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Some Non-genetic Sources of Variation in Fleece Weights of Fleisch Merino Sheep in Five Commercial Flocks in Egypt

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THIS STUDY was carried out on five farms owned by the Egyptian Meat and Milk Organization, located in different regions in Egypt. The data comprised 7291, 2571 and 1248 records of the first three greasy fleece weights of lambs born during three successive years starting in 1969.

The least squares analysis of variance was used for partitioning the total variation in the three fleece weights studied into parts attributable to farm, year and season of birth, sex, type of birth, and the regression of fleece weight on age at shearing. Duncan's multiple range test was used to compare statistically the differences between the least squares means of the different levels of each factor.

The overall mean greasy fleece weights were 1.31 kg, 3.70 kg and 2.63 kg for the three shearings, respectively. Farm and year of birth affected significantly ($P<0.01$) all fleece weights studied. Season of birth had a significant effect, only on the first and second fleece weights ($P<0.01$). Regression on age at shearing was significant ($P<0.01$) in the first and third fleece weights only. Sex and type of birth had no significant effect on any of the three fleece weights. The contribution of all factors studied to the total variance in the first, second, and third fleece weights were 42.22%, 57.19% and 36.04%, respectively. Farm was found to be the most important source of variation in fleece weight traits followed by year of birth.

Merino sheep are mainly imported to Egypt for improving wool production through pure breeding and crossing with local breeds.

Before planning a breeding programme, it is essential to get an idea about the different sources of variation in the traits that will be included in the programme.

Among the non- genetic factors known to affect wool production, farm, year and season of birth, sex, type of birth, and age at shearing were foundto be of particular importance (Kassab and Karam, 1961; Gjedrem, 1969 ; Fahmy *et al.*, 1969; Labban and Radwan, 1971; Aboul-Naga *et al.*, 1972; and singh *et al.*, 1972). This work was undertaken to study the effect of some non-genetic factors on the greasy fleece weight of the first three successive shearings in five commercial flocks of Fleisch Merino sheep raised in different regions in Egypt.

Materials and Methods

A. *Materials*

Data used in this study were collected under farm conditions from 7291 Fleisch Merino lambs born to ewes imported in 1966. The lambs were located in five farms belonging to the Egyptian Meat and Milk Organization. The farms of Abis, Paul Place, and Saft Khaled were close to the western border of the Delta, Yousofiah was located east of the Delta, and Kom Osheim was in a desert area south west of Cairo.

Lambs were kept in open sheds each carrying 300 lambs. The total capacity of each farm was 6000 heads. Two lambing seasons were defined. November 1, to April 30 and May 1, October 31 according to the availability of pasture and mildness of the weather. Relatively better conditions usually prevailed in the first season. Lambs suckled all their Dam's milk and creep feeding was allowed . After weaning lambs were put on pasture. Clover (*Trifolium Alexandrinum*), Alfalfa (*Medicago sativa*), and Sweat sorghum (*Sorghum saccaratum*) were available for grazing and were considered to meet most of the nutritional requirements of the lambs. Concentrates were used when high-energy feeding was required during growth and breeding seasons, and for supplementation when pasture was poor. Males were separated from females at the age of eight months, and extra individuals were prepared for marketing. The routine control of infectious diseases and internal parasites was practiced, and external parasites were controlled during summer by monthly dipping. Shearing was usually practiced once a year (May- June). The first clip was usually done when lambs were nearly 8-12 months old. Greasy fleece weight was recorded individually to the nearest 0.1 kg.

B. *Statistical procedures*

Least squares analysis of variance (ANOVA) described by Harvey (1960) was used for partitioning the total variation in the three shearings studied into parts attributable to non - genetic sources of variance assumed to influence each of them. The non-genetic factors included in the model which were assumed to underly an observation on fleece weight were : farm, year and season of birth, sex and type of birth. As lambs were clipped at different ages, it was of interest to test linearity of the regression of fleece weight on age of lamb at shearing. Age at shearing was treated as a continuous variable and the effect of age was included in the model as an independent factor on which fleece weight was regressed.

