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The Influence of Pregnancy and Lactation on Merino Wool Production.

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Introduction.

The wool farmer is aware that the fineness of the fleeces of merino ewes is influenced by the suckling of lambs and that the basal metabolism of the merino sheep is greatly affected during pregnancy and lactation. In discussing the basal metabolism of Australian merino sheep, Lines and Peirce (1931) conclude that pregnancy did not appear to increase the metabolism up to a time when three-fifths of the normal term had elapsed. Duerden, Bosman and Botha (1931), while comparing the influence of wool fineness of a phosphorus sufficient diet with that of a phosphorus deficient diet, conclude that a finer fibre is grown during the lactation period than during the period of gestation. In the latter experiment the sheep were stall-fed and the lambs were weaned from their mothers three weeks after birth. In practice, however, the merino lamb is usually weaned at the age of four months, the longer suckling period influencing the basal metabolism and wool growth differently from that shown in the latter experiment. Since the influence of pregnancy and lactation on merino wool under farming conditions has not been recorded in South Africa, such a study is here described where the sheep were maintained in the Karroo, this area constituting the largest portion of the Union's wool producing country.

Material.

Wool samples of twelve months growth were taken from the shoulder regions of twenty-six merino stud ewes that were maintained at the Grootfontein School of Agriculture which is the centre of the Karroo area. Accurate records as regards shearing, service by rams and lambing were kept, and it was possible to identify the zones in the staple that correspond to the periods of pregnancy and lactation. Thirteen of the ewes lambed and the remainder served as controls. The ewes with lambs were placed on slightly better pasturage after lambing, in accordance with general farming practice. Otherwise all the sheep received similar treatment.

TABLE 1.

Comparison of Fibre Fineness between Pregnancy and Lactation and Normal Growth of Merino Ewes.

Ewe No.	Ewes with lambs.				Difference (Percent.).	Ewe No.	Ewes without lambs.				Difference (Percent.).
	Pregnancy period.		Lactation period.				Upper growth.		Lower growth.		
	Fibre thickness in μ. (Mean of 250 fibres.)	Quality number.	Fibre thickness in μ. (Mean of 250 fibres.)	Quality number.			Fibre thickness in μ. (Mean of 250 fibres.)	Quality number.	Fibre thickness in μ. (Mean of 250 fibres.)	Quality number.	
1	19·68 ± ·13	66's	18·49 ± ·11	70's	−11·7	5	20·14 ± ·13	64's	21·07 ± ·14	64's	+ 9·4
3	19·36 ± ·16	66's	18·14 ± ·13	70's	−13·6	6	17·30 ± ·13	80's	17·62 ± ·12	80's	not significant
4	19·53 ± ·10	66's	19·74 ± ·10	66's	not significant	8	19·78 ± ·11	66's	20·87 ± ·11	64's	+11·3
7	21·32 ± ·14	64's	19·89 ± ·12	66's	−12·9	10	20·51 ± ·14	64's	21·01 ± ·15	64's	not significant
9	20·31 ± ·16	60's	18·27 ± ·13	70's	−19·1	11	20·25 ± ·14	64's	20·99 ± ·12	64's	+ 7·4
12	21·09 ± ·18	64's	21·87 ± ·16	64's	+ 7·5	15	21·33 ± ·15	60's	22·02 ± ·13	60's	+ 6·6
13	19·84 ± ·12	66's	18·05 ± ·11	70's	−17·2	16	20·78 ± ·14	64's	21·04 ± ·13	64's	not significant
14	21·83 ± ·14	60's	19·62 ± ·14	66's	−19·2	17	22·15 ± ·12	60's	22·46 ± ·13	60's	,,
20	17·67 ± ·11	80's	16·50 ± ·11	90's	−12·8	19	20·08 ± ·16	64's	20·45 ± ·13	64's	,,
22	17·64 ± ·12	80's	16·22 ± ·11	90's	−15·4	23	21·80 ± ·15	64's	22·50 ± ·15	60's	+ 6·5
24	21·02 ± ·16	64's	20·44 ± ·15	64's	not significant	25	19·51 ± ·14	66's	21·72 ± ·14	64's	+23·9
29	19·27 ± ·16	66's	16·78 ± ·12	90's	−24·2	26	19·22 ± ·16	66's	19·33 ± ·16	66's	not significant
30	23·95 ± ·17	58's	21·19 ± ·14	64's	−21·7	27	20·98 ± ·13	64's	21·51 ± ·12	60's	+ 5·1
Mean	20·19 ± ·04	64's	18·86 ± ·04	70's	−12·7	Mean	20·29 ± ·04	64's	20·97 ± ·04	64's	+ 6·8

