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WOOL CHARACTERISTICS OF TEXEL SHEEP

BY

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SUMMARY

In January 1956, Tahreer Province in Egypt imported 395 Texel sheep from Holland. The wool characteristics of this foreign breed and those Texels born in Egypt were studied in this work. The traits dealt with were grease fleece weight, clean wool percentage, fiber diameter, crimps, staple length, fiber length, kemp percentage and density of fiber population. Both environmental and genetical factors affecting these traits were studied. Observations were taken at the first year of age for the imported Texel sheep, during which most of the wool grew abroad, and at the second and third years of age, in which wool grew in Tahreer Province.

Some of the wool characteristics were affected by the importation of this breed from Holland to Tahreer Province in Egypt, while the other characters were not influenced by this change. The characters which were not effected are the fiber diameter, crimps and kemp percentage.

The staple and fiber lengths of Texels decreased from the first to the third years of age. The percent of clean wool varied between 62.08 % at one year old to 72.01 % at the third year of age. The highest grease fleece weight was that obtained during the first twelve months of age, during which most of the wool grew abroad. Fleece weight for the second and third years of age were nearly the same. The highest number of fibers per square centimeter was found in winter season, while the least number was reported for the summer.

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Repeatability estimates obtained for wool characteristics were 0.550, 0.222, 0.410, 0.314, 0.263, 0.417 and 0.134 for grease fleece weight, clean wool yield, fiber diameter, crimps, staple length, fiber length and kemp percentage, respectively, while heritability estimates for the same characters were 0.31, 0.24, 0.23, 0.30, 0.29, 0.49 and 0.14 in the same order.

Significant correlations were found between body weight and grease fleece weight (0.380) body weight and fiber diameter (0.289) and body weight and fiber length (0.235). There were also significant correlations between fiber diameter and clean wool yield (0.301), crimps and staple length (0.253) and staple length and fiber length (0.750).

INTRODUCTION

The sheep population of Egypt, which amounts to 1.33 million head is mainly coarse wool type. The wool produced is used for rug and carpet manufacture. The local output amounts to 2.25 million kilos, and still far from the point of satisfaction for the industrial needs of the country.

In 1953, the Tahreer Province started a vast land reclamation scheme aiming at turning about two million acres of sandy soil into cultivable land. The Texel, Merino, Suffolk and Leicester breeds of sheep were introduced into this project in January 1956. It was thought that if these sheep could survive in this country without much degeneration, a great revolution in Egyptian sheep production might be possible as far as both fine wool and mutton production are concerned.

MATERIAL AND METHODS

In January 1956, the Tahreer Province imported 385 ewes and 10 rams of the Texel breed from Holland. According to the Central Bureau of sheep breeding in 1939, the Texel sheep has several excellent qualities. The average number of lambs born per birth is 1.88, while the average number of lambs reared 1.62. The average weight of ram lambs is nearly 45 kgs and ewe lambs 38 kgs., at four months of age. The average weight of greasy fleece is about 5.85 and 4.57 kgs.

for rams and ewes respectively. Quality of the fleece is generally 52's and 50's (Bradford system). This would be quarter blood by U. S. standards.

Two hundred and twelve Texel sheep were born in their homeland during the last three weeks of March and the first few days of April 1955. In April 1956, they were shorn for the first time. Second and third shearing took place at April 1957 and April 1958, respectively.

Fifty one Texel ewes were not mated during the mating season of October 1956, in order to study the effect of pregnancy on wool quantity and quality. Seventy Texel lambs sired by eight Texel rams were born in Tahreer Province during March 1957. They were shorn for the first time in April 1958.

Samples used in the analysis were taken from the imported Texel sheep at the following ages :

(*a*) 12 months old, in which most wool grew abroad.

(*b*) 24 months old, in which wool grew at Tahreer Province.

(*c*) 36 months old, in which wool grew at Tahreer Province.

The wool characteristics of Texels born in Egypt were studied at 12 months of age. The traits dealt with were grease fleece weight, clean wool percentage, fiber diameter, crimps, staple length, fiber length, kemp percentage and density of fiber population. Both environmental and genetical factors affecting these traits were studied.

