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CROSSBREEDING COMPONENTS FOR DAILY GAIN AND GROWTH RATE TRAITS IN CROSSING OF RHODE ISLAND RED WITH GIMMIZAH CHICKENS

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ABSTRACT: A crossbreeding experiment was carried out between two genotypes of chicken namely Rhode Island Red (RIR) as standard foreign breed and Gimmizah (Gim) as a developed strain. Two crosses were made: ♂RIR x ♀Gim and its reciprocal cross (♂Gim x ♀RIR) to study crossing effects on variance components of the studied traits with an approach to potency ratio. The studied traits were: daily gain (DG) and growth rate (GR) during different periods: hatch (0 week)-4, 4-8, 8-12, 0-8 and 0-12 weeks of age for the combined sex and separately for each sex by genotype.

Results showed there were significant differences for DG and GR for the combined sexes of both genotypes from 0 to 12 weeks of age . Gim had higher DG_{0-4}, DG_{4-8}, DG_{0-8} ,GR_{0-4} and GR_{0-8} than those of other genotypes. RIR had higher DG_{8-12} and DG_{0-12} and had faster GR during 4-8, 8-12 and 0-12 weeks of age than those of other genotypes. There were significant differences for DG and GR among males of genotypes from 0 to 12 weeks of age except DG_{0-8}. There were significant differences for DG and GR among females of genotypes from 0 to 12 weeks of age, except DG_{0-4} and DG_{0-12}.

Estimates of direct additive effects for the combined sex were negative and highly significant for DG_{0-4}, DG_{4-8}, DG_{0-8} and GR_{8-12} being -0.54, -1.23, -0.47 and -4.50, respectively. Therefore, direct additive effects favoring Gim sires for previous traits. RIR had better performance than Gim sires for $DG_{8-12,}$ DG_{0-12} ,GR_{4-8} and GR_{0-12}, because of the highly significant positive direct additive effects for these traits.

Direct additive effects of both males and females were positive and highly significant for DG_{4-8} , DG_{8-12}, GR_{8-12} and GR_{0-12}. All estimates of maternal effects for the combined sexes were positive and highly significant for DG during all experimental periods , GR_{4-8} , GR_{8-12} and GR_{0-12}. However, maternal effect estimates of both males and females were negative and significant for DG_{8-12}, GR_{4-8} and GR_{8-12} .

Key Words: Crossbreeding, daily gain, growth rate traits, superiority% and potency ratio.

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Heterosis for the combined sex , males and females were negative for each of DG and GR in this study, except heterotic effects for DG_{0-8} and GR_{8-12} of females had positive and highly significant being 1.92 and 2.17. Estimates of potency ratio ranged from -14.00 to 5.80. Over-dominance was shown for the dominant high parent (RIR) of DG_{4-8}, DG_{0-8}, GR_{0-4} and GR_{0-8} being 5.75, 2.30, 3.70 and 5.80, respectively in the cross RIR x Gim. On the other hand, the cross Gim x RIR showed over dominance for the high parent (Gim) in DG and GR during all experimental periods.In conclusion, the parental aptitudes were superior than their F1 for the DG and GR traits. Although, the highly significant positive direct additive and maternal effects were observed, heterotic effects conversely influenced these traits therefore they appear to be ineffective and crossing of RIR with Gim chickens are not recommended to improve growth traits.

INTRODUCTION

Growth can be regarded as a direct fitness trait that increases productive efficiency and thereby decreases production costs (Iraqi et al., 2013). Inadequate knowledge on the inheritance types of the productive traits in indigenous stocks had led to the lack of developing specialized sire and dam lines to produce the commercial hybrids.

Crossing is a method that can improve growth performance in poultry, which have a main purpose that is to produce superior crosses for growth traits which are influenced by various genetic and non-genetic factors. In Egypt, some authors crossed native breeds or strains of chicken with exotic adapted ones under Egyptian conditions (Iraqi et al., 2002 and Iraqi et al., 2013).

Performance comparisons among breeds and their crosses are justified because genetic differences among breeds or strains are large relative to genetic variation within breeds (Dickerson, 1992). These differences are an important potential source of genetic improvement in the efficiency of human food production from poultry through gains in performance from complementary breed effects and heterosis in crossbreeding. It is also valuable for averaging of breed effects and achieving intermediate values that are superior to opposite extremes (Kinghorn, 2000).

