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Physical Evaluation of the Fleece of $\frac{3}{4}$ Barki and $\frac{3}{4}$ Ossimi Crosses with Merino

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TWO GRADES of 25% Merino blood with either Ossimi or Barki were tested for their wool production and characteristics. No significant increase in clean fleece weight was recorded for either the two grades compared to their subsequent local grandparents being 1.30±0.14 kg for the $\frac{3}{4}$ B vs. 1;12±0.19 kg for the $\frac{3}{4}$ O vs. 1.39±0.18 kg for Ossimi.

Fibre diameter and length were significantly decreased in the crossbred relative to their local grandparents which contributed to the nonsignificant increase in clean fleece weight in the $\frac{3}{4}$ B and no increase at all in the $\frac{3}{4}$ O.

A nonsignificant increase in kemp percentage was noticed in both $\frac{3}{4}$ O (2.3±2.48%) and $\frac{3}{4}$ B (4.3±3.06%) with wide range of variation. The true wool percentage was significantly increased in the $\frac{3}{4}$ O (95.8 ± 3.12%) while in $\frac{3}{4}$ B (93.9±0.71%) the increase was not significant.

The breaking stress in creased in both B(20.0±1.63 g/mm^2)and $\frac{3}{4}$O (20.1±2.57 g/mm^2) relative to their respective local grandparents although the increase was not significant in case of the $\frac{3}{4}$ O. Highly significant correlation were found between the breaking strength and the fibre cross-sectional area within each breed group although the correlation was markedly lower in Merino suggesting the interference of climatic factors on the mechanical properties of Merino wool produced under the condition of the present study.

Eversince the importation of "Fleisch Merino" in 1960, it has been triedin several grades of crossing with the Egyptian sheep. Wool production were evaluated in several crosses; $\frac{3}{4}$ Merino $\frac{3}{4}$ Ossimi was inferior to the pure Merino both qualitatively and quantitatively and to the $\frac{1}{2}$ Merino $\frac{1}{2}$ Ossimi qualitatively (Elsherbiny and Elsheikh, 1969; and Seoudy *et al.*, 1969) found similar results with $\frac{3}{4}$ M-$\frac{1}{4}$ Barki, while $\frac{3}{4}$ Barki $\frac{1}{4}$ Merino was superior in its wool production in quantity . Lately, $\frac{3}{4}$ Ossimi-$\frac{1}{4}$ Merino and $\frac{3}{4}$ Barki-$\frac{1}{4}$ Merino were tried as possible combinations for carpet wool production. This study, therefore, was carried out to evaluate the wool clip produced by these two grades of sheep.

Material and Methods

This investigation was carried out in 1975 at Sakha Animal Production Research Station of the Animal Production Research Institute, and included wool samples form the mid - right-side position of 23 $\frac{3}{4}$ Ossimi-$\frac{1}{4}$ Merino ewes($\frac{3}{4}$O), 12$\frac{3}{4}$ Barki-$\frac{1}{4}$ Merino ($\frac{3}{4}$B), and 15 ewes of each Merino (M), Ossimi (O) and Barki (B).All the ewes included were about 18 months old.

The wool samples taken from Ossimi and Barki ewes represented two 6-monthes growth periods adding up to one year while that of Merino represented 12-months growth. Samples from the crossbred ewes represented 298 days of growth and were corrected to 12- months growth period on acount of the daily growth rate. The wool samples were scoured and the percentage yield was calculated as suggested by Chapman (1960). Fibre diameter was measured according to the A.S.T.M. designation (1961). Fibre length was measured using the WIRA single fibre length measuring machine . Fibre strength was measured as suggested by Neumann (1970) while the breaking stress was calculated using the equation:

$$\text{Stress} = \frac{\text{Breaking strength in mg,}}{\text{Cross-sectional area of the fibre (mm}^2\text{)}}$$

Fibre types by count were determined using the benzol test of Elphic (1932). Statistical analysis was carried out according to Snedecor and Cochran (1973) Heterosis in wool characters was estimated as a percentage of the difference. between crossbred groups and the expected mean performances of the purebred grandparent groups.