For studying these traits, except the density of wool fibers, the samples were taken at shearing time in April 1956, April 1957 and April 1958. Eight Texel ewe-lambs born in Egypt were chosen at random and prevented from being mated, and were used for estimating density of wool fibers.

Prior to shearing, a small sample of grease wool was clipped from the right shoulder of each animal. This sample was used to determine the shoulder's fiber diameter, number of crimps per two centimeters, staple length, fiber length and kemp percentage by weight.

At shearing time, each fleece was weighed in kgs., also a small sample of the side wool (weighing approximately 10-20 gms.) was taken from each sheep before shearing for estimating clean wool percentage.

For measuring staple length, fiber length, fiber diameter, crimps, clean wool percentage, kemp percentage and density of fiber population, the methods used have been previously reported by Ragab and Ghoneim (1961). The methods suggested by Snedecor (1950) were used for statistical analysis, while the method of half-sibs as reported by Lush (1949) was used for estimating the heritability of wool characteristics studied.

RESULTS AND DISCUSSION

1. *Grease Fleece weight.*

Table 1 shows the different characteristics. The highest grease fleece weight of Texel sheep was that produced during the first 12 months of age. This mostly grew abroad, while the wool of the second and third years of age, which grew in Tahreer Province, was nearly the same.

The decrease in fleece weight of the second year's crop compared to that of the first year came to 29.3%. These results are not in agreement with those reported by Spencer *et al* (1928), Mercuri and Chiavarelli (1934), Gorman *et al* (1942), Jones *et al* (1944), Terrill *et al* (1950), Ragab *et al* (1956) and Mason and Dassat (1958) who agreed that fleece weight increased with the advance in age in different breeds of sheep up to four years old.

Blackwell and Henderson (1955) estimated the linear regression of fleece weight on age of ewe to be—0.14 lb. per year. They stated also that the curve which relates wool production to age is usually curvilinear with a maximum appearing at about four years of age.

It seems that the climatic conditions of the Tahreer Province, as far as wool production of Texel sheep is concerned, are not ideal. The change from a cold humid country to an arid subtropical region, would be expected to exert its influence on the wool crop of the sheep. Naturally, it is not expected that one should get the same crop of wool from the sheep in their new habitat. If this breed of sheep is transferred to a more convenient locality, where humidity is higher, better results may be obtained.

However, the wool production of the imported Texel sheep under these new conditions, is far greater than that of the indigenous breeds of sheep. Sidky (1948) and Ragab *et al* (1956) stated that the average

TABLE 1

Averages for Wool Characteristics of Texel Sheep at different ages.

Character	Imported Texels						Texels born in Egypt	
	12 months old		24 months old		36 months old		12 months old	
	No.	Mean	No.	Mean	No.	Mean	No.	Mean
Fleece weight kgs.	212	4.43±0.05	140	3.14±0.05	124	3.08±0.04	70	2.45±0.06
Clean Wool %	10	62.08±2.08	106	63.66±0.95	92	72.01±0.56	70	68.28±1.22
Fiber diameter microns	10	28.31±0.79	106	29.21±0.21	92	32.31±0.24	70	29.22±0.23
No. of crimps per 2 cms.....	10	7.15±0.47	106	7.01±0.13	92	6.79±0.12	70	7.65±0.16
Staple length mm.	10	104.1±5.7	106	87.65±1.44	92	79.87±1.53	70	85.41±1.51
Fiber length mm.	10	156.7±6.1	106	148.4±1.8	92	142.1±2.1	70	150.7±2.6
Kemp %	10	0.15±0.02	106	0.27±0.01	92	0.34±0.01	70	0.23±0.01

weight of grease wool obtained from Egyptian Ossimi and Rahmani sheep ranged between 1.0 and 1.5 kg. annually. This means that the Texel sheep, under their new environmental conditions and in their first stage of acclimatization, were capable of giving an increase of about threefold over the wool crop of the indigenous sheep irrespective of the quality.

