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The Seasonal Influence on Merino Wool Production.

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THE fleece of the Merino sheep, unlike that of many other domestic mammals in which winter and summer changes take place, grows continuously from month to month and from year to year.

In the horse, cow, and donkey, seasonal variations occur (Duerden and Whitnall, 1931). Among the ovidae, seasonal shedding takes place in *Ovis ammon poli* (Crew, 1921), the Blackhead Persian (Boyd, 1927), the Aoodad and Mouflon sheep (Duerden and Seale, 1927), the Welsh Mountain sheep (Roberts, 1926), and the British mountain breeds (Duerden, 1927, 1929), all these being representative of the more primitive type of coat.

The Merino sheep, however, with its specialized fleece, has lost the power of seasonal shedding and, unlike its ancestors, has continuously growing follicles. Even though no shedding takes place, it is of interest to know whether its fleece is influenced by seasonal changes, and an analysis is outlined of the winter and summer growths of three Merino wethers that were maintained at the Grootfontein School of Agriculture, Middelburg, Cape, where extreme winter and summer climatic variations occur. Since a change in nutrition has a marked influence on Merino wool growth (Maré and Bosman, 1934), the experimental sheep were stall-fed.

MATERIAL AND METHODS.

The material for study was obtained from three forty-months-old Merino wethers which from birth were stall-fed on a balanced ration and were never shorn. The changes in winter and summer pasturage were thus eliminated, and it was possible to study the same staple of wool for consecutive seasons for three years, and also to compare the yearly growth for the first three years of the sheep's life.

The staples from the sheep were approximately twenty-five centimeters or ten inches in staple length. The first seven months' growth of the staple was not taken into account, since this portion, representing the coat of the lamb, is not comparable with the fleece grown by the adult merino (Botha, 1930). The remainder of each staple was divided into cuttings corresponding to the winter and summer growths. The guide for identifying the regions was obtained from

clippings taken at monthly intervals and used subsequently in a study of the monthly rate of growth. It was thus possible to identify accurately the seasonal and yearly growths in the same staple and to determine any changes in the regions.

The cuttings of the winter and summer growths that were in the greasy state were scoured by the benzene-saponin method (Miller and Bryant, 1932), and dried to constant weight in regain bottles (Barrit and King, 1926). The dry weights are summarized in Table 1. An estimate of the number of fibres in each cutting was made and the fibre fineness calculated. The method is similar to that used by Roberts (1927) for estimating fibre fineness, and takes into account the mean cross-sectional area of the fibres.

The Seasonal Changes in the Karroo.

In the Karroo there are varying factors that influence climate, such as temperature, humidity, sunshine, wind, etc. Meteorological observations for temperature, rainfall, sunshine, and wind at the Grootfontein School of Agriculture were available, and each of these shows seasonal variations as summarized in Table 1.

Table 1.—The Wool Analyses of Winter and Summer Growth of Three Merino Sheep that were Never Shorn and the Seasonal Meteorological Records at the Grootfontein School of Agriculture, Middelburg, Cape.

	Winter, 1931.	Summer, 1931/32.	Winter, 1932.	Summer, 1932/33.	Winter, 1933.	Summer. 1933/34.
Sheep No. 1.						
Dry weight (gms.).....	·4260	·4288	·4291	·4253	·4285	·4265
Fibre fineness (μ).....	20·8	20·9	20·9	20·7	20·9	20·8
Sheep No. 2.						
Dry weight (gms.).....	·3978	·3959	·3988	·3975	·3984	·3960
Fibre fineness (μ).....	18·7	18·6	18·7	18·7	18·7	18·6
Sheep No. 3.						
Dry weight (gms.).....	·4455	·4480	·4472	·4450	·4463	·4485
Fibre fineness (μ).....	18·1	18·2	18·1	18·1	18·1	18·2
Meteorological Records at Grootfontein (Averages).						
Maximum (degrees F.)....	62·7	83·7	64·7	84·9	63·0	77·9
Minimum (degrees F.)....	33·5	53·1	36·5	51·6	31·3	53·3
Sunshine, hours.....	8·0	11·2	8·5	11·1	8·2	9·2
Rainfall (inches).....	3·21	6·60	1·08	3·32	·82	12·5
Wind (miles per hour)....	3·5	3·6	4·2	3·5	5·0	2·9

As regards temperature, an extreme variation, typical of the Karroo, is shown. The four winter months of May, June, July, and August were regarded as the coldest period against the four summer months of November, December, January, and February, which constitute the hottest period of the year. Although the average maximum

and minimum temperatures in the table vary from 31·1° F. to 84·9° F., larger individual variations were recorded and the maximum often reached 90° F. in the shade and the minimum temperature as low as 15° F. or 17 degrees of frost.

