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ESTIMATES OF VARIANCE COMPONENTS AND HERITABILITIES OF PRE-WEANING GROWTH TRAITS OF ANGLO-NUBIAN AND BALADI KIDS

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SUMMARY

Data relevant to 573 Anglo-Nubian and 318 Baladi kids born at Alexandria University Experimental Station between 1997-2014 were utilized in this investigation to estimate variance components and heritabilities of birth weight (BW), weaning weight (WW) and average daily gain (ADG). In addition, effects of season and year of birth, sex of kid, type of birth and parity on the previous studied traits were investigated.

The least squares analysis with unequal subclass numbers showed that the overall means of BW, WW and ADG of Anglo-Nubian kids were 2.55 kg, 13.18 kg and 87.14 g, respectively, whereas they were for Baladi kids 2.25 kg, 10.19 kg and 64.74 g, respectively. On the other hand, the statistical analyses showed that fixed effects on all studied traits were generally significant (P<0.01or P<0.05), except for effects of season of birth on BW of Baladi and WW of Anglo-Nubian kids, and effects of parity on WW and ADG of Baladi breed.

Estimates of the direct heritability (h^2_a) and maternal heritability (h^2_m) ranged from 0.36-0.58 and 0.05-0.30, from 0.01-0.38 and 0-0.18 and from 0.08-0.46 and 0-0.17 for BW, WW and ADG of Anglo-Nubian kids, respectively. The corresponding values for Baladi Kids ranged from 0.26-0.45 and 0.12-0.29, from 0.28-0.39 and 0.03-0.19 and from 0.21-0.31 and 0.03-0.18, respectively. Furthermore, estimates of the total heritability (h^2_t) were moderate to high for BW in both breeds, and low to moderate for WW and ADG of Anglo-Nubian, and moderate for WW and ADG of Baladi breed. Estimates of the total maternal effects (t_m) were considerable for all the studied traits of both breeds. The results in general showed that maternal effects were significant source of variation for pre-weaning growth traits of Anglo-Nubian and Baladi kids. Therefore, these effects should be taken into consideration when carrying out genetic evaluations of pre-weaning growth traits of both Anglo-Nubian and Baladi kids in their herd.

Keywords: Variance components, heritability, maternal effects, pre-weaning growth, Anglo-Nubian, Baladi, kids

INTRODUCTION

Goats' population in Egypt was 4350000 heads in 2013, and they contribute about 5.34 % of the national total red meat production and about 3.56 % of total milk production (FAO, 2015). They have good potential as a meat producing farm animal, especially when their reproductive and productive efficiencies are considered. Pre-weaning growth traits of kids are important in determining profitability of any goat production enterprise (Boujenane and El Hazzab 2008, Supakorn and Pralomkarn 2009, Zhang *et al*. 2009, Gowane *et al.* 2011, Mohammadi *et al.* 2012, Bazzi 2013 and Gupta *et al.* 2016).

Pre-weaning growth traits of goats are determined not only by the kid's genetic potential for growth, but also by the maternal genetic effects and environmental factors (Supakorn and Pralomkarn 2009, Zhang *et al*. 2009, Assan 2013 and Gupta *et al.* 2016). Many researchers found that pre-weaning growth traits of kids were most affected by maternal effects (Boujenane and El Hazzab 2008, Rashidi *et al*. 2008, Zhang *et al*. 2009, Supakorn and Pralomkarn 2009, Gholizadeh *et al*. 2010, Gowane *et al.* 2011, Mohammadi, *et al.* 2012 and Sadegh *et al*. 2013). Therefore, when these traits are included in the breeding programs, both the direct and maternal component should be taken into consideration in order to achieve an optimum progress from the selection (Boujenane and El Hazzab 2008, Rashidi *et al*. 2008, Gholizadeh *et al*. 2010, Osman 2013 and Rout *et al*. 2018).

This investigation was carried out to estimate variance components and heritabilities (direct and maternal) of birth weight, weaning weight and average daily gain from birth to weaning of Anglo-Nubian and Baladi kids in an experimental herd of goats.

MATERIALS AND METHODS

Source of data:

Data used for this study were collected from the records of the goats' herd of the Experimental Station, Faculty of Agriculture, Alexandria University. The records covered the period from 1997 to 2014 and included 573 and 318 Anglo-Nubian and Baladi kids presenting 20 and 18 sires and 125 and 84 dams, respectively. The structures of data are found in Table (1).

