

### Some Non-Genetic Factors Affecting Body Weights and Measurements of Fleisch Merino Lambs under Egyptian Conditions

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**D**ATA USED in this study were collected on 2269 lambs born, during the period from 1970 through 1972, to a commercial flock of imported Fleisch Merino sheep located at El Salbia Breeding Station, Sharkia Governorate and belonging to the General Meat and Milk Organization. This study aimed at evaluating the effect of some non-genetic factors (year, sex and type of birth) on body weight and body measurements, namely; body height, body length, heart girth, thigh length, thigh circumference and loin width, at different ages from birth up to weaning time (4 months of age).

Year of birth was not an important source of variation in body weight at the different ages studied, while it was the most important factor affecting body measurements.

Male lambs slightly exceeded females in their body weight at birth and at 2 months of age. Differences, however, were non-significant. Body measurements of males were generally greater than those of the females.

Single lambs were significantly heavier than twins at all ages. They also showed greater body measurements.

The productive efficiency of an animal as a meat producer depends to a great extent on the amount of meat it produces which is mainly determined by its body weight and body dimensions. Body weight and body dimensions of the animal are influenced by many specific non-genetic factors. This study was conducted to evaluate the effects of some of these factors in Fleisch Merino lambs raised under semi-arid conditions of Egypt from birth till weaning at 4 months of age.

## Material and Method

### *Animals and data*

Animals used in this study were the lambs produced by a commercial flock of Fleisch Merino sheep imported from the German Democratic Republic in 1966 with the aim of increasing mutton production. This flock was maintained in the sheep breeding station belonging to the General Meat and Milk Organization, located in the semi-arid region at El-Salhia, Sharkia Governorate, east of the Nile Delta. Data used comprised 2269 lambs sired by 162 during 3 consecutive years from 1970 and to 1972, inclusive. Observations on body weight and body measurements of lambs were taken within 24 hr after birth. Thereafter, they were recorded exact at monthly intervals. Weights were taken to the nearest 0.1kg and body measurements were measured to the nearest 0.5 cm. Traits studied were body weight, body height, body length, heart girth, thigh length, thigh circumference and loin width taken at birth, 2 months, 3 months and 4 months of age.

### *Management*

During winter and spring the ewe flock was kept all the time in open sheds, while during summer and autumn they were driven to the field in the morning for grazing and returned to their sheds in the afternoon. Rams were kept indoors and whenever possible they were allowed to graze in the field apart from the ewes. The breeding season usually started in September and lasted for about 3 months, so that lambing took place during the period from February to April. Ewes were assigned to be mated with rams at random so that each ram was allowed to breed about 20-25 ewes each season. The newly born lambs were raised with their dams, individually, in separate temporary pens for 2 weeks after birth and thereafter in groups in shed-partitions till they were weaned at 4 months of age. The breeding stock was fed all year round on a concentrate mixture having 57.65% starch equivalent and 9.98% digestible protein. Ewes were provided with an amount ranging from 0.3 to 1.0 kg of that mixture per head per day, while rams were given 0.25 kg per head per day. In addition, Egyptian clover or alfalfa was introduced to the animals in their sheds in amounts ranging from 8 to 10 kg during winter and spring. While during the rest of the year, animals were allowed to graze alfalfa in the field daily in the morning, after being provided with 1.25-1.50 kg of hay per head. For two weeks prior to the breeding season, breeding ewes were flushed with an additional 0.25 kg of the concentrate mixture described above/ewe/day. During the breeding season, each breeding ram was fed on additional 0.25 kg of horse bean per day. Lambs, after birth, suckled their dams naturally till weaning at an average of 4 months of age. Starting with the 14<sup>th</sup> day of age, they were creep-fed with Egyptian clover supplemented with a concentrate mixture having 63.28% starch equivalent and 15.51% digestible protein. Daily amount of concentrate mixture for each lamb was increased gradually up to 40 g till the 4<sup>th</sup> week of age and increased thereafter to reach 350 g per lamb per day during the period from 4<sup>th</sup> to 16<sup>th</sup> week age.