Crossing constitute one of the tools for the exploitation of the genetic variation and the hybrid vigour by combination of the different important characteristics of each breed (Hanafi and Iraqi 2001) and for the exploitation of maternal genetic effects or sex-linked effects, associated to particular combinations between breeds or lines. The analysis of the combining aptitude and the difference between the productive performances of crossbreds help in identifying the best possible combinations in the exploitation of hybrid vigour according to the desired objectives (Mekki et al., 2005). The crossing between the adapted local chicken and exotic standard breeds would allow exploiting the rusticity of first and the productive performances of the later at a time in tropical environment to produce adapted and more productive genetic types (Saadey et al., 2008). This crossing could consequently, allow higher genetic gains in shorter time and therefore reach the objectives of the crossing more quickly.

Mather and Jinks (1982) reported that the presence of the interaction between sire breed and dam breed indicates the existence of non-additive gene effect. Shebl et al. (1990) found highly estimates of non-additive gene effects for native breeds. Many investigators confirmed the superiority of crossbreds over the purebreds regarding some economic traits (Abdou, 1992 and Nawar and Abdou, 1999). When offspring are considered to be better, or more fit for survival than their parents, positive heterotic effects in the first generation may have resulted from two possible causes: Firstly, direct individual heterosis which resulted from uniting pairs of somatic genes (Sheridan, 1981) and secondly the intra or inter allelic interactions (Dickerson, 1992). Heterosis caused by non-additive gene effects could decrease through recombination of favorable genes or recombination loss (Dickerson, 1965).

This work aimed at estimate direct additive, maternal additive, heterotic effects as well as potency ratio for the studied traits for the combined sex and for each sex separately in a crossbreeding experiment involving RIR and Gim chickens.

MATERIALS AND METHODS

This study was conducted at El-Takamoly Poultry Project at Al-Azab which belongs to Fayoum Governorate. A crossbreeding experiment was carried out between two genotypes of chicken namely Rhode Island Red (RIR) as a standard foreign breed (well adapted to local conditions) and Gimmizah (Gim) as a developed strain (established from Dokki-4 ♂ x White Plymouth Rock ♀ for four generations). Two crosses were made: RIR x Gim and its reciprocal cross (Gim x RIR). A total of 10 males and 120 females were used as a parent, natural mating was used in the family pen to study crossing effects on variance components of the studied traits with an approach to potency ratio. Eggs were collected from each pen throughout seven days and incubated in full-automatic draft machine. Number of chicks obtained per strains and crosses were 385, 372, 365 and 360 for RIR, Gim, RIR x Gim and Gim x RIR (the first parent is a sire), respectively.

All mixed-sex chicks of the chosen genotypes were brooded on floor. All populations were maintained under similar environmental conditions. Birds were subjected to continuous light for the first week of age and then photoperiod was reduced to 16 hours of light/day. Management practices were kept uniform as possible throughout the experimental period. From hatch to eight weeks of age, all chicks according to NRC (1994) had free access (ad libitum) to starter diet containing 18.93% CP and 2797.1 Kcal of ME/Kg. From nine weeks to the 12 weeks of age, a grower diet was used containing 15.05% CP, 2716.7 Kcal of ME/Kg, 1.01% calcium and 0.46% available phosphorous.

The studied traits:

1. Daily gain (DG): DG during intervals of 0-4, 4-8 and 8-12 while cumulative DG was estimated during intervals of 0-8 and 0-12 weeks of age.
2. Growth rate (GR): GR during intervals of 0-4, 4-8 and 8-12 while cumulative GR was estimated during intervals of 0-8 and 0-12 weeks of age were estimated according to the equation of Brody (1945) as follows:

$$GR\% = \frac{W2 - W1}{0.5(W1 + W2)} * 100$$

where: W1 = Initial body weight at the onset of a certain period.
W2 = Final body weight at the end of the same period.

Statistical analysis:

Data were subjected to one-way analysis of variance by using SPSS software (SPSS, 2003) and the significant differences among the averages were tested according to Duncan`s multiple range test (1955). using the following model:

$$Yij = \mu + Gi + eij$$

where:

Yij: observed value in ith genotype of the jth individual, μ: common mean, Gi : genotype effect and eij : random error.

Estimation of crossbreeding components:

Effects of direct additive, maternal additive and direct heterosis estimates for all traits were calculated using the Software Package CBE (Wolf, 1996). Estimates of each component were calculated according to Dickerson (1969 and 1973) as follows:

Direct additive effects:

½ [(RIR x RIR – GIM x GIM) – (GIM x RIR – RIR x GIM)].

Maternal additive effects:

½ [(GIM x RIR – RIR x GIM)].

Direct heterosis:

½ [(RIR x GIM + GIM x RIR) – (RIR x RIR + GIM x GIM)]

Potency ratio (PR):

PR based on the mid-parents (MP) was determined according to equation given by Smith (1952) (PR) as follows:

$$PR = \frac{F_1 - MP}{\frac{1}{2}(P_2 - P_1)}$$

where:

F_1 = mean of crosses. MP = mid-parents.
P_1 = mean of the lower parent.
P_2 = mean of the higher parent.