Results and Discussion

Grease and clean fleece weights

Table 1 shows that Ossimi and Barki had light mean grease and clean fleece weights (1 64$\pm$0 21,1 33$\pm$0 21,1 39$\pm$0 18 and 1 12$\pm$0 19 kg, respectively with great variation among fleeces. In Barki the grease fleece weight ranged between 0 95 and 2 00 while the clean fleece weight ranged between 0 80 and 1 84 kg. In Ossimi the grease fleece weight ranged between 0 53 and 1 71 kg while the clean fleece weight ranged between 0 95 and 1 67 kg. Merino had a comparatively high mean grease fleece weight 3 01$\pm$0 44 kg with a relatively low clean fleece weight 1 55$\pm$0 17 kg. The $\frac{3}{4}$ B and $\frac{3}{4}$ O had mean grease fleece weights of 2 46$\pm$0 39 and 2 39$\pm$0 25 kg, respectively, which expressed in relatively high heterosis estimates over their grandparents, especially for the Ossimi cross (40 57 and 20 55%, respectively). These heterosis were even higher than that of Merino back crosses ($\frac{3}{4}$ M.O and $\frac{3}{4}$ M.B) in the same flock (Aboulnaga, unpublished data). However, most of the increase in the fleece weight of the studied crosses was in the grease in other fleece contaminants. Clean fleece weights of $\frac{3}{4}$ 0 and $\frac{3}{4}$ B were 1 39$\pm$0 15 and 1 30$\pm$0 14 kg, respectively. Heterosis percentage in clean fleece weight was only 2 80 and 5 90 for the

3 crosses, respectively. Consequently, the $\frac{3}{4}$ O did not attain any increase in clean fleece weight compared to the local Ossimi, while an increase of 16% was attained in the clean fleece weight of the $_4/^3$ B as compared to the Barki. This increase, however, was not significant (P 0 05). It was assumed therefore that Merino had little or no effect in increasing the wool output in its 25% blood crosses with Ossimi and Barki sheep. This result conforms with the findings of Amble and Malhotra (1968) who found that Rambouillet had no effect in ncreasing the clean fleece weight of its crosses with Ramour Bushair, the native Indian hairh sheep.

Yield and grease percentage

Both Ossimi and Barki had relatively high yields being: 69 7±5 45 and 71 8±4 20% respectively, while Merino had a lower yield 47.0±3 41% (Table 1). The $\frac{3}{4}$ B and the $\frac{3}{4}$ O both had low yields but significantly higher than Merino, although lower than their grandparents Barki and Ossimi.

The grease percentage was in a reverse trend to the yield in most cases since the high yielding groups had lower grease percentages in their fleeces. This is clear from Table 1, where Ossimi had the highest yield but the lowest grease content while Merino had the lowest yield with the highest grease percentage. Introduction of 25% Merino blood resulted in an increase in the grease percentage in the fleece of the crossbred offspring as compared to its local grandparent, this increase was significant in case of $\frac{3}{4}$ O.

Heterosis in grease percentage was negative for both $\frac{3}{4}$ B (-16 2%) and $_4/^3$ O (-4 9%). The grease percentage was markedly declined toward that of the coarse wool grandparent. This result is in accordance with the findings of Khan *et al.* (1968) and Mirajkar and Patil (1970).

Fibre diameter and length

Both $\frac{3}{4}$ O and $\frac{3}{4}$ B showed finer mean fibre diameters than their respective local grandparents, and their fineness were declined more towards the fine wool of Merino. This result might show the dominance of fineness in Merino as previously reported by Burns (1955). Seoudy (1966) reported similar results with Merino when crossed with Barki. Variability in fibre diameter was much similar in both $\frac{3}{4}$ O and $\frac{3}{4}$ B. This variability was higher than that of the pure Barki. Both $\frac{3}{4}$ O and $\frac{3}{4}$ B had almost similar mean fibre lengths although both of them had significantly less fibre length than its respective local grandparents . Variability in fibre length however was increased in $\frac{3}{4}$ O and $\frac{3}{4}$ B as compared to the respective Ossimi and Barki grandparents. The number of crimps per inch was increased in both $\frac{3}{4}$ O and $\frac{3}{4}$ B, the increase however was more pronounced in $\frac{3}{4}$ O as compared to the relatively low number of crimps exhibited by Ossimi (Table 2). The Merino, as a fine wool breed, seems to have also a dominant genetic effect increasing the number of crimps per inch in the wool of its offspring, since the number of crimps was almost similar in $\frac{3}{4}$ O and $\frac{3}{4}$ B in spite of their different genetic make up inherited from their local grandparents.