It was found that there was a highly significant difference between ages in grease fleece weight of Texel sheep. This result is in accordance with those obtained by Hazel and Terrill (1946), Terrill *et al* (1947 and 1948), Price *et al* (1953) and Karam and Ragab (1959) using different breeds of sheep; all concluded that age had a pronounced effect on fleece weight.

As far as the effect of lambing on grease fleece weight is concerned. The results obtained (Table 2) showed that although dry ewes produced

TABLE 2

Averages for wool characteristics of Texel ewes lambed and not lambed during their second year of age.

Character	Ewes not lambed		Ewes lambed		Significance
	No.	Mean	No.	Mean	
Grease fleece weight (kgs.)	51	3.11±0.06	82	1.02±0.05	N. S.
Clean wool percentage	51	64.59±1.28	49	63.68±0.30	N. S.
Fiber diameter (microns)	51	28.84±0.28	49	29.17±0.29	N. S.
No. of crimps per 2 cms.	51	6.90±0.16	49	6.80±0.17	N. S.
Staple length (mm.)	51	90.09±2.22	49	83.74±1.86	S.
Fiber length (mm.)	51	150.45±2.49	49	143.91±2.60	N. S.
Kemp percentage	51	0.276±0.01	49	0.271±0.01	N. S.

S. = significant (at 5 %) N. S. = non-significant

heavier fleeces than wet ewes, yet there was no significant difference between the two groups. These results are in agreement with those of Jones *et al* (1936) and (1944) who found that dry ewes produce heavier fleeces than ewes which lambed in Rombouillet sheep.

The average fleece weight for imported Texels (4.44 kgs.) was higher than that of Texel sheep born in Egypt (2.43 kgs.) at 12 months of age. The difference of 1.99 kgs. between the two groups was highly significant. Actually, most of this difference was due to the fact that the sheep born in Egypt were attacked by a variety of skin diseases which lead to shearing for the sake of treatment. At the second year of age, Texels born in Egypt produced an average of 3.09 kgs. of grease wool, compared to 3.14 kgs. for imported Texel sheep at the same age. The difference of 0.05 kgs. between the two groups, was not significant.

Repeatability of grease fleece weight.

Repeatability measures the fraction of the variance in the single record which was caused by permanent individual differences between animals for a particular character. It is useful in showing the amount of attention that should be paid to early records in predicting later ones, and in comparing animals with different numbers of records.

In the present study, 140 Texel sheep having three subsequent shearings; i. e. at one year, two years and three years of age, were available for estimating repeatability of fleece weight. The correlation between fleece weight of the first shearing and that of the second one was 0.529, compared to 0.590 between the first and third shearing and 0.531 between fleece weight of the second shearing and that of the third one. This lead to an average repeatability of 0.550 (Table 3).

TABLE 3

Repeatability and heritability estimates of wool characters for Texel sheep

Character	Repeatability	Heritability
Grease Fleece weight	0.550	0.31
Clean Wool yield	0.222	0.24
Fiber diameter	0.410	0.23
Crimps	0.314	0.30
Staple length	0.263	0.29
Fiber length	0.417	0.49
Kemp percentage	0.134	0.14

These estimates are in close agreement with those obtained by Terrill (1939), Rasmussen (1942) and Terrill *et al* (1950) who estimated the repeatability of fleece weight as 0.59, 0.56 and 0.70 respectively in Rombouillet sheep. Morley (1951) found that it was 0.74 in Australian Merino sheep, while Blackwell and Henderson (1955) estimated it as 0.608 in four breeds of sheep under farm conditions. Mason and Dassat (1958) found that repeatability of fleece weight in the Italian Sopraviosana sheep ranged between 0.36 and 0.57. Karam and Ragab (1959) studying fleece weight in Texel sheep, reported that the correlation between the weight of the first shearing and that of the second one was 0.61.

Heritability of Grease Fleece Weight.

Heritability is estimated to show the fraction of the variance which is mainly caused by differences in the heredity of the animals as compared to the total variance for the character concerned. The correlation between half—sibs intra sire was used for estimating the heritability of grease fleece weight.