PR was used to interpret the degree of dominance of one parent on the another, since the mean of F_1 crosses were very close to the mean of the dominant parent. Mather and Jinks (1982) reported that when PR values were around zero,-1< PR< +1, equal + 1 or -1 and -1 > PR >+1, these values means that the degrees of dominance were: no dominance, partial dominance, complete dominance and over dominance for the (dominant) high parent of the traits, respectively. The corresponding negative values of PR means that no dominance, partial dominance, complete dominance and over dominance for the low parent of the traits studied.

RESULTS AND DISCUSSION

Genotype effect:

Means presented in Table 1 showed that each of DG and GR during all experimental periods were affected by different genotypes. There were significant differences for DG and GR among genotypes from 0 to 12 weeks of age. Gim had higher DG_{0-4}, DG_{4-8}, DG_{0-8}, GR_{0-4} and GR_{0-8} than other genotypes. However, Gim had lower GR_{8-12} than other genotypes. Similarly, significant genotypic effects for GR were reported by several authors (Aly et al., 2005, Aly and Abou El-Ella 2006 and Iraqi et al., 2013). Gim had faster GR than Bandarah during different periods 0-4, 4-8, 8-12, 0-8 and 0-12 weeks of age (Aly et al., 2005).

RIR had higher DG_{8-12} and DG_{0-12} and had faster GR during 4-8, 8-12 and 0-12 weeks of age but RIR had the worst DG_{0-4} being 7.69 g than other genotypes. RIR x Gim and its reciprocal had slower GR_{0-4} ,GR_{0-8} and GR_{0-12} than their parents. Similarly, RIR x Gim had the worst DG_{4-8}, DG_{8-12}, DG_{0-8}, DG_{0-12} than its parents and its reciprocal.

The results of GR are in contradiction to those reported by Aly et al. (2005) and Aly and Abou El-Ella (2006) that the studied crosses had higher GR during 0-4, 4-8, 0-8 and 0-12 than their parents, the result of GR_{8-12} in the present study is confirmed by those reported by Aly et al. (2005) that the studied crosses had lower GR_{8-12} than their parents.

Among males by genotypes, means presented in Table 2 showed that there were significant differences for DG and GR from 0 to 12 weeks of age except DG_{0-8}. Males of RIR had higher DG and GR during all experimental periods except the period from 0 to 4 for DG and GR and 0-8 weeks of age for GR than males of other genotypes. However, males of RIR had the worst DG_{0-4} than males of other genotypes. Males of Gim had higher DG and GR during the period from 0 to 4 weeks of age than males of other genotypes, whereas had lower DG_{4-8} and GR_{4-8} than males of other genotypes. Males of RIR x Gim and its reciprocal had lower DG_{8-12}, DG_{0-12}, GR_{0-4}, GR_{8-12} , GR_{0-8} and GR_{0-12} than their parents.

Among females by genotypes, there were significant differences for DG and GR from 0 to 12 weeks of age, except DG_{0-4} and DG_{0-12} (Table 3). RIR females had higher DG and GR during 8-12 weeks of age than females of other genotypes. Similarly, females of Gim had higher DG_{0-8}, GR_{0-4}, GR_{4-8} and GR_{0-12} than other genotypes' females however, Gim females had lower DG_{8-12} and GR_{8-12} than other genotypes' females. Gim x RIR females had lower DG_{4-8}, DG_{8-12}, DG_{0-8}, GR_{0-4}, GR_{4-8}, GR_{0-8} and GR_{0-12} than their parents females and its reciprocal.

Direct additive effects:

Estimates of direct additive effects indicated that most estimates were negative and highly significant for DG_{0-4}, DG_{4-8}, DG_{0-8} and GR_{8-12} being -0.54, -1.23, -0.47 and -4.50 respectively (Table 4), therefore direct additive effects were pronounced in favor of Gim sires for previous mentioned traits. However,. highly significantly positive direct additive effects for DG_{8-12}, DG_{0-12} ,GR_{4-8} and GR_{0-12} being 1.22, 0.12, 1.50 and 0.50, respectively were observed (Table 4). This means that RIR strain surpassed Gim strain for GR at 4-8 and 0-12 weeks of age. The same results were obtained by (Sherif, 1991, Aggrey and Cheng 1994, Bahie El-Deen et al., 1998 and Iraqi et al., 2013).

