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EVALUATION OF ANIMAL MODELS AND GENETIC PARAMETERS OF MILK PRODUCTION IN GABALY BALADI BLACK RABBITS USING THE DF-REML PROCEDURE

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تقييم نماذج الحيوانات والمعايير الوراثية لإنتاج الحليب في الأرانب البلدي الاسود والكاليفورنيا باستخدام برنامج DF-REML

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Abstract

Number of litters collected from Gabaly (G) and Baladi Black (BB) rabbits respectively, and used to evaluate weekly milk yield (MY) and litter weight gain (LG) from kindling up to the end of 4th wk (28 days) of age, were 131 and 155 records for the evaluation of (MY) while 128 and 155 litters were used for the evaluation of litter gain (LG),. Flocks of the two breeds were raised at the Experimental Rabbitry, Animal Production Research Institute, Borg El-Arab Alexandria Governorate, Egypt. Derivative Free Restricted Maximum Likelihood (DF-REML) Animal Model was used for the estimation of variance components and heritability.
G rabbits recorded relative superiority in performance over that of BB ones for the milk yield traits. Year-season combination exerted significant effect on litter gain in G rabbits. The performance of rabbit does for the traits studied increased significantly ($P \leq 0.01$; $P \leq 0.001$; $P \leq 0.0001$) in winter and autumn seasons compared to spring seasons irrespective of the year of production. Heritability estimates were low and ranged from 0.001 to 0.03 for MY and from 0.001 to 0.02 for LG in G, while varied from 0.001 to 0.07 for MY and from 0.001 to 0.03 for LG in BB rabbits.

Keywords : Rabbit, Milk yield, Heritability

الملخص:

عدد الأمهات التي تم جمعها من أرانب الجبلى والأرانب البلدي الأسود على التوالي، والتي استخدمت لتقييم إنتاج الحليب الأسبوعي وزيادة وزن النتاج من الولادة حتى نهاية الأسبوع الرابع (28 يومًا) من العمر، كان 131 و155 سجلاً لتقييم انتاج اللبن بينما تم استخدام 128 و155 نتاج لتقييم زيادة الوزن. تم تربية قطيع من السلالتين في محطة الأرانب التجريبية، معهد بحوث الإنتاج الحيواني، محطة بحوث الانتاج الحيوانى ببرج العرب محافظة الإسكندرية، مصر.
الاحتمالية القصوى المقيدة بدون مشتقات (DF-REML) تم استخدام نموذج الحيوان لتقدير مكونات التباين والوراثة.
النتائج التحصل عليها سجلت أرانب الجبلى تفوقًا نسبيًا في الأداء مقارنة بأرنب البلدى الاسود في صفات إنتاج الحليب. كان لتفاعل السنة والموسم تأثير كبير معنويا على زيادة عدد المواليد في أرانب الجبلى.
حيث زادت أداء إناث الأرانب للصفات المدروسة بشكل كبير(0.01 ؛0.001 ؛ P ≤0.0001) في فصلي الشتاء والخريف مقارنة بفصول الربيع بغض النظر عن سنة الإنتاج.
تقديرات الوراثة كانت منخفضة وتراوحت بين 0.001 إلى 0.03 لانتاج اللبن ومن 0.001 إلى 0.02 لزيادة وزن النتاج في أرانب الجبلى، بينما تراوحت بين 0.001 إلى 0.07 لانتاج الحليب ومن 0.001 إلى 0.03 لزيادة وزن النتاج في الارانب البلدى الاسود.

الكلمات المفتاحية: الأرانب، إنتاج الحليب، قابلية التوريث.

Introduction

Accurate estimation of variance components and genetic parameters is crucial for determining the genetic potential for trait improvement through selection. The Derivative Free Restricted Maximum Likelihood (DF-REML) Animal Model is one of the new methodologies that can provide precise estimates in this regard.