Table 1: Means, standard deviations (SD), coefficient of variation (CV %) and distribution of the data for birth weight (BW), weaning weight (WW) and average daily gain (ADG) of Anglo-Nubian and Baladi kids.

Items	Anglo-Nubian			Baladi		
	BW	WW	ADG	BW	WW	ADG
Mean, (kg or gm)	2.55	13.18.	87.14	2.25	10.19	64.74
SD, (kg or gm)	0.54	3.43	27.42	0.43	2.59	19.56
CV (%)	21.18	26.02	31.47	19.11	25.42	30.21
No. of records	573	446	446	318	266	266
No. of sires	20	19	19	18	17	17
No. of dams	125	90	90	84	79	79
No. of buck kids	279	215	215	159	127	127
No. of doe kids	294	231	231	159	139	139
No. of single kids	128	100	100	95	81	81
No. of twin kids	374	290	290	205	170	170
No. of triplet kids	71	56	56	18	15	15

Flock management:

Animals were housed in semi closed pens, fed on *Berseem* (*Trifolium alexandrinum*) during winter and spring and on stubble and *Berseem* hay and/or fodder sorghum (*Sorghum bicolor)* during summer and autumn. Supplementary concentrate ration of about 0.25 kg / head was offered daily along the year.

Kidding of the herd was managed all year around. Females were first mated at about 18 months of age. Sires and dams were selected as yearlings on the basis of visual appraisal for type and size rather than on a pre-set intensive selection programme. Once the doe entered the breeding flock, there is no chance for culling until the end of its productive life.

Statistical procedures:

Least squares of GLM procedure (SAS 2008) were utilize to test the significance of the fixed effects of season of birth (4 seasons), year of birth (6 periods), sex (male and female), type of birth (single, twin and triplet) and parity (7 parities) on birth weight (BW), weaning weight (WW) and average daily gain (ADG) from birth to weaning of kids. Months of birth were classified by season into autumn births between September and November, winter births between December and February, spring births between March and May and summer births between June and August. Years of birth from 1997-2014 were classified to six periods (1= 1997-1999, 2= 2000-2002, 3=2003-2005, 4= 2006–2008, 5= 2009-2011and 6= 2012-2014). Parity was between 1 and 6 or over. Each breed data were analyzed separately. The statistical model fitted was:

$\mathbf{Y_{ijklmn}} = u + \mathbf{A_i} + \mathbf{B_j} + \mathbf{C_k} + \mathbf{D_l} + \mathbf{P_m} + \mathbf{e_{ijklmn}}$ where,

$\mathbf{Y_{ijklmn}}$: either BW, WW or ADG traits; **μ**: an underlying constant specific to each trait; A_i: the fixed effect of i^{th} season of birth (i=1,2,3 and 4); $\mathbf{B_j}$: the fixed effect of j^{th} year of birth (j=1,2,3……6); $\mathbf{C_k}$: the fixed effect of k^{th} sex (k=1 and 2); $\mathbf{D_l}$: the fixed effect of l^{th} type of birth (l=1 and 2); P_m: the fixed effect of m^{th} parity (m=1,2,3…..6) and $\mathbf{e_{ijklmn}}$: random residual assumed to be independent normally distributed with mean zero and variance σ_e^2 .

Univariate animal models were fitted to estimate (co)variance components and heritabilities for each trait using Wombat program (Meyer, 2006). The following four models were used:

$y = Xb + Z_a a + e,$ (1)

$y = Xb + Z_a a + Z_c c + e,$ (2)

$y = Xb + Z_a a + Z_m m + e$ (3)

$y = Xb + Z_a a + Z_m m + Z_c c + e$ (4)

where y is a n × 1 vector of observations for each trait; b, a, m, c and e are vectors of fixed effects (season of birth, year of birth, sex, type of birth and parity), direct additive genetic effects, maternal additive genetic effects, maternal permanent environmental effects and the residual effects, respectively; X, Za, Zm, Zc are the incidence matrices of fixed effects, direct additive genetic effects, maternal genetic effects and maternal permanent environmental effect; A is the numerator relationship matrix between animals; and σ_{am} is the covariance between additive direct and maternal genetic effects. The (co)variance structure for the model was:

$V(a) = A\sigma^2_a, V(m) = A\,\sigma^2_m,\ V(c) = I_P\,\sigma^2_c,\ V(e) = I_R\,\sigma^2_e$ and $Cov(a, m) = A\,\sigma_{am}$

where I_P and I_R are identity matrices with orders equal to the number of dams and the number of kids, respectively and σ^2_a, σ^2_m, σ^2_c, and σ^2_e are direct additive genetic variance, maternal additive genetic variance, maternal permanent environmental variance, and residual variance, respectively.

