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VARIATION IN FIBRE AND MEDULLA DIAMETER OF SUMMER AND WINTER CLIP OF HASHTNAGRI BREED

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Abstract. Studies on the true and medullated fibres of the autumn and spring shearing clips of Hashtnagri breed were carried out keeping in view the effects ot pasture variation, temperature fluctuation and other climatic conditions. The possible influence of these factors on the fibre diameter and medulla variation were discussed. The relationship of fibre diameter with the temperature and nutrition is discussed in detail.

In Pakistan shearing is done twice a year, once in April (spring shearing) and the other in October (autumn shearing). The spring sheared wool is mainly grown in the winter months, i.e. from November to March, while the autumn sheared wool grows in the summer months, viz. from April to September. The total wool production is about 40 million lb. out of which 55% is obtained in the autumn clip and the rest is obtained from spring clip.[1] The variation in these two shearing seasons is very large. In most areas, the maximum temperature rises up to 118°F in summer and drops to 52°F. in winter.

Apart from the effect of temperature, other factors such as nutrition, length of days, humidity and rain may also affect the quality of wool. In summer, usually the pasture conditions are good and the sheep get more time for grazing while in winter the sheep do not get much nutrition except in spring. Moreover, during this period the days are short and often rain prevents the sheep from grazing.

Hashtnagri breed was selected due to the fact that extreme climatic conditions prevail in the area where the sheep is reared. Moreover, it is a typical carpet wool breed and this study will help in finding the difference in quality of the wool grown in the two shearing seasons. This study will also help in adopting a suitable classing system in the country as the two sheared wools become mixed.

The present study was undertaken to find out the difference in fibre diameter and medulla diameter of the two shearing seasons of Hashtnagri breed. The possible causes of these variation including the effect of temperature, nutrition, day length and rain were discussed in detail.

Materials and Methods

Wool Samples

The wool samples were obtained from Hashtnagri sheep kept in a sheep farm at these Laboratories. The sheep were sheared on 16 April 1970 which represents the shearing period from 14 October 1969 to 15 April 1970. The wool samples were taken from each sheep from the midside and these samples are called spring sheared wool. The sheep were again sheared on 16 October 1970 which shows the growth of wool from 16 April 1970 to 16 October 1970. The wool samples were taken from the same sheep of the same area (midside) and these samples are called autumn sheared wool. Ordinary scissors were used for shearing. Ten samples each of autumn and Spring season were obtained. The samples were cleaned with petroleum ether and then with alcohol followed by water and the following studies were made on these wools.

Medullation. Medullated and true fibres were separated from the spring and autumn samples by benzene method as described elsewhere.[2]

Diameter; Measurements. Ten medullated fibres from each sample were withdrawn at random for determination of fibre and medulla diameter. Each fibre was mounted on slide using glycerine and covered with a coverslip. The fibre diameter and the corresponding medulla diameter were recorded at an interval of 0.5 mm by using a lanameter[3] at a magnification of ×500. The direction of the fibre was so m maintained that the tip portion was subjected first followed by middle and root end of the fibre. The mean of each fibre was so adjusted that it give 46 readings. It was assumed that each reading corresponds to the fibre growth of fourth day. The reading as plotted in Fig. 1 and 2 are just arbitrary divisions of the whole fibres. The mean of the ten fibres of each sample was found. The same procedure was adopted for finding the diameter of true wool fibres.

Temperature. Maximum and minimum emperatures were recorded daily at 5 p.m. between 16 October 1969 October 1970, i.e. the period of growth of the wool fibre of spring and autumn shearings.

Seasonal Conditions. Peshawar area, which is the home track of the Hashtnagri breed and where the present study has seen carried out, gets abundant rainfall during March and April while July, August and September are often dry. The month of October and November following this dry spell, often get appreciable rainfall. The month of December usually gets no rainfall while the following months of the winter season, i.e. January and February get sufficient rainfall. This is the normal course of seasonal variation during the year.