This method is increasingly becoming one of the preferred methods of estimation because among other reasons it accounts for selection and downward bias in the data (Häckl et al 2023 and Searle, 1989). Selection for growth rate has been performed in the Gabaly (G) rabbit to meet demands of rabbit meatm, Marín-García et al (2023). Accurate determination of rabbits' individual breeding or transmitting ability values for such an economic trait is fundamental for planning and attaining progress in breeding programs (Abdel-Ghany, *et. al.*, 2003). In this respect, Best Linear Unbiased Prediction (BLUP) estimated by different procedures is a reliable approach to predict breeding values of animals and to adjust simultaneously for fixed effects of the model (Adeolu and Ibe 2020 and Lukefahr, 1992).

The principal differences in litter growth and survival rate during the suckling period are greatly dependent on the amount of milk produced by the doe from kindling up to 21 days, where doe milk is the sole source of nutrient supply for young rabbits. In this respect, EL Nagar et al (2014) and Lukefahr et al., (1983) detected a strong positive association between milk production of the doe and both litter size and weight traits at 21 days of age.

The present study aimed to evaluate and quantify the non-genetic (year-season) fixed effect influencing milk yield, MY, litter gain (LG at the 7^{th}, 14^{th}, 21^{st} and 28^{th} day post kindling in Gabaly (G) and Baladi Black (BB) rabbits in addition to estimate the additive and phenotypic variance co-variance matrices and heritability estimates.

MATERIALS AND METHODS

Data of the present study consisted of rabbit field records collected through two consecutive years (2024 – 2025) on milk production traits in Gabaly (G) and Baladi Black (BB) rabbits raised at the Experimental Rabbitry, Animal Production Research Institute, Borg El-Atrab Alexandria Governorate, Egypt for genetic and environmental evaluation.

Does were housed in individual cages provided with nest boxes, feeders and automatic drinkers. They were fed on a commercial pelleted diet containing approximately 17.3% protein, 2.49% crude fat and 13% crude fiber. Feed and water were provided *ad libitum* all time.

Matings started in Autumn-2024 and terminated at the end of spring-2025. Milk yield of does was recorded twice weekly in grams using the weight-suckle-weight method described by Lukefahr et al., (1983) and averages of the two records of each week and the multiplied by 7 to get the weekly milk yield, as well as litter gain up to at the 7^{th} (LG1wk), 21^{st} (LG3wk) and up to 28^{th} day (LG4wk) in G and BB rabbits.

Data of G and BB rabbit does pertaining to litter milk production traits were analyzed using Derivative Free Restricted Maximum Likelihood Animal Model. The model adopted for analyzing the data comprised the effect of year-season combination (as fixed effect) in addition to direct additive and permanent environmental effects.

Heritability estimates (h^2) were computed for each breed, as the ratio of additive variance components to the overall phenotypic variance.

Numbers of does and dams along with number of litters for the two breeds are listed below:

Item	G	BB
No. of litters	128	155
No. of does	59	55
No. of dams	36	32

StatistiG analysis

Milk yields and litter gain traits during the 1st, 2nd, 3rd and 4th week of age for 283 litters of G and BB rabbits were recorded. Starting variance and covariance values were obtained by REML method of VARCOMP procedure (SAS, 1996) to be used for the estimation of the more precise and reliable estimates of multi-trait animal model variance and covariance components.

The following animal model was used:

$$y = Xb + Z_a u_a + Z_c u_c + e$$

where y = vector of observations on animal; b = vector of unknown fixed effect peculiar to year-season (5 levels); u_a = vector of random direct additive genetic effect of the animal for the ith trait; u_c = vector of random permanent environmental effect (doe – parity of the litter combination); **e**= vector of random error; X, Z_a and Z_c are incidence matrices relating records of ith trait to the fixed, random animal and random common litter effects, respectively.
Records of spring 1996 were not included in the statistiG analysis because of their unavailability because of the effect of the hemorrhagic viral disease.
The transmitting ability was estimated by dividing the breeding value by two.