*Analysis of data*

Statistical analyses of data were performed using the least squares procedures as outlined by Harvey (1960). Constants were fitted for year birth, sex and type of birth. The effect of age of dam on the traits studied, although expected as an important factor, yet it was not included in the model of the analyses because of the lack of the information concerning age of ewes at the time of their importation. Tests of significance for difference between individual level means within factors were carried out using Duncan's multiple range test (1955) after Steel and Torrie (1960).

**Results and Discussion***Body weight*

Least squares means of body weight of lambs at birth, 2,3 and 4 months of age are shown in Tables 1,2,3 and 4.

*Effect of year of birth:* Year of birth was found to be a nonsignificant source of variation at all ages studied except at 3 months of age (Tables 1 through 4). At the age, it proved significant ( $P < 0.01$ ) and accounted for 6.3% of the total variance. These results are consistent with those of Basset *et al.* (1967) on Range Rambouillet sheep and Dass and Acharya (1970) on Bikaneri sheep who reported that the effect of year of birth on birth and weaning weight, was not significant. Contrary to these results, significant year effects on body weights of lambs from birth to weaning were reported by Galal *et al.* (1965), Fahmi *et al.* (1969), Sidwell and Miller (1971) and El-Kouni *et al.* (1974) working with different breeds of sheep and their crosses. Differences in birth and weaning weights of lambs from year to year are often explained by yearling differences in climatic, hygienic, managerial and nutritional conditions as well as to the probable change in the genetic merit of the flock under study. The non-significant effects of year of birth on lambs' body weight either at birth or at weaning obtained in this study may be due, in part to the fact that the data were collected on a flock raised under the farm conditions where most of the environmental factors responsible for year to year differences were to some extent controlled. It might be true as well that the genetic changes have not been expressed yet because this study covered only a period of three years.

*Effect of sex:* Results presented in Tables 1, 2, 3 and 4 show that male lambs exceeded females by 0.12 and 0.14kg in their body weight at birth and at 2 months of age, respectively, while male lambs were slightly heavier (0.08kg) than the females at birth 3 and 4 months of age. However, all differences were small and non-significant. In this concern, Sidwell *et al.* (1964), Aboul-Naga *et al.* (1972), El-Kouni *et al.* (1974) and many others found that the effect of sex on body weight of lambs at birth and at weaning was in favour of male lambs and was more pronounced at weaning. Similar to the results of this study, Ruttle (1971) and Malik and Acharya (1972) pointed out that sex of lamb did not give evidence to be a significant factor influencing weaning weight of lambs.

*Effects of type of birth:* Constants for the effect of type of birth on body weight of lambs, illustrated in Tables 1,2,3 and 4, indicate that single lambs were heavier at birth than twins and remained so till weaning at 4 months of age. Differences due to the effect of type of birth at the four ages studied were statistically significant. Fahmi *et al.* (1969), El-Tawil *et al.* (1970), Ruttle (1971), El-Kouni *et al.* (1974) and many others gave identical results with different breeds and breed crosses of sheep, since they showed that single born lambs were significantly heavier than those from twin lambing at birth and at weaning. The inferior body weight of twin lambs compared to that of singles at birth is apparently due to the fact that the ewe has a limited capacity in providing her youngs with nutrients during their prenatal development, thus the level of nutrients available for single lambs would be greater than that available for twins. Also, the superiority of body weight of the single lamb at weaning age over that of the twin lamb may be due to the faster growth during the suckling period caused by the greater milk and better care provided by its dam besides to the birth weight advantage they have. This agrees with the interpretation of Dickerson *et al.* (1975) who described the heavier body weight of single lambs at weaning than that of twins to the fact that the growth depends mainly upon the milk provided by the dam and in case of twins only a part of the dam's milk is available for each lamb.