Estimates of direct heritability (h^2_a), maternal heritability (h^2_m) and permanent maternal environmental effects (c^2) were calculated as ratios of estimates of σ^2_a, σ^2_m, and σ^2_c, respectively, to the phenotypic variance σ^2_p). The direct-maternal correlation (r_{am}) was computed as the ratio of the estimates of direct-maternal covariance (σ_{am}) to the product of the square roots of estimates of σ^2_a and σ^2_m. The total heritability for each trait was estimated (Willham, 1972) as $h^2_t = h^2_a + 0.5\ h^2_m + 1.5\ h_m\ r_{am}\ h_a$, which predicts the expected response to phenotypic selection. The total maternal effect, $t_m = ¼\ h^2_a + h^2_m + c^2 + h_m\ r_{am}\ h_a$ was calculated to estimate repeatability of doe performance.

RESULTS AND DISCUSSION

The means, standard deviation (SD) and coefficient of variation (CV %) of the studied traits are shown in Table 1.The overall means of BW, WW and ADG of Anglo-Nubian kids were 2.55 kg, 13.18 kg and 87.14 g, respectively, their corresponding values for Baladi kids were 2.25 kg, 10.19 kg and 64.74 g, respectively. Although Anglo-Nubian breed had more twin and triplet births, higher BW means of kids of that breed were attained. Anglo-Nubian does are larger in size and BW of their kids was slightly higher than that of Baladi with differences remaining consistent for WW. High ADG of Anglo-Nubian reflects the genetic potential of the kids and the mothering ability of the does and caused an increase in WW of Anglo-Nubian kids over Baladi kids.

Fixed effects:

The results of analysis of variance in Table 2 show that fixed effects on all studied traits were generally significant ($P<0.01$or $P<0.05$) except for effects of season of birth on BW of Baladi and WW of Anglo-Nubian kids and effects of parity on WW and ADG of Baladi breed. Fixed effects on pre-weaning growth traits of kids of different goat breeds along with the world have been well depicted in the literature (Boujenane and El Hazzab 2008, Otuma and Osakwe 2008, Rashidi *et al.* 2008, Hermiz *et al.* 2009, Zhang *et al.* 2009, Mohammadi *et al.* 2012, Bedhane *et al.* 2013, Deribe and Taye 2013, Osman 2013, Bingol *et al*. 2014, Paul *et al*. 2014, Ray *et al.* 2015, Syahirah *et al.* 2016, Gupta *et al.* 2016 and Rout *et al.* 2018).

Table 2: Effects of season and year birth, sex of kid, type of birth and parity on birth weight (BW), weaning weight (WW) and pre-weaning average daily gain (ADG) of Anglo-Nubian and Baladi kids.

Source of variation	Anglo-Nubian				Baladi		
	df[a]	BW	WW	ADG	BW	WW	ADG
Season of birth	3	**	**NS**	*	**NS**	**	**
Year of birth	5	**	*	*	**	**	**
Sex of kid	1	**	**	**	**	**	**
Type of birth	2	**	**	**	**	**	**
Parity	5	**	**	**	**	**NS**	**NS**
Error		**(556)**	**(429)**	**(429)**	**(301)**	**(249)**	**(249)**

NS: Not significant (P>0.05); *: Significant (P< 0.05); **: Highly significant (P< 0.01)
Figures within parentheses are the degree of freedom (df) for error.

Variance components and heritabilities:

Estimates of variance components (σ^2_a, σ^2_m, σ^2_c, σ^2_e and σ^2_p), heritabilities (h^2_a, $h^2_m$and h^2_t), fraction of variance due to maternal permanent environmental effects (c^2), total maternal effect (t_m) and log-likelihood (Log L) for BW, WW and ADG of Anglo-Nubian and Baladi kids are shown in Table 3.

