

A STUDY OF SOME BODY MEASUREMENTS IN A CROSS BETWEEN MERINO AND BARKI SHEEP LIVING UNDER DESERT CONDITIONS II-WEANING AND YEARLING MEASUREMENTS¹

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Under the semi-arid conditions prevailing in the northern strip of the Egyptian Western Desert, the early selection of lambs at weaning age, before the onset of the dry season, should help in solving the over-grazing problem in the region, and in saving the relatively expensive supplemental feeds. Selection at this age will be effective when considering those traits in which weaning performance is highly correlated with performance at yearling or later ages. Body weight and size may be considered as important criteria for selection at weaning age. The lamb performance at yearling or later ages may be predicted from these objective measurements obtained at weaning.

Numerous investigations have been carried out on weaning and yearling body weight and dimensions of sheep, as influenced by various factors including breed, sex, type of birth, age of dam, etc. However, studies on the correlation between weaning and yearling measurements are lacking.

Accordingly, the data reported in the first part of this series (Fahmy *et al*, 1964) were used to study body weight and dimensions at weaning and yearling ages and the correlations among them in Merino and Barki sheep, and their crossbred and backcross (MBxB) lambs.

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MATERIAL AND METHODS

Body weights and dimensions at weaning (16 weeks) and yearling ages (52 weeks) were obtained by interpolation among the data previously described by Fahmy *et al* (1964) on 106 single lambs of four breed groups (Merino, Barki, Merino Barki and Merino Barki \times Barki), raised at Ras El-Hekma Desert Research Station.

The analysis of variance in each of the various body measurements as affected by breed and sex was carried out according to Snedecor (1956), using the method of weighted means. Simple regressions and correlations among body measurements at weaning and yearling ages were also estimated, using the methods described by the same author.

RESULTS AND DISCUSSION

Weaning Measurements:

1. *Body Weight.*—At 16 weeks of age, there were significant differences in body weight among breed groups (Table 1). Bred differences have been similarly found to cause a significant effect on weaning weight by other authors including Hazel and Terrill (1946), Asker *et al* (1952), Ragab *et al* (1953), de Baca *et al* (1956), Harrington *et al* (1958) and Neville *et al* (1959).

As shown in Table 2, the backcross MBB and the cross-bred MB lambs were the heaviest at weaning (23.61 and 22.87 kg respectively). Hybrid vigour was evidently exhibited by both groups. The average weaning weight of Barki lambs was 21.80 kg, which compares favourably with the results obtained on Rahmani and Ossimi lambs of similar age under farm conditions by Badreldin (1951), Asker *et al* (1952), Ragab *et al* (1953) and Ghoneim *et al* (1957). Merino lambs, on the other hand, were the lightest group, their average weaning weight being 19.94 kg. Their poor performance is a result of their slow growth during the pre-weaning period (Fahmy *et al* 1964), and suggests their poor adaptability to desert conditions.

Sex difference constituted a highly significant source of variation in weaning weight of lambs, as shown in Table 1. Ram-lambs were heavier than ewe-lambs at weaning by 0.93,

TABLE 1.—Analysis of Variance in Body Measurements at Weaning (16 weeks)

Source of Variation	Degrees of Freedom	Mean Squares							
		Body Weight	Height at Withers	Height at Hook	Length	Depth at Chest	Width at Shoulder	Width at Hook	Circumference
Sex	1	120.91**	81.91**	102.06**	28.41**	10.93**	10.29**	4.54**	70.05*
Breed-group	3	51.44**	36.93**	26.30*	33.06**	14.58**	3.79*	1.95*	66.48**
Sex \times Breed	3	13.38	20.83*	10.49	8.77	1.73	1.15	0.73	15.63
Individual	98	8.28	6.50	6.93	3.61	1.22	0.99	0.50	10.37

* Significant at 5 % level.