Comparing results of the effect of type of birth with those of year of birth and sex of lamb, it could be stated that at each age, type of birth was the most important factor that affected body weight of the lambs studied (Tables 1, 2,3 and 4). It accounted for 10.9, 3.1, 9.9 and 2.3% of the total variation at birth, 2,3 and 4 months of age, respectively. Results of most of the literature consulted coupled with those of the present study lead to the conclusion that type of birth is one of the most important factors influencing birth and weaning weight of lambs and should not be ignored when comparing body weight of single with that of twin born lambs.

#### *Body measurements*

The general means for body height, body length, heart girth, thigh length, thigh circumference and lion width of lambs at the four ages studied are shown in Tables 1,2,3 and 4.

*Effect of year of birth:* Results of analyses of variance indicate that, with the exception of thigh length at 2 months of age, all the body measurements studied varied significantly ( $P < 0.01$ ) at birth, 2,3 and 4 months of age. Differences due to year effect on these traits, in general, accounted for a considerable amount of their variation (Tables 1,2,3 and 4). Findings of the present study on the effect of year of birth on body measurements of Fleisch Merino lambs are in agreement with those reported on lambs of different breeds and breed crosses. From birth up to weaning time by Cassard and Weir (1956), Badawi and Hamada (1959), El-Oksh *et al.* (1962), Fahmi *et al.* (1964), Aboul-Naga *et al.* (1968), Abdel-Aziz (1973) and Gheith (1976). Bearing in mind, the contribution of the factors studied, to the variance of body measurements, it could be stated that except for thigh circumference at birth, year of birth ranked first among all the factors studied.

Results of the present study coupled with those of the literature cited lead to conclude that year of birth is an important source of variation in body measurements of lambs and should be accounted for when comparing lambs born in different years on the basis of their body measurements.

*Effect of sex:* Results of the analyses, with respect to the effect of sex on body measurements, showed that sex did not significantly affect the body measurements studied except at birth affecting only body height ( $P < 0.05$ ), body length ( $P < 0.01$ ), heart girth ( $P < 0.01$ ) and thigh length ( $P < 0.01$ ). However, comparing the mean body measurements of males versus females generally revealed that male lambs showed higher dimensions than females at all the ages studied. Although sex differences in the body measurements studied were slight and did not attain significance except only for 4 traits at birth, yet the observations of this study confirm the superiority of male lambs over females in their body measurements as reported by Badawi and Hamada (1959), Fredrickson *et al.* (1967), Aboul-Naga *et al.* (1968), Abdel Aziz (1973), Geith (1976) and others.

*Effect of type of birth:* Least squares estimates set up in Tables 1, 2, 3 and 4 illustrate that except for loin width at 2 months of age, body measurements of lambs born as singles surpassed those of lambs born as twins at all ages studied from birth up to weaning at 4 months of age. Except for thigh length and loin width at two months of age, differences in the six body measurements studied were in most cases statistically highly significant. These results are identical to those reported in the literature by many authors who showed that differences due to the effect of type of birth in body measurement of lambs in different breeds and breed crosses of sheep were statistically in favour of single born lambs (Cassard and Weir, 1956; Badawi and Hamada, 1959; Fahmi *et al.* 1964; Abdel-Aziz, 1973 and Geith, 1976).

The differences observed between single and twin lambs of the present study were more evident at birth and decreased thereafter with the advance in age. This is somewhat expected since twin lambs are liable to overcome gradually the disadvantage they had during their prenatal life with the advance in age. This is particularly when lambs start becoming less dependent on their dams.

It could be generally concluded that growth data in terms of body weights and / or body dimensions should be adjusted for the effects of type of birth and sex when comparing lambs differing in these 2 factors. Additional adjustment for year differences are also required when lambs being compared are born in different years.