Due to limitations of the data, many empty cells were found, and it was not possible to calculate the interactions between the factors affecting the different shearings. The fixed effects linear model assumed to underly the ANOVA was :

$$Y_{ijklmn} = \mu + f_i + rj + t_k + X_l + P_m + ba_{ijklmn} + e_{ijklmn}$$

where :

Y_{ijklmn} is the observation taken on the n*th* lamb of the m *th* type of birth and the l *th* sex born in the K *th* season of birth in the j *th* year of birth at the i *th* farm

μ is an effect common to all observation,

f_i is the effect due to the i *th* farm; i=1,2, . . . 5;

r_j is the effect due to the j *th* year of birth;

j = 1,2, 3;

t_k is the effect due to the k *th* season of birth;

k= 1,2;

X_l is the effect due to the l *th* sex; l=1, 2;

P_m is the effect due to the m *th* type of birth; m= 1,2;

a_{ijklmn} is the age of the n *th* lamb in days expressed as a deviation from its mean.

b is the partial regression coefficient on age of lamb (a), and;

e_{jklmn}, is a random effect peculiar to the *ijklmn th* observation with $e \sim IRN (o, \sigma e)$.

To obtain a unique solution for the least squares equations, the restriction imposed on the model was that the summation of the levels of each effect = o. Comparisons among least squares means were performed by the Duncan's multiple range test as described by Steel and Torrie (1960).

The contribution of each factor to the total variance in each trait was calculated by equating the mean squares to their corresponding expectations and solving for the desired value.

Results and Discussions

A. *Overall means and total variances*

Table 1 presents the least squares means for the first three grease fleece weights. The overall means were 1.02 $\pm$ 0.029 kg, 3.71 $\pm$ 0.119 kg and 2.63 $\pm$ 0.045kg for the first, second, and third shearings, respectively. The overall mean of the second shear was the highest of the first three successive shearings, while the first shear was the lowest. These results coincide with those arrived at by many workers (Slen and Banky, 1958; Ragab *et al.*, 1969 and Guirgis and Galal, 1972). Some other results showed that the maximum wool production was attained nearly at the third shearing (Shelton and Menzies, 1968; Mullaney *et al.*, 1969 and Gjedrem, 1969). However, Mason and Dassat (1954) studying two groups of Langhe sheep in Italy, did not find a consistent trend for the effect of age on fleece weight. In one group of ewes there was a gradual but diminishing increase up to eight years of age, while in the second group, the second fleece weight was the highest.

The ANOVA presented in Table 2 showed that farm had a significant effect on all of the three shearings ($P < 0.05$). Year and season of birth affected only the first two shears ($P<0.05$), while the partial regression coefficients of greasy fleece weight on age at shearing were significant ($P < 0.05$) in the first and third shearings.

For the same breed in Egypt, published work reported estimates ranging from 1.43 g to 5.14 g for the mean greasy fleece weight (El-Sherbiny and El-Sheikh, 1969; Labban and Radwan, 1971 and Aboul-Naga *et al.*, 1972). In comparison with native breeds in Egypt, the overall mean of Ossimi, Rahmani and Barki ranged from 1.36 kg to 3.15 kg. The first fleece weight ranged from 0.98 kg to 2.42 kg, and the second year fleece weight ranged from 1.63 kg to 3.29kg (Ragab *et al.*, 1956; Ragab and Ghoneim, 1961; El-Sherbiny and El-Sheikh, 1969; Fahmy *et al.*, 1969; Seoudy *et al.*, 1969; Aboul-Naga *et al.*, 1972 and Guirgis and Galal, 1972).

TABLE 1. Least squares means ($\bar{x}$) standard errors (S.E.), and results of Duncan's multiple range test (1) of differences between means of fleece weights.