For imported Texels, 46 sires having 181 daughters one year old, 108 daughters from 31 sires 2 years old, and 29 sires having 95 daughters 3 years old, were available for estimating the heritability of fleece weight at different ages. For Texels born in Egypt, only 70 lambs produced by 8 sires were used for estimating the heritability of this character at one year of age.

The heritability of fleece weight was 0.50, 0.23 and 0.25 for imported Texels at one year old, 2 years old and 3 years old, respectively. This lead to an average heritability of 0.31 (Table 3), while the estimate was 0.45 for yearling Texels born in Egypt.

These results are in the range of the findings obtained by Terrill and Hazel (1943), Rae (1948), Morley (1951), Kyle and Terrill (1953), Shelton *et al* (1954), Blackwell and Henderson (1955) and Mason and Dassat (1958) which ranged between 0.14 and 0.67 in different breeds of sheep.

The average estimate of heritability for grease fleece weight of imported Texel sheep which was found to be 0.31 for the three ages studied by

paternal half-sib correlation is in close agreement with that reported by Karam and Ragab (1959) which was 0.30 in the same breed using the regression of offspring on midparent.

The heritability estimates for grease fleece weight of imported Texel sheep, were smaller than their corresponding repeatabilities. This means that there are more permanent environmental differences affecting fleece weight. Nevertheless, some genetic improvement based on individual selection is possible, because of the high heritability of fleece weight.

2. *Clean Wool Percentage.*

The average clean wool percentage, being 62.08 and 63.66, was nearly the same at the ages of 12 and 24 months, while it increased to 72.01 at 36 months of age (Table 1). Since shrinkage depends mainly upon the amount of yolk and swint or wool grease as well as dirt and foreign materials, these results show that the amount of wool grease secreted during the third year of age was smaller than that produced at the second year of age, as the animals were kept under the same environment at Tahreer Province during those two stages of age.

The increase in clean wool percentage with advancing age, are in agreement with those reported by Jones *et al* (1944) and Terrill *et al* (1950) who found that clean fleece weight increased from one year of age to the third year of age in Rombouillet sheep.

There was a highly significant difference between ages in clean wool percentage. This is in accordance with the results obtained by Hazel and Terrill (1946), Terrill *et al* (1944 *a* and *b*), Price *et al* (1953) and Ragab *et al* (1956) who reported that age had a significant effect on clean fleece weight of different breeds of sheep.

The results presented in Table 2 show the effect of lambing on clean wool percentage. The difference of 0.91% between the two groups was not significant.

The average clean wool percentage was 62.08 and 68.28 for imported Texels and those born in Egypt at 12 months of age, respectively. The difference between the two groups was significant.

The average repeatability of 0.222 for clean wool percentage is very low compared to that of 0.543 reported by Morley (1951) in Australian

Merino sheep. The low estimate may be due to the small number of samples used at one year of age.

The heritability estimate obtained for either clean wool percentage or shrinkage at one year was found to be 24 for Texel sheep born in Egypt. This estimate is low compared to those reported by other workers. Terrill and Hazel (1943) gave an estimate of 0.38 for yearling Rambouillet ewes, while Morley (1951) found that clean fleece weight and yield heritability was 0.62 and 0.75 respectively in Australian Merino sheep.

3. *Fiber Diameter.*

There was a gradual increase in fiber diameter beginning with 28.31 microns at one year old and ending with 32.31 microns at 36 months of age. Jone *et al* (1944) and Terrill *et al* (1950) found in Rambouillet sheep that fiber diameter gradually increases as age advances. The same trend was found by Badreldin *et al* (1952) and Ragab *et al* (1956) in Egyptian Ossimi and Rahmani sheep. This gradual increase in fiber diameter with advanced age leads to the highly significant difference observed between ages in fiber diameter of the imported Texel sheep.

As far as the effect of lambing on fiber diameter is concerned, the results obtained (Table 2) showed that although dry ewes had smaller fiber diameters than ewes with lambs, nevertheless, the difference between the two groups, was not significant.

Bosman (1935) reported that pregnancy does not influence Merino wool fineness. However, these results are in accordance to those stated by Jones *et al* (1944) who found that the diameter of fibers produced by the fertile ewes averaged slightly coarser than that produced by dry ewes in Rombouillet sheep.