TABLE 1 Grease percentage, grease and clean fleece weights of the different breed groups.

Parameter	Barki	3/4 B	Merino	3/4 O	Ossimi
Crease fleecewt.kg	1.33±0.21	2.46±0.39	3.01±0.44	2.39±0.25	1.64±0.21
C.V.%	26.9%	23.6%	26.6%	24.7%	22.6%
Grease percentage	2.35±0.56	2.87±7.36	6.67±	2.61±0.74	1.43±0.53
C.V.%	31.2%	13.6%		34.0%	60.2%
Clean fleece wt.kg	1.12±0.19	1.30±0.14	1.55±0.17	1.39±0.15	1.39±0.18
C.V.%	29.7%	15.83%	20.4%	25.7%	24.6%

TABLE 2 Physical measurements means, coefficients of variations within fleeces and between individuals.

Parameter	Barki	3/4 B	Merino	3/4 O	Ossimi
Mean fiber diameter Mm.	34.6±2.40	28.2±1.84	21.5±0.94	24.2±1.71	32.4±1.51
C.V.% within fleeces	59.2%	36.9%	18.9%	35.9%	31.7%
C.V.% between animals	12.1%	8.2%	7.9%	15.1%	8.3%
Mean fiber length cm. . . .	16.4±1.22	12.6±1.33	10.0±0.80	12.9±0.94	17.6±1.54
C.V.% within fleeces	26.6%	32.4%	19.25%	35.8%	30.2%
C.V.% between animals	13.6%	16.6%	14.6%	15.6%	17.9%

Fibre types

The percentage of true wool fibres although high in all the breed groups studied, yet significant differences were detected between Merino (100% true wool) and all the other breed groups. Three-quarte Ossimi had a significantly higher true wool percentage than Ossimi (Table 3), contrarily, $\frac{3}{4}$ B hand lower but nonsignificant true wool percentage than Barki. A greater variability in true wool percentage was noticed in $\frac{3}{4}$ O compared to $\frac{3}{4}$ B, represented in the wide range lending the $\frac{3}{4}$ B to show more decline towards the fibre coarseness while the $\frac{3}{4}$ O showed more trend towards fibre fineness. Since the

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Medullation and kemp

Both Ossimi and Barki contained a small percentage of medullated (hair) fibres being 4·0±1·95 and 2·1±1·17, respectively (Table3). Merino, however, contained no hair fibres. As expected, the ¾ O and the ¾ B contained lower percentage of medullated fibres compared to their local purebed grandparents, this reduction in medullation was highly significant in ¾ O while it was not significant in ¾ B.

TABLE 3 Mean percentages of fiber types by count and their coefficients of variations.

Mean true wool fiber types	Barki	3/4B	Merino	3/4O	Ossimi
Mean true wool percentage . .	96.6±2.22	93.9±0.71	100±0.00	95.8±3.12	94.1±2.25
C.V.%	3.42	6.32	—	7.00	4.80
Mean medullated fibers% . .	2.1±1.17	1.6±1.13	nil	1.2±0.71	4.0±1.95
C.V.%	100.00	115.7	—	232.7	266.7
Mean kemp fibers%	0.9±0.75	4.3±3.06	nil	2.3±2.48	1.9±0.89
C.V.%	142.58	110.8	—	251.9	83.0
Coloured fibers% . . .	0.4±0.75	0.2±0.52	nil	0.8±0.84	nil
C.V.%	356.3	345.9	—	254.7	—

Although Ossimi contained higher percentage of kemp fibres than Barki, the ¾B contained a larger kemp percentage (4·3±3·06%) than ¾O (2·3±2·48%). Variations between fleeces, however, were greater in ¾O than in ¾B. This was expressed in the wider range (0·00 - 20·1) and higher C.V. 251·9% in the ¾O as compared to the ¾B (range 0·00 - 11·31 and C.V. 110·8%).