Classification	1*st* shear (g)			2*nd* shear (g)			3*rd* shear (g)		
	N	$\bar{x}$	S.E.	N	$\bar{x}$	S.E.	N	$\bar{x}$	S.E.
Overall mean	7.88	1.02	0.029	2571	3.70	0119	1246	2.63	0.045
Farm									
Abis	1140	1.30 a	0.009	543	4.15 a	0.120	234	2.48 a	0.050
Paul Place	773	1.05 b	0.012	211	3.68 b	0.120	77	2.38 a	0.065
Saft Khaled	1098	0.88 c	0.011	249	3.46 c	0.120			
Yousofiah	2927	0.91 d	0.010	795	3.53 d	0.120	376	2.60 b	0.047
Kom Osheim	2250	1.02 b	0.009	773	3.66 b	0.119	361	3.05 c	0.050
Year of birth									
1969	2762	1.05 a	0.029	1251	3.66 a	0.021	1248	2.63	0.045
1970	2556	1.28 b	0.029	1320	3.73 b	0.021			
1971	1973	1.06 a	0.029						
Season of birth									
Nov. - Apr.	6244	1.08 a	0.028	2156	3.75 a	0.119	1003	2.62 a	0.045
May - Oct.	1047	1.17 b	0.030	415	3.65 b	0.120	245	2.64 a	0.053
Sex									
Males	3215	1.13 a	0.029	57	3.71 a	0.121	27	2.64 a	0.081
Females	4076	1.13 a	0.028	2514	3.68 a	0.120	1221	2.63 a	0.026
Type of birth									
Singles	5836	1.12 a	0.028	2024	3.71 a	0.119	970	2.64 a	0.046
Twins	1454	1.13 a	0.029	547	3.69 a	0.120	278	2.63 a	0.049
Regression on age at shearing	-0.00008			0.00001			0.0001		

(1) Within each classification, those means followed by the same letter do not differ singificantly from each other, otherwise they do differ significantly at $p < 0.05$.

Wool yield for the crossbreds of Merino with native breeds in Egypt was reported to range from 1.43 kg to 2.94 kg, from 1.59 kg to 2.77 kg for the first and second shearings, respectively. (Ragab *et al.*, 1969; Aboul-Naga *et al.*, 1972 and Guirgis and Galal, 1972). It did not seem from the available work that crossing Merino with native sheep would result in a considerable increase in fleece weight. Improvement attained by crossing might have happened in the quality of wool.

The total variance increased gradually from the first to the third shearing (Table 3). The percentages of the total variance in fleece weights attributable to all non-genetic sources of variation studied were also given in Table 3. All effects contributed 42.22%, 57.19% and 36.04% of the total variance in the first, second, and third shearings, respectively. A consistent trend was nearly observed for the effect of different sources of variation in fleece weight. Farm was the most important source in the three shearings, followed by year of birth, season of birth, sex and type of birth except in the third shearing, where sex contributed more to the total variance than season of birth.

B. *Effect of farm*

Table 1 presents the least squares means for the first three successive fleece weights classified by farm. Among the farms studied the most northern farm (Abis) had significantly higher ($P < 0.05$) means for the first and second greasy fleece weights. No regional grouping of the farms could explain the effect of farm on fleece weight means. Imam (1976) reported that the same flock had also the highest mean yearling body weight ($P < 0.05$). Body weight at the age of the third shearing was not included in the study. Differences in greasy fleece weight might be partly due to differences in body weight (Mullaney and Brown, 1957; Gjedrem, 1959 and Singh *et al.*, 1972). Other factors such as type of bedding, frequency of dipping and pasture management would affect the amount of impurities which in turn could affect the greasy fleece weight.

Table 2 presents the least squares analysis of variance for fleece weights. Farm was found to have a highly significant effect ($P < 0.01$) on the first three successive shearings studied. Table 3 presents the percentages of total variance in fleece weight attributed to farm effect.

Farm was the highest source of variation affecting fleece weights and contributed 18.14%, 43.92% and 34.4% of the total variance in the first, second and third fleece weights, respectively.

C. *Effect of year of birth*

Table 1 presents the least squares means for the first three fleece weights of lambs born in the years 1969, 1970 and 1971. Complete records for the three shears were available only for lambs born in 1969. Two shears were recorded for 1970 - born lambs and only the first-shear records were available for the lambs born in 1971. The highest fleece weight means for the first and second shears, were for lambs born in 1970 ($P < 0.05$).