RESULTS AND DISCUSSION

Means and coefficients of variation of uncorrected records:

Overall, the actual milk yield and litter gain means in G and BB rabbits, along with their standard deviations and coefficients of variation (CV %) during the suckling period, are presented in Table 1.

Table (1): Overall actual Means; standard deviations (SD); coefficients of variability (CV%) and number of observations (N) on milk yield and litter gain in Gabaly (G) and Baladi Black (BB) rabbits up to 7th , 14th , 21st and 28th day post kindling.

Traits	Gabaly rabbits				Baladi Black rabbits			
	N	Mean	SD	CV%	N	Mean	SD	CV%
Milk yield								
during the 1st Wk	128	0.462	0.116	22.03	155	0.498	0.129	25.98
during the 2nd Wk	128	0.786	0.144	18.57	155	0.859	0.204	23.74
during the 3rd Wk	128	0.832	0.174	21.08	155	0.887	0.217	24.51
during the 4th Wk	128	0.357	0.114	30.59	155	0.375	0.136	36.30
Litter Gain								
up to the 7th day	128	0.059	0.027	47.57	155	0.065	0.021	31.95
up to the 21st day	128	0.058	0.022	36.69	155	0.059	0.017	28.46
up to 28th day	128	0.096	0.046	48.26	155	0.068	0.017	25.25

The figures in this table reveal that the means of milk yield traits in this study fall within the ranges reported in most Egyptian studies (e.g., Yamani 1991, Hassan et al., 1992; Rashwan, 1993; El-Sayiad, 1994; Marai et al., 1994, Nasr, 1994; Ahmed, 1997; and Amira El-Deghadi, 2019) and are relatively lower than those reported in non-Egyptian studies (e.g., Lukefahr et al., 1983; Rashwan and Karoly, 1989). Unexpectedly, results presented in Table 1 revealed that BB rabbits showed generally higher milk yield and litter gain performance compared with that of G rabbits. Besides, values of milk yield showed a general trend indicating that these values increased slightly as the suckling period advanced till the 3rd wk and decreased than after. These results may mean that under such intensive production (mating females after 7 days of kindling) adopted in the flock under consideration, females reach their beak of milk production at the 21st day post-kindling. The reduction in production following that beak could be due to reaching the ultimate junctures of pregnancy in these does, (Ahmed; 1997 and

Nagwa Ahmed 2004). The opposite trend was greatly observable in case of litter gain. Nevertheless, the decreased performance of G rabbits than that of BB, though not tested statistiGly, may be a process of acclimatization for those rabbits to the Egyptian environment or may be some sort of inbreeding depression due to closing the flock.

Coefficients of variation (CV %) for milk yield and litter gain ranged from 19.57 to 31.59 and from 35.69 to 47.26, respectively, in G rabbits. The respective ranges in BB were from 23.74 to 36.30 and from 25.25 to 31.95; which seems wider and consequently less uniform than that for G. These higher phenotypic variabilities of BB rabbits could be advantageous if they are associated with a reasonable heritability estimate.

Effect of Year-season

Year-season effect on litter gain of G rabbits up to 7th, 21st and 28th day post kindling were significant (P≤0.05; and P≤0.01) (Table 2).

Table (2): Year season combinations were used to analyze the least squares means of milk yield and litter gain traits for Gabaly (G) and Baladi Black (BB) rabbits during the 1st, 2nd, 3rd, and 4th week after kindling.

Year-Season combination	Milk yield during							
	1st Wk		2nd Wk		3rd Wk		4th Wk	
	No.	Mean	No	Mean	No.	Mean	No	Mean
Gabaly rabbits:		ns		ns		ns		ns
Autumn -2024	44	0.476	44	0.766	44	0.868	44	0.378
Winter-2024	15	0.486	15	0.798	15	0.776	15	0.322
Autumn -2025	12	0.457	12	0.721	12	0.788	12	0.305
Winter-2025	35	0.444	35	0.827	35	0.828	35	0.365
Spring-2025	26	0.478	26	0.781	26	0.851	26	0.365
Baladi Black rabbits:		ns		ns		ns		ns
Autumn -2024	39	0.489	39	0.808	39	0.839	39	0.352
Winter-2024	18	0.541	18	0.895	18	0.888	18	0.364
Autumn -2025	37	0.460	37	0.806	37	0.867	37	0.395
Winter-2025	40	0.510	40	0.861	40	0.893	40	0.385
Spring-2025	20	0.496	20	1.023	20	1.008	20	0.375