The difference of 0.699 microns between imported Texels and those boen in Egypt, in fiber diameter, at the age of one year, was not significant. This means that Tahreer Province conditions did not change the fineness of Texel sheep, for the wool of imported Texel sheep was mainly grown abroad, while that of Texels born in Egypt was produced under Tahreer Province conditions.

The average repeatability of fiber diameter was found to be 0.410 for Texel sheep. Terrill *et al* (1950) reported an estimate of 0.56 for repeatability of fiber diameter in Rambouillet sheep, while Karam and Ragab (1959) found that the correlation between fleece grade of the first shearing and that of the second one was 0.45 in Texel sheep.

The estimate of heritability for fiber diameter of Texels born in Egypt was found to be 0.23. This estimate is close to that of 0.26 reported by Morley (1951) for yearling Australian Merino sheep, but lower than those reported by Kyle and Terrill (1953) and Shelton *et al* (1954) who found that heritability of fiber diameter ranged between 0.33 and 0.57 in different breeds of sheep.

4. *Crimps.*

The average number of crimps per two centimeters ranged between 6.79 and 7.15 for imported Texel sheep at different ages. There was no significant difference between ages in the number of crimps of imported Texel sheep. This shows that age is not responsible for the incidence of fiber crimps. On the other hand, it also indicates that the change of environment did not injure the crimps of wool fibers in Texel sheep.

Lambing proved to have no significant effect on the incidence of crimps (Table 2). No significant difference in the number of crimps was found between the imported Texels and Texel sheep born in Egypt at one year old.

The few number of animals used at one year old is responsible for the low estimate of repeatability for crimps of imported Texel sheep (Table 3). The estimate of heritability for the number of crimps per two centimeters of Texels born in Egypt was 0.30 at one year of age. This estimate is in close agreement with that reported by Morley (1951) who found that heritability for the number of crimps per inch was 0.28 in yearling Australian Merino sheep, Rae (1948) gave an estimate of 0.43 for the same character in New Zealand Romney sheep.

5. *Staple Length.*

The decrease of staple length from yearling age to the third year of age, is not in agreement with results reported by Jones *et al* (1944), Terrill *et al* (1950) and Ragab *et al* (1956) who found that staple

length increases as age advances till the third or fourth year in different breeds of sheep. The reduction in staple length may be attributed to the sudden change in the sheep habitat from their humid and cold homeland in the Netherlands to the hot dry climate of the Tahreer Province in Egypt.

Age had a highly significant effect upon staple length of Texel sheep. This is in accordance to the results given by Hazel and Terrill (1943 and 1946), Terrill *et al* (1947, 1948) Sidwell *et al* (1951) and Price *et al* (1953) in different breeds of sheep.

Dry ewes were superior to the ewes with lambs in staple length (Table 2) The difference of 6.35 mms. in staple length between the two groups was significant. Jones *et al* (1944) found that fertile ewes produced wool which averaged 0.08 inch shorter than ewes that did not lamb during the year in Rambouillet sheep.

Comparing the staple length of imported Texels at one year of age to those born in Egypt at the same age, a highly significant difference between the two groups was found. This means that the Texel sheep born in Egypt had a shorter staple length than their parents which were born abroad. This strengthens the previous findings that staple length in the Texel breed of sheep is affected by the hot climate.

The small number of animals used at yearling age is responsible for the low estimate of average repeatability for staple length (Table 3). Terrill (1934) estimated the coefficient of repeatability as 0.57 in Rambouillet ewes, and the workers at the Western Sheep Breeding Laboratory (1949) stated a value of 0.75 for a group of Rambouillet rams, while Morley (1951) found that repeatability of staple length was 0.71 in Australian Merino sheep.

Heritability of staple length for Texels born in Egypt was found to be 0.29 at yearling age. This estimate is in agreement with those reported by many workers, since they ranged from 0.21 to 0.49 in many different breeds of sheep (Terrill and Hazel, 1943 ; Hazel and Terrill, 1943 and 1946 ; Rae, 1948 ; Morley, 1931 ; and Karam *et al*, 1953).