** " " 1 % "

3.45, 1.58 and 4.03 kg in Barki, Merino, MB and MBB groups respectively. Sex difference at weaning was about 4.86 kg in Columbia and Targhee lambs (Hazel and Terrill, 1946) about 5.44 kg in Rahmani lambs (Ragab *et al*, 1953) and up to 6.7 kg in Polish long-wool sheep (Domanski, *et al*, 1959).

2. *Body Dimensions.*—The evidence for the presence of heterosis is shown by the fact that the two crosses, MB and MBB groups, surpassed both pure breeds in all body dimensions (Table 2). Barki lambs, however, did not differ from either crossbred groups significantly except in height at withers and hook and body length. On the other hand, Merino lambs were the lowest in all body dimensions, except length, in which they exceeded the Barki. These differences among the four breed groups are highly significant (Table 1) and reflect the parallel differences in their growth rates during the pre-weaning period, which were studied by Fahmy *et al*, (1964).

Barki lambs at weaning were of lower height at withers and body length, but greater heart girth than Ossimi and Rahmani lambs of similar age, as reported by Ragab *et al* (1953).

Male lambs had significantly greater body dimensions than females (Table 1). Ragab *et al* (1953) observed significant sex differences in body dimensions of Rahmani, but not of Ossimi lambs at weaning. The interaction between breed and sex was not significant in any measurement except height at withers. This was due to the fact that MB females exceeded males in this character. This finding may be due to sampling variation.

Yearling Measurements :

1. *Body Weight.*—At 52 weeks of age, there were still existing highly significant differences among breed groups in body weight (Table 3). Yearling Merinos were 7.5 to 9.4 kg lower than other groups in body weight (Table 2) which further shows the low adaptability of that breed to desert conditions. No significant difference existed among the other three groups. The average body weights of MBB, MB and Barki yearlings (38.40, 36.87 and 36.54 kg respectively) compare favourably with those reported by Badreldin (1951) in Ossimi and Rahmani sheep.

TABLE 2.—Average Body Measurements at Weaning and Yearling Ages and Their Ranges of Significance in the Four Breed Groups (Weighted mean difference test)

Measurement	Weaning				Yearling			
Body Weight, kg.	23.61 MBB	22.87 MB	21.80 B	19.94 M	38.40 MBB	36.87 MB	36.54 B	29.04 M
Height at Withers, cm.	53.44 MBB	52.23 MB	50.84 B	50.75 M	61.15 MBB	60.31 MB	58.51 B	56.10 M
Height of Hook, cm.	55.42 MBB	54.31 MB	53.19 B	53.15 M	64.03 MBB	63.02 MB	61.70 B	58.19 M
Length, cm.	46.26 MBB	46.00 MB	45.30 M	43.96 B	55.22 MBB	54.55 MB	53.26 B	52.04 M
Depth at Chest, cm.	23.82 MBB	23.33 MB	23.31 B	21.80 M	28.99 MBB	27.70 B	27.41 MB	25.09 M
Width at Shoulder, cm.	15.65 MB	15.30 MBB	15.30 B	14.70 M	19.14 MBB	18.82 MB	18.73 B	17.48 M
Width at Hook, cm.	12.44 MBB	12.38 MB	12.10 B	11.70 M	16.04 MBB	15.44 MB	15.26 B	14.03 M
Circumference, cm.	66.01 MBB	65.89 MB	64.61 B	62.25 M	87.59 MBB	86.92 MB	83.43 B	76.81 M

N.B. Means connected by the same line are not significantly different 5% level from each other.

Differences between the two sexes in yearling weight were highly significant (Table 3).

3.45, 1.58 and 4.03 kg in Barki, Merino, MB and MBB groups respectively. Sex difference at weaning was about 4.86 kg in Columbia and Targhee lambs (Hazel and Terrill, 1946) about 5.44 kg in Rahmani lambs (Ragab *et al*, 1953) and up to 6.7 kg in Polish long-wool sheep (Domanski, *et al*, 1959).