Year-Season combination	Litter Gain up to					
	7th day		21st day		28th day	
	No.	Mean	No.	Mean	No.	Mean
Gabaly rabbits		**		*		**
Autumn -2024	45	0.062	44	0.059	44	0.105
Winter-2024	18	0.0728	18	0.059	18	0.090
Autumn -2025	10	0.039	11	0.067	11	0.119
Winter-2025	38	0.061	38	0.059	37	0.083
Spring-2025	26	0.051	26	0.054	25	0.094
Baladi Black rabbits		ns		ns		ns
Autumn -2024	39	0.063	39	0.066	39	0.071
Winter-2024	18	0.075	18	0.064	18	0.073
Autumn -2025	37	0.064	37	0.055	37	0.067
Winter-2025	40	0.065	40	0.056	40	0.065
Spring-2025	20	0.062	20	0.056	20	0.066

Year season effects on milk yield traits (during the 1st, 2nd, 3rd and 4th week of the suckling period were not significant. In this respect, Amira El-Deghadi (2019) and Ahmed (1997) reported that year-season effects were significant on milk yield 3 and milk yield 21 in G

rabbits. Yamani (1991) and Ayyat et al., (1995) showed that significance could be detected for season-of-kindling on milk yield up to 7th , 14th , 21st day post kindling. However, Hassan et al., (1992) and Nasr (1994) failed to detect any significant effect for season-of-kindling during the 3rd wk milk yield.
The year season least squares means for milk yield indicated that autumn milk yield was generally the lightest relative to those of other seasons, in both breeds. This might be due to that ambient temperature and relative humidity during autumn were not appropriate for doe milk production performance. Also, the heaviest milk yield and milk coefficients were, in general, achieved during winter in G and during spring in BB rabbits. Furthermore, the highest milk yield was recorded during winter in G during the 1st. and 3rd. wk. and in BB rabbits up to 7th and 28th day. This might be because of the more suitable ambient temperature and relative humidity. These results are in agreement with those of Maertens et al (2006) and Papp et al., (1983) who reported that the highest milk production and daily milk yield were given at 15 °C and daily milk yield fell down by 7.7 g for every one degree centigrade increase in temperature above 20 °C. Szendrő et al (2018) and Maertens and De Groote (1990) reported that high ambient temperature above 30 °C causes the decline of milk yield by about 9%. These differences in milk yield with the change of year-season may be due to variation in climatic conditions (e.g. ambient temperature, relative humidity...) and day length from one year-season to another. Habeeb et al (2018) and Ahmed, (1997) attributed differences in litter traits by year-season to be due to variation in climatic conditions from one year-season to another.

Variance component (σ):

