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GENETIC, PHENOTYPIC AND ENVIRONMENTAL TRENDS TOWARDS IMPROVING BODY WEIGHT IN BARKI SHEEP

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ABSTRACT

Genetic, phenotypic and environmental trends for some body weights at birth (*BW*), 120 days (*W120)*, 360 days (*W360)* and at 480 days (*W480)* were estimated to evaluate the breeding plan implemented in Barki sheep flock of the Desert Research Centre. The study also investigated the effects of various environmental factors on these traits. The data set employed in this study was obtained from 3192 records of lambs progenies of 186 sires reared at two research stations; Ras Elhekma (from 1963 to 1972) and Maryout (from 1973 to 2004). Animal breeding values, heritabilities and both genetic and phenotypic correlations for studied body weights were also estimated. Genetic and phenotypic trends were calculated by regression of breeding and phenotypic values on birth year respectively. Environmental trend was attained by subtracting genetic trend from the phenotypic one.

Results indicated that average least square means of males had significantly heavier body weights compared with females for the studied body weights. As age of dam increased, body weights tended to be significantly heavier for BW and W120. Ras Elhekma research station exhibited heavier BW, W120 and W360 as well as lighter W480 compared with Maryout research station. The heritabilities of the studied body weights tend to increase as age increased. Genetic correlations among W120, W360 and W480 were greater with higher magnitude than those of phenotypic ones. Least squares means of animal breeding values for birth year were found to range from 3.50 kg to 3.68 kg, from 17.19 kg to 20.24 kg, from 30.46 kg to 37.27 kg and from 35.26 kg to 43.08 kg for BW, W120, W360 and W480, respectively during the examined study period. Genetic, phenotypic and environmental trends for the studied traits exhibited substantial irregular fluctuations among the examined years and being of higher magnitude in Ras Elhekma than in Maryout research station. Ras Elhekma research station had obviously positive genetic trend for BW (15 gm/ year), W120 (189 gm/year), W360 (448 gm/ year) and W480 (521 gm/ year) as well as negative phenotypic trend for BW (-18 gm/ year), W120 (-702 gm/year), W360 (-322 gm/year) and W480 (-345 gm/ year). Positive genetic trends appeared in Ras Elhekma research station indicate genetic improvement in Barki sheep flock reared in this location. The declines in the studied phenotypic traits observed in the Barki sheep flock during the examined period might be attributed to the negative and higher magnitudes of the environmental trends which might reflect some environmental inadequacies such as diseases, insufficient feeding and harsh climatic conditions.

INTRODUCTION

Barki sheep considered the main breed dominates under the harsh conditions and food shortage prevailed in the north western coast of Egypt. Desert Research Centre established Barki sheep flock in 1963 where animals were subjected to a breeding plan based mainly on selection for body weight. Since it has not been evaluated, it is imperative to follow the results of such breeding plan to assess its development and to make effective adjustments. Thus, the present study aimed to evaluate that breeding plan and determine the phenotypic trends, and divide it into its genetic and environmental components. The study of genetic trend in a population is of significant importance to monitor the selection for a given trait, since it corresponds to the observed changes in the average breeding values of animals during the selection process (Potocnik *et al*., 2007). Defining the genetic trend helps to monitor the efficiency of improving strategies used and the amount of the genetic changes occurred for the traits under selection over time. In addition to assure that the selection pressure is directed towards the traits of economic importance to achieve the selection objectives (Yaeghoobi *et al.,* 2011).

Genetic aspects of body weights become vital for producers and being the primary selection emphasis for meat production. Precise estimates of genetic parameters are often predicted after adjusting for environmental factors in order to estimate breeding values and predict genetic progress (Santus *et al.,* 1993). Selection supported with breeding values brought better input on the genetic potential of the animal. Thus, the present study was also planned to investigate the effects of various environmental factors on body weights at some remarkable stages; birth, weaning, yearling and first mating.

MATERIALS AND METHODS

Data

Pedigree information and the data used in this study were obtained from the sheep flock of the Desert Research Centre reared at two research stations; Ras Elhekma (from 1963 to 1972) and Maryout (from 1973 to 2004). Management of both flocks was almost the same where the breeding season carried out once a year in June – July to start lambing at October – November. Ewes were often first mated at approximately 16 months of age (480 days). At birth, lambs were weighed to assign birth weight, then body weights were recorded at biweekly interval till weaning followed by monthly interval till the animal removed from the flock. Shearing took place once a year during April- May. Feeding depends mainly on grazing at Ras Elhekma while rely on cut and carry at Maryout research station. Detailed flock management was described by El-Wakil *et al.* (2009).

