Inheritance of Heterotypical Fibres in Lohi Sheep

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In this study efforts were made to observe the incidence of heterotypical fibres depending upon the genetic make up of the individuals. The samples were taken from six different regions of the body and were analysed for these types of fibres. The parents were classified into "higher" and "lower" groups with respect to their heterotypical fibre percentages. The percentages of these fibres in dams ranged between 14.0 and 49.9, and in their offspring between 20.0 and 49.9. The estimated heritability, 0.489 on an averge, indicated that the major part for the incidence of these fibres is played by heredity, as compared to that of environment. The heterotypic character of the fibre appeared to be dependent upon polygenic effect.

INTRODUCTION

Haq (1955, 1961) stated that wool stands as third on the list of commodities exported from Pakistan, and earns a considerable amount of foreign exchange to the national exchequer every year. Pakistan wool is categorised in the international markets as a superior quality of carpet wool. It is used for manufacturing various kinds of carpets, rugs, and floor coverings. Though Pakistan wools are of superior quality, there is considerable room for improving them, specially in respect of desirable characteristics like heterotypical nature of the fibres. So far, practically nothing is known about the inheritance of wool quality of the sheep thriving in various parts of this country. This investigation was, therefore, carried out to study the inheritance of the heterotypical fibres in the fleece of the *Lohi* breed.

REVIEW OF LITERATURE

White (1930) found from his study that the birthcoat was inherited by more than one factor. Nanda and Singh (1948) concluded from their study on the improvement of wool quality by selective breeding in *Bikaneri* and *Lohi* sheep that the percentage of medullation in the fleece of the progeny was directly related to the percentage of medullation in the ewes and rams. Indreb (1954) also obtained a correlation for medullation between sires and sons. Schinckel (1955) observed that the inheritance of birthcoat in *Merino* sheep is of multifactorial nature. Olbrycht (1960) concluded from his sudies on

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Merino lambs that the appearance of medullated fibres depends on both environmental and genetic factors. He further indicated that their inheritance seemed to be dependent on a large number of polymeric genes. Chaudhri (1964, unpublished) reported the heterotypical fibres ranging from 15.3 to 44.0 per cent in *Lohi* sheep wool. Ahmad and Nabi (1965) found these fibres ranging from 8.7 to 44.9 per cent in this very breed.

MATERIALS AND METHODS

The *Lohi* sheep unit available at the West Pakistan Agricultural University, Lyallpur was used to study the inheritance of heterotypical fibres. The unit comprised 28 dams and 2 sires. Wool samples were collected from the six different regions of the body; neck, shoulder, withers, side, back and britch. One hundred fibres from each sample of every region of each individual were drawn at random and the fibres identified with the use of benzene. The doubtful fibres were examined under microscope for the confirmation of the visual findings.

After the fibre analysis was completed, the average percentages of heterotypical fibres were calculated for each individual. The animals were divided into two groups based on heterotypical fibre percentages; dams and sires having more than 30 per cent of such fibres were classified as "higher" and less than 30 per cent as "lower" group. Fourteen dams and one sire were placed in each higher and lower groups. Seven dams from higher and the same number from lower were mated to one sire and rest to the other sire as below:

First group : Higher sire × Higher dams.

Second group : Higher sire × Lower dams.

Third group : Lower sire × Higher dams.

Fourth group : Lower sire × Lower dams.

The lambs born were fed from their respective dams. The sampling technique and the wool analysis method used in the case of lambs were the same as in their parents.

RESULTS AND DISCUSSION

Distribution of dams in regard to their heterotypical fibre percentages is shown in Table 1, while that of offspring is shown in Table 2.

TABLE 1. *Distribution of experimental flock with respect to heterotypical fibres.*

(DAMS)

Heterotypical fibre percentage	Percentage of individuals			
	First group	Second group	Third group	Fourth group
14.0 to 16.9	..	..	..	16.67
17.0 to 19.9	..	28.57	..	16.67
20.0 to 22.9	..	14.29	..	..
23.0 to 25.9	..	28.57	..	33.33
*26.0 to 28.9	..	14.29	..	33.33
29.0 to 31.9	28.57	14.29	..	..
32.0 to 34.9	14.29	..	28.57	..
35.0 to 37.9	28.57	..	42.86	..
38.0 to 40.9	..	..	..	..
41.0 to 43.9	..	..	14.29	..
44.0 to 46.9	14.29	..	14.29	..
**47.0 to 49.9	14.29	..	..	..

