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 36.08%, 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 found to be of particular importance (Kassab and Karim, 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 Sweet sorghum (*Sorghum saccharatum*) 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:

\[
Y_{ijkmn} = \mu + f_i + r_j + l_k + X_{l} + P_m + ba_{ijklm} + e_{ijklmn}
\]

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.

\( \mu \) is an effect common to all observations,

\( f_i \) is the effect due to the \( i \)th farm; \( i = 1, 2, \ldots, 5 \);

\( r_j \) 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; \( l = 1, 2 \);

\( \beta_m \) is the effect due to the \( m \)th type of birth; \( m = 1, 2 \);

\( a_{ijklm} \) 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;

\( e_{ijklmn} \) is a random effect peculiar to the \( ijkln \)th observation with \( e \sim IRN(0, \sigma^2) \).

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 \( = 0 \). 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 \( \pm \) 0.045 kg 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 shearings (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-Sherbini and El-Sheikha, 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 1.35 kg to 3.15 kg. The first fleece weight ranged from 0.52 kg to 2.42 kg, and the second year fleece weight ranged from 1.63 kg to 3.29 kg (Ragab et al., 1956; Ragab and Ghoelam, 1961; El-Sherbini and El-Sheikha, 1969; Palmy et al., 1969; Seoudy et al., 1969; Aboul-Naga et al., 1972 and Qureshi and Galal, 1972).

| TABLE 1. Least-squares means (x) standard errors (S.E.) and results of Duncan's multiple range test (1) of differences between means of fleece weights. |
|-------------------|------------------|------------------|------------------|------------------|
|                   | 1st shear (g)    | 2nd shear (g)    | 3rd shear (g)    |
|                   | N    | x   | S.E. | N    | x   | S.E. | N    | x   | S.E. |
| Overall mean      |      |     |     |      |     |     |      |     |     |
| Farm              |      |     |     |      |     |     |      |     |     |
| Albi              |      |     |     |      |     |     |      |     |     |
| Total Place       |      |     |     |      |     |     |      |     |     |
| Soft-Khaliel      |      |     |     |      |     |     |      |     |     |
| Youssifah         |      |     |     |      |     |     |      |     |     |
| Kom Obeid      |      |     |     |      |     |     |      |     |     |
| Year of birth     |      |     |     |      |     |     |      |     |     |
| 1969              |      |     |     |      |     |     |      |     |     |
| 1970              |      |     |     |      |     |     |      |     |     |
| 1971              |      |     |     |      |     |     |      |     |     |
| Season of birth   |      |     |     |      |     |     |      |     |     |
| Nov.-Aug.         |      |     |     |      |     |     |      |     |     |
| May.-Oct.         |      |     |     |      |     |     |      |     |     |
| Sex               |      |     |     |      |     |     |      |     |     |
| Males             |      |     |     |      |     |     |      |     |     |
| Females           |      |     |     |      |     |     |      |     |     |
| Type of birth     |      |     |     |      |     |     |      |     |     |
| Singles           |      |     |     |      |     |     |      |     |     |
| Twins             |      |     |     |      |     |     |      |     |     |
| Regression on age at shearing | 0.00028 | 0.00027 | 0.0001 | 0.0001 |

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

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Wool yield for the crossbreeds 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 Ghrir and Gafal, 1972). It did not seem from the available work that crossing Merino with native sheep would result in a considerable increase in fleeces 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 fleeces weights attributable to all non-genetic sources of variation studied were also given in Table 3. All effects contributed 42.22%, 57.19% and 38.04% 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 fleeces 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 2 presents the least squares means for the first three successive fleeces 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 fleeces weights. No regional grouping of the farms could explain the effect of farm on fleeces 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 this study. Differences in fleeces weight might be partly due to differences in body weight (Mallan and Brown, 1957; Gjelum, 1959 and Singh et al., 1972). Other factors such as type of feeding, frequency of dipping and pasture management would affect the amount of impurities which in turn could affect the fleeces weight.

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

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

C. Effect of year of birth

Table 1 presents the least squares means for the first three fleeces weights of lambs born in the years 1959, 1970 and 1971. Complete records for the 397 lambs were available only for lambs born in 1959. Two shears were recorded for 1970-bred lambs and only the first-shear records were available for the lambs born in 1971. The highest fleeces weight mean for the first and second shearings were for lambs born in 1970 (P < 0.05).