As regards sunshine, the meteorological observations show a seasonal variation of from 8·0 to 11·2 in sunshine hours. This figure, however, does not indicate the intensity of the sunlight, but records concerning the latter were not available.

Observations on rainfall for the same four-monthly periods show a variation of from 1·08 inches to 12·5 inches. Rainfall influences the nutritional value of the pasturage, but in this case the sheep were stall-fed, and the rainfall therefore does not have the same influence on wool growth as when the animals are run on the veld.

As regards wind force, the winter months of 1932 and 1933 show a higher rate per hour than the summer months of these years. Although the average of the wind force is not higher than five miles per hour, twenty miles per hour was frequently recorded.

The variations in the seasonal factors are shown to be appreciable, and whether these factors have an influence on Merino wool production has been a controversial topic among wool farmers.

Experimental Results.

The wool analyses of the experiment are summarized in Table 1. As regards the dry weights of the wool cuttings, there is no significant difference between the consecutive seasons or between the consecutive years, the difference shown being well within experimental error. As regards fibre fineness no difference is shown between the winter and summer growths, nor between the yearly growths. It must therefore be concluded that *the seasons have no influence on wool fineness in the Karroo, provided the feed is kept constant.* There is also no difference in fibre fineness from year to year for the first three years under similar conditions of feed. (The lamb's coat representing the first seven months of growth being disregarded.)

Conclusion.

The Merino sheep does not show seasonal changes in wool fineness in a varying Karroo climate provided the feed is kept constant.

As regards length, several workers have shown that the rate of growth is constant from month to month (Burns, 1931; Fraser, 1931) and from year to year (Duerden and Maré, 1931) if the feed is kept constant. It follows, therefore, that in the Karroo at least there is no seasonal influence on the dimensional attributes of fineness and length which affect the volume of wool produced by Merino sheep, provided the nutrition is not changed.

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REFERENCES.

BARRIT, J., AND KING, A. T. (1926). The Sulphur Content of Wool. *Jnl. Text. Inst.*, Vol. 17, pp. T.386-395.

BOTHA, P. S. (1930). The Transformation of the Birth Coat of Merino into Fleece of the Adult. A Thesis for the M.Sc. degree to the University of S.A. (not published).

BOYD, EVELYN (1927). The Primitive Coat of the Blackhead Persian. *S.A. Jnl. Sci.*, Vol. 24.

BURNS, R. H. (1931). Monthly Wool Growth of Rambouillet Ewes. *Jnl. Text. Inst.*, Vol. 22, No. 2, pp. T.98-109.

CREW, F. A. E. (1921). On the Fleeces of Certain Primitive Species of Sheep. *Ann. Appl. Biol.*, Vol. 8, pp. 164-169.

DUERDEN, J. E., AND SEALE, P. M. (1927). The Ancestral Covering of Sheep. *S.A. Jnl. of Sci.*, Vol. 24, pp. 421-422.

DUERDEN, J. E. (1927). Studies on Sheep and Wool. *Science Bull.* No. 59, Dept. of Agriculture, Union of S.A.

DUERDEN, J. E. (1929). The Zoology of the Fleece of the Sheep. *S.A. Jnl. Sci.*, Vol. 26, pp. 459-469.

DUERDEN, J. E., AND WHITNALL, A. B. M. (1930). Seasonal Variation in the Coat of Some Domestic Mammals. *S.A. Jnl. Sci.*, Vol. 27, pp. 521-545.

DUERDEN, J. E., AND MARÉ, G. S. (1931). Rates of Growth of Merino Wool Month by Month. *17th Rept. Dir. of Vet. Serv. and Anim. Indust.*, Onderstepoort, pp. 807-811.

FRASER, K. M. (1931). The Rate of Growth of a South Australian Fleece. *Jnl. Council for Sci. and Indust. Res.* (Nov.).

MARÉ, G. S., AND BOSMAN, V. (1934). The Influence of Feed on the Merino Sheep. *Onderstepoort Jnl. Vet. Sci. and Anim. Indust.*, Vol. 3, No. 1, pp. 199-210.

MILLER, WM. C., AND BRYANT, D. M. (1932). An Apparatus for Scouring Small Samples of Wool and a Modified Apparatus for Determining Dry Weights. *Jnl. Text. Inst.*, Vol. 23, pp. T.267-T.273.

ROBERTS, J. A. FRASER (1926). Kemp in the Fleece of the Welsh Mountain. *Jnl. Text. Inst.*, Vol. 17, pp. 1274-1290.

ROBERTS, J. A. FRASER (1927). A New Method for the Determination of Fineness of Wool and of the Fleece. *Jnl. Text. Inst.*, Vol. 18, pp. T.48-54.