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Growth Performance of Rahmani and Chios Lambs Weaned at Different Ages

[1]S.F. Abbas, [2]M. Abd Allah, [1]F.M. Allam, [2]A.A. and Aboul-Ella[2]

[1]Animal Production Department, Faculty of Agriculture, Assiut University.
[2]Animal Production Department, Faculty of Agriculture, Al-Azhar University, Assiut. Egypt

Abstract: Two hundred and sixty seven Rahmani and Chios lambs were used in this study to determine the effects of weaning age and environmental factors on the growth performance of Rahmani and Chios lambs. Weaning system had a significant effect on body weight at 3 and 4 month, after four months, the weaning systems did not differ significantly in terms of weight up to one year of age. Weaning system had a significant effect on average daily gain (ADG). Chios lambs were heavier significantly ($P<0.01$) than Rahmani lambs at all stages of growth. Breed of lambs did not differ significantly in ADG and total gain at all periods studied. Lambing year significantly affected body weights at all ages studied, except at one year of age. Lambing season and age of dam were not significant effect on body weight of lambs at birth and subsequent periods.

Key words: Rahmani, Chios, Lambs, daily gain, weaning age

INTRODUCTION

In Egypt, new born lambs routinely are left on their dams for 60 to 90 day; milk production in tropical sheep is poor and rapidly drops after lambing (Combellas, 1974 and Rondon, *et al*. 1976). Milk production is very limited after 60 day (NRC, 1985) thus, lambs are forced to compete vigorously with their dams for available forge, also the poor milk production means that the lamb must consume other feedstuffs within a few weeks of birth. Early weaning of lambs can be useful in ewes with low milk production. It can also provide a solution to the problems of raising orphan lambs in the flock. Also, early weaning may be improve ewe's body condition, so the ewe is able to conceive earlier and flock management is eased, however the health and normal growth of the lamb must not be comprised (Combellas, 1981).

In temperate breeds of sheep weaned between 42 and 126 days have grown only slightly less rapid than those weaned in the normal manner (Yalcin, *et al*. 1969 and Bhat, *et al.* 1978). There is, however, little information on the performance of tropical breeds. The objective of this study was to determine the effects of weaning age, breed and environmental factors on the growth performance of Rahmani and Chios lambs under subtropical conditions.

MATERIAL AND METHODS

Animal and Management:

The present study was carried out at the Experimental Farm of Animal Production Department, Faculty of Agriculture, Al-Azhar University, Assiut branch. A total number of 267 lambs (146 Rahmani and 121 Chios) were used in this study. Animals were housed under semi-open sheds. Ewes were mated for the first time at age of one year and rams at two years. At lambing, new born lambs were kept with their dams in lambing pens and birth weight was recorded. At the beginning of the second week of suckling period, the lambs were separated from their dams twice daily, each lasted two hours. Lambs were gradually fed on a starter (ground corn 70 %, wheat brain 13 %, Soya bean 15 %, limestone 1.5 % and salt 0.5 %). Green fooder (*Trifolium alexandrinum*) was available during winter and green maize plants (Darawa) was available during summer. Lambs born from March to August were considered summer lambings and those born from September to February were considered winter lambings.

Statistical Analysis:

Lambs weighing at least 10 kg were randomly assigned to one of the following three weaning regimes **T1** = lambs were weaned at 8 weeks of age (early weaning), **T2** = lambs were weaned at 12 week of age

Corresponding Author: S.F. Abass, Animal Production Department, Faculty of Agriculture, Assiut University.

(normal weaning); and **T3** = lambs were weaned at 16 weeks of age (late weaning). Lambs were weighted monthly to the nearest, weights were measured in the morning before feeding. Average daily gain was calculated.