6. *Fiber Length.*

The same trend of staple length was found in the case of fiber length. The decrease in fiber length from yearling age to the third year of age is

small when compared with that of the staple length, though, a significant difference between ages was found in fiber length of imported Texel sheep.

Dry Texel ewes produced wool with an average fiber length of 150.45± 2.49 mms., while ewes with lambs had a fiber length of 143.91± 2.60 mm. (Table 2). Nevertheless, the difference between the two groups in this respect, was not significant.

When comparing the difference in fiber length of the imported Texels to those which were born in Egypt at the age of 12 months, no significant difference between the two groups was found. This is contradictory to what was found in staple length of the same breed.

The average repeatability of fiber length for imported Texels was found to be 0.417. This estimate is higher than that of staple length for the same animals, but it is lower than the repeatability reported by other workers (Terrill, 1934; Western sheep Breeding laboratory, 1949; and Morley, 1951).

The estimate of heritability for fiber length of Texels born in Egypt was 0.49 at one year of age. Although this value is higher than that of staple length for the same animals, yet it is still in the range of heritability previously mentioned for staple length.

7. *Kemp Percentage.*

The increase of kemp percentage from yearling age up to the third year of age is due to advance in age, rather than the change of environment (Table 1). Badreldin *et al* (1952) and Ragab *et al* (1956) studying this problem in Egyptian Ossimi and Rahmani sheep came to the conclusion that kemp percentage increased as age advanced. Age had a highly significant effect upon kemp percentage and this is in agreement with the results reported by Grandstaff and Wolf (1947).

The kemp percentage in Texel sheep was found to be very small and negligible. Duerden (1926) and Roberts (1926) stated that 2-3 % of kemp at the shoulder is a certain indication of a kempy fleece. Therefore, the fleeces of Texel sheep cannot be considered of the kempy type. Moreover, the kemp in Texel fleeces is very short compared to wool fibers; a case that does not affect the value of Texel wool in manufacture. The

difference of 0.005 in kemp percentage between Texel ewes with lambs and dry ones was not significant (Table 2).

The average repeatability for kemp percentage was 0.134 of imported Texel sheep (Table 3). The few number of animals used in the experiment at one year of age may be the cause of the low estimate of repeatability for this character. However, no significant correlation was found between any two ages in kemp percentage of Texel sheep.

Heritability of kemp percentage for Texels born in Egypt was found to be 0.14 at one year of age. Bryant (1936) studying kemp in the fleece of Scottish Mountain Blackface sheep, found correlations between sire and offspring of 0.28 and dam and offspring of 0.25.

The heritability of percent kemp shows that the variation in this character is due mainly to environmental factors rather than genetic ones. However, more estimates from different breeds of sheep including greater numbers of animals are needed to throw more light on the inheritance of this character.

8. *Density of Wool Fibers.*

The average number of fibers per square centimeter for the four seasons was 3675.5 and 3145.8 fibers for the shoulder and hip regions respectively. It was 3410.7 fibers per square centimeter for both regions.

The highest number of fibers per square centimeter was found in winter season, while the lowest number was reported in summer. This is not in accordance with Galpin (1948) who found that the least number of fibers was observed at winter in Romney sheep in England. It was noticed that when the temperature decreased from summer to autumn, the number of fibers per square centimeter tended to increase for the same individuals. This indicates that the high temperature and dry desert conditions of Tahreer Province, especially in summer, are not conducive to maximum wool production of Texel sheep. It was found that the differences between number of fibers for shoulder and hip regions, as well as the differences between individuals, were highly significant. This is in agreement with the results reported by many workers in different breeds of sheep (Wolf *et al,* 1943 ; Hardy and Wolf, 1947 ; Galpin, 1948 ; and Badreldin *et al,* 1952).

It was also found that there was a highly significant difference between seasons in the number of fibers per square centimeter. This was explained by Galpin (1948) and Badreldin *et al* (1952) who found that the skin expands through growth while the number of fibers remains stable from about one month of age.

It is interesting to note that the shoulder region was more variable in the number of fibers per square centimeter than the hip region at all seasons. The same observation was reported by Wolf *et al* (1943) in Rambouillet sheep.