RIR had better performance than Gim sires for DG_{8-12}, DG_{0-12} ,GR_{4-8} and GR_{0-12} .The results of additive effects for GR_{0-4}, GR_{8-12} and GR_{0-4} in the present study were in accordance with those reported by Aly and Abou El-Ella (2006) also found that additive effects for GR_{0-4} and GR_{0-8} were negative (-2.15 and -2.31) when they crossed Bandarah as a sire x Gim as a dam.

Direct additive effect estimates of males were positive and highly significant for DG_{4-8}, DG_{8-12} and GR during all experimental periods except the period from hatch to 4 weeks of age. Whereas were negative and highly significant for DG_{0-4} and GR_{0-4} being -1.11 and -1.25 (Table 5). Similarly, direct additive effect estimates of females were negative and highly significant for DG_{0-8}, GR_{4-8} and GR_{0-8} being -4.23, -0.93 and -0.66, respectively (Table 6). On the other hand, direct additive effect estimates of females were positive and highly significant for DG_{4-8}, DG_{8-12}, GR_{0-4}, GR_{8-12} and GR_{0-12} (3.57, 2.31, 0.47, 7.68 and 0.62, respectively).

Maternal additive effects:

All estimates of maternal effects were positive and highly significant for DG during all experimental periods ranging from 0.02 to 25.42. Similar trend of positive maternal effects were found for GR_{4-8}, GR_{8-12} and GR_{0-12} being 1.00, 1.50 and 0.50, respectively as shown in Table 4. Aly and Abou El-Ella (2006) reported similar trend of positive maternal effects for GR_{4-8} and GR_{8-12}.Conversely, Aly and Abou El-Ella (2006) reported negative maternal effect% for GR_{0-12} in the cross of Bandarah x Gim. As for maternal additive effects, it could be seen that using Gim strain as a dam line improved DG and GR during the intervals of 4-8, 8-12 and 0-12 weeks of age. The previous results indicated that using Gim strain as a dam line may be favorable when selection for GR during the intervals of 4-8, 8-12 and 0-12 weeks of age was applied.

Maternal effect estimates of males were negative and significant for DG_{8-12}, GR_{4-8} and GR_{8-12} being -0.54, -0.25 and-1.78, respectively but there were positive and significant for GR_{0-4} of 0.24 as shown in Table 5. However, all Maternal effect estimates of females were negative and highly significant except DG_{0-8}, it was positive and highly significant being 3.54 as shown in Table 6.

Heterotic effects:

Estimates of heterotic effects were highly significant for all studied traits. Heterosis were negative for each of DG ranging from -2.73 to –o.35 and GR ranging from -4.00 to -2.50 during all experimental periods as shown in Table 4. These results were confirmed with those reported by Mandour et al. (1992) that heterosis% for GR was negative at 2 weeks of age being – 3.03%. On the other hand, Iraqi et al. (2013) reported significant positive heterotic effects for DG_{0-4}, DG_{4-8} and DG_{8-12} being 1.27,1.81and 3.34, respectively.

Aly et al. (2005) and Aly and Abou El-Ella (2006) reported that heterosis% was positive for GR_{0-4}, GR_{4-8} , GR_{0-8} and GR_{0-12}. Similarly, Mandour et al. (1992) found that heterosis% for GR was positive (10.16) at 5 weeks of age. On the other hand, heterosis% was negative for GR_{8-12} (Aly and Abou El-Ella, 2006).

All estimates of heterotic effects of males and females were negative and highly significant except heterotic effects for DG_{0-8} and GR_{8-12} of females had positive and highly significant being 1.92 and 2.17 (Tables 5 and 6). This result means that females offspring had better than their females parent for these periods.

These results are not in accordance with those of Mafeni et al (2005), who used as exotic birds the German Dahlem Red crossed to the Cameroon local chicken, but corroborate the results of works achieved by Fotsa and Manjeli (2001) and Keambou et al (2010) that got in general, the parental aptitudes superior to those of the F1 for parameters such as the daily weight gain, feed consumption and consumption index. Heterotic and maternal effects can importantly influence early growth rate (Fairfull, 1990), but they appear to be sporadic and could be of less important than sex linkage (Barbato and Vasilatos-Younken, 1991).

Negative heterosis for certain hybrids may have resulted from outbreeding depression, where a crossbred chicks tended to be less fit and not always better than their parents. In other words, a hybrid inherits from their parents that makes them unfit for survival (Van Vleck, 1993)

The large negative heterosis indicates the possibility of major genes in the populations that reduce BW (Piao et al., 2002). Heterosis was low and not significant may be due to the high heritability for these traits (Moritsu et al., 1997)

Superiority%:

Percentages the superiority of reciprocal crossbreds to the developed stock presented in Table 7 showed that all estimates of GR superiority% were negative except GR_{8-12} for combined sex and females and GR_{4-8} for males were positive.