Methods.

A fibre analysis of each sample was made at two regions along the staple corresponding to the growth periods of pregnancy and lactation. Similar zones were taken from the staples of the dry ewes.

The method of fibre sampling and measurement and also the standards of classification into quality numbers, were those established by Duerden (1929). The mean fibre thickness was based on the measurement of 250 fibres selected at random from each zone of sampling.

Experimental Results.

The fibre fineness and quality numbers of the analysis are summarised in table form (Table I). On the left-hand side of the table are given the results from the ewes with lambs and a distinction is made between the periods of pregnancy and lactation. On the right-hand side of the table are given the ewes without lambs and the upper and lower growths of the staples, corresponding to the growth periods of lactation and gestation respectively are distinguished.

In general the fibre measurements and quality numbers are finer during lactation than during gestation, except in sheep numbers 4 and 24, where this difference is not significant as is shown by the probable errors of the mean. In sheep number 12 there was an increase of 7·5 per cent. in fibre thickness.

The ewes with lambs show a refining varying from 11·7 to 24·2 per cent., the difference being based on the cross-sectional areas of the fibres.

As regards quality numbers the differences between regions are summarised as follows:—

A 58's quality number was refined to a 64's quality number.

A 60's quality number was refined to a 66's or a 70's quality number.

A 64's quality number was refined to a 66's quality number.

A 66's quality number was refined to a 70's or a 90's quality number.

A 80's quality number was refined to a 90's quality number.

When the group of ewes with lambs was considered as a whole, a mean fibre fineness of 20·9μ or a 64's quality number was recorded during pregnancy. During lactation this was refined to 18·86μ or a 70's quality number showing a reduction in fibre thickness of 12·7 per cent.

In the ewes without lambs, the upper and lower growths were not significantly different in some individuals, in others there was a slight increase in fibre fineness.

When the group of dry ewes is considered as a whole, the upper growth, corresponding to the pregnancy period of the ewes with lambs, measured 20·29μ or a 64's quality number. The lower growth, corresponding to the lactation period of the ewes with lambs, showed an increase in fibre thickness of 6·8 per cent. over the upper growth and measured 20·97μ or a 64's quality number. Presumably the lower growth of the dry ewes was produced under more favourable conditions of pasturage.

The pregnant ewes and the dry ewes were run in the same flock and received the same treatment, and the wool of the two groups did not differ significantly. During the pregnancy period the ewes with lambs averaged 20·19 $\pm$ ·04μ and the dry ewes 20·29 $\pm$ 0·4μ. The probable errors calculated on 3,250 fibres that were measured in each group, showed no significant difference in fineness between the two groups. The shearings of the previous year similarly showed no difference between the two groups and it can, therefore, be assumed that a 64's quality number was in this respect the normal growth.

The lower growth of the dry ewes showed an increase of 6·8 per cent. over the upper growth and showed an increase over the fineness of the pregnant ewes, and was due to improved pasturage of the Karroo veld during the time. Due to this, it can be concluded that lactation had a greater influence on wool fineness than is indicated by the results obtained from the ewes with lambs. If the lower growth of the dry ewes is considered as the control then the decrease in fineness due to lactation was from 20·97μ to 18·97μ or a decrease of 19·1 per cent.