Data were statistically analyzed using the GLM procedure of the SAS package, 8.1 version (SAS, 1998). Analysis was performed according to the following linear model:

$$\mathbf{Y}_{ijklmnop} = \mu + \mathbf{WS}_i + \mathbf{B}_j + \mathbf{S}_k + \mathbf{T}_l + \mathbf{Y}_m + \mathbf{BS}_n + \mathbf{A}_o + \mathbf{e}_{ijklmnop}$$

Where: $\mathbf{Y}_{ijklmnop}$ = studied trait, μ = overall mean, $\mathbf{WS}_i$ = fixed effect of the i^{th} weaning system (i = early, normal and late weaning), $\mathbf{B}_j$ = fixed effect of the j^{th} breed (j = Rahmani and Chios lambs), $\mathbf{S}_k$ = fixed effect of the k^{th} sex of lamb (k = male and female), $\mathbf{T}_l$= fixed effect of the l^{th} lamb birth type (l = single and twin), $\mathbf{Y}_m$= fixed effect of the m^{th} lambing year (m = 2006 and 2007), $\mathbf{BS}_n$= fixed effect of the n^{th} birth season (n = winter and summer), $\mathbf{A}_o$ = fixed effect of the o^{th} age of dam (o = 1, 2, 3, 4 and 5) where. 1 = 2yr–old or less, 2 = ≤ 3yr–old, 3 = ≤ 4yr–old, 4 = ≤ 5yr–old, and 5 = > 5yr–old., $\mathbf{e}_{ijklmnop}$= effect of the p^{th} random error.

RESULTS AND DISCUSSION

Body Weight:

Weaning Age:

The results presented in Table (1) indicated that early and normal weaned lambs were slightly heavier at 2 months of age than late weaning lambs with insignificant differences. Moreover, normal and late weaned lambs were heavier significantly (P<0.01) at three and four months of age than early weaned lambs. This result indicated that average body weight recorded at 3 and 4 months of age increased with lengthening the suckling period and the growth of lambs is temporarily slowed down after weaning.

The three weaning ages did not differ significantly in weight up to one year of age. However, after six months of age, early weaned lambs tended to be heavier than normal and late weaning lambs. The superiority of early weaned lambs in body weight post-weaning could be due to differences in rumen development or rumen capacity and increasing solid feed consumption compared to normal or late weaned lambs. The present trends agree with the findings of Bhat *et al.* (1978). On the other hand, Aboul-Naga *et al.* (1980) found an increase in post-weaning body weight with the advance in age at weaning in which system. Similar trends were reported by El-Fiky (1984).

Table 1: Least squire means ± standard errors of factors affecting body weight from birth to one years of Rahmani and Chios lambs