The present study dealt with body weights at some remarkable stages; at birth, *BW*; weaning, *W120*; yearling, 360 days, *W360* and first mating, 480 days, *W480*. BW was kept as recorded while W120, W360 and W480 were adjusted to body weights at 120, 360 and 480 days, respectively. The adjustments for individual body weights to different ages were made by interpolation between the data of two successive ages assuming linear growth function during the short intervals. Prior to analyses, abnormal records such as incomplete growth pattern as well as few numbers of twinning were excluded from the data set. After editing, the data set consisted of 3192 records of lambs which were progenies of 186 sires. Records of BW (3191 offspring), W120 (3191 lambs), W360 (1719 animals) and W480 (1476 animals) were analyzed.

Statistical Analysis

Analysis of variance was carried out for the data to split the total variance into its components by the least square technique using the general linear model procedure of SAS (2004). Comparisons among subclass means were also carried out following Tukey test (SAS, 2004). The following mathematical model was used to determine the effect of environmental factors on the traits under consideration:

$$\mathbf{Y_{ijklm}=\mu+S_i+L_j+R_{k(j)}+A_l+E_{ijklm}} \qquad \mathbf{(1)}$$

Where, Y_{ijklm} is the observation of the studied trait (BW, W120, W360 or W480) of m^{th} animal of i^{th} gender, j^{th} location and k^{th} year within location and l^{th} age of dam; S_i is the fixed effect of gender (1=male and 2=female); L_j is the fixed effect of location (1= Ras Elhekma and 2= Maryout); $R_{k(j)}$ is the fixed effect of year within location (Ras Elhekma from 1963 to 1972 and Maryout from 1973 to 2004); A_l is the fixed effect of age of dam (2,3,4 and 5 years and more); E_{ijklm} is the random residual error assuming to be NID $(0,\sigma^2)$.

Genetic parameters for the studied traits were also estimated. Multiple traits animal model (MTDFREML) proposed by Boldman *et al.* (1995) was used to estimate the heritability, genetic and phenotypic parameters. The same previous fixed effects were included in this analysis regarding the animal, sire and dam as random effects. The following linear model was used:

$$Y=X\beta+Z_a a+e \qquad (2)$$

Where: Y = is N vector of observations of BW, W120, W360 and W480, X= is the incidence matrix for fixed effects mentioned previously in model (1), β = is the vector including the overall mean and the same fixed effects as those stated in model (1), Z_a = is the incidence matrix for random effects, a = is the vector of direct genetic effect of animal assuming $V(a) = \sigma^2_a$; and e = is a vector of random residuals normally and independently distributed with zero mean and variance $\sigma^2_e I$.

The animal expected breeding values (EBVs) were also obtained from the previous analysis. The mean values of EBVs according to birth years were calculated. Genetic trends were estimated by regression of average estimated breeding values on year of birth. The presented animal breeding values were obtained by adding the least squares means of a given body weight to the corresponding additive genetic effects extracted from the animal model. The least squares solutions of estimated breeding values were plotted against the year of birth to determine the genetic trend (Ahmad, 2007). After standardization of the studied body weights data according to the fixed effects, the phenotypic trend was calculated as the linear regression of the adjusted means for a given body weight on the years of birth (Bakir and Kaygisiz, 2009). Environmental trend was calculated by subtracting genetic trend from the phenotypic one as described by Kunaka and Makuza (2005).

RESULTS AND DISCUSSION

Tables (1 and 2) present overall means for body weights at birth (*BW)*; weaning, (*W120)*; yearling, 360 days, (*W360)* and at first mating, 480 days, (*W480)* according to the analysis of variance for non- genetic factors affecting these traits. It is indicated that increased body weight being associated with increased variation in terms of standard deviation as supported by Wilson *et al.* (1996). Tables (1 and 2) revealed that males had significantly heavier body weights compared with females for all studied body weights. As age of dam increased, body weights tended to be significantly heavier for all studied body weights till the age of four years, then a slight decrease was detected for those ewes aged 5 years and more. Ras Elhekma research station exhibited significantly ($P<0.01$) heavier W120 and lighter W360 and W480 compared with Maryout research station. The obtained results were similar to those reported elsewhere for Barki sheep in the same flock (Bedier *et al.*, 1995; El-Wakil, 2009) and other flock (Abdel-Aziz, 1994) as well as in Bakhtiari sheep of Iran (Edriss *et al.*, 2002) and Dhamari sheep in Yemen (Al-bar *et al.*, 2002).