TABLE 2. **Least squares analysis of variance for fleece weights of the first three shearings.**

Source of variation	Trait					
	1*st* d.f.	Shear MS.	2*nd* d.f.	Shear MS.	3*rd* d.f.	Shear MS.
Farm	4	27.810*	4	26.248*	3	20.758*
Year of birth	2	37.408*	2	7.422*		
Season of birth. . . .	1	3.746*	1	2.406	1	0.027
Sex	1	0.0	1	0.030	1	0.004
Type of birth	1	0.196	1	0.124	1	0.028
Regression on age at shearing	1	20.366*	1	0.027	1	8.167*
Residual	7278	0.082	2560	0.063	1240	1.170

* $P<0.01$

TABLE 3. **Percentage of the total variance in fleece weights of the first three shearings attributed to different sources of variation.**

Source of variation	Trait		
	1 *st* shear	2 *nd* shear	3 *rd* shear
	V%	V%	V%
Farm	22.68	43.92	34.41
Year of birth . . .	14.68	9.69	
Season of birth. . .	2.86	3.32	0.24
Sex	0.0	0.20	1.26
Type of birth . . .	0.0	0.05	0.13
Residual	57.78	42.82	63.96
Total variance (kg^2)	0.12	0.14	0.25

Table 2 presents the least squares analysis of variance for the different fleece weights. Year of birth had a highly significant effect on the first and second fleece weights ($P < 0.01$). The percentages of total variance in fleece weight attributable to differences of year of birth was found to be the second among the three most important sources of variation affecting the first and second fleece weights.

However, year of birth seemed to have a decreasing effect on fleece weight. The contribution of year of birth to the first and second grease fleece weights was 14.68% and 1.64%, respectively (Table 3).

D. *Effect of season of birth*

Table 1 presents the least squares means of different fleece weights for the November to April and for the May to October seasons of birth. No consistent trend was observed in the effect of season of birth on successive fleece weights. In the first fleece weight, May to October born lambs yielded significantly more greasy wool than those born in November to April ($P<0.05$). This result coincided with the findings of Kassab and Karam (1961). The superiority of May to October born lambs in the first fleece weight might be due to the fact that the lambs born in that season were significantly heavier at yearling body weight than those born in November-April (Imam, 1976).

In the second shear, the situation was reversed (Table 1)), November to April born lambs yielded significantly more wool than those born in May to October ($P < 0.05$).

This result is in accordance with the findings of Karam (1959). In the third shear, there was no statistical evidence of difference between the mean fleece weights of the lambs born in the two seasons.

These results were supported by the least squares analysis of variance for different fleece weights (Table 2). The effect of season of birth was significant, ($P < 0.01$) on the first and second fleece weights, but was not significant on the third fleece weight. Season of birth was found to contribute 2.86%, 3 32% and only 0.24% of the total variance in the first, seasoned and third fleece weights, respectively (Table 3).

E. *Effect of sex.*

The least squares means for the fleece weights of males and females given in Table 1 were not significantly different in the three shears. The least squares analysis of variance for different fleece weights (Table 2) showed no effect of sex on the first three shears.

The importance of sex as a source of variation in fleece weight was negligible (Table 3). Sex accounted for 0.0%, 0.20% and 1.26% of the total variance in the first, second and third fleece weights, respectively. These results were supported by many published studies which showed that sex had no significant effect on fleece weight (Ragab *et al.*, 1956 ; Kassab and Karam, 1961; Young *et al.*, 1965; Fahmy *et al.*, 1969 and Guirgis and Galal, 1972).

F. *Effect of type of birth*

Least squares means for different fleece weights of single - and twin -born lambs are presented in Table 1. In all of the three shears, no significant differences were observed between singles and twins. Analysis of variance showed no significant effect of type of birth on different fleece weights(Table2). The percentages of the total variance in different fleece weights attributable to type of birth were almost nil,representing 0.0%, 0.05% and 0.13% of the total variance in the first, second and third fleece weights, respectively (Table 3).