This result indicates that the incidence of kemp frequency was increased in Barki crosses while it decreased in Ossimi crosses. It worthy noted here that the present Barki flock had been imposed to selection against the persistancy of kemp in the flock. As the incidence of kemp is strongly inherited (Henderson, 1968) and is dependent on multiple genes action (Slee and Carter, 1962), it is reasonable to assume that both Ossimi and Barki are heterozygous for the multiple genes responsible for the expression of the character. Since Merino was free from kemp, it was expected that its crosses with either Ossimi or Barki would reduce the kemp percentage in theire offspring. On the contrary, however, the kemp percentage was increased. Similar results had been reported by Ghanem (1965) and Danarjan *et al.* (1972). Burns (1967) showed that Merino did not affect the central primary checking in its offspring with hairy sheep which in turn increased the proportion of kemp in $\frac{3}{4}$ Merino fleeces, while central checking occurred in the Wenslydalehairy sheep crossbred which had a reduced kemp percentage.

TABLE 4. **Mean fiber breaking stress,c.v. between fibers and animals and the coefficient of correlation between breaking strength and fiber cross-sectional area.**

Parameter	Barki	3/4 B	Merino	3/4 O.	Ossimi
Mean breaking stress g/Mm² . .	17.6±2.23	20.0±1.63	13.0±1.68	20.1±2.57	19.5±1.51
C.V.between fibers%	36.7	36.9	33.6	48.8	49.6
C.V. between animals% . . .	23.1	12.7	23.5	27.4	14.0
Correlations between strength and fiber cross-sectional area	0.768**±0.034	0.834**±0.020	0.482**±0.06	30.710**±0.025	0.786**±0.031

**= significant at $P < 0{\cdot}01$

Colored fibres

No coloured firbres were found in the fleece of Merino nor in the fleece of Ossimi. Barki, however, had a small mean percentage 0.4± 0.75. In both $\frac{3}{4}$ B and $\frac{3}{4}$ O small mean percentage of coloured fibres were found being 0.8±0.84 and 0.2±0.52, respectively (Table 3). It was clear therefore that the local sheep breeds contain genetic factors responsible for pignmentation although their fleeces may not show up any fleece colourations. This result is in agreement with that reported by Elsherbiny (1968).

Fibre breaking stress

Calculation of the fibre breaking stress revealed that both $\frac{3}{4}$ Band $\frac{3}{4}$ O had higher stress than their respective grandparents. The difference was highly significant in case of $\frac{3}{4}$ B while it was not signifiant in case of $\frac{3}{4}$ O. This result together with a heterosis of +21.97% and+12.56% for $\frac{3}{4}$ B, respectively reflect the presence of an overdominance exhibited by the local breeds especially the Barki over the Merino grandparent. This postulation has been previously suggested by Guirgis (1967) in Barki sheep. Palian and Bagaric (1959) also came to a similar conclusion when they crossed coarse wool sheep with Merino. No significant differences, however, were found between $\frac{3}{4}$O and $\frac{3}{4}$B in their fibre breaking stress, although greater variability in this respect was exhibited by $\frac{3}{4}$O relative to $\frac{3}{4}$B. A highly significant correlation was found between individual fibre breaking strength and its subsequent cross-sectional area within each breed group. The coefficient of correlation of both Merino (0.482) and $\frac{3}{4}$B (0 834) differed significantly from each other and from the other breed groups, while there was no significant differences between Ossimi, $\frac{3}{4}$O and Barki. The Barki. The relatively low correlation between diameter and fibre breaking strength in the Merino reflects a haserdous effect of weather on the Merino fleece. The tenderness in wool is caused primarily by nutritional factors manifesting their effect on the thining of fibre diameter (James, 1963), or else by climatic factors such as the solar radiation which does not affect the diameter but the cystine content of the fibres (McMahon and Speakman , 1941). The reduction in fibre diameter or the systine content of the fibre is accompanied by reduced breaking strength (Alexander, Hudson and Earland, 1963). In the later case, however, the reduction in cystine content is not accompanied by changes in fibre diameter hence, the correlation normally found between breaking strength and fibre diameter is impaired which might be the case noticed in Merino in the present study. If this proves to be true, pure breeding of Merino sheep under condition similar to these in this study, should be considered cautiously since it would produce unsound wool.