Items	Birth weight (kg)		2 month weight(kg)		3 month weight(kg)		4 month weight(kg)		6 month weight(kg)		9 month weight(kg)		Year weight (kg)	
	N	LSM ± SE	N	LSM ± SE	N	LSM ± SE	N	LSM ± SE	N	LSM ± SE	N	LSM ± SE	N	LSM ± SE
Overall mean	267	3.45 ± 0.45	237	13.7 ± 1.47	230	16.97 ± 1.74	226	19.86 ± 2.11	218	24.98 ± 2.70	216	32.20 ± 3.89	216	40.0 ± 4.24
Weaning system		Ns		Ns		**		**		Ns		Ns		Ns
Early	89	3.47 ± 0.054	78	13.80 ± 0.19 ^{a}	76	15.97 ± 0.23 ^{b}	75	19.05 ± 0.28^{b}	73	24.74 ± 0.37	72	32.37 ± 0.53	72	40.46 ± 0.58
Normal	87	3.42 ± 0.054	78	13.91 ± 0.19 ^{ab}	75	17.78 ± 0.22 ^{a}	75	20.23 ± 0.27^{a}	73	24.96 ± 0.35	73	32.15 ± 0.51	73	39.88 ± 0.56
Late	91	3.47 ± 0.052	81	13.38 ± 0.18 ^{b}	79	17.16 ± 0.22 ^{a}	76	20.32 ± 0.27^{a}	72	25.24 ± 0.35	71	32.08 ± 0.51	71	39.65 ± 0.57
Breed of lambs		Ns		**		**		**		**		**		**
Rahmani	146	3.42 ± 0.054	133	13.38 ± 0.19	126	16.57 ± 0.23	123	19.19 ± 0.28	116	24.05 ± 0.37	114	31.21 ± 0.53	114	38.89 ± 0.59
Chios	121	3.49 ± 0.046	104	14.02 ± 0.16	104	17.37 ± 0.19	103	20.54 ± 0.24	102	25.90 ± 0.31	102	33.19 ± 0.44	102	41.12 ± 0.48
Lamb sex		**		**		**		**		**		**		**
Male	116	3.70 ± 0.046	106	14.01 ± 0.16	106	17.33 ± 0.19	104	20.26 ± 0.23	100	25.51 ± 0.30	99	33.23 ± 0.44	99	41.19 ± 0.48
Female	151	3.21 ± 0.045	131	13.39 ± 0.16	124	16.61 ± 0.19	122	19.47 ± 0.23	118	24.44 ± 0.30	117	31.17 ± 0.44	117	38.81 ± 0.48
Birth type		**		**		**		**		**		*		0
Single	195	3.61 ± 0.039	179	14.13 ± 0.13	172	17.49 ± 0.16	168	20.47 ± 0.19	160	25.62 ± 0.25	159	32.85 ± 0.36	159	40.68 ± 0.40
Twins	72	3.29 ± 0.059	58	13.27 ± 0.21	58	16.45 ± 0.25	58	19.26 ± 0.31	58	24.34 ± 0.40	57	31.55 ± 0.58	57	39.31 ± 0.63
Lambing year		*		**		**		**		**		*		Ns
2006	159	3.54 ± 0.039	139	13.10 ± 0.13	136	16.47 ± 0.16	134	19.09 ± 0.19	128	24.28 ± 0.26	126	31.59 ± 0.37	126	39.64 ± 0.41
2007	108	3.36 ± 0.059	98	14.31 ± 0.21	94	17.47 ± 0.25	92	20.64 ± 0.31	90	25.67 ± 0.41	90	32.81 ± 0.58	90	40.36 ± 0.64
Lambing season		Ns		Ns		Ns		Ns		Ns		Ns		Ns
Summer	181	3.52 ± 0.038	163	13.59 ± 0.13	156	17.19 ± 0.16	154	20.04 ± 0.19	147	25.32 ± 0.26	145	32.11 ± 0.37	145	39.67 ± 0.41
Winter	86	3.39 ± 0.061	74	13.81 ± 0.22	74	16.76 ± 0.26	72	19.69 ± 0.32	71	24.63 ± 0.42	71	32.29 ± 0.60	71	40.33 ± 0.66
Age of dam		Ns		Ns		Ns		Ns		Ns		Ns		Ns
2yr-old or less	58	3.36 ± 0.066	50	13.79 ± 0.23 ^{ab}	50	16.93 ± 0.28	50	19.79 ± 0.34	50	19.79 ± 0.34	50	24.17 ± 0.43	50	31.24 ± 0.63
≤ 3yr-old	55	3.47 ± 0.068	50	13.56 ± 0.23 ^{ab}	49	16.98 ± 0.28	48	19.66 ± 0.34	45	19.66 ± 0.34	45	24.42 ± 0.45	45	31.95 ± 0.65
≤4yr-old	56	3.51 ± 0.067	49	13.87 ± 0.23 ^{a}	48	17.10 ± 0.28	47	19.99 ± 0.35	46	19.99 ± 0.35	46	24.86 ± 0.45	46	32.32 ± 0.65
≤5yr-old	51	3.38 ± 0.069	43	13.84 ± 0.25 ^{ab}	43	16.82 ± 0.30	42	19.47 ± 0.37	40	19.47 ± 0.37	40	25.63 ± 0.49	38	32.99 ± 0.71
> 5yr-old	47	3.54 ± 0.072	45	13.44 ± 0.24 ^{b}	40	17.03 ± 0.30	39	20.42 ± 0.37	37	20.42 ± 0.37	37	25.80 ± 0.49	37	32.51 ± 0.71

*= (P<0.05), ** = (P < 0.01). , NS = (P > 0.05). $^{a, b}$: Means within the same classification followed by different letters differ significantly (P<0.05).