Studies on the effect of type of birth on fleece weights gave variable results. Young *et al.* (1965), Gjedrem (1969), El-Tawil *et al.* (1970), and Sidwell *et al.* (1971) indicated the superiority of singles over twins in greasy fleece weight. Yet results found in other studies showed that the effect of type of birth was dependent on breed (Slen and Banky, 1958); farm (Drinan, 1968),and (Aboul-Naga *et al*; 1972).

References

Aboul-Naga, A.M., El-Tawil, E.F. Galal, E. Salah, E., Labban, F., and Khishin, S.S. (1972) The effect of crosssing Merino with Ossimi and Barki sheep on some productive traits. *J. Agric. Sci. Camb.* **78**, 275.

Drinan, J.P. (1968) The relative productivity of sirgle and twin born Merino. *Proc. Aust. Soc. Anim. Prod.* **7**, 208.

El-Sherbiny, and El-Sheikh, A.S. (1969) Physical characteristics of the fleece of Merino and its crosses with Ossimi sheep in the U.A.R. *J. Anim. Prod. U.A.R.*, 9, 15.

El-Tawil, E.A., Hazel, L.N., Sidwell, G.M. and Terrill, C.E. (1970). Evaluation of environmental factors affecting birth, weaning and yearling traits in Navajo sheep. *J.Anim. Sci.* 31, 823.

Fahmy, M.H., Galal, F., Salah, E., Charon, Y.S. and Khishin, S.S. (1969) Crossbreeding of sheep under semi-arid conditions. *Anim. Prod.* 11, 351.

Gjedrem, T. (1969) Phenotypic and genetic parameters for fleece weights and some wool quality traits. *Acta Agric. Scand.*, **19**, 103.

Guirgis, R.A., Galal, E. and Salah, E. (1972) The association between kemp and some vigour and wool characteristics in Barki and Merino Barki cross. *J. Agric. Sci. Camb.* **78**, 345.

Harvey, W.R. (1960) Least-squares analysis of data with unequal subclass numbers. *Mimeograph U.S. Dept. Agric., ARS*, 20-80.

Imam, El-Sayed, A. (1976) *Causes of variation in some economic traits in the merino sheep.* Ph. D. Thesis,Fac. Agric., Univ. of Cairo, 1976.

Karam, H.A. (1959) Fleece weight in Rahmani sheep. *(Alexandria J. Agric. Res.* **7**., 221).

Kassab, S.A. and Karam, H.A. (1961) Effects of some environmental factors on body and fleece weights of Barki sheep. *J. Anim. Prod. U.A.R.* 1, 149.

Labban, F.M. and Radwan, A. (1971) A study of some economic characters of an imported Merino flock. *J. Anim. Prod. U.A.R.* **9**, 303.

Mason, J.L and Dassat, P. (1954) Milk, meat and wool production in the Langhe sheep in Italy. *Z. Tierr. Zucht. Biol.* **62** ,131. Cited by Slen & Banky (1958).

Mullaney, P.D. and **Brown, G.H.** (1957) Effects of variation in age and birth weight on fleece traits at eighteen and thirty months. *Aust. J. Exp. Agric. Anim. Husb.*, **7**, 303.

Mullaney, P.D., Young, S.S.Y. and **Hayland, P.G.** (1969) Genetic and phenotypic parameters for wool characteristics in fine - wool Merino, Corriedale, and Polworth sheep. I-Influence of various factors on production. *Aust. J. Agric. Res.* **20**, 1161.

Ragab, M.T. and **Ghoneim , K.E.** (1961) Wool characteristics of Barki sheep. *J. Anim. Prod. U.A.R.* **1**, 23.

Ragab, M,T., Asker, A.A. and **Ghoneim, K.** (1956) Kemp, clean wool and grease fleece weight in Ossimi, Rahmani sheep and their crosses. *Annals of Agric. Sci., Fac. Agric., Univ. Ain Shams*, **1**, 177.