TABLE 1. Least squares constants, tests of significance and percent of variation (V) of

Classification	No. of records	Body weight (kg)		Body height cm		Body length	
		Constant D ± S.E. M R T	% of V	Constant D ± S.E. M T R	% of V	Constant D ± S.E. M T R	% of V
General mean	2269	2.97±0.06		33.9±0.2		22.5±0.2	
Year of birth		N.S.	0.4	**	22.1	**	27.4
1970. . . . .	1265	0.09±0.07a		0.2±0.0.2a		2.8±0.2a	
1971. . . . .	686	-0.08±0.06b		-3.2±0.3b		0.2±0.3b	
1972. . . . .	318	-0.01±0.1ab		3.0±0.1c		-3.0±0.5c	
Sex . . . . .		N.S.	0.3	**	0.5	**	0.7
Males . . . . .	1633	0.06±0.04a		0.3±0.1a		0.3±0.1a	
Females . . . . .	636	-0.06±0.04a		-0.3±0.1b		-0.3±0.1b	
Type of birth . . . . .		**	10.9	**	9.9	**	7.1
Singles . . . . .	1706	0.33±0.03a		1.1±0.1a		0.9±0.1a	
Twins . . . . .	563	-0.33±0.03b		-1.1±0.1b		-0.9±0.1b	

Duncan's multiple range test. Within the same classification the appearance of the same o. The same notation is followed in similar tables.

factors influencing body weight and body measurements of lambs at birth.

Heart girth (cm)			Thigh length (cm)			Thigh circumference (cm)			Loin width (cm)		
Constant ± S.E.	D M R T	% of V	Constant ± S.E.	D M R T	% of V	Constant ± S.E.	D M R T	% of V	Constant ± S.E.	D M R T	% of V
33.7±0.2			11.6±0.10			15.5±0.10			5.10±0.10		
**		31.6	**		8.3	**		13.5	**		51.2
-3.8±0.3a			0.6±0.10a			-0.5±0.2a			-0.80±0.07a		
-5.2±0.3b			0.6±0.10a			-1.2±0.20b			-2.27±0.03b		
9.0±0.5			-1.2±0.0.20b			1.7±0.49c			3.07±0.10c		
**		0.3	**		1.8	N.S.		0.0	N.S.		0.0
0.3±0.1a			0.2±0.04a			-0.05±0.08a			-0.01±0.04a		
-0.3±0.1b			-0.2±0.04b			0.05±0.08a			0.01±0.04a		
**		6.2	**		3.0	**		14.8	**		1.2
1.1±0.1a			0.2±0.04a			0.5±0.10a			0.20±0.03a		
-1.1±0.1b			-0.2±0.04b			-0.5±0.10b			-0.20±0.03b		

letters with 2 constants signifies that they do not differ significantly (5% level), otherwise they  
 N.S. = Not significant \* = P < 0.05 \*\* = P < 0.01

TABLE 2. Least square constants, tests of significance and percent of variation (V) of factors

Classification	No. of records	Body weight Kg.			Body height (cm)			Body length (cm)		
		Constants ±S.E.	D M R T	% of V	Constant ±S.E.	D M R T	% of V	Constant ±S.E.	D M R T	% of V
General mean	1019	8.19±0.18			45.8±0.3			32.2±0.2		
Year of birth . . .		N.S.		0.3	**		55.9	**		23.3
1970 . . . . .	620	0.10±0.20a			-4.1±0.3a			0.3±0.2a		
1971 . . . . .	292	-0.13±0.24a			-7.5±0.4b			2.6±0.4b		
1972 . . . . .	107	0.03±0.04a			11.6±0.7c			2.3±0.2c		
Sex . . . . .		N.S.		0.0	N.S.		0.4	N.S.		0.3
Males . . . . .	677	0.07±0.09a			0.2±0.1a			0.2±0.1a		
Females . . . . .	342	-0.07±0.09a			0.2±0.1a			0.2±0.1a		
Type of birth . . .		**		3.1	**		6.2	**		8.7
Singles . . . . .	810	0.32±0.10a			1.0±0.1a			0.9±0.1a		
Twins . . . . .	209	0.32±0.10b			-1.0±0.1b			0.9±0.1b		