Potency ratio (PR):

Estimates of PR are presented in Table 8 indicated that these estimates ranging from -14.00 to 5.80. Estimates of PR showed that over-dominance were shown for the dominant high parent (RIR) of DG_{4-8}, DG_{0-8}, GR_{0-4} and GR_{0-8} being 5.75, 2.30, 3.70 and 5.80, respectively in the cross RIR x Gim. There were over-dominance effects for the low parent (Gim) of DG_{8-12}, DG_{0-12}, GR_{4-8} and GR_{0-12} (-1.41,-3.70, -1.26 and -4.46, respectively) in the same cross. Partial dominance for RIR parent was shown in DG_{0-4} being 0.67 whereas there were partial dominance of DG_{8-12} for the low parent (-0.73). On the other hand, the cross Gim x RIR showed over dominance for the high parent (Gim) in DG and GR during all experimental periods. Similarly, Aly et al. (2005) reported over dominance for the low parent of GR_{8-12} (Gim x Bandarah), whereas there were partial dominance for the high parent of GR_{0-8} and GR_{0-12} and he found over-dominance PR for the high parent of GR_{0-4} in the same cross. There were partial dominance PR for the high parent of GR during 0-4 and 0-8 weeks of age (Bandarah x Gim) and over dominance for the high parent of GR_{4-8}, but there were over dominance for the low parent of GR_{8-12} in the same cross (Aly et al., 2005).

Table (1): Means ±PSE for daily gain and growth rate for the combined sexes during different periods.

Trait	Genotype					
	RIR	Gim	RIRx Gim	Gim x RIR	PSE	P
DG_{0-4}	7.69^{d}	8.72^{a}	7.83^{c}	7.88^{b}	0.008	$\leq$0.01
DG_{4-8}	13.12^{b}	15.21^{a}	11.83^{d}	12.20^{c}	0.008	$\leq$0.01
DG_{8-12}	18.22^{a}	14.37^{b}	12.86^{d}	14.27^{c}	0.009	$\leq$0.01
DG_{0-8}	10.42^{b}	11.15^{a}	9.84^{d}	10.05^{c}	0.006	$\leq$0.01
DG_{0-12}	13.06^{a}	12.22^{b}	10.85^{d}	11.45^{c}	0.003	$\leq$0.01
GR_{0-4}	155.00^{a}	157.00^{a}	152.00^{b}	152.00^{b}	0.006	$\leq$0.01
GR_{4-8}	86.00^{a}	81.00^{b}	79.00^{b}	81.00^{b}	0.005	$\leq$0.01
GR_{8-12}	59.00^{a}	47.00^{c}	48.00^{c}	51.00^{b}	0.006	$\leq$0.01
GR_{0-8}	180.50^{a}	181.52^{a}	177.58^{b}	178.51^{b}	0.500	$\leq$0.01
GR_{0-12}	190.00^{a}	188.00^{ab}	186.00^{b}	187.00^{b}	0.006	$\leq$0.01

Means having different superscripts within each row are significantly different at specified P and PSE: pooled standard error.

Table (2): Means ± PSE for daily gain and growth rate for males during different periods.

Trait	Genotype					
	RIR	Gim	RIR x Gim	Gim x RIR	PSE	P
DG_{0-4}	7.84^{c}	9.85^{a}	8.71^{b}	8.91^{b}	0.11	$\leq$0.01
DG_{4-8}	15.59^{a}	13.78^{b}	13.86^{b}	14.30^{b}	0.16	$\leq$0.01
DG_{8-12}	22.32^{a}	17.60^{b}	15.79^{c}	14.64^{d}	0.21	$\leq$0.001
DG_{0-8}	11.79^{a}	11.76^{a}	11.44^{a}	11.59^{a}	0.18	NS
DG_{0-12}	15.43^{a}	13.77^{b}	12.80^{c}	12.67^{c}	0.22	$\leq$0.01
GR_{0-4}	158.48^{b}	160.88^{a}	154.65^{c}	155.14^{c}	0.19	$\leq$0.001
GR_{4-8}	93.30^{a}	76.87^{c}	82.60^{b}	82.10^{b}	0.16	$\leq$0.001
GR_{8-12}	62.47^{a}	51.04^{b}	49.95^{b}	46.40^{c}	0.45	$\leq$0.001
GR_{0-8}	182.89^{a}	181.66^{b}	179.84^{c}	179.42^{c}	0.2	$\leq$0.01
GR_{0-12}	190.89^{a}	188.99^{b}	187.77^{c}	187.33^{c}	0.13	$\leq$0.001

Means having different superscripts within each row are significantly different at specified P and PSE: Pooled standard error.