Ragab, M.T., Sharafeldin, M.A. and **Mikled, M.I.** (1959) A study on wool characteristics of fine and coarse wool crossbreds. *J. Anim. Prod. U.A.R.* , **9**, 243.

Seoudy, A.M., Ghanem, Y.S. and **Ghoneim, K.E.** (1969) Effect of crossing Merino with Barki sheep on some wool characteristics. *J.Anim. Prod. U.A.R.* **9**, 299.

Shelton, M.J. and **Menzies, J.W.** (1958) Genetic parameters of some performance characteristics of range fine - wool ewes. *J. Anim. Sci.* **27**,1219.

Sidwell, G.M., Wilson, R.L. and **Hourihan, M.E.** (1971) Production in some pure breeds of sheep and their crosses. IV- Effect of crossbreeding on wool production. *J. Anim. Sci.* **32**, 1099.

Singh, B.P., Singh, B.B. and **Singh, M.R.** (1972) Relationships of wool yield with age, weight and body measurements of Bikaneri sheep. *Indian J. Agric. Sci.* **42**, 218.

Slen, S.B. and **Banky, E.C.** (1958) The relationship of clean fleece weight to age in three breeds of range sheep. *Canad. J. Anim. Sci.* **38**, 61.

Steel, R.G.D. and **Torrie, J.H.** (1960) "*Principles and Procedures of Statistics*" McGrawHill International Book Comp., New York.

Young, S.S.Y., Brown, G.H., Turner, H.N. and **Dolling, C.H.S.** (1965) Genetic and phenotypic parameters for body weight and greasy fleece weight at weaning in Australian Merino sheep. *Aust. J. Agric. Res.* **16**, 997.

دراسة أثر بعض العوامل غير الوراثية على التباين فى وزن الجزة الخام للأغنام المرينو الألمانى فى خمسة قطعان تجارية تجارية فى مصر

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أجريت الدراسة فى خمس مزارع تابعة للمؤسسة المصرية العامة للحبوب والألبان موزعة على أنحاء مختلفة من القطر المصرى ، وقد تناولت أوزان جزات الصوف الخام لعدد ٧٢٩١ جزة أولى ، ٢٥٧١ جزة ثانية ، ١٢٤٨ جزة ثالثة أخذت من حملان من المرينو الالمانى ولدت خلال ٣ سنوات متتالية من عام ١٩٦٩ – عام ١٩٧١ .

استخدمت طريقة الحد الأدنى للمربعات لتحليل التباين (هارفى ١٩٦٠) وذلك لفصل التباين الكلى فى أوزان الجزات الثلاث الى أجزاء تعزى الى أثر المزرعة ، سنة الميلاد ، موسم الميلاد ، الجنس ، نمط الميلاد (مفرد أو توأم) وانحدار وزن الجزة على العمر عند الجز واستخدام اختبار دنكان لمقارنة معنوية الفروق بين المتوسطات .

وجد أن المتوسط العام لوزن الجزة الخام كان ١٫٣١ كجم للجزة الأولى ، ٣٫٧٠ كجم للجزة الثانية ، ٢٫٦٣ كجم للجزة الثالثة .

والدراسة معنوية تأثير العوامل البيئية المذكورة على مستوى ٠٫٠١ وجد أن أثر المزرعة كان معنويا على الجزات الثلاث . وكان تأثير موسم الميلاد معنويا فقط على وزن الجزة الأولى والثانية ، كما كان انحدار وزن الجزة على العمر عند الجز معنويا فقط على وزن الجزة الأولى والثالثة ، أما الجنس ونمط الميلاد فلم يكن لهما أى تأثير معنوى على وزن أى جزة من الجزات الثلاث .

كما وجد أن جميع العوامل التى تمت دراستها تكون ٢٢٫٤٢٪ ، ١٩٫٥٧٪ ٣٦٫٠٤٪ من مكونات التباين الكلى من وزن الجزة الأولى والثانية والثالثة على الترتيب ، وقد كانت المزرعة أهم أسباب التباين تلتها سنة الميلاد .