Studying the variation in number of fibers, it was found that there was no increase in the number of fibers per square centimeter from twelve months to two years of age in either shoulder or hip regions. This is in agreement with Coat (1943) and Galpin (1948) who found that there was no increase in fiber number after the seventh month of age in Romney sheep.

Phenotypic Correlations Between Wool Characteristics.

The Phenotypic correlations between the various characters studied were computed within ages and groups (Tables 4, 5 and 6).

The high positive correlation between body weight and grease fleece weight is in agreement with those reported by Spencer *et al* (1928), Duerden *et al* (1932), Terrill and Stoehr (1942), Pohle and Keller (1943), Jones *et al* (1944), Hunt *et al* (1952), Terrill and Kyle (1952) and Morley (1955) using different breeds of sheep. This positive correlation is rather logical since wool production depends upon the skin surface and size of the animal.

Tables 5 and 6 illustrate that there was a positive correlation between body weight and fiber length. Although this is in accordance to Terrill and Kyle (1952), yet it disagrees with the findings of Pohle and Keller (1943), Workers at the Western Sheep Breeding Laboratory (1946), Hunt *et al* (1952), Karam *et al* (1953) and Fox and Esplin (1954) who found that there was no significant correlation between body weight and staple length using different breeds of sheep.

The presence of a positive correlation between grease fleece weight and fiber diameter, and between fleece weight and fiber length is supported

TABLE 4

Correlation coefficients between body weight and wool characteristics for Texels born in Egypt at 12 months of age.

Items	Body weight	Grease Fleece wt	Clean wool yield	Fiber diameter	Crimps	Staple length	Fiber length	Kemp
Body weight	—	.380**	.060	.289*	.148	.181	.235*	-.080
Grease Fleece weight	.380**	—	-.001	.214	.021	.020	-.085	-.071
Clean wool yield	.060	-.001	—	-.301*	-.087	-.178	-.075	.152
Fiber diameter	.289*	.214	-.301*	—	.115	-.101	.123	-.148
Crimps	.148	.021	-.087	.115	—	-.253*	-.033	.030
Staple length	.181	-.020	-.178	.101	-.253*	—	.758**	-.108
Fiber length	.235*	-.085	-.075	.123	-.033	.750**	—	-.071
Kemp	-.080	-.071	.152	-.148	.030	-.108	-.071	—
D. F.	68	68	68	68	68	68	68	68

TABLE 5

Correlation coefficients between wool characteristics for imported Texel sheep at 24 months of age.

Items	Grease Fleece wt.	Clean Wool yield	Fiber diameter	Crimps	Staple length	Fiber length	Kemp
Grease Fleece wt.	—	-.020	.252*	.150	.050	.182	-.021
Clean wool yield	-.020	—	.667**	-.162	.133	.112	-.154
Fiber diameter	.252*	.667**	—	-.052	.245*	.457**	.017
Crimps	.150	-.162	-.052	—	-.246*	-.002	-.087
Staple length	.050	.133	.245*	-.246*	—	.688**	-.190
Fiber length	.182	.112	.457**	-.002	.688**	—	-.102
Kemp	-.021	-.154	.017	-.087	-.190	-.102	—
D. F.	104	104	104	104	104	104	104

TABLE 6

Correlation Coefficients between body weight and wool characteristics for imported Texels at 36 months of age.

Items	Body weight	Grease Fleece wt.	Clean wool yield	Fiber diameter	Crimps	Staple length	Fiber length	Kemp
Body weight	—	.672**	.197	.586**	.072	.374**	.438**	.011
Grease Fleece wt.	.672**	—	-.005	.291**	-.048	.100	.187	-.056
Clean wool yield	.197	-.005	—	-.028	-.186	.259	.194	-.109
Fiber diameter	.586**	.291**	-.028	—	-.062	.208*	.282**	.047
Crimps	.072	-.048	-.186	-.062	—	-.236*	-.065	.081
Staple length	.374**	.100	.259*	.208*	-.236*	—	.812*	-.201
Fiber length	.438**	.187	.194	.282**	-.065	.812**	—	.189
Kemp	.011	-.056	-.109	.047	.081	-.201	-.189	—
D. F.	122	122	90	90	90	90	90	90

by the results reported in other studies (Spencer *et al* [1928], Lambert *et al* [1938], Pohle and Keller [1943], Berge *et al* [1944], Jones *et al* [1944], Slen [1949], Morley [1951] and Hunt *et al* [1952]).