Model 1, which ignored the permanent environmental and additive maternal effects, had the lowest Log Likelihood values (Log L) for all studied traits of both Anglo-Nubian and Baladi kids. However, model 4 that included direct and maternal genetic and permanent environmental effects was the most appropriate model for BW of both breeds and for WW and ADG of Baladi and model 2 that included direct and maternal permanent environmental effects was the most appropriate model for WW and ADG of Anglo-Nubian. Hence, the genetic and permanent maternal environmental effects were important for BW of kids of both breeds and for WW and ADG of Baladi kids. For Anglo-Nubian, model 2 was considered to be better than model 4 for WW and ADG, because the maternal genetic effects in model 4 were approximately zero. On the other hand, model 4 was the best model for WW and ADG of Baladi kids. Generally, the permanent environmental effect was determined to be more important than maternal additive effect for WW and ADG of kids of both breeds in this herd.

Table 3: Estimates of variance components and genetic parameters for birth weight (BW), weaning weights (WW), and average daily gain (ADG) of Anglo-Nubian (A) and Baladi (B) and kids.

Breed	Trait	Model	σ^2_a	σ^2_m	σ^2_c	σ^2_e	σ^2_p	h^2_a	h^2_m	c^2	h^2_t	t_m	Log-l
A	BW	M1	0.19	-	-	0.14	0.34	0.58 (0.11)	-	-	0.58	0.14	13.31
		M2	0.13	-	0.08	0.12	0.34	0.39 (0.14)	-	0.24 (0.07)	0.39	0.34	26.99
		M3	0.13	0.12	-	0.13	0.37	0.36 (0.14)	0.30 (0.08)	-	0.51	0.39	24.56
		M4	0.13	0.02	0.07	0.12	0.34	0.38 (0.15)	0.05 (0.10)	0.20 (0.09)	0.41	0.35	27.20
	WW	M1	4.81	-	-	7.83	12.7	0.38 (0.14)	-	-	0.38	0.10	-772.26
		M2	0.12	-	2.33	9.75	12.2	0.01 (0.07)	-	0.19 (0.06)	0.01	0.19	-767.92
		M3	0.24	2.21	-	9.76	12.2	0.02 (0.08)	0.18 (0.06)	-	0.11	0.19	-768.65
		M4	0.12	0.00	2.33	9.75	12.2	0.01 (0.07)	0.000 (0.40)	0.19 (0.39)	0.01	0.19	-767.92
	ADG	M1	38. 4	-	-	446.3	827.8	0.46 (0.14)	-	-	0.46	0.12	-1663.69
		M2	65.3	-	134.6	589.5	789.3	0.08 (0.11)	-	0.17 (0.07)	0.08	0.19	-1660.73
		M3	69.7	130.3	-	590.3	970.3	0.09 (0.17)	0.17 (0.07)	-	0.17	0.19	-1661.13
		M4	74.5	0.10	143.2	583.1	800.8	0.09 (0.12)	0.00 (0.47)	0.18 (0.47)	0.09	0.20	-1660.75
B	BW	M1	0.10	-	-	0.12	0.22	0.45 (0.12)	-	-	0.45	0.11	58.19
		M2	0.06	-	0.05	0.10	0.22	0.29 (0.14)	-	0.25 (0.08)	0.26	0.32	65.81
		M3	0.06	0.07	-	0.11	0.23	0.26 (0.14)	0.29 (0.09)	-	0.40	0.36	65.45
		M4	0.06	0.03	0.03	0.10	0.22	0.27 (0.14)	0.12 (0.16)	0.14 (0.13)	0.33	0.33	66.08
	WW	M1	2.72	-	-	4.18	6.89	0.39 (0.13)	-	-	0.39	0.10	-392.23
		M2	2.27	-	1.07	3.65	6.99	0.32 (0.15)	-	0.15 (0.07)	0.32	0.24	-388.79
		M3	2.04	1.38	-	3.84	7.26	0.28 (0.15)	0.19 (0.09)	-	0.38	0.26	-389.50
		M4	2.22	0.24	0.91	3.66	7.03	0.32 (0.16)	0.03 (0.13)	0.13 (0.11)	0.33	0.24	-388.75
	ADG	M1	124. 2	-	-	282.6	406.8	0.31 (0.13)	-	-	0.31	0.08	-922.84
		M2	94.7	-	64.2	251.7	410.6	0.23 (0.14)	-	0.16 (0.07)	0.23	0.21	-919.46
		M3	88.5	78.5	-	260.0	427.0	0.21 (0.14)	0.18 (0.09)	-	0.30	0.24	-920.10
		M4	94.0	12.6	54.8	251.5	413.0	0.23 (0.15)	0.03 (0.13)	0.13 (0.12)	0.24	0.22	-919.43