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Height of Hook, cm.	55.42 MBB	54.31 MB	53.19 B	53.15 M	64.03 MBB	63.02 MB	61.70 B	58.19 M
Length, cm.	46.26 MBB	46.00 MB	45.30 M	43.96 B	55.22 MBB	54.55 MB	53.26 B	52.04 M
Depth at Chest, cm.	23.82 MBB	23.33 MB	23.31 B	21.80 M	28.99 MBB	27.70 B	27.41 MB	25.09 M
Width at Shoulder, cm.	15.65 MB	15.30 MBB	15.30 B	14.70 M	19.14 MBB	18.82 MB	18.73 B	17.48 M
Width at Hook, cm.	12.44 MBB	12.38 MB	12.10 B	11.70 M	16.04 MBB	15.44 MB	15.26 B	14.03 M
Circumference, cm.	66.01 MBB	65.89 MB	64.61 B	62.25 M	87.59 MBB	86.92 MB	83.43 B	76.81 M

N.B. Means connected by the same line are not significantly different 5% level from each other.

Differences between the two sexes in yearling weight were highly significant (Table 3).

TABLE 3.—Analysis of Variance in Body Measurements at Yearling (52 weeks)

Source of Variation	Degrees of Freedom	Mean squares							
		Body Weight	Height at Withers	Height at Hook	Length	Depth at Chest	Width at Shoulder	Width at Hook	Circumference
Sex	1	690.3**	106.40**	118.50**	62.17**	38.71**	15.19**	3.7*	66.50
Breed-group	3	284.5**	95.36**	110.87**	36.41**	40.87**	9.89**	11.2**	429.50**
Sex X Breed	3	11.4	14.63	11.75	6.19	4.95	0.55	1.0	7.80
Individual	89	23.2	6.10	7.37	5.82	1.76	1.13	0.7	18.57

* Significant at 5% level.

**

1%

2. *Body Dimensions.*—Highly significant differences existed among breed groups in all dimensions studied (Table 3). The backcross MBB group exceeded the other three groups in all dimensions, and was followed by the crossbred MB, the Barki and finally the Merino groups, except in the case of depth at chest, in which Barkis slightly exceeded the MB lambs (Table 2).

In all dimensions except circumference, males significantly exceeded females (Table 3).

Correlation and Regression Estimates.

The correlation coefficients between body weight and each of four body dimensions : height at withers, length, depth at chest and circumference and between height at withers and length were calculated at weaning and yearling ages (Table 4), and were all found to be positive and highly significant. At weaning, body weight was more highly correlated with circumference than with the other three measurements, while at yearling age, body weight was more highly correlated with body length. The only exceptions were the Merino and the MBB groups at weaning, and the MBB group at yearling ages. Ragab *et al* (1953) similarly observed that heart-girth had the highest correlation with body weight.

Also, the regression coefficients of body weight on each of the four selected dimensions mentioned above were calculated at weaning and yearling ages and are presented in Table 4. They represent the change in body weight per centimeter change in each dimension.

The correlations between weaning and yearling measurements and the regressions of yearling on weaning measurements are shown in Table 5. The correlations are all positive and highly significant. These results show that yearling performance can be predicted at weaning, and selection for body measurements can be safely performed at about four months of age.

SUMMARY

Body weight and seven body dimensions of 106 single lambs of Barki, Merino, Merino Barki and Merino Barki x Barki breed groups, raised at Ras El-Hekma Desert Research station, were taken at weaning and yearling ages.