The highly positive correlation found between fiber diameter and clean wool yield (Table 5) indicates that as fibers become coarser, clean wool percentage tends to increase. This is in accordance with the findings of Spencer *et al* (1928), Pohle and Keller (1944), Burns (1946) and Slen (1949) for different breeds of sheep.

There was a negative correlation between staple length and number of crimps (Tables 4, 5 and 6). This says that as wool increases in length, number of crimps tends to decrease. Although this is not in agreement with Davenport and Ritzman (1926), and Swart and Kotze (1937) who found that there was a positive correlation between the number of crimps and the length of the fibers; yet our results are in accordance to those reported by Morley (1951) for Australian Merino sheep.

It is interesting to note from the tables 4, 5 and 6 that there was no correlation between kemp and the other wool characters. Therefore, it is concluded that kemp percentages are not correlated with any other wool characters. Hence, the elimination of kemp would not injure any economical wool quality.

The estimates given in the tables are phenotypic correlations which include environmental variations as well as those related to hereditary factors. The genetic correlation which refers only to genetic reasons, shows to what extent two characters are governed by the same set of genes. Thus, phenotypic correlations alone cannot be used in setting up breeding plans. Nevertheless, such phenotypic correlations give an idea about the general magnitude of relationship between the different traits, bearing in mind their significance from the genetic standpoint. It was not possible, however, to calculate the genetic correlations in the present work because of the limited number of daughter-dam pairs.

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الملخص

استوردت مديرية التحرير سنة ١٩٥٦ (٣٩٥) رأساً من أغنام التكسل من هولندا ، وقد درست صفات الصوف لهذه الأغنام تحت الظروف المحلية ووجد أن بعض صفات الصوف قد تأثرت بعوامل البيئة الجديدة . بينما لم تتأثر بعض الصفات ، فقد حافظت الأغنام على مستوى صفاتها المعروفة عنها فيما يختص بسمك الفتلة والتموج ونسبة الشعر الصلب – أما طول فتلة الصوف فقد نقص من العام الأول إلى العام الثالث ، كما اختلفت نسبة الصوف النظيف بين ٦٢,٠٨ ٪ فى السنة الأولى من عمرها إلى ٧٢,٠١ ٪ فى السنة الثالثة من عمرها .

وكانت أكثر نسبة دهن عالية فى الصوف الخام هى تلك الناتجة فى مدة الإثنى عشر شهراً الأولى من عمرها ، وهى تمثل الصوف الذى أتم نموه فى الخارج وكان الصوف الخام الناتج فى خلال الإثنى عشر شهراً الأولى من عمر الأغنام أكثر احتواء على الدهن من أى صوف آخر أنتجته . وهذا الصوف هو الذى نما فى الخارج وليس محلياً . هذا ولم يتأثر الوزن الكلى للصوف فى الأغنام التالية أى العام الثانى والثالث عما كان عليه فى العام الأول .

وقد اتضح أن الصوف الذى ينمو فى الشتاء يكون أكثر غزارة من الصوف الذى ينمو فى باقى فصول العام ، بينما كان الصوف الذى ينمو فى الصيف هو الأقل غزارة ، وقد تبين أن المعامل التكرارى لصفات الصوف كان ٠,٥٥٠ – ٠,٢٢٢ – ٠,٤١٠ – ٠,٣١٤ – ٠,٢٦٣ – ٠,٤١٧ – ٠,١٣٤ لوزن الجزة وناتج الصوف النظيف وقطر فتلة الصوف والتموج وطول فتلة الصوف وثخانتها ونسبة المح ، كما وجد أن هناك ارتباطات معنوية بين وزن الجسم ووزن الجزة وقطر الفتلة وطولها .