Results in Table 3 showed that the analysis of milk yield data in animal models showed that the magnitude of the error term is largely comparable. In G rabbits, the additive genetic variance (σ^2A) was generally higher than in BB rabbits, except during the 1st week post-kindling. However, the additive covariance was more favorable for BB rabbits. These findings suggest that G rabbits in the flock are likely to respond better to direct selection than BB rabbits. In terms of litter gain, the additive genetic variance of BB rabbits was generally higher than that of G rabbits, except up to the 3rd week post-kindling, with similar error term tendencies across breeds. On the other hand, the magnitude of the additive covariance, and apart from the negative or positive signs, was generally in favor of G rabbits. These results reveal that unlike milk yield for G rabbits in the flock under consideration are expected to respond poorer to direct selection of litter gain than BB ones.
In this respect, the phenotypic variance, (diagonal elements) phenotypic covariance (off-diagonal elements) of milk yield data revealed that in G are generally higher than those of BB rabbits except that during the 2nd wk post-kindling, (Table 3). However in case of litter gain, a reverse trend to that of milk yield, was observed.
These low and insignificant figures of additive variance components highlighted the importance and the strong magnitude of the environmental component of variance linked with the genetic differences connected with milk yield and litter gain traits. As an estimator of such an environmental variance permanent environment was evaluated (as percentage). A general trend was observed for that sort of variance component is that it was relatively greater at first (reaching as much as 0.029%) and diminished thereafter in both traits with the advancement of age of the litter post-kindling. However, it may even disappear in some cases.
Khalil et al. (1987) and Hassan et al. (2015) noted that the low sire variance component percentages indicate a significant environmental component of variance linked to the doe during kindling and raising litters to weaning. They suggested that due to the impact of litter size on milk production and litter gain, which are fitness traits, additive variance may have decreased over time through natural selection.

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Table (3): Genetic and phenotypic variance-covariance matrices, along with the percentage contributions of permanent environment and error to the phenotypic variance of milk yield (MY) and litter gain (LG) traits in Gabaly (G) and Baladi Black (BB) rabbits during the suckling period.

Traits	Genetic Variance Co-variance Matrix				Permanent%
	MY-Wk1	MY-Wk2	MY-Wk3	MY-Wk4	
<u>MY of Gabaly rabbits</u>					
1st Wk.	0.03145	0.04465	0.00530	0.00027	0.028
2nd Wk.		0.06318	0.00860	0.00045	0.024
3rd Wk.			0.00199	0.00001	0.002
4th Wk.				0.00055	0.001
<u>MY of Baladi Black rabbits:</u>					
1st Wk.	0.04983	0.05438	0.00521	0.00066	0.0061
2nd Wk.		0.05978	0.00588	0.00058	0.0046
3rd Wk.			0.00058	0.00004	0.0017
4th Wk.				0.00028	0.0021

<u>LG of Gabaly rabbits</u>	LG-Wk1	LG -Wk3	LG -Wk4	Permanent%
up to 7th day	0.07210	0.05961	0.00290	0.0350
up to 21st day		0.05079	0.00413	0.0100
up to 28th day			0.00209	0.0001
LG of Baladi Black rabbits:				
up to 7th day	0.08228	0.04993	-0.00158	0.0291
up to 21st day		0.03637	0.00603	0.0078
up to 28th day			0.00808	0.0000

	Phenotypic Variance Co-variance Matrix				Error
MY of Gabaly rabbits	MY-Wk1	MY-Wk2	MY-Wk3	MY-Wk4	
1st Wk.	1.00461	2.15997	1.33067	0.78464	0.94
2nd Wk.		5.52676	3.85708	2.27900	0.98
3rd Wk.			2.91491	1.72171	1.00
4th Wk.				1.02589	1.00
MY of Baladi Black rabbits:					
1st Wk.	0.6842	1.9776	1.3007	0.7840	0.92
2nd Wk.		5.9645	3.9801	2.4018	0.99
3rd Wk.			2.7086	1.6345	1.00
4th Wk.				0.9984	1.00

LG of Gabaly rabbits	LG-Wk1	LG -Wk3	LG -Wk4	Error
up to 7th day.	2.4389	2.0387	1.3733	0.93
up to 21st day.	2.0387	3.9709	4.0028	0.98
up to 28th day.	1.3733	4.0028	4.3976	0.99
LG of Baladi Black rabbits:				
up to 7th day.	2.066	2.229	1.566	0.93
up to 21st day.		4.943	4.895	0.98
up to 28th day.			5.248	1.00

Abdel-Kafy et al (2012) reported that the small additive variance components underscore the significant impact of environmental factors on the genetic differences associated with litter

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size and litter weight traits in BB rabbits, emphasizing the potential for improvement in the gene pool.

