Quick Evaluation of the Geometric Fineness of Cotton

B. C. Panda
Division of Agricultural Physics, Indian Agricultural Research Institute, New Delhi 110 012

Received 20 January 1977; revised received 25 April 1977

An indirect method has been suggested for quick evaluation of the geometric fineness of cotton from a knowledge of its mass fineness and maturity coefficient.

THE geometric fineness of cotton is a varietal characteristic and hence makes possible the selection and reproduction of desired types. At present no independent equipment is available for quick evaluation of the geometric fineness of cotton; the existing methods of evaluation are time-consuming and hence are less suitable for screening a large number of samples in a routine way at the operator's level. However, the Micronaire apparatus, being convenient and rapid, has been adopted universally for routine investigation of mass fineness. This apparatus can be used for the determination of the maturity coefficient of cotton fibres by the Causticaire method. The fibre maturity can also be obtained easily with the Micronaire apparatus with the help of a special attachment called spacer, as has been adopted by us in our Institute. Thus, the mass fineness and maturity coefficient values, being conveniently obtained using the Micronaire apparatus in a routine manner, we now indicate the relationship between the geometric fineness and these given sets of values.

The geometric fineness of the cotton fibre can be best represented by its total cross-sectional area. The geometric fineness of the fibres comes out to be

\[
\text{Geometric fineness} = \frac{\text{Total cross-sectional area}}{\text{Mass fineness}} \times \text{Maturity coefficient} \quad \text{(3)}
\]

Hence from Eqs. (1) and (2), the expression for the geometric fineness of the fibres comes out to be

\[
\text{Geometric fineness} = \frac{\text{Mass fineness}}{\text{Bulk density} \times \text{Maturity coefficient}} \quad \text{(3)}
\]

For expressing the geometric fineness in square microns, Eq. (3) is transformed to assume the form

\[
\text{Geometric fineness} = 0.6464 \times \frac{\text{Mass fineness (millitex)}}{\text{Maturity coefficient}} = 25.45 \times \frac{\text{Mass fineness (Micronaire value)}}{\text{Maturity coefficient}} \quad \text{(4)}
\]

In Eq. (4), we have incorporated the average bulk density of standard cotton fibres whose value has been taken as 1.547 g/cm\(^3\) at 25-30°C.

Thus, rapid evaluation of the geometric fineness of cotton is possible from a knowledge of its mass fineness and maturity coefficient. As this parameter is an important varietal characteristic, the present method for its evaluation will be of immense value to the cotton breeders for selecting materials for fineness breeding programmes. Finally, in order to classify the fibres as very fine, fine, average, coarse and very coarse, we present in Table 1 a range of values of their geometric fineness.

<table>
<thead>
<tr>
<th>Fibre designation</th>
<th>Range of values for geometric fineness ((\mu^2))</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very fine</td>
<td>&lt; 100</td>
</tr>
<tr>
<td>Fine</td>
<td>100-130</td>
</tr>
<tr>
<td>Average</td>
<td>135-165</td>
</tr>
<tr>
<td>Coarse</td>
<td>170-200</td>
</tr>
<tr>
<td>Very coarse</td>
<td>&gt; 200</td>
</tr>
</tbody>
</table>

References