This paper envisages the need of quality assessment for the purpose of quality improvement. If tasting the tasar yarn as per the test method used for mulberry raw silk yarn, it is found almost all falls in grade-less category which hinders the passage for improvement. As the physical and chemical property of tasar raw silk differs to that of mulberry raw silk, the method of test has to be modified suitably so that the tasar silk can be tested and graded in a better way. In the absence of testing and grading method to accommodate all the Tasar silk produced in the industry, the buyer and seller will not have any reference for improvement as well as for fair transaction. In the age of competitive market of apparel textiles, testing of different parameters of yarn to determine its quality and its grouping in different varieties has become very important for a particular end use. All the textile yarns are tested by one or more methods for its quality characteristics.

In the study, suitable testing and grading method for Indian tasar silk yarn has been developed which has been adopted by BIS as national standard.

Keywords: Tasar silk, classification, variation, tenacity, elongation, cohesion.
parameters and norms that can be used for tasar raw silk as reference for grading and develop suitable method and procedures for testing such parameters. Converting the developed method into BIS standard has been done. By introduction of testing & grading in the tasar sector it not only help for the fair trade but also help the reellers to improve the quality of tasar silk produced.

**Material and Methods**

The 460 lots tasar raw silk produced in the country and 14 lots of imported variety has been procured and processed for quality parameters. Out of 474 lots, 299 lots are from commercial production units. The sample selection is based on the quality information available with the local weavers in the cluster and fair distribution for all qualities from superior to inferior grades. Also 116 lots of tasar silk yarn has been produced at DCTSC, Cuttack by dry reeling method (Charkha reeling machine) and wet reeling method (Wet Reeling machine). CTR&TI has supplied 59 lots with the existing facility available at the institute.

For the purpose of selection of test parameters, preliminary studies has been conducted for 20 samples and analysed. Preliminary studies in winding test will be conducted on samples selected on random basis for modification in winding speed (speed between 30 to 100 rpm), yarn tension etc., in-comparison with the mulberry raw silk testing methods besides the no. of yarn samples and its length to be taken into consideration for size test.

The remaining tasar yarn samples will be tested to generate following data and results will be used to develop suitable tasar yarn testing methods for grading of tasar raw silk.

- Winding and size results.
- Tenacity and elongation results.
- Cohesion results
- Yarn defects.

The test results are compiled, analysed and extrapolated to form a flexible scale grading method. Statistical methods employed to prioritize the test parameters and accordingly weightage given to arrive at the final yarn grades.

**Results and Discussions**

**Winding performance during winding test**

Both dry reeled and wet reeled Tasar silk yarn showed very poor winding performance even at lower speeds mainly due to unevenness, entanglements in the yarn and poor cohesion among the filaments. Buniyad reeled yarn have shown higher breaks mainly due to fibrillation of individual filaments. Due to very poor winding performance, winding speed of 30 mpm was proposed for winding test and the duration is 30 minutes or till the skein exhaust which ever is early.

474 tasar yarn samples were subjected to winding performance test and the results show that the winding breaks per 5 skeins varied from 0 to 22 & Average winding breaks is 3 per 5 skeins per 30 minutes of winding. The result of the winding breaks is expressed as number of breaks per 5 skeins per half hour winding duration and expressed as whole number. As winding breaks mainly depend upon the denier of the yarn, for the preparation of classification table three categories of size was considered i.e. yarn size upto 80 denier and above 80 denier. The whole data was divided into two based on above category. Each data set is analysed and bifurcated into 5 classes. The frequency distribution of 461 samples if winding breaks is as given in table 1 and graphical presentation is as given in graph 1.

<table>
<thead>
<tr>
<th>Winding breaks</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>73</td>
<td>17</td>
</tr>
<tr>
<td>1</td>
<td>41</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>64</td>
<td>15</td>
</tr>
<tr>
<td>3</td>
<td>88</td>
<td>21</td>
</tr>
<tr>
<td>4</td>
<td>48</td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>31</td>
<td>7</td>
</tr>
<tr>
<td>6</td>
<td>21</td>
<td>5</td>
</tr>
<tr>
<td>7</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>8</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>4</td>
<td>1</td>
</tr>
</tbody>
</table>

**Graph 1 : Frequency of winding breaks**

**Size and Size uniformity test**

The size and its uniformity is very important parameter which is directly affecting both economics of manufacture and quality but also on the type of product to be manufactured. In this context, emphasis was given to this parameter and highest weight-age given in classification.