TABLE 4.—Regressions and Correlations of Some Body Measurements at Weaning and Yearling Ages

Measurements		Barki			Merino			M X B			M B X B		
Y	X	b	S _b	r	b	S _b	r	b	S _b	r	b	S _b	r
Weaning	Weaning												
Weight	height	0.77 ± 0.13		0.73	1.06 ± 0.26		0.72	0.65 ± 0.17		0.57	0.96 ± 0.11		0.90
"	length	1.25 ± 0.20		0.74	1.02 ± 0.13		0.89	1.11 ± 0.19		0.73	1.27 ± 0.28		0.74
"	depth	2.22 ± 0.30		0.80	2.40 ± 0.35		0.86	1.58 ± 0.40		0.58	2.22 ± 0.24		0.91
"	circumf.	0.78 ± 0.09		0.83	0.86 ± 0.12		0.87	0.75 ± 0.08		0.86	0.84 ± 0.10		0.89
length	height	0.43 ± 0.08		0.68	0.86 ± 0.24		0.67	0.49 ± 0.10		0.66	0.44 ± 0.10		0.71
Yearling	Yearling												
weight	height	1.17 ± 0.24		0.67	1.71 ± 0.49		0.68	1.37 ± 0.43		0.52	1.64 ± 0.22		0.88
"	length	2.09 ± 0.20		0.88	1.38 ± 0.21		0.86	1.43 ± 0.30		0.67	2.06 ± 0.27		0.88
"	depth	3.18 ± 0.41		0.82	2.34 ± 0.38		0.85	1.51 ± 0.51		0.49	3.20 ± 0.37		0.90
"	circumf.	1.05 ± 0.14		0.80	0.84 ± 0.23		0.69	0.70 ± 0.17		0.62	0.97 ± 0.26		0.67
length	height	0.50 ± 0.10		0.67	1.03 ± 0.32		0.65	0.73 ± 0.20		0.57	0.67 ± 0.11		0.84

N.B.—All "b" and "r" values are significant at 1% level.

TABLE 5.—Regressions and Correlations between Weaning and Yearling Measurements

Measurements		Barki			Merino			M X B			M B X B		
Y	X	b	S _b	r	b	S _b	r	b	S _b	r	b	S _b	r
Yearling	Weaning												
Weight	Weight	1.33 ± 0.23		0.72	1.21 ± 0.44		0.59*	1.27 ± 0.22		0.74°	1.36 ± 0.26		0.79
height	height	0.81 ± 0.12		0.76	0.82 ± 0.15		0.83	0.48 ± 0.11		0.42*	0.90 ± 0.10		0.91
length	length	0.90 ± 0.17		0.70	0.97 ± 0.24		0.83	0.67 ± 0.19		0.56	0.88 ± 0.27		0.62
depth	depth	0.83 ± 0.18		0.65	1.56 ± 0.34		0.77	0.74 ± 0.25		0.48	0.97 ± 0.17		0.82
circumf.	circumf.	0.94 ± 0.16		0.73	0.85 ± 0.32		0.58	0.80 ± 0.19		0.61	0.77 ± 0.20		0.68
Yearling	Yearling												
weight	height	1.07 ± 0.28		0.58	1.20° ± 0.59		0.48°	0.88* ± 0.34		0.44	1.54 ± 0.25		0.84
"	length	2.07 ± 0.42		0.67	1.53 ± 0.40		0.72	1.48 ± 0.40		0.57	2.12 ± 0.62		0.64
"	depth	2.82 ± 0.75		0.57	3.86 ± 1.06		0.70	2.74 ± 0.77		0.56	2.85 ± 0.75		0.68
"	circumf.	1.00 ± 0.25		0.59	1.13 ± 0.37		0.63	0.94 ± 0.22		0.64	1.02 ± 0.31		0.63

All b and r values are significant at 1% level except those with (°), non significant and (*), significant at 5% level.

Statistical analysis showed significant differences among breed groups and between sexes at both ages. Hybrid vigour was shown by the two crossbred groups, while the Merino group was the poorest in all measurements.

High, positive and highly significant correlations were obtained between different measurements at the same age and between the two ages studied. It was concluded that selection for body measurement can be safely performed at weaning time. Regression coefficients among some body measurements were also calculated.

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