As evident from table (2), all studied body weights showed significant fluctuations all over examined years within location with no definite trend. Heavier weights (standard deviations) for BW (3.81 (0.64) kg), W120 (22.68 (3.25) kg), W360 (40.82 (5.13) kg) and W480 (44.48 (5.28) kg) were attained at years 1998, 1963, 1998 and 2004, respectively while lighter weights (standard

Table (1). Analysis of variance for body weights at birth, BW; 120 days, W120; 360 days, W360

SOV	BW		W120		W360		W480	
	DF	MS	DF	MS	DF	MS	DF	MS
Total	3190		3190		1718		1475	
Gender	1	9.34**	1	70.98**	1	643.59**	1	931.41**
Location	1	0.43	1	1030.09**	1	34.37**	1	867.77**
Year/ location	26	4.12**	26	1229.02**	26	1304.46**	26	971.44**
Age of dam	3	9.03**	3	142.85**	3	60.25**	3	39.30**
Residual	3159	0.36	3159	39.63	1687	32.62	1444	37.07

*, ** Significant at P<0.05 and P< 0.01, respectively

deviations) for BW (3.09 (0.73) kg), W120 (8.22 (6.68) kg), W360 (21.81(3.82) kg) and W480 (27.86 (4.84) kg) were detected at years 1999, 1990, 1990 and 1973, respectively.

The variability of the considered body weights due to years of birth within location were highly significant (Table 1). Year of birth were reported to significantly affect body weight in Barki sheep (Bedier *et al.*, 1995), Bakhtiari sheep in Iran (Edriss *et al.*, 2002), Dhamari sheep in Yemen (Al-bar *et al.*, 2002) and Indian Gaddi sheep (Negi *et al.*, 1987). Highly significant variations of body weights due to years within location might reflect the level of feeding, management and environmental conditions under which the sheep flock was maintained. The level of feeding and management varies according to the ability and efficiency of farm manager, husbandry system as well as method and intensity of culling.

Table (3) presents the heritabilities, genetic and phenotypic correlations for the studied body weights. It appeared that heritabilities tend to increase as age increased. That is inversely matched with the environmental proportion of total variance which was found to be 0.90, 0.76, 0.61 and 0.57 for BW, W120, W360 and W480, respectively. As the animal grown up, the environmental factors affecting body weights tend to decrease while the intrinsic potentiality of the animal became more obvious. That context was supported by Atkins (1984). Table (3) also showed that genetic correlations of BW appeared to be lower with other studied body weights compared with the phenotypic ones. However, genetic correlations among W120, W360 and W480 were greater with higher magnitude than the corresponding phenotypic ones. Estimates of heritabilities, genetic and phenotypic correlations obtained from the present study were almost similar to that estimated by El-Wakil (2004) in the same flock. Atkins (1984) indicated that genetic correlations of birth weight with weight at any other age were negligible, those correlations between pre weaning body weight and adult body weight were low while other genetic correlations between body weights were moderate to high. Thus, he indicated that selection for increased mature weight would result in little change in birth weight and growth to weaning but moderate changes in post weaning and hogget weights.

Genetic, phenotypic and environmental trends were of higher magnitude in Ras Elhekma than in Maryout research station (Table 4). Ras Elhekma research station had obviously positive genetic trend for BW (15 gm/ year), W120 (189 gm/year), W360 (448 gm/ year) and W480 (521 gm/ year) as well as negative phenotypic trend for BW (-18 gm/ year), W120 (-702 gm/year), W360 (-322 gm/year) and W480 (-345 gm/ year). Consequently, environmental trends were found to be negative at Ras Elhekma research station for all studied body weights. The magnitude of genetic trends seemed to be increased as age increased, probably matched with increased heritabilities in that direction (Tables 3 and 4). On the other hand, the magnitudes of phenotypic, genetic and environmental trends were very little and almost close to zero for all studied body weights at Maryout research station. Comparable results were obtained from a study of Rahmani and Ossimi local breeds over a 30-year period (Shaat *et al.*, 2004). Genetic trends for lamb weights at 60, 120 and 180 days of age were estimated as 38, 92 and 135 gm per year in Rahmani ($P<0.0001$) and 20, 21 and 21 gm per year in Ossimi ($P<0.0001$), respectively.