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

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Trait</th>
<th>Shear MS.</th>
<th>Shear MS.</th>
<th>Shear MS.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st d.f.</td>
<td>2nd d.f.</td>
<td>3rd d.f.</td>
<td></td>
</tr>
<tr>
<td>Farm</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>20.758*</td>
</tr>
<tr>
<td>Year of birth</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>0.027</td>
</tr>
<tr>
<td>Season of birth</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.004</td>
</tr>
<tr>
<td>Sex</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.028</td>
</tr>
<tr>
<td>Type of birth</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>8.167*</td>
</tr>
<tr>
<td>Regression on age at</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1.170</td>
</tr>
<tr>
<td>shearing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residual</td>
<td>7278.0</td>
<td>2560.0</td>
<td>1240.0</td>
<td>1.170</td>
</tr>
</tbody>
</table>

* P<0.01

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

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Trait</th>
<th>1st shear</th>
<th>2nd shear</th>
<th>3rd shear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm</td>
<td>V%</td>
<td>22.68</td>
<td>43.92</td>
<td>34.41</td>
</tr>
<tr>
<td>Year of birth</td>
<td>V%</td>
<td>14.68</td>
<td>9.69</td>
<td>1.26</td>
</tr>
<tr>
<td>Season of birth</td>
<td>V%</td>
<td>2.86</td>
<td>3.32</td>
<td>0.24</td>
</tr>
<tr>
<td>Sex</td>
<td>V%</td>
<td>0.0</td>
<td>0.20</td>
<td>0.13</td>
</tr>
<tr>
<td>Type of birth</td>
<td>V%</td>
<td>0.0</td>
<td>0.05</td>
<td>0.13</td>
</tr>
<tr>
<td>Residual</td>
<td>V%</td>
<td>37.78</td>
<td>42.82</td>
<td>63.96</td>
</tr>
<tr>
<td>Total variance (kg²)</td>
<td>V%</td>
<td>0.12</td>
<td>0.14</td>
<td>0.25</td>
</tr>
</tbody>
</table>

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 $14.66\%$ 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).
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 (Table 2). 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 (Slender and Banky, 1958); farm (Drinan, 1968) and (Aboul-Naga et al.; 1972).

References


دراسة أثر بعض العوامل غير الوراثية على النتائج في وزن الجزء الخام للإغنام البرياني الأثيوبي في خمسة قطاعات تجارية 

تاجرى في مصر

محمد رشدي وجاهز، محمد عبد الوهاب فرخ الدين، السيد أحمد إمام

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البحث التجاري في خمس مزارع تابعة للمؤسسة المصرية العامة للصغر
والألبان متوفرة على أعوام مختلفة من الفترة المحيطة، وقد استُخلصت أوران
جزء الصويا الخام لـ 1371 جزءًا، 7872 جزءًا، ١٤٨٢ جزءًا، ١٤٨١ جزءًا
ثالثة متوسطة من مجموع البرياني الأثيوبي، وتم خلال سنتين متتاليتين من
عام ١٣٨٩ - عام ١٣٩١.

استخدمت طريقة البدء الأثيوبي للترميمات للتحلل البرياني (مارس 1980).
وركز على الحليب الكلى في أوران الجزء الثالث إلى أجزاء عظمي أم الجد
الظهر، سنة البلاد، موسم البلاد، الجنس، لنطاط البلاد، معدل أم الرأس
واختيار دولة امراض على الدم أندو الجذور واستخدام اتصال ذلك بتراوحة مختارة
الفرق بين المستويات.

وجاء أن المتوسط العام لوزن الجزء الخام كان ٣٢.١ كجم للجزء الأول
٤٦.٠ كجم للجزء الثاني، ٤٧.٣ كجم للجزء الثالث، ٣١.٢ كجم للجزء الرابع.
ودراسة متوازنة أثر العوامل البيئية المتغيرة على مستوى pré، وجد أن
البروتيكية كان متوازنًا على المراعي الفاكهة، وكان تأثیر محاصيل البرياني
متوسط على ورزن الجزء الأول والثاني، ولكن كان تأثیر مولدن الجزء على المر
في نتائج محاصيل فقط على ورزن الجزء الأول والثاني، أما الجنس، ونطاق اللد،
でした فكلما نقص ليك لـ، تأثیر محاصيل على ورزن الرأس، مثل انخفاض

كما وجد أن جميع العوامل التي تمت دراستها تغير ١٥٣.٢ %، ٢٤.٨ %
٢٤.٨ % من مكادرات النتائج من وزن الجزء الأول والثاني ونطاق اللد
على الترتيب، وجدت البروتيكية أثرية أسباب التباين في سنة البلاد،