σ^2_a: direct additive genetic variance, σ^2_m: maternal genetic variance, σ^2_c: maternal permanent environmental variance, σ^2_e: residual variance, σ^2_p: phenotypic variance, h^2_a: direct heritability, h^2_m: maternal heritability, c^2: fraction of phenotypic variance due to maternal permanent environmental effects, h^2_t: total heritability ($h^2_t = h^2_a + 0.5\ h^2_m + 1.5\ mr_{am}h$), t_m: total maternal effect ($t_m = ¼\ h^2_a + h^2_m + c^2 + mr_{am}h$) and log-l: log- likelihood values.

In addition, model 1 had the highest estimates of σ^2_a and h^2_a for BW, WW and ADG of both breeds. The addition of the maternal effects in the models reduced the values of both σ^2_a and h^2_a compared to model 1for all studied traits in both breeds. Several studies showed that including of the maternal effects in the models resulted in more accurate estimation of (co)variance and genetic parameters of growth traits of kids (Gholizadeh *et al*. 2010, Gowane *et al*. 2011 and Osman 2013 and Rout *et al*. 2018). The current estimates of h^2_a and h^2_m varied from 0.36-0.58 and 0.05-0.30, from 0.01-0.38 and 0-0.18 and from 0.08-0.46 and 0-0.17 for BW, WW and ADG of Anglo-Nubian kids, respectively, the corresponding values for Baladi kids were varied from 0.26-0.45 and 0.12-0.29, from 0.28-0.39 and 0.03-0.19 and from 0.21-0.31 and 0.03-0.18, respectively. These estimates of h^2_a and h^2_m for body weights showed a tendency to decrease with advanced in ages. This tendency has also been documented in several studies (Assan, 2013, Osman 2013 and Gupta *et al.* 2016). The moderate to high h^2_a estimates obtained in this study for BW of both breeds indicated that direct genetic effects constitute a large portion of the phenotypic variances for this trait. The low h^2_a estimates obtained in this study for WW and ADG of Anglo-Nubian kids except in model 1 indicated that direct genetic effects constitute a little portion of the phenotypic variances for these traits of this breed. Hence, slow genetic response would be expected through direct selection for these traits in Anglo-Nubian kids. This may be attributed to the low nutritional levels and the differences in managing practices at the goats breeding station, creating large environmental variations. However, moderate h^2_a estimates for WW and ADG of Baladi kids suggested that efforts could be made, thus, in bringing about improvement in these traits through selection, as well as managerial practices. The estimates of h^2_m for BW were higher than for WW and ADG for Anglo-Nubian and Baladi kids. Hence, maternal additive effects constitute an important part of variation for BW of both breeds. The low h^2_m estimates for WW and ADG of Anglo-Nubian and Baladi kids in model 2 and very low in model 4 indicated that genetic effects constitute a little portion of the phenotypic variances for these traits of both breeds. Hence, the maternal genetic effect was determined to be lower important than permanent environmental effect for WW and ADG of Anglo-Nubian and Baladi kids in this herd.

The estimates of h^2_a and h^2_m in the literature were ranged from 0.04 to 0.54 and 0.04 to 0.33 for BW, from 0.02 to 0.51 and 0 to 0.30 for WW and from 0.04 to 0.39 and 0.01 to 0.52 for ADG, respectively depending on the model used and the breed of kids (Shaat *et al*. 2007,Boujenane and El Hazzab2008, Kantanamalakul *et al*. 2008, McManus *et al*. 2008, Rashidi *et al.* 2008, Hermiz *et al*. 2009,Supakorn and Pralomkarn 2009, Zhang *et al.* 2009, Alade *et al.* 2010, Gholizadeh *et al.* 2010, Gowane *et al.* 2011, Mohammadi *et al.* 2012, Snyman2012, Bedhane *et al.* 2013, Osman 2013, Sadegh *et al*. 2013, Kuthu *et al.* 2017 and Rout *et al.* 2018). Hence, the current estimates of h^2_a and h^2_m for all studied traits are generally in agreement with those reported in the literature on several breeds of goats.