Estimated Breeding Values (EBV) for each animal was detected and the mean values of EBVs according to birth years were calculated. Table (5) showed the least- squares means of animal breeding values for birth year to be ranged from to 3.50 kg to 3.68 kg, from 17.19 kg to 20.24 kg, from 30.46 kg to 37.27 kg and from 35.26 kg to 43.08 kg for BW, W120, W360 and W480, respectively during the examined study period. Figs. (1- 4) show the least-squares mean values of BW, W120, W360 and W480 for birth year as phenotypic trend and demonstrated the least squares mean of animal breeding values of each studied body weight trait for birth year as genetic trend. Generally, genetic and phenotypic

Table (2). Means and their standard deviations (SD) for body weights at birth, BW; 120 days, W120; 360 days, W360 and 480 days, W480 according to gender, age of dam, locations and year of birth.

	BW		W120		W360		W480	
	n	mean(SD)	N	mean(SD)	N	mean(SD)	n	mean(SD)
Overall means	3191	3.54(0.64)	3191	15.26(7.05)	1719	31.55(7.24)	1476	36.63(7.56)
Gender								
Female	1572	3.49(0.62)a	1572	15.13(6.82)a	899	30.99(7.02)a	785	35.79(7.43)a
Male	1619	3.59(0.64)b	1619	15.39(7.26)b	820	32.17(7.44)b	691	37.59(7.60)b
Age of dam								
2	461	3.33(0.58)a	461	14.50(6.76)a	217	30.30(6.94)a	175	34.11(7.41)a
3	655	3.47(0.62)b	655	15.09(7.13)ab	360	32.08(6.80)b	315	37.08(6.95)b
4	674	3.62(0.65)c	674	15.62(7.42)b	380	32.07(7.32)b	339	37.53(7.87)b
5 and more	1401	3.61(0.63)c	1401	15.43(6.90)b	762	31.40(7.45)ab	647	36.62(7.59)b
Location								
Ras Elhekma	765	3.56(0.55)	765	16.10(7.34)a	519	31.23(7.34)a	411	34.13(7.38)a
Maryout	2426	3.54(0.66)	2426	15.00(6.93)b	1200	31.69(7.20)b	1065	37.60(7.41)b
Year of birth								
Ras Elhekma								
1963	54	3.60(0.44)	54	22.68(3.25)	53	33.74(5.49)	52	33.22(6.49)
1964	79	3.66(0.43)	79	22.40(3.81)	76	35.23(5.73)	75	36.69(7.45)
1965	81	3.70(0.62)	81	19.12(6.28)	47	34.47(7.60)	28	38.33(8.88)
1966	99	3.60(0.52)	99	13.19(7.08)	42	24.84(9.11)	10	37.57(7.31)
1967	109	3.48(0.60)	109	11.87(6.56)	50	30.78(5.56)	40	33.91(6.69)
1968	106	3.55(0.57)	106	16.50(6.50)	73	28.87(6.17)	53	31.25(5.81)
1969	78	3.37(0.57)	78	11.11(7.49)	43	28.04(7.69)	31	30.79(8.77)
1970	52	3.59(0.47)	52	14.66(5.97)	43	30.34(6.89)	41	34.20(7.67)
1971	48	3.45(0.61)	48	16.68(6.53)	43	30.14(5.83)	43	33.62(5.78)
1972	59	3.56(0.54)	59	16.93(7.26)	49	33.20(7.65)	38	33.83(7.31)
Maryout								
1973	56	3.62(0.53)	56	15.92(5.02)	49	28.25(6.62)	48	27.86(4.84)
1975	77	3.42(0.57)	77	16.93(6.50)	71	29.89(6.28)	70	34.25(7.81)
1976	70	3.52(0.64)	70	14.95(8.17)	46	26.65(5.10)	43	29.29(5.56)
1977	48	3.61(0.60)	48	14.51(6.81)	40	28.40(5.55)	11	37.36(4.76)
1984	81	3.77(0.59)	81	15.05(6.69)	64	37.23(4.27)	61	40.90(5.87)
1989	271	3.63(0.53)	271	11.82(5.68)	82	25.68(5.37)	59	31.86(4.20)
1990	75	3.40(0.52)	75	08.22(6.68)	35	21.81(3.82)	33	30.25(4.37)
1992	123	3.36(0.79)	123	13.24(8.70)	65	23.76(5.85)	38	33.75(6.30)
1994	118	3.69(0.47)	118	15.66(5.23)	64	25.95(4.74)	55	33.25(5.40)
1995	203	3.36(0.56)	203	10.47(7.41)	34	30.61(4.49)	28	36.03(5.58)
1997	276	3.75(0.61)	276	17.70(7.41)	190	35.17(5.43)	176	40.06(5.30)
1998	205	3.81(0.64)	205	16.38(6.89)	72	40.82(5.13)	72	43.22(4.86)
1999	132	3.09(0.73)	132	16.79(3.88)	66	29.86(5.36)	60	35.12(6.47)
2000	162	3.30(0.74)	162	17.99(4.71)	51	33.82(2.00)	51	39.97(2.71)
2001	168	3.28(0.64)	168	11.46(7.34)	41	29.98(4.01)	41	37.65(5.56)
2002	135	3.75(0.55)	135	17.58(4.40)	120	34.84(6.25)	120	42.57(7.21)
2003	116	3.72(0.74)	116	18.51(3.97)	50	33.79(4.98)	40	38.91(5.79)
2004	110	3.44(0.69)	110	18.03(3.57)	60	37.49(4.66)	59	44.48(5.28)