Breed of Lambs:

Chios lambs were heavier at birth than Rahmani ones (Table 1). Birth weight of Chios was relatively heavier than that the corresponding averages reported by Mousa (1991) (3.06 kg) and Hamdon (1996) (3.25 kg). Variations among genetic groups regarding body weights were highly significant (P<0.01). Chios lambs had a heavier body weight than Rahmani lambs at 2, 3 and 4 months. The genotype of the ewe affects early growth of her lambs through her mothering ability and milk yield. These results are in accordance of those reported by Fahmy *et al.* (1969); Aboul-Naga, (1970) and Combellas *et al*. (1980). Post weaning weights of Chios lambs tended to be heavier than those of Rahmani lambs. The effect of breed on birth weight and subsequent weights of lambs is well documented. The early stages of growth are known to be strongly influenced by breed size, milk producing ability of the dam, the environment under which lambs are maintained, notably availability of adequate feed supply (Gatenby 1986 and Notter and Copenhaver 1980).

Sex of Lambs:

Males were significantly (P<0.01) heavier than female at birth in both breed (Table 1). The differences in the average birth weights observed between both sexes may be due to differences in rate of skeletal development as well as the differences in the chromosomal structure during the prenatal growth period (Attalah, 1988). Male lambs were heavier significantly (P<0.01) than female lambs at three weaning systems. Similar results were obtained by Fahmy, *et al.* (1969) who found that sex effect on body weight increased with advance in age increasing due to the secretion of sex hormones with advance in age. Male lambs maintained their weight superiority at birth compared to females until 12 months of age with significant difference (P<0.01) at all stages (Table 1) may be attributed to the action of sex hormones which play a major role in accelerating growth. Similar results were reported by Suliman, (1994) indicated that male lambs were heavier than females at different ages from 4 to 12 months of age.

Birth Type:

Single born lambs was significantly (P<0.01) heavier at birth than twin born lambs. (table 1). This result agree with those obtained by Mousa (1991), Hassan (1993a) and Klewiec *et al*.(2002). Birth type had significant (P<0.01) effect on body weight during the period studied (Table 1). Single born lambs have maintained their weight superiority up to weaning and beyond. The results indicated that single lambs generally excelled the twins in their body weight recorded at 2, 3 and 4 months of age by 0.86, 1.04 and 1.21 kg, respectively. The same results were reported by Ugalde Orta (1978). This difference arises because of the competition between the twins for their dam's milk and their smaller size at birth (Fall, *et al.*1982).

Effects of birth type on weight were significant even after weaning. The effect of birth type is consistent with other reports in the literature. The influence of birth type on growth performance is well documented by Tuah and Baah (1985). In this study, lambs born as singles had maintained their weight superiority at birth throughout the study period. Several workers reported similar effect of type of birth on body weight at different ages Hassan (1984); Sallam *et al*., (1988) and Morsy (2002).

Lambing Year and Season:

Lambs born in 2006 were heavier significantly (P < 0.05) at birth than lambs born in 2007. Season of lambing had no significant effect on birth weight. This result may be due to the moderate weather conditions and a viability of the green forage during pregnancy. The effect of lambing year on body weight (Table1) at 2, 3 and 4 months were highly significant (P<0.01). Similar result was reported by many investigators, such as Abul-Naga *et al*. (1972) and El-Kimary *et al.* (1979). Differences in body weight from year to year is mostly due to variation in climatic, feeding and management conditions, which either affects the lambs directly or indirectly through their effects on dams. Lambs born in the first lambing season did maintain their superiority in birth weight at all stages of growth. Lambs born in summer had higher body weight than those born in winter. This could probably be due to better quality pasture during the last two to three months of gestation period of dams lambed in summer compared to those lambed at the beginning of the winter season. Similar results were reported by Mousa (1991) and Hassen *et al*. (2004). There was no significant difference between years at final weight in spite that lambs born in 2007 were heavier (P<0.05) from weaning to 270 days of age showing little advantage in the other weights. It is known that year or even month of birth may cause variations on weight and performance of lambs due to climatic variations and/or management (Bathaei and Leroy, 1997). In this study, differences between groups were only observed in the first post-weaning months, probably as a consequence of lambs from 2006 being born at the beginning of the winter season (Oct/Nov), having, therefore, more access to forage than those born in 2007 (May/July) and having higher

weights at weaning. The effect of season of lambing on body weight at all periods studied was not significant (P>0.05). Lambs born in the summer season and those born in winter season had relatively similar growth rate up to 270 days of age. Similar results were reported by Mousa (1991) who found that the effect of lambing season on post weaning weight of lambs was not significant.