*The sire used at "lower" had 28.50 per cent of heterotypical fibres.
**The sire used as "higher" had 47.33 per cent of heterotypical fibres.

TABLE 2. *Distribution of progeny with respect to heterotypical fibres.*

(OFFSPRING)

Heterotypical fibre percentage	Percentage of individuals			
	First group	Second group	Third group	Fourth group
14.0 to 16.9	..	..	..	..
17.0 to 19.9	..	..	..	..
20.0 to 22.9	..	..	..	12.50
23.0 to 25.9	..	..	..	50.00
26.0 to 28.9	..	..	28.57	37.50
29.0 to 31.9	..	20.0	57.14	..
32.0 to 34.9	..	50.0	14.29	..
35.0 to 37.9	..	30.0	..	..
38.0 to 40.9	28.57	..	..	..
41.0 to 43.9	14.29	..	..	..
44.0 to 46.9	14.29	..	..	..
47.0 to 49.9	42.86	..	..	..

Tabe 3 indicates the heritability estimates for the heterotypical fibres based on regression of offspring on dams. This table also shows the correlation observed between dams and their offspring for these fibres.

TABLE 3. *Estimates of heritability of heterotypical fibres and correlation between dams and offspring.*

Group		Heritability $(h)^2$	Correlation
First group	..	0.466	0.457
Second group	..	0.576	0.657
Third group	..	0.382	0.455
Fourth group	..	0.542	0.698
Average	..	0.489	0.553

It is evident from the results indicated in Table 1 that 85.74 per cent of dams belonging to the First group and all those of the Second group had lower percentages of heterotypical fibres than their mated sires. The dams in the third group were higher than their sires and only 33.33 per cent of those in the fourth group were with similar percentages of fibres as those of the sires. The results are close to the findings of Chaudhri (1964 unpublished), who reported that heterotypical fibres ranged from 15.0 to 44.0 in *Lohi* sheep wool. Ahmad and Nabi (1965) observed the range of 0.7-544.0 from the analysis of *Lohi* sheep wool.

The offspring distribution showed an overall range which was nearly the same as that of their dams. Generally speaking, the individuals of each group had tended towards the higher figures as compared to their relative dam groups; but offspring belonging to the third group had moved towards the lower percentages of heterotypical fibres.

Table 3 indicates that the heterotypical fibres are highly heritable and can safely be depended upon for individual selection. Therefore, mass selection can produce quicker improvements. It can be concluded that phenotypic selection based on laboratory findings of percentages of heterotypical fibre can lead to the selection for desired genotypes.

The inheritance based on the data collected indicates that there is no proper ratio in any one of the crosses designed. This also showed the absence of simple Mendelian inheritance, except for the principle of quality of sexes which showed clearly that no one sex exerted any special influence upon the offspring, and that the heterotypical character was not sex linked.

Tables 1 and 2 show that the offspring display an intermediate effect and do not present any apparent segregation. Further, higher correlation coefficients of the dams and their offspring indicate a proportion of desired genes. There is also no clear ratio among reciprocal crosses made in the second and third group parents, indicating that inheritance is governed by multiple factors, and that a large number of genes are at work. It is safe to infer that each gene has no major effect, and it is a case of quantitative inheritance. The estimated higher heritability figures indicate that the expression of these fibres depend upon the genetic make up of animals as compared to their environment.

The above results are in agreement with the findings of White (1930), who reported that birthcoat is inherited by more than one factor. Nanda and Singh (1948) in *Lohi* and *Bikaneri* sheep and Indreb (1954) in *Dala* sheep reported that the percentage of medullation in progeny is directly related to their parents. Schinckel (1955) observed that the inheritance of birthcoat in *Merino* sheep is of multifactorial nature. He further stated that the phenotypic variations are adequately accounted for by an additive genetic situation. Olbrycht (1960) reported in *Merino* sheep that the appearance of medullated fibres depended on both genetic and enviromental factors, and their inheritance seemed to depend on a large numbers of polymeric genes.

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