TABLE 3. Least squares constants, tests of significance and percent of variation (V) of factors

Classification	No. of records	Body weight			Body height cm			Body length cm		
		Constant + S.E.	D M R T	per- cent of V	Constant + S.E.	D M R T	% of V	Constant + S.E.	D M R T	% of V
General mean	698	10.13±0.19			48.5±0.3			35.3±0.3		
Year of birth		**		6.3	**		57.7	**		16.1
1970	474	0.76±0.19a			-4.8±0.3a			-0.6±0.3a		
1971	185	0.96±0.23a			-6.8±0.4b			-2.5±0.4b		
1972	39	-1.72±0.42b			11.6±0.7c			3.1±0.7c		
Sex		N.S.		0.0	N.S.		0.0	N.S.		0.0
Males	418	-0.04±0.07a			0.1±0.1a			0.1±0.1a		
Females	280	0.04±0.07a			-0.1±0.1a			-0.1±0.1a		
Type of birth		**		9.9	**		6.1	**		11.0
Singles	544	0.44±0.08a			0.8±0.1a			0.8±0.1a		
Twins	154	-0.44±0.08b			-0.8±0.1b			-0.8±0.1b		



influencing body weight and body measurements of lambs at 2 months of age.

Heart girth cm			Thigh length cm			High circumference (cm)			Loin width cm		
Constant ±S.E.	D M R T	% of V	Constant ±S.E.	D M R T	%	Constant ±S.E.	D M R T	% of V	Constant ±S.E.	D M R T	% of V
47.1±0.3		66.0	16.3±0.20			21.3±0.20			7.4±0.10		
**			N.S.		0.8	**		43.9	**		42.8
-6.9±0.3a			-0.3±0.20a			-2.7±0.20a			-1.6±0.20aV		
-9.7±0.4b			0.2±0.20a			-1.1±0.20b			-2.7±0.20b		
16.6±0.7c		0.1	0.1±0.10a			3.8±0.40c			4.3±0.40c		
N.S.			N.S.		0.0	N.S.		0.0	N.S.		0.0
0.2±0.2a			0.04±0.09a			0.04±0.08a			0.01±0.70a		
-0.2±0.2a			-0.40±0.90a			-0.04±0.08a			-0.01±0.07a		
**		2.0	N.S.		0.0	**		1.2	N.S.		0.0
0.7±0.02a			0.020±.10a			0.3±0.10a			-0.1±0.10a		
-0.7±0.2b			-0.002±0.10a			-0.3±0.1b			0.1±0.10a		

influencing body weight and body measurements of lambs at 3 months of age.

Heart girth cm			Thigh length cm			Thigh circumference (cm)			Loin width cm		
Constant + S.E.	D M R T	% of V	Constant + S.E.	D M R T	% of V	Constant + S.E.	D M R T	% of V	Constant + S.E.	D M R T	% of V
50.8±0.4		63.7	17.5±0.1		12.2	21.6±0.2		41.2	7.8±0.1		73.8
**			**			**			**		
-8.3±0.4a			-0.2±0.7a			-1.2±0.2a			-1.5±0.1a		
-8.7±0.5a			0.6±0.2b			1.3±0.3b			-2.2±0.1b		
17.0±0.9b			-0.4±0.1a			-0.1±0.1ab			3.7±0.2c		
N.S.		0.0	N.S.		0.0	N.S.		0.0	N.S.		0.0
0.1±0.2a			0.04±0.05a			0.1±0.1a			-0.01±0.03a		
-0.1±0.2a			-0.04±0.04a			-0.1±0.1a			0.01±0.03a		
**		4.3	**		5.2	**		2.4	**		0.4
0.9±0.2a			0.2±0.1a			0.3±0.1a			0.1±0.03a		
-0.9±0.2b			-0.2±0.1b			-0.3±0.1b			-0.3±0.1b		

TABLE 4. Least squares constants, tests of significance and percent of variation (V) of factors influencing body weight and body measurements of lambs at weaning 4 months of age.