Different letters a, b, c and d are significantly different at 0.05 level

Table (3). Heritablities (on diagonal), genetic (above diagonal) and phenotypic correlations (below diagonal) for body weights at birth, BW; 120 days, W120; 360 days, W360 and 480 days, W480 in Barki sheep.

	BW	W120	W360	W480
BW	0.10	0.10	0.23	0.26
W120	0.30	0.24	0.89	0.83
W360	0.29	0.63	0.39	0.99
W480	0.27	0.48	0.86	0.43

trends exhibited substantial irregular fluctuations among the examined years. Genetic and phenotypic trends of BW showed very little changes and being almost constant over the examined years which might indicate that this trait has not been responded to any selection procedures (Fig.1). The almost constant BW all over the examined years might be regarded as sign of adaptation of Barki sheep to harsh climatic conditions and feed shortage. Heavier BW could be a response of higher feed requirements and being a chief cause for dystocia.

The curves of phenotypic trends for W120, W360 and W480 appeared to have sharper fluctuations than that of the genetic ones over the examined years which might reflect the inconsistent management system and exhibited the environmental influence on these traits (Figs 2- 4). On the other hand, the genetic trend showed slight increase in these body weights at Ras Elhekma while declined at Maryout research station which probably matches with the positive genetic trends depicted during the prevailing conditions of Ras Elhekma research station (Table 4). This waving in the mean EBVs observed at Ras Elhekma could be attributed to the management system applied which does not have a systematic selection and probably due to the use of sires having better breeding values for the considered traits during the examined years. While genetic trends of the studied traits were positive in Ras Elhekma research station, high negative magnitudes of the environmental trends observed in table (4) resulted in worsening the phenotypic trends for W120, W360 and W480. The declines of the genetic trends observed for the studied traits at Maryout research station (Table 4 and Figs. 2- 4) might be attributed to some environmental inadequacies such as insufficient feeding, diseases and harsh climatic conditions (Sargolzaei and Edriss, 2004). It is likely that the genetic – environment interaction has an important role in improving body weights in Barki sheep.

Table (4). Genetic, phenotypic and environmental trends for body weights (kg) at birth, BW; 120 days, W120; 360 days, W360 and 480 days, W480 in Ras Elhekma and Maryout research stations.

Trend		BW±SE	W120±SE	W360±SE	W480±SE
Genetic	**Ras Elhekma**	0.015± 0.003	0.189±0.025	0.448±0.049	0.521± 0.055
	Maryout	-0.000±0.000	-0.000±0.000	-0.001±0.000	-0.001± 0.001
Phenotypic	**Ras Elhekma**	-0.018±0.01	-0.702±0.41	-0.322±0.35	-0.345±0.25
	Maryout	-0.000±0.000	0.001±0.001	0.002±0.001	0.003±0.0012
Environmental	**Ras Elhekma**	-0.033	-0.891	-0.77	-0.866
	Maryout	0.00	0.001	0.002	0.003