Pasture Conditions. The period between 15 March 15 May is the period of abundant pasture. This period is not only marked for the amount of green pasture

but also is known for the quality of pastures. The pasture conditions sometimes remain good up to mid June because of the late rainfall in spring. From June onwards the pasture conditions gradually start declining with the result that during the months of August and September the pasture conditions become poor. The following months, i.e. October and November, are again the months of good pasture. This is followed by the drought period of the December, January and February.

During this study, the sheep were kept on natural grazing throughout the year except during the months of December, January, and February. During these winter months besides natural grazing, dried pasture of various quality were fed to them in pans. Besides the dry pasture, wheat chaff, green barley and cotton seed cakes were also fed as a supplement food. This is the normal course of grazing and supplement feeding during the year in the region where the study has been carried out.

Results and Discussion

Table 1 presents data on the average fibre diameter and corresponding medulla diameter of the summer and winter shearing lots.

Comparing the average diameter and medulla diameter of the autumn and spring lots of shearing, it can easily be concluded that average diameter variation of the autumn fibres are considerably greater than the fibres of the spring clip. The average dia meter of autumn clip ranges between 67.8 - 104.4 u, while the range of diameter of the (spring clip) is between 58.5 - 96.0μ. This is clearly in conformity with the established fact that the fibres are finer in winter than in the summer.[4] This fact is also clear by comparing the average diameter of individual sheep in the autumn columns with the spring columns. The mean diameter of sheep no. 18, 20, 27, 40, 42, 59 and 64 in the autumn columns are greater than the mean diameter of the corresponding sheep in the spring columns. Similarly the corresponding mean medulla diameter of the autumn clip are greater than the average medulla of the spring clip. The average diameter and medulla diameter of sheep no. 8 and 66 are showing reverse trend, which may be the result of late seasonal mating and utimately the late pregnancy and lactation.

The results in table 2 illustrate the diameter variation of the true fibres during the autumn and spring periods. Unlike medullated fibres the diameter variation of true fibres, here is not very high. The range of diameter during the autumn period is between 19.0 - 25.0μ while in spring, the variation ranges between 14.8 - 20.5 u. This shows that the variation of diameter of true fibres during the autumn and spring is comparatively small. The fibres of spring lots are finer than the fibres of the autumn lot. Comparison of the April and October lots of the average diameter of each sheep reveals that the average diameter listed in autumn column I against each sheep is higher than those recorded in the April column. This again is

TABLE 2. COMPARISON OF THE MEAN DIAMETER OF TRUE FIBRES OBTAINED FROM THE SPRING AND AUTUMN CLIPS OF HASHTNAGRI BREED.

Sheep	Spring-sheared	Autumn-sheared(
8	18.4	23.2
18	15.1	20.8
20	20.5	23.9
27	16.9	20.5
40	19.7	22.2
42	14.8	25.0
59	18.6	21.1
60	15.8	19.0
64	19.6	23.9
66	19.7	23.7
Mean	17.91	22.3

TABLE 2. COMPARISON OF THE MEAN DIAMETER OF FRUE FIBRES OBTAINED FROM THE SPRING AND AUTUMN CLIPS OF HASHTNAGRI BREED.

Sheep	Spring-sheared	Autumn-sheared
8	18.4	23.2
18	15.1	20.8
20	20.5	23.9
27	16.9	20.5
40	19.7	22.2
42	14.8	25.0
59	18.6	21.1
60	15.8	23.9
64	19.6	23.9
66	19.7	23.7
Mean	17.91	22.3

TABLE 3. MEAN MAXIMUM AND MINIMUM TEMPERATURE OF THE PERIOD 16 OCTOBER 1969 15 OCTOBER, 1970.

