred had the highest TVC (L.E 32.92/chicken), followed by RIR×Fayoumi crossbred (L.E 32.28/chicken), then reciprocal crossbred (L.E 31.24/chicken) and finally Fayoumi purebred (L.E 31.02/chicken). Consequently, TC was the highest for RIR purebred (L.E 41.02/chicken) followed by RIR×Fayoumi crossbred (L.E 40.38/chicken), then reciprocal crossbred (L.E 39.34/ chicken) and the lowest for Fayoumi purebred (L.E 39.12 /chicken). These results agreed with the observations of (Abinda *et al*., 2012; Azharul *et al*., 2005; Horst, 1988; Khawaja *et al*., 2012; Muhammad *et al*., 2003; Rahman *et al*., 2004), who showed that RIR purebred consumed more feed than those of Fayoumi and crossbred chickens, and had the highest total costs of production. On the contrary (Akhtar *et al*., 2007) recorded that there were significant higher feed consumption/bird/week in Fayoumi (808) than RIR (738). Also, (Khawaja *et al*., 2013) found that feed intake of Fayoumi×RIR (115 g/hen /day) was higher than feed intake of reciprocal crossbred (112 g/hen/day). Concerning number of eggs sold per hen, Fayoumi purebred was the highest (66.82 egg/hen), followed by Fayoumi × RIR crossbred (66.74 egg/hen), then RIR purebred (61.44 egg/hen) and the lowest egg number was for RIR×Fayoumi crossbred (58.38 egg/hen). Consequently, the return from egg sales was the highest for Fayoumi purebred (L.E 40.09/chicken), followed by Fayoumi × RIR crossbred (40.04/chicken L.E), then RIR purebred (L.E 36.86 /chicken) and the lowest egg number was for RIR × Fayoumi crossbred (L.E 35.o2 /chicken).

These results agreed with the observations which found that Fayoumi laid more eggs than other breeds (types) (Bekele *et al*., 2010a; Regassa *et al*., 2013). These results also agreed with some observations of significant differences ($p \leq 0.05$) between Fayoumi × RIR which were higher than reciprocal crossbred (Alewi *et al*., 2012; Rahman *et al*., 2004). On the contrary, some authors found that RIR × Fayoumi crossbred was higher than other reciprocal breed (Miah *et al*., 2002; Zaman *et al*., 2004). Concerning hen Weight at sale, it was the highest for RIR purebred (1928.16 g/chicken), followed by Fayoumi x RIR crossbred (1632.60 g/chicken), then reciprocal crossbred (1573.54 g/chicken) and finally Fayoumi purebred which had the lowest body weight (1376.47 g/chicken). Consequently, the return from hen sales was the highest for RIR purebred (L.E 23.16/chicken), followed by Fayoumi x RIR crossbred (L.E 19.67/chicken), then reciprocal crossbred (L.E 18.96) and finally Fayoumi purebred (L.E 16.51/chicken). These results agreed with the observations of final body weights of Sonali (RIR×Fayoumi) and Fayoumi (1001 and 959 g) at 14 weeks of age with a tendency to be higher for Sonali (Azharul *et al*., 2005), (Halima *et al*., 2006) and (Melesse *et al*., 2013). Our results also agreed with the observations of the body weights of Fayoumi x RIR crossbreed and reciprocal crossbred at 23 weeks of age were 1453 and 1449g (Rahman *et al*., 2004). Similarly, some previous studies found that RIR produced the largest eggs. Egg production in crossbred was mostly influenced by Fayomi sire. But concerning body weight, the effect of the Rhode Island dam was significant. FF was the lightest body weight at all ages (Barua *et al*., 1998). RIR layers exhibited significantly more body weight, and produced heavier eggs than those produced by Fayomi. Body weight and egg production are positively correlated traits. (Bekele *et al*., 2010b) have reported that the genetic background of chickens would influence egg weight. TR values were the highest for RIR purebred (L.E 67.02/chicken), followed by Fayoumi x RIR crossbred (L.E 66.71/chicken), then Fayoumi purebred (L.E 63.6/chicken) and finally RIR x Fayoumi crossbred (L.E 60.98/chicken). From our results, we found that RIR purebred and Fayoumi x RIR crossbred showed high significant total return.

These results agreed with (Abinda *et al*., 2012; Javed *et al*., 2003; Rajput *et al*., 2005) that Rhode Island Red have potentials of a higher economic return as layers and / or broilers. The high egg and meat production genes, present in RIR, can possibly be transferred to Fayoumi, so as to produce a crossbred having higher survival and better economic returns. So net profit was significantly higher ($P < 0.05$) for Fayoumi × RIR crossbred (L.E 27.37/chicken), followed by RIR purebred (L.E 26 /chicken), then Fayoumi purebred (L.E 24.48/chicken) and the lowest was RIR×Fayoumi crossbred (L.E 20.6/chicken). These results indicated that Fayoumi × RIR crossbred and RIR purebred give higher net profit values compared with the other crossbred and the other purebred. Fayoumi × RIR crossbred's net profit was the highest, which may be attributed to the improvement which occurred in body weight, body weight gain, egg production, stimulation of birds' immunity, decrease of total costs, especially feed costs, than the other genotypes. This result agreed with those of Asghar *et al*. (2000), Omar (2003) and Ahmed (2007) where they reported that net profit significantly ($P < 0.01$) differed among different breeds. From our results, we can conclude that cross-bred chickens gained better body weight than Fayoumi purebred and was close to RIR purebred chickens. The crossbred chickens of Fayoumi × RIR showed better performance in all traits and better net profit than crossbred chickens of RIR× Fayoumi, which indicates that cross breeding has a potential for improving economically important productive traits.

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