Physical Characteristics of Wools of Native and Crossbred Sheep

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The effect of cross-breeding two native breeds of sheep (Malpura and Sonadi) with two exotic breeds (Dorset and Suffolk) on wool quality has been investigated. While improvement in wool quality was achieved in respect of fibre fineness and medullation, there was reduction in staple length. The correlation study revealed a highly significant positive correlation between fibre medullation and diameter, but there was a weak significant positive correlation between fibre diameter and staple length.

Dual purpose sheep like Malpura, Sonadi, Bikaneri, Jaisalmeri, etc. reared in Rajasthan produce coarse quality wool suitable for producing rugs, carpets and mattresses. It is proposed to improve these breeds (both for mutton and wool quality) by modifying the genotype characters by cross-breeding with dual purpose exotic Dorset and Suffolk sheep. This paper presents the results for two coarser breeds, Malpura and Sonadi (native), and Dorset and Suffolk sheep wools crossbred with the natives. The quality improvement achieved with respect to physical characteristics of the fibres and the relationships, if any, between the physical characteristics of the fibres, viz. fibre-diameter, medullation and staple length, have been worked out.

Arora et al. showed that infusion of exotic blood in native breeds improves the wool quality in terms of fibre fineness, medullation and crimp. Narayan in her studies on Magra breed wool analyzed the covariances between fibre length and medullation and reported that the correlation between diameter and medullation for individual samples was significant. Mahajan and Rathore also found that the partial correlation coefficient between fibre diameter and medullation was highly significant and a weak but significant correlation existed between fibre diameter and staple length. Bettini and Caria also found a significant correlation between fibre diameter and medullation. Mirajker and Patil observed that medullated fibres are normally longer than other wool fibres in the same lot.

Materials and Methods

Six breeds and breed crosses, viz. Malpura, Sonadi, Dorset × Malpura, Suffolk × Malpura, Dorset × Sonadi and Suffolk × Sonadi, were taken. Samples from mid-side region of 65, 36, 14, 67, 31 and 23 animals of Malpura, Dorset × Malpura, Suffolk × Malpura, Sonadi, Dorset × Sonadi and Suffolk × Sonadi respectively were used for the study of physical characteristics. The flocks are being maintained at the farms of this institute. The infusion of exotic blood in crossbred animals was at 50% level.

From each wool sample collected from individual animals, 25 separate staples were taken and the staple length was measured with the help of a measuring scale and a pair of forceps. The average of 25 staples was calculated. For fibre diameter, test samples were taken from individual animal samples by zoning and halving method. Four hundred observations from each test sample were taken on projection lamimeter at 250 × magnification. The diameters of pure and medullated fibres were recorded separately and the percentage calculated.

Results and Discussion

For the sake of convenience, the results have been interpreted separately in two parts: (i) Dorset and Suffolk crosses with Malpura and (ii) Dorset and Suffolk crosses with Sonadi.

The physical parameters, viz. fibre fineness, medullation and staple length of Dorset × Malpura, Suffolk × Malpura and Malpura are given in Table 1. It is evident that the crossbred wools have improved fibre fineness and medullation, whereas there is a reduction in the average staple length. The improvement in fineness is about 13 μ, i.e. about 32%. The improvement in terms of medullation is less in the case of Dorset × Malpura (37%) as compared to Suffolk × Malpura (50%). The staple length gets reduced by about 26 and 40% in Dorset × Malpura and Suffolk × Malpura respectively due to the genetic variations in the crosses.
Table 1—Physical Characteristics of Crossbred and Pure-bred Sheep Wools