The present estimates of (c^2) obtained from models 2 and 4 were relatively important for all studied traits for Anglo-Nubian and Baladi kids. The estimates of c^2 were varied from 0.20-0.24, 0.19-0.19 and 0.17-0.18 for BW, WW and ADG of Anglo-Nubian kids, respectively, the corresponding values for Baladi kids were varied from 0.14-0.25, 0.13-0.15 and 0.13-0.16, respectively. These estimates indicated that maternal permanent environmental effects were a significant source of variation for pre-weaning growth traits of Anglo-Nubian and Baladi kids. Hence, maternal permanent environmental effects should be taken into consideration when carrying out strategies for long term selection programmes for both breeds. Estimates of c^2 for all studied traits for Anglo-Nubian were relatively higher than those for Baladi kids. These estimates are in agreement with those documented in different goat breeds in many countries of the world by Boujenane and El Hazzab2008, Kantanamalakul *et al*. 2008, McManus *et al*. 2008, Rashidi *et al.* 2008, Gholizadeh *et al.* 2010, Gowane *et al.* 2011, Mohammadi *et al.,* 2012, Snyman 2012, Bedhane *et al.* 2013, Osman 2013, Sadegh *et al*. 2013 and Rout *et al.* 2018. Maternal permanent environmental effects probably reflected differences in the uterine capacity of the does for growth of the fetus and the effect of multiple births.

The current estimates of the total heritability (h^2_t) were ranged from 0.39-0.58, 0.01-0.38 and 0.08-0.46 for BW, WW and ADG of Anglo-Nubian kids, respectively, the corresponding values for Baladi kids were ranged from 0.29-0.45, 0.32-0.39 and 0.23-0.31, respectively. The estimates of h^2_t for BW and WW are generally in agreement with those (0.22-0.35 and 0.16-0.23) and those (0.08-0.32 and 0.05-0.23) estimated values for BW and WW reported by Rashidi *et al.* (2008) and Gholizadeh *et al.* (2010) in Markhoz and Raeini goats in Iran, respectively. Estimates of h^2_t (0.21-0.39, 0.08-0.12 and 0.07-11, respectively) for BW, WW and ADG were higher than those reported by Gowane *et al*. (2011) in Sirohi goat in India. Mohammadi *et al.* (2012) reported estimates of h^2_t (0.17, 0.30 and 0.12) for BW, WW and ADG in Raeini Cashmere goats in Iran. Gowane *et al.* (2011) pointed out that the estimates of h^2_t are model sensitive. When maternal effects are important in the expression of a trait, h^2_t is of crucial importance in terms breeding and is useful in selection response based on phenotypic values.

Estimates of the total maternal effect (t_m)obtained in this study were ranged from 0.14-0.39, 0.10-0.19 and 0.12- 0.20 for BW, WW and ADG of Anglo-Nubian kids, respectively, the corresponding values for Baladi kids were varied from 0.11-0.36, 0.10-0.26 and 0.08-0.24, respectively. These estimates showed that maternal effects were a significant source of variation for pre-weaning growth traits of Anglo-Nubian and Baladi kids. Therefore, maternal effects should be considered when carrying out genetic evaluations of pre-weaning growth traits of kids of both breeds in this herd. Gowane *et al.* (2011) reported lower estimates of t_m (0.10-0.18, 0.03-0.10 and 0.03-0.16) for BW, WW and ADG in Sirohi goat in India than the current findings.

CONCLUSIONS

The low genetic variations in WW and ADG of Anglo-Nubian kids proved that selection occurred in a slow genetic response. On the other side, the moderate genetic variations in WW and ADG of Baladi proved that selection resulted in a considerable genetic response. The results of this study showed the importance of inclusion of the maternal effects in the model of analysis, since the inclusion of these effects leads to more accurate estimation of variance component and heritabilities for pre-weaning growth traits of both breeds. Therefore, these effects should be taken into consideration when carrying out genetic selection strategies for long term breeding programs of pre-weaning growth traits for both Anglo-Nubian and Baladi kids in this flock.