Classification	No. of records	Body weight Kg.			Body height cm.			Body length cm			Heart girth cm			Thigh circumference (cm)			Loain width cm		
		Constant D + S.E. M R T	% of V	+ of V	Constant D + S.E. M R T	% of V	+ of V	Constant D + S.E. M R T	% of V	+ of V	Constant D + S.E. M R T	% of V	+ of V	Constant D + S.E. M R T	% of V	+ of V	Constant D + S.E. M R T	% of V	
General mean	554	13.89±0.37	0.2	51.8	50.6±0.4	**	8.0	37.6±0.4	**	56.8	53.7±0.6	**	19.1±0.2	10.7	22.6±0.5	**	39.5	8.3±0.1	58
Year of birth																			
1970	427	-0.39±0.37a			-4.8±0.4a			-0.7±0.4a			-8.5±0.6a		-0.5±0.2a		-0.6±0.5a			-1.4±0.1a	
1971	112	-0.06±0.42a			-6.0±0.4b			-1.7±0.5b			-6.9±0.6b		0.3±0.3b		2.8±0.5b			-2.0±0.1b	
1972	15	0.45±0.79a			10.8±0.8c			2.4±0.9c			15.4±1.2c		0.2±0.5ab		-2.2±1.0a			3.4±0	
Sex																			
Males	302	-0.04±0.10a	0.0		0.1±0.1a	0.0	0.3	0.2±0.1a		0.0	-0.1±0.2a		0.05±0.06a	0.0	N.S.		0.0	N.S.	0
Females	252	0.04±0.10a			-0.1±0.1a			-0.2±0.1a			0.1±0.2a		-0.05±0.06a		-0.04±0.1a			-0.003±0.03a	
Type of birth:																			
Singles	427	0.27±0.12a	2.3	2.1	0.4±0.1a	**	3.0	0.4±0.1a	**	1.9	0.5±0.2a	**	0.2±0.07a	4.4	**	**	2.6	0.5±0.1a	*
Twins	127	-0.27±0.12b			-0.4±0.1b			-0.4±0.1b			-0.5±0.2b		-0.2±0.07b		-0.5±0.1b			-0.1±0.04a	1.1

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### تأثير بعض العوامل غير الوراثية على وزن وأبعاد الجسم في حملان أغنام مربيو اللحم تحت الظروف المصرية

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وغريب الصياد

زراعة الأزهر ، كلية العلوم الزراعية بمشتهر وزراعة القاهرة

شملت هذه الدراسة البيانات المأخوذة على ٢٢٦٩ حملا مولودة خلال الفترة من ١٩٧٠ - ١٩٧٢ لتطعيم أغنام اللحم المستورد بمحطة تربية الأغنام بالصالحية - محافظة الشرقية التابعة للمؤسسة العامة للحوم والألبان .

هدفت هذه الدراسة الى تقييم تأثير بعض العوامل غير الوراثية ( السنة - الجنس - نوع الميلاد ) على وزن وأبعاد الجسم - طول الجسم - محيط الصدر - طول الفخذ - محيط الفخذ وعرض القطن ) عند الأعمار المختلفة من الميلاد وحتى عمر الفطام ( ٤ أشهر ) .

لم يكن لسنة الميلاد تأثيرا ملحوظا على وزن الجسم عند الأعمار المختلفة المدروسة بينما كان لسنة الميلاد تأثيرا واضحا على مقاييس الجسم . زادت الحملان الذكور على الإناث زيادة طفيفة في وزن الميلاد والوزن عند عمر شهرين فقط وكانت الفروق غير معنوية بينما امتازت الذكور عن الإناث في أبعاد الجسم بصفة عامة عند كل الأعمار . الحملان الفردية كانت أعلى وزنا وأكبر قفاً . أبعاد الجسم من الحملان التوائم عند كل الأعمار .