GENETIC PARAMETERS

Heritability estimates

Heritability can be estimated using three different methods: (a) by comparing the phenotypic similarity between relatives, (b) through the results of selection experiments, and (c) by comparing the phenotypic variance within genetic lines to that of the population mating at random. The DF-REML animal model primarily utilizes the first method, which involves assessing phenotypic likeness between relatives. If a breeder selects individuals to be parents of the next generation based solely on their phenotypic values, the success in altering the population's characteristics can only be predicted by understanding the extent to which these phenotypic values correspond to breeding values.

Table (4): Heritability estimates of milk yield (MY) and litter gain (LG) traits in Gabaly (G) and Baladi Black (BB) rabbits during the suckling period.

	Heritability (diagonal) and genetic correlation (off -diagonal)			
	MY-Wk1	MY-Wk2	MY-Wk3	MY-Wk4
MY of Gabaly rabbits:				
1st Wk.	0.03034			
2nd Wk.	0.89597	0.01542		
3rd Wk.	0.71136	0.89900	0.0022	
4th Wk.	0.06834	0.07258	0.02139	0.0002
MY of Baladi Black rabbits:				
1st Wk.	0.07598			
2nd Wk.	0.89970	0.04		
3rd Wk.	0.98535	0.89267	0.003	
4th Wk.	0.18703	0.18464	0.07747	0.003
	Litter Gain			
	Wk1	Wk3	Wk4	
LG of Gabaly rabbits:				
up to 7th day.	0.03956			
up to 21st day.	0.99506	0.01179		
up to 28th day.	0.25624	0.40186	0.0056	
LG of Baladi Black rabbits:				
up to 7th day.	0.03782			
up to 21st day.	0.91273	0.00636		
up to 28th day.	-0.06328	0.34175	0.00133	

This correspondence is quantified by an important genetic parameter known as heritability. The ratio of total genetic variation to total observed variance is referred to as the coefficient of heritability in the broad sense. However, the heritability estimated by animal model algorithms using the REML procedure differs, as it represents the ratio of additive genetic variation to total observed variance, or heritability in the narrow sense. The additive genetic variance component plays a key role in determining the resemblance among relatives.

Heritability estimates using REML method for milk yield and litter gain traits in G and BB rabbits, presented in Table 4, were relatively very low.

Heritability estimates in BB rabbits were to some extent lower than those of G ones for milk yield and ranged from 0.001 to 0.03031 and from 0.001 to 0.07298 in G and BB rabbits; respectively. These estimates were similar to the ranges reported by El Raffa. [30], Baselga and Garcia. [31], Youssef., et al. [28], Nofal., et al. [32], Iraqi., et al. [24], Gad. [33], Gharib., et al. [34] and Iraqi. [35]. The respective records for litter gain were 0.001 to 0.02956 and 0.00154 to 0.03982. In contrast, the superiority concerning litter gain heritability estimates were generally in favor of BB rabbits with the same previously mentioned obvious trend of its diminishing magnitude as litters advance in age.

In this respect, Ayyat *et al*. (1995) reported that heritability estimates for milk yield of G rabbits during the 1st, 2nd and 3rd week ranged from 0.09 to 0.22. Lukefahr *et al.*, (1996) showed that milk yield heritability estimate at 21 days was 0.11. Ahmed (1997) reported that heritability estimates of milk production traits from kindling up to 21 days were low in both breeds G and Gabalyn) and ranged from 0.064 to 0.121 in G and from 0.014 to 0.261 in Gabalyn rabbits. The low estimates of heritability for most studied traits in the two breeds under consideration, suggest that maternal effects and non-genetic factors constituted the major source of variation for those traits.

Genetic correlation

In the improvement plan, it is important to consider the genetic correlation between traits when selecting for a specific trait. Genetic correlation is a population parameter that indicates how much genetic change in one trait is associated with changes in another trait that was not selected for. This parameter is influenced by the degree of association between the two traits, often due to the pleiotropic effects of genes that control them. There are two types of associations: permanent associations, which are due to genes controlling both traits, and temporary associations, which are due to genes being located close together on the same chromosome. The strength of the temporary association depends on the distance between the genes, with a larger distance leading to a faster dissolution of the association.