The length of 22.5 meters per kilcha and 45 meters per kilcha was tried for consideration. For the purpose of selection of test length to be considered for size test, it is observed that the length of 45 meters per each test sample (kilcha) is good enough to give required level of precision.

Data results of all tasar samples tested showed wide range of size of yarn, varying from 32 denier to 216 denier. The details of size and its uniformity expressed as Coefficient of Variation (CV%) is as given table 2. Graphical frequency distribution of 40-80d, 80-120d and above 120d is given in graph 2. As the total lots available below 40 d is minimal it is not being considered for frequency distribution graph.

| Table 2 : Size and its uniformity expressed as Coefficient of Variation (CV%) |
|-----------------------------|----|---|
| Minimum                    | 32 | 4.8|
| Maximum                    | 216| 45 |
| Average                    | 106| 19 |
As the size is varying to a large extent and based on the application & its utility, four groups of size was proposed for classification. The four groups are as shown in table 3.

Table 3: Denier range of four groups.

<table>
<thead>
<tr>
<th>Denier Range</th>
<th>40 d (4.49 tex) &amp; finer</th>
<th>41 to 80 d (5 to 8.94 tex)</th>
<th>81 to 120 d (8.95 to 13.39 tex)</th>
<th>121 d (13.4 tex) &amp; coarser</th>
</tr>
</thead>
</table>

Data in each group is analysed and bifurcated into 6 of tenacity and elongation is as given in graph 3&4.

Tenacity and Elongation test:

Tenacity (strength) and Elongation (stretch-ability) are the two parameters which are very much essential for any textile yarn. The importance is felt only if the values falls below certain limit.

As temperature and RH are affecting the test results, it is essential to test in standard atmospheric conditions i.e. 27 C and 65% RH. 454 samples out of 474 samples were taken for analysis and the remaining data is not considered as the results are deviating to a large extent due to environmental factors. The samples were analysed and found that tenacity is varying for a large extent from as low as 1 g/d and high of 3.6 g/d. The average tenacity is 2.1 g/d. In order to facilitate improvement in yarn quality three classifications are proposed. Graphical representation of frequency distribution of tenacity and elongation is as given in graph 3&4.

Cohesion test for warp variety of tasar silk yarn.

Cohesion plays an important role in warp variety of tasar yarn. The yarn is being tested as per testing of mulberry silk yarn. As the cohesion in tasar yarn is very low, in the beginning of tasar silk industrial growth, cohesion is considered only for warp variety. The testing method is as per mulberry silk testing procedure.

32 samples of warp variety of the samples tested for cohesion and found that the result varied from as low as 1 stroke to 15 stroke. The average result is 8 stokes.

Grading table / Classification table:

The grading/classification table is a reference table indicating level of quality of both individual parameter as well as overall quality of the yarn. The data generated from the test results were further bifurcated into sub groups based on the groups / category. The bifurcated data is analysed and grouped to form classification norms which is as given in table 4.
Conclusion

It is concluded that the tasar silk yarn as on date is very inferior in many of the quality parameters and extremely good in some parameters viz. Elongation. As a matter of fact that tasar silk yarn quality has to improve a lot in order to make it’s demand to grow further. In order to facilitate the improvement of tasar silk yarn quality national standards were published by BIS which is the outcome of this study. The national standards when implemented in the field will facilitate both reelers and weavers to get better quality yarn at a better price. With continuous monitoring of tasar yarn quality, the reelers can improve their product i.e. tasar silk yarn as well as it facilitate the weaver to choose the right raw material.

References


BIS standard IS:15090 part 1 to 11 for testing and classification of mulberry raw silk.

BIS standard IS:15825 part1 to 5 for testing and grading of dupion silk.

BIS standard IS 15826 for testing and grading of MRTM produced tasar twisted silk.

ASTM D2255 –96 for grading spun yarn appearance.

ISA standard Part II – Raw silk testing and classification for mulberry raw silk.

Chinese grading standard for tasar silk yarn.