Period	Min. temp. (F)	Max. temp. (F)
16—31 October	61.4	83.2
1 —15 November	57.3	77.2
16—30 November	44.0	73.0
1 —15 December	42.0	70.4
16—31 December	39.7	68.0
1 —15 January	41.0	65.0
16—31 January	41.5	61.7
1 —15 February	41.5	69.6
16—28 February	47.6	68.0
1 —15 March	49.1	68.1
16—31 March	54.3	77.8
1 —15 April	61.6	90.5
16—30 April	65.5	93.0
1 —15 May	70.1	96.8
16—31 May	75.4	103.5
1 —15 June	79.2	105.1
16—30 June	82.4	105.1
1 —15 July	80.5	101.0
1 —15 August	79.8	98.9
16—31 August	80.0	95.1
1 —15 September	77.3	92.1
16—30 September	70.2	93.2
1 —15 October	69.0	90.9

in keeping with the findings of Ryder[6] that there is marked difference in length and diameter of the autumn (summer) and spring (winter) fibres.

Table 3 shows the half monthly average of the minimum and maximum temperatures between the period 16 October to 15 April which is also the period of spring growth of wool fibres. Similarly the half monthly average maximum and minimum temperature of the period of autumn growth of wool fibres, i.e. 16 April to 15 October are given in Table 3. Both these tables indicate great fluctuation in the temperatur of spring and autumn period. The temperature variation are more marked from the temperature curves of Fig. 1 and 2 where the average maximum temperature of two consecutive days is plotted. The sudden increase and decrease in the temperature, as evident from curves I and II, is due to climatic changes. It, is therefore, clear that the climatic variations which may be the result of clouds, thunder storm and rain are substantially high in this region. The pattern of these changes is not constant for every year. It is, therefore, important to mention here that the results reported in this communication are strictly applicable for the year 1970. The authors are of the opinion that study on a paticular breed for a single year cannot be generalised for the whole time unless an average result of at least 10 years study on a single breed is reported.[7]

It is evident from Fig. 1 that there is a direct relationship between temperature and fibre diameter. As the temperature rises from mid-April to mid-May, the fibre diameter also rises during the same period. Then from 15 May to 15 June with the slight decrease of temperature the fibre diameter shows gradual decline, then again from July to October with the declining temperature the fibre diameter also decreases.

The effect of nutrition on the wool growth and consequently on the diameter variation is an established fact.[8] Considering the average diameter curve in Fig. I, in the light of pasture variation between the period 16 April - 14 October, it is indicated that the maximum fibre diameter lies in the month of May which is also the period of abundant pasture of numerous variaties. The pasture are at maximum during this period of the year. Thereafter up to 1 July continuous decrease in diameter starts. Pasture conditions are also declining during this period as the green pasture of spring reaches to seeding stage after mid May and then it slowly starts decreasing. From the diameter curve it can easily be understood that the fibre diameter becomes constant in the months of August and September. The situation of pasture availability in this period is relatively poor. This is also the severe period of the summer months with highest humidity resulting in the less grazing time. From 1st October the upward trend of fibre diameter again starts as the pasture situation during the last September and early November is again improving.

Figure 2 represents the average trend of fibre diameter variation against the temperature variation between 15 October to 15 April, i.e. the period