Age of dam did not have a significant effect on birth weight. Age appears to have no consistent effect on the body weight of suckled lambs in the first 4 months after birth. It could be noticed that ewe's aged ≤ 4 years or more had highest body weight than other groups of age. The increase in the average body weight of lambs as age of dam increased may be attributed to the improvement in their mothering ability coupled with larger amount of ewes' milk available to the lambs and to the positive correlation between birth weight and weaning weight. These results agree with those reported by Barghout and Abdel-Aziz (1986) and Suliman (1994). The effect of age of dam on body weights at 6, 9 months and yearling weights was not significant.

Weaning System:

Weaning system had a significant effect on average daily gain at all periods studied, while it was not significant on average daily gain from birth to yearling (Table 2) . Early weaned lambs had lower ADG from birth to 60 day and from birth to 120 days but there was a quick recovery to similar weights by 180 days. The similarity of weight gains between the groups weaned at 8, 12 and 16 weeks of age could be attributed to the low milk production which has been seen in this breeds from the 8th week of lactation. Daily growth rate may be reduced by stress, because the release of glucocorticoid hormones is accompanied by reduced growth hormone production (Kuhn *et al.,* 1990). An alteration in growth rate may also result from the decrease of the quantity of food ingested or from an impairment of digestive function caused by weaning stress (Dantzer and Mormede, 1979). Similar results were obtained by Schichowski *et al.* (2008) who reported that lambs weaned at 8 weeks of age had significantly greater average daily gain compared with lambs weaned at 16 wk of age. On the other hand, El-Shaffei *et al.*(1975) found that weaning age was no significant effect of breed group on weight gain.

Table 2: Average daily gain (ADG) of Rahmani and Chios lambs from birth to 365 days of age