The weakeness of Merino wool might also be due to the effect of the hot climate on the fatty acids of the grease of the fleece. Weldsman (1966) stated that hot wether causes wool grease tool undergo auto-oxidation, thus increasing the acid content of the expense on the alcoholic fraction.

Conclusion

Introduction of Merino blood at a rate of 25% into the local sheep breeds did not significantly increase the wool output from either $\frac{3}{4}$O or the $\frac{3}{4}$B. This seems to be brought about by reduction in both fibre diameter and length. Greater variability in fibre diameter and length was shown in the $\frac{3}{4}$O as compared to the local Ossimi . Also greater variability in fibre length was shown in the $\frac{3}{4}$B as compared to Barki. Moreover, crossing with Merino increased the incidence of kemp which is an objectionable character in wool manufacture. The only character seems to be improved was the fibre breaking stress but even this improvement does not justify crossing with Merino since all the other wool characteristics were impaired. It seems therefore that Merino is not the suitable breed to be crossed with the local sheep for better wool for carpet production. The suggestion of Burns (1967) that crossing with one of the known long wool breeds *e.g.*, Romney Marsh or Lincoln might be worth consideration to increase the amount of wool produced by hairy sheep. Such long breeds are known to produce heavy but long coarse fleeces with relatively uniform fibre diameter. These sheep with central primary check should reduce if not eliminate the great amount of kemp fibres usually found in the Merino-local breed crosses. Meanwhile, such a cross between local sheep and long wool breeds should rapidly increase the fleece weight without impairing the carpet wool characteristics. The other alternative, however to improve the wool production is by selective breeding programmes among the local sheep, although it may take several generations to achieve some genetic progress.

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دراسة لتقييم صفات الصوف الطبيعية فى خلائط ٣/٤ أوسيمى و ٣/٤ برقى مع المرينو

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كلية الزراعة ، جامعة الأزهر

شملت هذه الدراسة تقييم انتاج الصوف وصفاته فى درجتين من درجات خلط اغنام الاوسيمى والبرقى المحليه مع اغنام المرينوهما ٣/٤ اوسيمى • ١/٤ مرينو و ٣/٤ برقى • ١/٤ مرينو •

لم يحقق أى من الخليطين زيادة معنوية فى وزن الجزه عن مقابلة المحلى وكان وزن الجزه فى خليط ٣/٤ برقى ١ر٣٠ ± ٠ر١٤ كجم مقابل ١ر١٢ ± ٠ر١٨ كجم للبرقى و ١ر٣٩ + ٠ر١٥ كجم لخليط ٣/٤ أوسيمى مقابل ١ر٣٩ + ٠ر١٨ كجم للأوسيمى •

أظهر قطر وطول الألياف نقصا معنويا فى كلا الخليطين عن الأغنام المحلية مما ساهم فى عدم تحقق أى زيادة فى وزن الصوف النظيف لهذه الخلائط عن الأغنام المحلية •

فزادت نسبة الصوف الميت فى جزات هذه الخلائط عن مقابلاتها المحلية مع وجود تباين كبير فيما بينها وكان ٣ر٢ + ٤٨ر٢٪ لخليط ٣/٤ برقى ، ٣ر٤ + ٠٦ر٣٪ لخليط ٣/٤ أوسيمى وفى نفس الوقت زادت نسبة الصوف الحقيقى حيث بلغت ٩٥ر٨ + ١٢ر٣٪ ، ٩٣ر٩ + ٧١ر٠٪ لكلا الخليطين على التوالى كما زادت متانة الألياف فى الصوف الخليط لتصبح ٠ر٢٠ + ١ر٦٣ جرام/مم٣ لخليط ٣/٤ برقى و ١ر٢٠ + ٢ر٥٧ جم /مم٢ لخليط ٣/٤ اوسيمى وكان الفرق بينها وبين الصوف المحلى معنويا فى حاله الأوسيمى •

وقد لوحظ أن معامل الارتباط بين متانة الالياف وقطر الليفه عند تقديره داخل أفراد كل نوع ذو معنوية عالية ولو أنه كان ينخفض بشكل واضح فى أغنام المرينو مما يمكن معه الاستدلال على أن للظروف الجوية المحلية بعض التاثير على المواصفات الميكانيكية لصوف المرينو المنتج محليا •