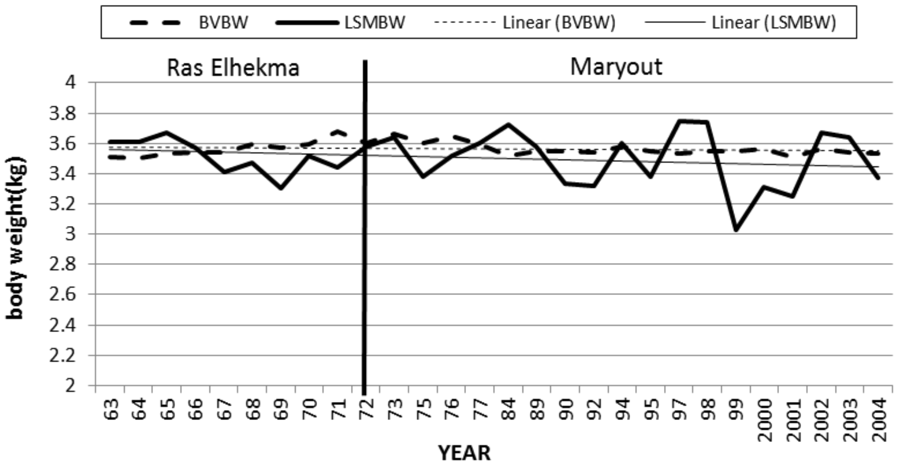

Fig. 1. Genetic (Breeding value, BV) and phenotypic (Least square means, LSM) trends for birth weights, *BW* from 1963 to 2004.

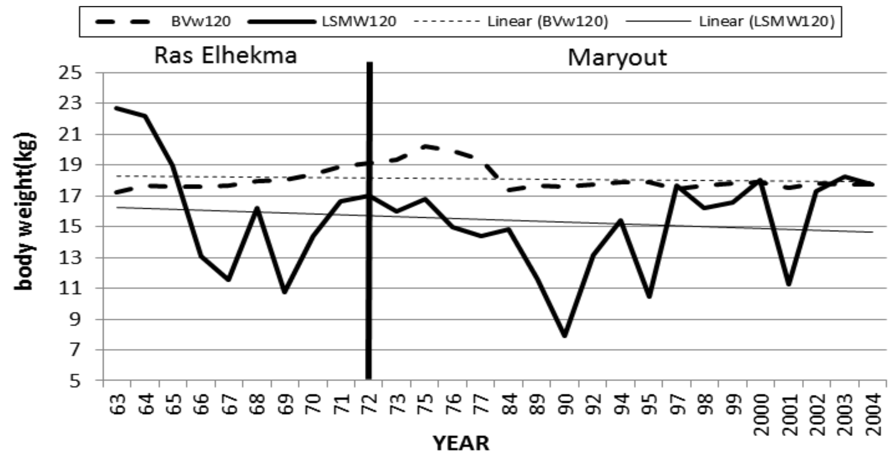

Fig. 2. Genetic (Breeding value, BV) and phenotypic (Least square means, LSM) trends for body weights at day120, *W120* from 1963 to 2004

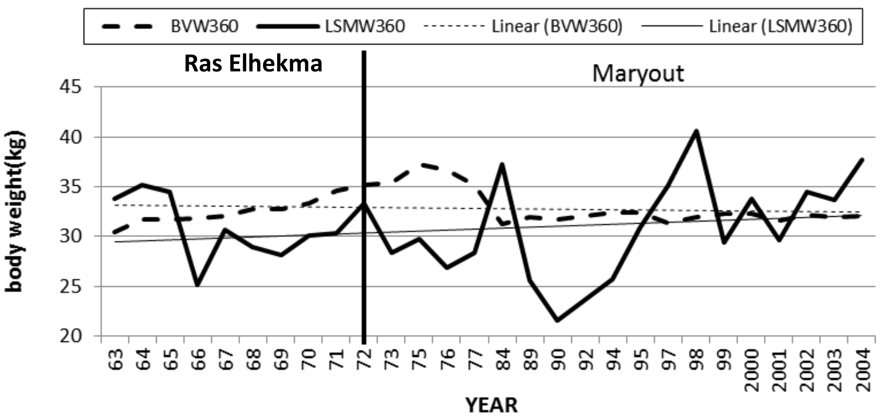

Fig. 3. Genetic (Breeding value, BV) and phenotypic (Least square means, LSM) trends for body weights at day 360, *W360* from 1963 to 2004.