Genetic correlations among MY and LG traits in both BB and G rabbits, as shown in Table 4, indicate strong correlations. The estimates for BB rabbits were somewhat higher than those for G rabbits for the MY trait, while the opposite was true for G rabbits. Therefore, selection criteria for these traits can be based on these correlations. However, values of genetic correlations obtained from animal model procedures have limited practiG utility and are somewhat difficult to interpret and unreliable. The covariance produced by the multi-trait animal model is often uncertain and subject to debate, as it does not consistently differ from zero, particularly when analyzing more than one or two traits.

Transmitting abilities:

Transmitting ability estimates for MY and LG traits in G and BB rabbits, presented in Tables 5 and 6, respectively, exhibited a common trend of being shrinked as litters become older. Transmitting ability ranges in BB rabbits were to some extent lower than those of G ones for MY and LG revealing a broader genetic variability in G rabbits to select form. Apart from the ranges and when considering the maximum transmitting ability estimates, it was found that BB rabbits were greater to G ones in MY figures while the reverse was veritable in case of LG which would increase the expected performance of their progeny regarding these two traits. These results may give reasons to expect that direct selection in G rabbits is expected to improve MY performance of their progeny at levels relatively higher than that expected from BB ones and vice versa with regard to LG.

Table (5): Animal transmitting ability in milk yield (MY) traits for Gabaly (G) rabbits from the 1st to the 4th week of age**.**

ALL Data							
Traits	Max.	Min.	Range	Positive Records	% of Positive Records	Higher 30%	
						Min.	Range
MY during the 1st Wk.	0.141	-0.180	0.320	45	46.392	0.024	0.116
MY during the 2nd Wk.	0.208	-0.273	0.481	45	46.392	0.034	0.173
MYduring the 3rd Wk.	0.038	-0.059	0.097	50	51.546	0.005	0.032

MYduring the 4th Wk.	0.022	-0.013	0.033	53	54.639	0.002	0.019
LG up to 7th day.	0.124	-0.2882	0.417	59	60.825	0.023	0.106
LG up to 21st day.	0.106	-0.2396	0.347	59	60.825	0.019	0.089
LG up to 28th day.	0.006	-0.0132	0.019	59	60.825	0.001	0.005
Total Number of does = 99							
Doe Data							
Trait	Max.	Min.	Range	Positive Records	% of Positive Records	Higher 30%	
						Min.	Range
MY during the 1st Wk.	0.140	-0.180	0.320	26	44.068	0.031	0.109
MY during the 2nd Wk.	0.207	-0.273	0.480	26	44.068	0.043	0.164
MY during the 3rd Wk.	0.037	-0.059	0.096	29	49.153	0.007	0.031
MY during the 4th Wk.	0.021	-0.013	0.033	32	54.237	0.002	0.018
LG up to 7th day.	0.129	-0.288	0.418	36	61.017	0.033	0.096
LG up to 21st day.	0.108	-0.240	0.347	36	61.017	0.002	0.106
LG up to 28th day.	0.006	-0.013	0.019	36	61.017	0.002	0.004
Total Number of does = 60							
DAM Data							
Traits	Max.	Min.	Range	Positive Records	% of Positive Records	Higher 30%	
						Min.	Range
MY during the 1st Wk.	0.070	-0.084	0.154	19	50.000	0.021	0.049
MY during the 2nd Wk.	0.104	-0.119	0.223	19	50.000	0.027	0.077
MY during the 3rd Wk.	0.019	-0.021	0.040	21	55.263	0.004	0.014
MY during the 4th Wk.	0.008	-0.006	0.015	21	55.263	0.001	0.007
LG up to 7th day.	0.065	-0.144	0.209	23	60.526	0.015	0.050
LG up to 21st day.	0.054	-0.120	0.174	23	60.526	0.012	0.041
LG up to 28th day.	0.003	-0.007	0.010	23	60.526	0.000	0.003
Total Number of does = 40							

The numbers of positive records for doe; dam or their combined data were generally in favour of G rabbits. All these assessments revealed that though of the intensive selection that G rabbits have been subjected for in their origin country, still and under the Egyptian environment they have the an endurable genetiG capability to be improved.