Table (3): Means ± PSE for daily gain and growth rate for females during different periods.

Trait	Genotype					
	RIR	Gim	RIR x Gim	Gim x RIR	PSE	P
DG $_{0-4}$	7.82^{a}	7.87^{a}	7.60^{a}	7.09^{a}	0.24	NS
DG $_{4-8}$	10.86^{b}	13.79^{a}	10.88^{b}	9.82^{c}	0.24	≤0.01
DG $_{8-12}$	12.64^{a}	11.65^{c}	13.07^{b}	11.44^{c}	0.23	≤0.01
DG $_{0-8}$	9.50^{b}	10.88^{a}	8.56^{c}	8.51^{c}	0.29	≤0.001
DG $_{0-12}$	11.08^{a}	11.61^{a}	10.49^{a}	9.56^{a}	0.36	NS
GR$_{0-4}$	152.53^{b}	153.45^{a}	148.3^{c}	146.51^{d}	0.23	≤0.001
GR$_{4-8}$	76.07^{c}	86.63^{a}	77.09^{b}	74.65^{d}	0.18	≤0.001
GR$_{8-12}$	53.85^{a}	40.70^{d}	50.55^{b}	48.34^{c}	0.17	≤0.001
GR $_{0-8}$	186.65^{a}	186.74^{a}	184.91^{b}	183.57^{c}	0.21	≤0.001
GR$_{0-12}$	177.27^{b}	180.18^{a}	175.28^{c}	173.70^{d}	0.18	≤0.01

Means having different superscripts within each row are significantly different at specified P and PSE: Pooled standard error.

Table (4): Estimates of direct additive, maternal additive and heterotic effects for DG and GR% of combined sex during different periods.

Trait	Additive effects ±Sd RIR♂ xGim♀	%	Maternal effects ±Sd	%	Heterotic effects ± Sd	%
DG $_{0-4}$	-0.54±0.005**	-6.58	0.02±0.005**	0.24	-0.35±0.007**	-4.26
DG $_{4-8}$	-1.23±0.008**	-8.68	0.19±0.006**	1.34	-2.15±0.008**	-15.17
DG $_{8-12}$	1.22±0.009**	7.48	0.71±0.006**	4.35	-2.73±0.009**	-16.75
DG $_{0-8}$	-0.47±0.003**	-4.35	0.10±0.003**	0.93	-0.84±0.005**	-7.78
DG $_{0-12}$	0.12±0.003**	0.95	25.42±0.11**	201.1	-1.49±0.003**	-11.79
GR$_{0-4}$	-1.00±0.005^{NS}	-0.64	0.2E^{-05}±0.004^{NS}	0.2E^{-05}	-4.00±0.005**	-2.56
GR$_{4-8}$	1.50±0.005**	1.79	1.00±0.003**	1.19	-3.50±0.005**	-4.19
GR$_{8-12}$	-4.50±0.006**	-8.49	1.50±0.003**	2.83	-3.50±0.006**	-6.60
GR$_{0-8}$	-0.97±0.500^{NS}	-0.54	0.47±0.350^{NS}	0.26	-2.97±0.500**	-1.64
GR$_{0-12}$	0.50±0.005**	0.26	0.50±0.004**	0.26	-2.50±0.005**	-1.32

Sd: Standard deviation,, NS: Not significant,*: Significant at P≤0.05 and **: Significant at P≤0.01 .

Table (5): Estimates of direct additive, maternal additive and heterotic effects for DG and GR% of males during different periods.

Trait	Additive effects ±Sd RIR♂ xGim♀	%	Maternal effects ±Sd	%	Heterotic effects ± Sd	%
DG $_{0-4}$	-1.11±0.12**	-12.55	0.10±0.1NS	1.13	-0.03±0.12NS	12.78
DG $_{4-8}$	0.68±0.18**	4.63	0.22±0.14NS	1.50	-0.60±0.18**	10.20
DG $_{8-12}$	2.94±0.21**	14.73	-0.54±0.13**	-2.71	-4.74±0.21**	-13.55
DG $_{0-8}$	-0.06±0.20NS	-0.51	0.26±0.20NS	2.21	0.07±0.18NS	18.75
DG $_{0-12}$	0.89±0.22**	6.10	-0.06±0.14NS	-0.41	-1.86±0.22**	-2.81
GR$_{0-4}$	-1.25±0.20**	-0.78	0.24±0.11*	0.15	-4.98±0.20**	0.09
GR$_{4-8}$	8.47±0.17**	9.95	-0.25±0.11*	-0.29	-2.74±0.17**	-0.35
GR$_{8-12}$	7.49±0.65**	13.19	-1.78±0.15**	-3.14	-8.58±0.65**	-5.53
GR$_{0-8}$	0.82±0.22**	0.45	-0.20±0.22NS	-0.11	-2.63±0.22**	-0.06
GR$_{0-12}$	1.17±0.15**	0.62	-0.22±0.14NS	-0.12	-2.39±0.15**	-0.06

Sd: Standard deviation ,, NS: Not significant,*: Significant at P≤0.05 and **: Significant at P≤0.01 .