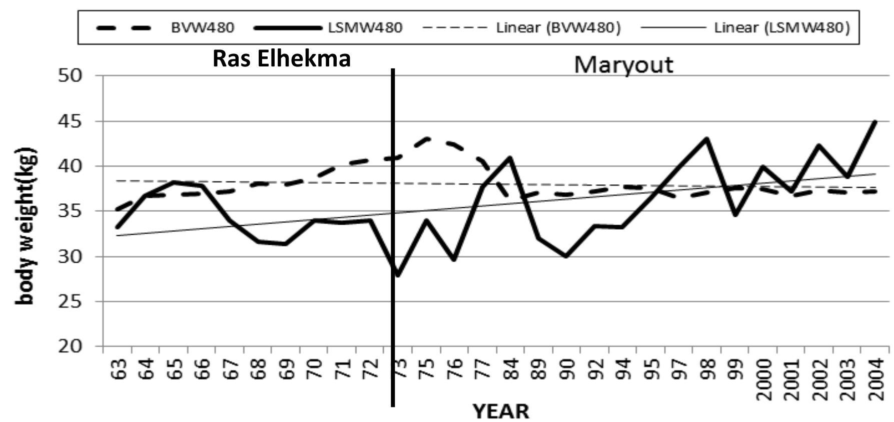

Fig. 4. Genetic (Breeding value, BV) and phenotypic (Least square means, LSM) trends for body weights at day 480, *W480* from 1963 to 2004.

Table (5). Estimated least square means (kg) of animal breeding values for body weight at birth, BW; 120 days, W120; 360 days, W360 and 480 days, W480 calculated according to birth years within location.

YEAR	Estimated least square means±SE of animal breeding values			
	BW	W120	W360	W480
Ras Elhekma				
1963	3.51±0.01	17.20±0.15	30.46±0.34	35.26±0.39
1964	3.50±0.01	17.69±0.12	31.68±0.28	36.68±0.32
1965	3.53±0.01	17.61±0.12	31.75±0.27	36.84±0.32
1966	3.54±0.01	17.59±0.11	31.86±0.25	37.01±0.29
1967	3.54±0.01	17.69±0.11	32.00±0.24	37.14±0.28
1968	3.59±0.01	17.98±0.11	32.74±0.24	38.03±0.28
1969	3.57±0.01	18.02±0.12	32.68±0.28	37.92±0.33
1970	3.59±0.01	18.37±0.15	33.36±0.34	38.67±0.40
1971	3.68±0.01	18.88±0.16	34.60±0.36	40.13±0.42
1972	3.60±0.01	19.14±0.14	35.15±0.32	40.73±0.38
Maryout				
1973	3.66±0.01	19.31±0.12	35.35±0.25	40.93±0.29
1975	3.60±0.01	20.24±0.10	37.27±0.21	43.08±0.24
1976	3.65±0.01	19.88±0.11	36.61±0.22	42.35±0.26
1977	3.59±0.01	19.36±0.13	35.15±0.27	40.60±0.31
1984	3.52±0.01	17.37±0.10	31.22±0.21	36.24±0.24
1989	3.55±0.01	17.64±0.06	31.90±0.11	37.03±0.13
1990	3.55±0.01	17.58±0.11	31.73±0.22	36.83±0.25
1992	3.54±0.01	17.73±0.08	32.08±0.17	37.23±0.19
1994	3.58±0.01	17.85±0.08	32.42±0.17	37.65±0.20
1995	3.55±0.01	17.91±0.06	32.40±0.13	37.58±0.15
1997	3.53±0.00	17.42±0.05	31.39±0.11	36.46±0.13
1998	3.55±0.01	17.65±0.06	31.91±0.13	37.04±0.15
1999	3.55±0.01	17.79±0.08	32.30±0.16	37.52±0.19
2000	3.56±0.01	17.87±0.07	32.28±0.15	37.44±0.17
2001	3.51±0.01	17.55±0.07	31.62±0.15	36.69±0.17
2002	3.56±0.01	17.77±0.08	32.16±0.16	37.33±0.18
2003	3.54±0.01	17.75±0.08	31.96±0.17	37.06±0.20
2004	3.53±0.01	17.76±0.09	32.04±0.18	37.19±0.20

In conclusion, the obtained parameters and estimates of breeding values for some recorded body weights gave an opportunity to compare the phenotypic and genetic sides of the studied Barki sheep flock. The irregular genetic and phenotypic trends depicted among the examined years might reveal that there was no or little genetic improvement occurred in the evaluated flock as a result of lacking effective directional selection (Ulutas *et al.*, 2010). Thus a breeding program should be activated by implementing selection based on breeding values to improve genetic merit of animals and increase sheep productivity. Genetic progress can be made in growth performance of Barki sheep if reasonable levels of animal management as well as selection pressure are maintained.