Table (6): Animal transmitting ability of milk yield traits for Baladi Black rabbits (BB) from the 1st to the 4th week of age.

ALL Data							
Traits	Max.	Min.	Range	Positive Records	% of Positive Records	Higher 30%	
						Min.	Range
MY during the 1st Wk.	0.4761	-0.1924	0.6685	43	52.439	0.028	0.448
MY during the 2nd Wk.	0.5213	-0.2090	0.7304	44	53.659	0.029	0.492
MY during the 3rd Wk.	0.0496	-0.0210	0.0705	41	50.000	0.003	0.046
MY during the 4th Wk.	0.0125	-0.0113	0.0237	40	48.780	0.002	0.010
LG up to 7th day.	0.0437	-0.0970	0.1407	44	53.659	0.011	0.032

Trait	Max.	Min.	Range	Positive Records	% of Positive Records	Higher 30% Min.	Higher 30% Range
LG up to 21st day.	0.0292	-0.0646	0.0939	44	53.659	0.008	0.022
LG up to 28th day.	0.0023	-0.0047	0.0071	45	54.878	0.001	0.002
Total Number of does = 99							
Doe Data							
Trait	Max.	Min.	Range	Positive Records	% of Positive Records	Higher 30%	
						Min.	Range
MY during the 1st Wk.	0.4761	-0.1924	0.6685	26	50.000	0.038	0.439
MY during the 2nd Wk.	0.5213	-0.2090	0.7304	27	51.923	0.038	0.483
MY during the 3rd Wk.	0.0496	-0.0210	0.0705	25	48.077	0.005	0.045
MY during the 4th Wk.	0.0125	-0.0113	0.0237	25	48.077	0.003	0.009
LG up to 7th day.	0.0437	-0.0970	0.1407	26	50.000	0.013	0.031
LG up to 21st day.	0.0292	-0.0646	0.0939	26	50.000	0.008	0.021
LG up to 28th day.	0.0023	-0.0047	0.0071	27	51.923	0.001	0.002
Total Number of does = 60							
DAM Data							
Trait	Max.	Min.	Range	Positive Records	% of Positive Records	Higher 30%	
						Min.	Range
MY during the 1st Wk.	0.1938	-0.0660	0.2597	17	56.667	0.021	0.173
MY during the 2nd Wk.	0.2128	-0.0714	0.2842	17	56.667	0.022	0.191
MY during the 3rd Wk.	0.0198	-0.0073	0.0271	16	53.333	0.002	0.017
MY during the 4th Wk.	0.0073	-0.0052	0.0125	15	50.000	0.001	0.006
LG up to 7th day.	0.0218	-0.0396	0.0614	18	60.000	0.011	0.011
LG up to 21st day.	0.0146	-0.0265	0.0411	18	60.000	0.007	0.008
LG up to 28th day.	0.0012	-0.0021	0.0032	18	60.000	0.000	0.001
Total Number of does = 40							

Conclusions

Baladi Black (BB) rabbits showed generally a higher MY and LG performance compared to that of G. Putting in mind that low figures of additive variance components revealed the importance and the strong magnitude of the environmental component of variance linked with the genetic differences in MY and LG traits.

BB rabbits perform well for milk production traits than exotic ones, this may be due to that exotic breeds after a period of acclimatization and subjection to unintended inbreeding diminishes to the extent that they were comparable to the native breed. Besides, and due to the intensive selection which was performed in their origin countries, the additive variance of exotic breed was regressed. However, and due to that native breed was not subjected to such selection programs, native breed additive variance component is of high magnitude which enables selection for such traits which are expected to respond greater and faster than exotic ones.

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