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تقديرات مكونات التباين والمكافيء الوراثي لصفات النمو قبل الفطام للجديان الأنجلونوبيان والبلدي

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استخدم في هذا البحث بيانات سجلات لجديان عددها ٥٧٣ أنجلونوبيان و٣١٨ بلدي مولودة في محطة بحوث كلية الزراعة جامعة الإسكندرية خلال الفترة من ١٩٩٧-٢٠١٤م. وذلك من أجل تقدير مكونات التباين والمكافيء الوراثي لصفات وزن الميلاد ووزن الفطام ومعدل النمو اليومي من الميلاد حتى الفطام للجديان. وأيضاً من أجل دراسة تأثير كل من موسم الميلاد وسنة الميلاد والجنس ونوع الميلاد وترتيب موسم الميلاد على الصفات موضع البحث.

تم تحليل البيانات إحصائياً بطريقة الحد الأدنى للمربعات باستخدام برنامج الـ SAS. أوضحت النتائج أن المتوسط العام كان ٢.٥٥ كجم لوزن الميلاد و١٣.١٨ كجم لوزن الفطام و٨٧.١٤ جم لمعدل النمو اليومي للجديان الأنجلونوبيان. وأيضاً كان ٢.٢٥ كجم، ١٠.١٩ كجم و٦٤.٧٤ جم لنفس الصفات على الترتيب للجديان البلدي. كما وأوضحت النتائج أن تأثيرات موسم الميلاد، سنة الميلاد، الجنس، نوع الميلاد وترتيب موسم الميلاد كانت معنوية (P<0.05 أو P<0.01) على الصفات موضع البحث فيما عدا أن موسم الميلاد ليس له تأثيراً معنوياً على وزن الميلاد للجديان البلدي ووزن الفطام للجديان الأنجلونوبيان وترتيب موسم الميلاد لم يكن له تأثيراً معنوياً على وزن الفطام ومعدل النمو اليومي للجديان البلدي.

تم تحليل البيانات بواسطة نموذج الحيوان Univariate Animal Model بإستخدام برنامج Wombat. طبقت أربعة نموذجات تختلف فيما بينها في احتوائها أو عدم احتوائها علي التأثير الوراثي الأمي والتاثير الأمي البيئي المستديم كما تضمنت هذه النموذجات تأثيرات العوامل الثابتة موضع البحث. تراوحت تقديرات المكافيء الوراثي االمباشر والأمي بين ٠.٣٦-٠.٥٨ و ٠.٠٥-٠.٣٠، ٠.٠١-٠.٣٨ و ٠-٠.١٨ وبين ٠.٠٨-٠.٤٦ و ٠-٠.١٧ لوزن الميلاد، وزن اللفطام ومعدل النمو اليومي علي الترتيب للجديان الأنجلونوبيان. كما وتراوحت بين ٠.٢٦-٠.٤٥ و ٠.١٢-٠.٢٩ و ٠.٢٨-٠.٣٩ و٠.٠٣-٠.١٩ وبين ٠.٢١-٠.٣١ و ٠.٠٣-٠.١٨ لنفس الصفات بالترتيب للجديان البلدي. إن عدم وجود التاثيرات الأمية في نموذج التحليل الاحصائي أدى إلى زيادة تقديرات المكافيء الوراثي المباشر لكل الصفات في كلتا السلالاتين. وكانت تقديرات المكافيء الوراثي الكلي متوسطة إلى مرتفعة بالنسية لوزن الميلاد في كلتا السلالاتين ومنخفضة إلى متوسطة بالنسبة لصفتي وزن الفطام ومعدل النمو اليومي في الأنجلونوبيان ومتوسطة للصفتين في البلدي. وأوضحت النتائج أن التأثير الأمي الكلي هام بالنسبة للصفات موضع البحث في كلتا السلالاتين.

أظهرت النتائج بصفة عامة أن التأثيرات الأمية تعتبر من مصادر التباين الهامة بالنسبة لصفات النمو قبل الفطام في كلتا السلالاتين. لذا بنبغي وجود هذه التأثيرات في نموذج التحليل الاحصائي عند إجراء التقييم الوراثي لصفات النمو قبل القطام للجديان الأنجلونوبيان والبلدي في القطيع موضع البحث.