<table>
<thead>
<tr>
<th>Breed</th>
<th>Staple length cm</th>
<th>Reduction %</th>
<th>Fibre diameter μ</th>
<th>Improvement %</th>
<th>Medullation °</th>
<th>Improvement %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dorset × Malpura</td>
<td>4.4 ± 0.3(40.1)</td>
<td>26.6</td>
<td>27.4 ± 1.1(24.0)</td>
<td>31.5</td>
<td>39.5 + 1.9(29.6)</td>
<td>36.9</td>
</tr>
<tr>
<td>Suffolk × Malpura</td>
<td>3.6 ± 0.3(37.5)</td>
<td>40.0</td>
<td>27.1 ± 1.1(12.6)</td>
<td>32.3</td>
<td>31.4 ± 2.5(29.1)</td>
<td>49.8</td>
</tr>
<tr>
<td>Malpura</td>
<td>6.0 ± 0.2(29.9)</td>
<td>—</td>
<td>40.0 ± 1.4(28.7)</td>
<td>—</td>
<td>62.6 ± 1.6(20.1)</td>
<td>—</td>
</tr>
<tr>
<td>Dorset × Sonadi</td>
<td>5.5 ± 0.5(39.2)</td>
<td>24.7</td>
<td>27.7 ± 1.1(20.9)</td>
<td>45.3</td>
<td>44.6 ± 2.9(31.5)</td>
<td>35.9</td>
</tr>
<tr>
<td>Suffolk × Sonadi</td>
<td>4.5 ± 0.4(36.4)</td>
<td>38.3</td>
<td>29.2 ± 0.9(14.7)</td>
<td>42.4</td>
<td>41.2 ± 2.8(31.7)</td>
<td>40.8</td>
</tr>
<tr>
<td>Sonadi</td>
<td>7.3 ± 0.2(19.0)</td>
<td>—</td>
<td>50.7 ± 1.5(24.5)</td>
<td>—</td>
<td>69.6 ± 1.6(12.4)</td>
<td>—</td>
</tr>
</tbody>
</table>

Values within parentheses represent CV %

The physical characteristics of Dorset × Sonadi, Suffolk × Sonadi and Sonadi wools are also given in Table 1. There is significant improvement in crossbred wools over Sonadi wool with regard to fibre fineness and medullation. The fineness has improved by about 45 and 42% in Dorset × Sonadi and Suffolk × Sonadi respectively and medulla has improved by 36 and 41% in Dorset × Sonadi and Suffolk × Sonadi respectively as compared to pure Sonadi wool. The staple length gets reduced by about 25 and 38% in Dorset × Sonadi and Suffolk × Sonadi respectively with the infusion of exotic blood.

To see the relationship among various fibre attributes, i.e. fibre diameter, medullation and staple length, simple correlation coefficients have been worked out and are presented in Table 2. It is evident that there is a significant positive correlation between medullation and fibre diameter even at 1% level of significance in the case of all the six wools. It is also observed that medullation is positively related significantly with staple length in all the six wools, except Sonadi. As far as the relationship between staple length and fibre diameter is concerned, it is significant in three wools, viz. Dorset × Malpura, Malpura and Suffolk × Sonadi.

In most of the breeds, the relationship between fibre diameter and staple length is observed to be either non-significant or of a comparatively weaker nature. Therefore, staple length is being dropped and the prediction equation of the type \( Y = a + bX \) is attempted, where \( Y \) is the average fibre diameter; \( a \), constant; \( b \), regression coefficient; and \( X \), medullation in degrees.

The values of \( a \) and \( b \) for all the six breed and breed crosses are given in Table 3. It is seen that the regression coefficients are highly significant in all the cases, except in the case of Suffolk × Sonadi, where the level of significance is at 5%.

Figs. 1-6 show the simple regression of diameter on medullation in the six experimental pure bred and crossbred wools.

**Conclusion**

Infusion of exotic blood (Dorset and Suffolk) in

![Fig. 1—Simple regression of diameter on medullation for Dorset × Malpura wool (o-o) calculated; and (---) observed.](image-url)
native breeds (Malpura and Sonadi) has improved the fibre fineness and medullation, whereas staple length gets shortened. There is a significant positive effect of medullation on fibre diameter even at 1% level of significance in all the six wools. Therefore, medullation may be taken as an approximate indication of fibre fineness while grading indigenous coarser wools.
instead of crimp, since it is almost absent in coarser varieties of Indian wools like Malpura and Sonadi.

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