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الملخص العربى

الإتجاهات الوراثية والمظهرية والبيئية لتحسين بعض أوزان الجسم فى الأغنام البرقى

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تم تقدير الاتجاهات الوراثية والمظهرية والبيئية لبعض أوزان الجسم عند الميلاد وعند عمر ١٢٠ يوم وعند عمر ٣٦٠ يوم وعند عمر ٤٨٠ يوم وذلك بهدف تقييم برنامج تحسين قطيع الأغنام البرقى التابع لمركز بحوث الصحراء. استهدفت الدراسة كذلك التعرف على تأثيرالعوامل البيئية على هذه الصفات. اشتملت بيانات الدراسة على ٣١٩٢ سجل للحملان أبناء لعدد ١٨٦ كبش تم تربيتهم فى محطتين بحثيتين هما رأس الحكمة (منذ عام ١٩٦٣ حتى عام ١٩٧٢) ومريوط (منذ عام ١٩٧٣ حتى عام ٢٠٠٤). تم تقدير المكافئات الوراثية، القيم التربوية والارتباطات الوراثية والمظهرية لأوزان الجسم المدروسة، كما تم تقدير الاتجاهات الوراثية والمظهرية من خلال إنحدار القيم التربوية والقيم المظهرية على سنة الميلاد على الترتيب، وكذلك تم حساب الإتجاهات البيئية بالفرق بين الإتجاهات المظهرية والإتجاهات الوراثية.

أوضحت النتائج أن متوسط الحد الأدنى للمربعات للذكور كان أثقل فى الأوزان المدروسة مقارنة بالإناث. كما اتضح أن زيادة عمر الأم أدت إلى زيادة معنوية لأوزان الميلاد وعند عمر ١٢٠ يوما. فى محطة رأس الحكمة كانت أوزان الميلاد وعند عمر ١٢٠ يوم وعند عمر ٣٦٠ يوما أثقل وزنا بينما كان وزن الجسم عند ٤٨٠ يوم أخف وزنا مقارنة بمحطة بحوث مريوط. أوضحت الدراسة كذلك زيادة المكافئات الوراثية للصفات المدروسة بزيادة عمر الحيوان، كما كانت الإرتباطات الوراثية بين أوزان الجسم عند أعمار ١٢٠ يوم، ٣٦٠ يوم ، ٤٨٠ يوم أكبر وبقيم أعلى من الإرتباطات المظهرية. متوسط الحد الأدنى للمربعات للقيم التربوية لسنة الميلاد تراوح من ٣,٥٠ كجم إلى ٣,٦٨ كجم لوزن الميلاد، من ١٧,١٩ كجم إلى ٢٠,٢٤ كجم للوزن عند عمر ١٢٠ يوم، من ٣٠,٤٦ كجم إلى ٣٧,٢٧ كجم للوزن عند عمر ٣٦٠ يوم ، من ٣٥,٢٦ كجم إلى ٤٣,٠٨ كجم للوزن عند عمر ٤٨٠ يوم خلال فترة الدراسة. أظهرت الاتجاهات الوراثية والمظهرية والبيئية للصفات المدروسة اختلافات كبيرة خلال فترة الدراسة وكانت قيمة هذه الاختلافات أكبر فى محطة رأس الحكمة مقارنة بمحطة بحوث مريوط. أظهرت محطة بحوث رأس الحكمة اتجاهات وراثية موجبة لوزن الميلاد (١٥ جم/ السنة)، عند عمر ١٢٠ يوم (١٨٩جم /السنة)، عند عمر ٣٦٠ يوم (٤٤٨ جم / السنة)، عند عمر ٤٨٠ يوم (٥٢١ جم / السنة) وكذلك اتجاهات مظهرية سالبة لوزن الميلاد (-١٨ جم / السنة)، عند عمر ١٢٠ يوم (-٧٠٢ جم/ السنة)، عند عمر ٣٦٠ يوم (-٣٢٢جم /السنة)، عند عمر ٤٨٠ يوم (-٣٤٥ جم/ السنة). أوضحت الاتجاهات الوراثية الموجبة فى محطة بحوث رأس الحكمة حدوث تحسين وراثى للأغنام البرقى فى هذه المحطة. أشارت الدراسة إلى أن نقص القيم المظهرية للصفات المدروسة والتى لوحظت خلال فترة الدراسة ربما يعزى إلى مقدارالإتجاهات البيئية السالبة والتى تعكس بعض العوامل البيئية الغير ملائمة مثل عدم توفر الأغذية والأمراض علاوة على الظروف المناخية القاسية.