Table (6): Estimates of direct additive, maternal additive and heterotic effects for DG and GR% of females during different periods.

Trait	Additive effects ±Sd RIR♂ xGim♀	%	Maternal effects ±Sd	%	Heterotic effects ± Sd	%
DG $_{0-4}$	0.23±025NS	3.00	-0.26±0.21NS	-3.40	-0.50±0.25*	-6.53
DG $_{4-8}$	3.57±0.25**	29.40	-0.53±0.18**	-4.36	-6.48±0.25**	-53.36
DG $_{8-12}$	2.31±0.24**	17.97	-0.81±0.12**	-6.3	-0.89±0.24**	-6.92
DG $_{0-8}$	-4.23±0.29**	-42.73	3.54±0.20**	35.76	1.92±0.29**	19.40
DG $_{0-12}$	0.20±0.41NS	1.84	-0.46±0.19**	-4.23	-1.32±0.41**	-12.12
GR$_{0-4}$	0.47±0.23*	0.31	-0.93±0.15**	-0.61	-5.55±0.23**	-3.63
GR$_{4-8}$	-0.93±0.25**	-1.15	-0.53±0.18**	-0.65	-1.98±0.25**	-2.44
GR$_{8-12}$	7.68±0.17**	16.31	-1.10±0.12**	-2.34	2.17±0.17**	4.61
GR$_{0-8}$	-0.66±0.18**	-0.37	-0.79±0.11**	-0.44	-4.23±0.18**	-2.37
GR$_{0-12}$	0.62±0.21**	0.33	-0.67±0.14**	-0.36	-2.46±0.21**	-1.32

Sd: Standard deviation, NS: Not significant,*: Significant at P≤0.05 and **: Significant at P≤0.01 .

Table (7): Superiority% of reciprocal crossed to the developed parental stock of GR within the crossbred genotype for combined sex, males and females.

	Superiority%					
	RIR x Gim	**Gim x RIR**	**RIR x Gim**	**Gimx RIR**	**RIR x Gim**	**Gim x RIR**
	Male		**Female**		**Combined**	
GR_{0-4}	-3.87	-3.57	-3.31	-4.52	-3.18	-3.18
GR_{4-8}	+7.45	+6.80	-11.01	-13.83	-2.47	0.00
GR_{8-12}	-2.14	-9.09	+24.20	+18.77	+2.13	+8.51
GR_{0-8}	-1.00	-1.23	-2.72	-3.59	-1.66	-1.10
GR_{0-12}	-0.65	-0.88	-0.98	-1.70	-2.12	-0.53

Table (8): Estimates of potency ratio for DG and GR% during different periods.

	potency ratio				
	DG				
	DG_{0-4}	**DG_{4-8}**	**DG_{8-12}**	**DG_{0-8}**	**DG_{0-12}**
RIR x Gim	0.67	5.75	-1.41	2.30	-3.70
Gim x RIR	-14.00	-11.62	-3.87	-8.00	-4.97
	GR				
	GR_{0-4}	**GR_{4-8}**	**GR_{8-12}**	**GR_{0-8}**	**GR_{0-12}**
RIR x Gim	3.70	-1.26	-0.73	5.80	-4.46
Gim x RIR	-	-3.50	-2.33	-6.37	-5.00

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الملخص العربى

مكونات الخلط لصفات الزيادة اليومية فى وزن الجسم ومعدل النمو للخلط بين دجاج الرود أيلاند الأحمر و الجميزة