Conclusions.

Pregnancy does not influence merino wool fineness, but during lactation when the lambs are suckled, a finer quality number is produced. A staple of wool from lambing ewes, will, therefore, show no difference between the five months growth produced during pregnancy and that produced normally. The four months growth produced during lactation will be finer than either the normal growth or that grown during pregnancy.

The variation in fineness along the staple in lambing ewes is of importance to the merino judge and the breeder since an allowance is necessary for the change in fineness due to lactation. Not only is there a difference in fibre fineness between the two regions of pregnancy and lactation but also a difference in fleece density, since a reduction in fibre fineness influences the compactness of the fleece. The author (1934) has shown that the compactness of the merino fleece is dependant on the number of fibres growing per unit area of skin and their fineness. When the fineness is reduced, the degree of compactness is also reduced.

An analysis of the number of fibres grown per unit area on these ewes was available and a comparison of the reduction in fleece density, due to the refining of the fibre, is made in Table II.

TABLE II.

A Summary showing the Reduction in Fleece Density and in Scoured Fleece Weights due to Lactation and the Suckling of Lambs.

1. Sheep No.	2. Number of fibres grown per square inch	3. Pregnancy period. Quality number.	4. Pregnancy period. Fleece density as percent. skin area.	5. Lactation period. Quality number.	6. Lactation period. Fleece density as percent. skin area.	7. Percentage reduction in fleece density.	8. Reduction in scoured fleece weight (pounds) due to reduction in fibre fineness (4 months gestation).
30	39,300	58's	2·83	64's	2·05	27·5	·7
14	47,700	60's	2·85	66's	2·20	22·8	·6
9	41,700	60's	2·48	70's	1·72	30·6	·7
7	45,100	64's	2·34	66's	2·06	11·8	·3
3	59,700	66's	2·75	70's	2·45	10·9	·3
29	45,600	66's	2·12	90's	1·53	27·8	·6
22	67,900	80's	2·50	90's	2·28	8·8	·3

In the fourth and sixth columns of the table the fleece density, which is expressed as per cent. skin area, is shown to be appreciably diminished during the lactation period when compared with the period of pregnancy. For example, it is shown that sheep number 30 was reduced in fleece density from 2·83 per cent. to 2·05 per cent. Number 9 was reduced from 2·48 to 1·72 per cent. The percentage reduction in fleece density is shown in the seventh column and ranges from 8·8 to 30·6 per cent. which indicates an appreciable reduction in fleece density from the practical sheep judge's point of view.

A reduction in fibre fineness is also responsible for a reduction in the weight of the scoured fleece. In Table II this figure, obtained by using the Merino Slide Rule (Bosman, 1933) on the experimental results is shown in the last column, and ranges from ·3 to ·7 pounds in the scoured state.

The change in fibre fineness produced by lactation is a factor to be considered where the fleece characteristics of the merino are studied from a genetic aspect. A clear distinction is necessary between the zone produced during pregnancy and that produced during lactation, the former resembling the normal growth more than the latter.

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Summary.

A comparison is made of the influence of pregnancy and lactation on two groups of merino stud ewes maintained under farming conditions in the Karroo.

Pregnancy does not influence the fibre fineness of merino wool significantly.

Lactation and the suckling of lambs influences the fibre fineness of merino wool. The reduction in fineness ranged from 11·7 to 25·9 per cent. in individuals. The reduction of fineness for the group was 12·7 per cent.

Lactation reduced fibre fineness by one, two or three quality numbers.

The fleece density or compactness of the fleece is reduced by 8·8 to 30·6 per cent. due to the refining of the fibre during lactation and the suckling of lambs.

The scoured fleece weights are reduced by ·3 to ·7 pounds during the period of lactation and the suckling of lambs.

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