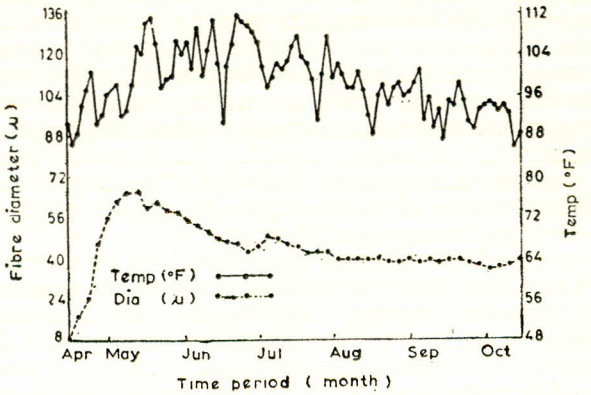

Fig. 1

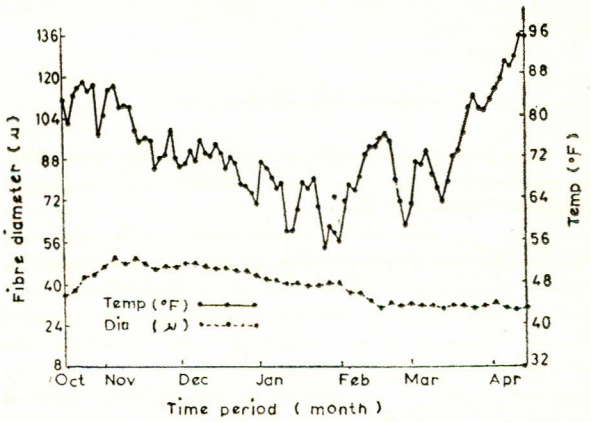

Fig. 2

spring clip. Here the relationship between the temperature and fibre diameter is not as distinct as in Figure 1. From November to Mid-February the temperature curve shows sharp decline whereas the fibre diameter is showing graual decrease. From mid-February to mid-April there is steep increase in the temperature curve whereas the corresponding fibre diameter remains almost constant.

Taking into account the effects of pasture on the diameter changes, the curve indicates maximum diameter during the month of November which is also the period of abundant pasture conditions.

The pasture position of November, is second next to the spring period during the whole cycle of the year. From October to mid February the diameter gradually decreases, this period is not representing the acutal trend of diameter variation as uring this season food is supplemented to the sheep. Actually there should be sharp decrease in the diameter during this period because of the minimum pasture conditions and lowest temperature. During the months of March and April the diameter is almost constant. The pasture during this period is good. The low fibre diameter during this period may be due to the fact that rainy season had started late in March result-

ing in the late germination of the pasture and consequently the later maturation of the green pasture. The low diameter may be the cause of lactation or because during the period there are always clouds and thunder storm preventing the sheep frequently from grazing and rendering it difficult for them to get suffient food.

Comparing the curves of Figs. 1 and 2 it can be concluded that the fibre growth and diameter variation of the autumn period is greater than the fibre diameter of the spring period. Our study also revealed that most of the medullated fibres of the autumn clip have the tip portion whereas the majority of the staples of the spring clip do not have the tip portion. This fact is evident from the two curves of Fig. 1 and 2. The probable cause for this may be attributed to the fact that the exposed part of the fibres is damaged by the severe sun rays or the scales of the fibre are easily eroded by contact and rubbing with hot bodies during the hottest period of the year.9

The maximum of fibre diameter occurs just after shearing (Figs. 1 and 2). Our finding, therefore, strongly support the statement that shearing stimulates the wool growth.10 It is also evident from our studies that neither the temperature nor the nutrition alone are responsible for the wool growth and diameter variation. The maximum temperature is shown dur.ng the months of June and July but the diamter is not maximum during the same period; similarly the pasture conditions are often good in March and April but the diameter shown against the same period is lower. Our study also revealed that the effects of nutrition are dominant over the fibre growth and diameter changes as shown between the period December to February. The supplementation of food considerably changes the fibre diameter, although the temperature is minimum during this period.

Conclusion

The following conclusion may be drawn from the present studies.

(1) The diameter of true and medullated fibres of autumn clip of Hashtnagri breed are greater than that of the fibres obtained from the spring clip.

(2) The influence of seasonal variation and climatic condition is more marked on the medullated fibre than the true fibre of the Hashtnagri breed.

(3) The variation of the diameter and medulla along the length of fibre is the result of changes in pasture conditions and temperature variation.

(4) Shearing stimulates wool growth and consequently diameter and medulla growth.

(5) The percentage of medullated fibre with tip end is greater in the autumn clip as compared to the spring clip.

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