بثينة يوسف فؤاد محمود و إنصاف أحمد الفل
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تم عمل خليطين من تزاوج ذكور الرود ايلاند الأحمر مع اناث الجميزة والعكس تزاوج ذكور الجميزة مع اناث الرود ايلاند الأحمر لدراسة تأثير مكونات الخلط على الصفات المدروسة.
الصفات التى تمت دراستها: الزيادة اليومية فى وزن الجسم وكذلك معدل النمو من عمر الفقس حتى ١٢ اسبوع من العمر للجنسين معا وكذلك لكل جنس منفردا.كانت هناك فروقا معنوية للجنسين معا بين التراكيب الوراثية للزياده اليومية فى وزن الجسم ومعدل النمو من عمر يوم وحتى ١٢ اسبوع. كانت الجميزة اعلى فى الزيادة اليومية فى وزن الجسم خلال الفترات من الفقس -٤ اسابيع،من ٤ -٨،الفقس-٨ وكذلك خلال نفس الفترة فى معدل النمو عن التراكيب الواثية الاخرى.كان الرود ايلاند الأحمر اعلى فى الزيادة اليومية لوزن الجسم خلال فترة من ٨-١٢ ومن الفقس-١٢ اسبوع وكان أسرع فى معدل النمو خلال الفترات ٤ -٨،٨-١٢،الفقس -١٢ اسبوع من العمر. كانت هناك فروقا معنوية بين ذكور التراكيب الوراثية للزياده اليومية فى وزن الجسم ومعدل النمو من الفقس-١٢ اسبوع ما عدا صفة الزيادة اليومية فى وزن الجسم من الفقس-٨ أسابيع. كانت هناك فروقا معنوية بين إناث التراكيب الوراثية للزيادة اليومية فى وزن الجسم ومعدل النمو من الفقس-١٢ أسبوع ما عدا صفة الزيادة اليومية فى وزن الجسم من الفقس-٤ اسابيع، الفقس-١٢ أسبوع.
كانت تقديرات القيم الاضافية المباشرة للجنسين معا سالبة وعالية المعنويه لصفات الزيادة اليومية فى وزن الجسم : من الفقس-٤،٤-٨،الفقس-٨ ومعدل النمو من ٨-١٢ اسبوع 0.54-،-1.23،0.47-،-4.50- على التوالى لذلك كانت القيم الاضافية المباشرة لصالح ذكور الجميزة للصفات السابقة.الرود ايلاند رد الأحمر كان افضل فى الاداء عن الجميزة كأب فى صفات الزيادة اليومية فى وزن الجسم من ٨-١٢،الفقس-١٢ ،معدل النمو ٤-٨،الفقس -١٢ اسبوع بسبب القيم الموجبة وعالية المعنويه للتأثيرات الاضافية المباشرة لهذة الصفات. التأثيرات الاضافية المباشرة لكل من الذكور والاناث كانت موجبة وعالية المعنوية للزيادة اليومية فى وزن الجسم من ٤-٨،٨-١٢،ومعدل النمو من ٨-١٢ ،الفقس -١٢ أسبوع.
كل تقديرات القيم الأمية للجنسين معا كانت موجبة وعالية المعنوية لصفات الزيادة اليومية فى وزن الجسم فى كل فترة التجربة،معدل النمومن ٤-٨،٨-١٢،الفقس -١٢ أسبوع . مع ذلك التقديرات القيم الامية للذكور والاناث كانت سالبة وعالية المعنوية للزيادة اليومية فى وزن الجسم من ٨-١٢ ،معدل النمو من ٤-٨ ،٨-١٢ أسبوع.
تأثيرات الخلط لكلا الجنسين معا وكذلك فى الذكور والاناث كانت سالبة للزيادة اليومية فى وزن الجسم ومعدل النمو فى هذه الدراسة ما عدا تأثير الخلط فى الاناث للزيادة اليومية فى وزن الجسم من الفقس -٨ اسابيع،معدل النمو من ٨-١٢ اسبوع كانت موجبة وعالية المعنويه 2.17،1.92 مما يعنى أن إناث النسل كانت أفضل من أمهاتها فى الأداء لهذة الصفات.
وقد تراوحت قيم قوة التوريث من 14- الى 5.8 كانت هناك سيادة فائقة لصالح الأب الأعلى فى الزيادة اليومية لوزن الجسم من ٤-٨،الفقس-٨ اسابيع،معدل النمو من الفقس-٤،الفقس-٨ وكانت قيمهم كالتالى 5.75،2.30،3.70،5.80 على التوالى فى خليط ذكورالرود ايلند الأحمر مع إناث الجميزة.على الجانب الاخر فى خليط الجميزة مع الرود ايلاند الأحمر وجد سياده فائقة للأب الاعلى(الجميزة) فى الزيادة اليومية فى وزن الجسم ومعدل النمو طوال الفترات التجربة.
تفوق الأباء على نسل الجيل الأول لصفات الزيادة اليومية فى وزن الجسم ومعدل النمو على الرغم من القيم الموجبة وعالية المعنوية للتأثيرات الإضافية والأمية. كان تأثير الخلط عكسى على هذه الصفات وهذا يوضح عدم فاعلية الخلط بين دجاج الرود ايلاند لأحمر والجميزة لتحسين صفات النمو.