Sources of variation	N	ADG1 (g) LSM ± SE	N	ADG 2 (g) LSM ± SE	N	ADG 3 (g) LSM ± SE	N	ADG 4 (g) LSM ± SE	N	ADG 5 (g) LSM ± SE	N	ADG 6 (g) LSM ± SE	ADG 7 (g) LSM ± SE	N	Total gain (kg) LSM ± SE
Overall mean	237	169.2± 25.6	230	149.2± 21.3	226	136.1± 19.9	218	89.17± 24.6	216	80.18± 22.4	216	86.50± 15.9	99.94± 12.3	216	36.51± 5.28
Weaning system		0		**		**		**		0		0	Ns		Ns
Early	78	170.7± 3.4	76	137.8± 2.9 ^{c}	75	129.0± 2.7 ^{b}	73	97.06± 3.4 ^{a}	72	84.52± 3.0 ^{a}	72	90.07± 2.2 ^{a}	101.1± 1.7	72	37.18± 0.72 ^{a}
Normal	78	173.6± 3.2	75	159.0± 2.7 ^{a}	75	139.6± 2.5 ^{b}	73	79.72± 3.2 ^{b}	73	79.74± 2.9 ^{b}	73	85.81± 2.1^{ab}	99.76± 1.6	73	36.68± 0.69 ^{ab}
Late	81	163.4± 3.2	79	150.8± 2.7 ^{b}	76	139.7± 2.5 ^{a}	72	90.73± 3.2 ^{a}	71	76.30± 2.9 ^{b}	71	83.60± 2.1^{b}	98.96± 1.6	71	35.67± 0.70 ^{b}
Breed of lambs		Ns		Ns		Ns		Ns		Ns		Ns	Ns		Ns
Rahmani	133	167.8± 3.3	126	149.2± 2.8	123	135.0± 2.6	116	86.78± 3.3	114	79.76± 3.0	114	84.37± 2.1	98.91± 1.6	114	35.98± 0.71
Chios	104	170.6± 2.8	104	149.2± 2.3	103	137.1± 2.2	102	91.56± 2.7	102	80.60± 2.4	102	88.62± 1.7	100.9± 1.3	102	37.05± 0.58
Lamb sex		Ns		Ns		Ns		Ns		**		Ns	*		0
Male	106	169.9± 2.8	106	150.4± 2.4	104	137.0± 2.2	100	91.13± 2.8	99	85.33± 2.5	99	88.18± 1.8	102.4± 1.4	99	37.19± 0.60
Female	131	168.5± 2.8	124	148.0± 2.4	122	135.1± 2.2	118	87.22± 2.8	117	75.04± 2.5	117	84.81± 1.8	97.48± 1.4	117	35.83± 0.60
Birth type		**		**		**		Ns		Ns		Ns	Ns		Ns
Single	179	174.8± 2.3	172	154.0± 1.9	168	140.4± 1.8	160	90.59± 2.3	159	80.40± 2.1	159	86.64± 1.5	101.5± 1.1	159	36.99± 050
Twins	58	163.6± 3.7	58	144.4± 3.1	58	131.8± 2.9	58	87.76± 3.6	57	79.97± 3.3	57	86.35± 2.3	98.37± 1.8	57	36.03± 0.79
Lambing year		**		**		**		Ns		Ns		0	Ns		Ns
2006	139	158.0± 2.3	136	143.0± 2.0	134	129.3± 1.9	128	86.91± 2.3	126	80.86± 2.1	126	89.25± 1.5	98.78± 1.2	126	35.75± 0.51
2007	98	180.4± 3.7	94	155.4± 3.1	92	142.9± 2.9	90	91.43± 3.7	90	79.51± 3.3	90	83.74± 2.4	101.1± 1.8	90	37.27± 0.79
Lambing season		Ns		Ns		Ns		Ns		**		0	Ns		Ns
Summer	163	167.1± 2.3	156	151.4± 2.0	154	137.4± 1.9	147	90.07± 2.3	145	74.92± 2.2	145	83.91± 1.5	98.88± 1.9	145	35.82± 0.51
Winter	74	171.3± 3.9	74	147.0± 3.2	72	134.7± 3.0	71	88.27± 3.8	71	85.45± 3.5	71	89.08± 2.4	101.0± 1.1	71	37.21± 0.82
Age of dam		0		Ns		Ns		Ns		0		Ns	Ns		Ns
2yr-old or less	50	170.1± 4.1^{ab}	50	148.1± 3.4	50	134.5± 3.2	50	90.65± 3.9	50	78.17± 3.6^{ab}	50	85.55± 2.5	99.27± 1.9	50	36.34± 0.85
≤ 3yr-old	50	169.0± 4.0^{ab}	49	152.8± 3.4	48	137.3± 3.2	45	85.02± 4.0	45	83.53± 3.7 ^{a}	45	87.63± 2.6	100.6± 2.0	45	36.81± 0.87
≤4yr-old	49	171.2± 4.0^{ab}	48	149.3± 3.4	47	136.3± 3.2	46	86.79± 4.0	46	84.06± 3.7^{ab}	46	85.81± 2.6	100.1± 2.0	46	35.79± 0.86
≤5yr-old	43	173.9± 4.4^{a}	43	150.6± 3.7	42	136.7± 3.5	40	91.09± 4.4	38	81.21± 4.0^{ab}	38	87.97± 2.9	101.9± 2.2	38	37.56± 0.96
> 5yr-old	45	161.7± 4.2^{b}	40	145.1± 3.6	39	135.6± 3.4	37	92.32± 4.4	37	73.96± 4.0 ^{b}	37	85.50± 2.8	97.77± 2.2	37	36.05± 0.94

Total gain (kg) = (yearling weight- Birth weight); ADG1= (2 month weight- birth weight)/60) x1000; ADG2= (3 month weight- birth weight/90) x1000
ADG3= (4 month weight- birth weight/120) x1000; ADG4 = (6 month weight-3 month weight)/90x1000; ADG5= (9 month wt- 6 month wt)/90 x 1000
ADG6= (yearling weight- 9 month wt)/90x 1000; ADG7= (yearling wt- Birth wt)/365 x 1000

There was no significant effect of weaning system on total gain. The non difference on total weight gain of lambs weaned at different ages observed in this study is in accordance with the findings reported in the literature (Cañeque *et al.,* 2001) and it could be due to the fact that lambs at 60 days of age have a ruminal digestive system sufficiently developed to obtain nutrients from solid food. In addition, ewe's milk yield is very low after two months of lactation resulting in insufficient nutrients for the lambs (Karim, *et al.,*2000). Therefore, under semiarid tropical conditions, lambs can be growth is not affected by sufficient weaned after 60 days of age as the lambs nutrients.

Breed of Lambs:

Rahmani and Chios lambs did not differ significantly in average daily gain (Table 2). Chios lambs had

higher average daily gain than Rahmani lambs, but the difference was not significant allover the experimental period. The two breeds had an average daily weight gain less than 100 g after weaning.

It is important to note that the low post weaning growth rate of the lambs of both breeds is far from their potential level. This indicates a possible genotype x environment interaction as Chios lambs shown a better performance in their origin where (Yalcin,1969) have reported a post-weaning average daily weight gain of over 105-110 g / day. Similar findings of the effect of breed on average daily gain were reported by Hassan (1993), Hamdon (1996), Marzouk and Mousa (1998) and Abd Allah (2005).

Lamb Sex:

Average Daily Gain (ADG):

Male lambs had significantly (P<0.01) higher average daily gain than from 6 to 9 months, and significant (P<0.05) from birth to 12 months of age(Table 2). The difference in rate of gain between the two sexes was not significant in other periods of the study. Male lambs have attained total gain significantly heavier (P<0.05) than female lambs (37.19 vs. 35.83 kg). These results are in agreement with Suliman (1994), Marzouk and Mousa (1998).

Birth Type:

Average daily gain of single born lambs was higher (P<0.01) than twin born lambs from birth to 2 months, from birth to 3 months and from birth to 4 months (Table 2). In areas where there is seasonal fluctuation in availability of fodder, it might be advantageous to maintain fast growing single born lambs that could reach marketable weights in shorter period rather than attempting to improve prolificacy of ewes to increase the number of lambs born per parturition (Awgichew,2000).These results are in agreement with those reported by Rastogi (2001) and Morsy (2002).

Lambing Year:

Year of lambing had a highly significant (P<0.01) effect on average daily gain of lambs at pre-weaning periods (Table 2). Lambs born in the year of 2007 were significantly heavier average daily gain at periods from birth to 2 months, from birth to 3 months and from birth to 4 months of age than lambs born in the year of 2006. The differences between years were not significant among average daily gains after 120 days except at period from 9 to 12 months. Lambs born in year of 2007 achieved total gain more than lambs born in 2006. Year and season influence growth rate through their effect on the availability of food supply. The decrease in average daily gain of lambs born in year 2006 after weaning may be due to the insufficient food supply in terms of either quantity or quality during the year. These findings agree with those reported by **Abd Allah (2005).**

Lambing Season:

Season of lambing had no significant effect on average daily gain of lambs at all periods studied except the periods from 6 to 9 months and from 9 to 12 months of age (Table 2). Lambs born in winter season were slightly faster in daily gain in the period from birth to 2 month, and at the subsequent periods. Lambs born in summer season had the highest average daily gain. The variation in daily gain from season to another may be due to variation in different climate conditions and feed availability during different seasons. These results are in agreement with those reported by Hassan (1993) and Morsy (2002).

Ewe Age:

Age of dam had no significant effect on total gain and average daily gain of lambs in most periods (Table 2). Lambs born from ewes of 2-year old or more had a significantly faster pre-weaning growth rate than those born from older ewes. This results may be attributed to the strong influence of the mothering ability of the dams on their offspring before weaning, as they greatly depended on their dams milk yield. The present results are in agreement with results of Barghout and Abd El-Aziz (1986) and Suliman (1994),. On the other hand, Morsy (2002) reported that age of dam had a highly significant effect (P<0.01) on daily gain in all periods studied except the second period.

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