

## Grading System of Ramie Fibre

S.C. Saha\*, A. Sarkar, G. Sardar, D.P. Ray and G. Roy

Quality Evaluation & Improvement Division, ICAR-National Institute of Research on Jute & Allied Fibre Technology, (Indian Council of Agricultural Research) 12 Regent Park, Kolkata, India

\*Corresponding author: scss1956@gmail.com

### ABSTRACT

Ramie is a highly versatile, white, lustrous and eco-friendly fibre with excellent properties<sup>1</sup>. In India, the cultivation as well as production of ramie is increasing because of its excellent strength, enhanced wet strength, lustre and microbial resistivity. At present there is no grading system in India. In view of the prospects of increased production and utilization of the fibre, a grading system for the decorticated fibres has been developed on the basis of fibre qualities. It is quite obvious that different varieties would differ in their properties and different application areas would demand different quality fibre. For this the fibre should be graded properly for utilization of the fibre in a better way. The fibres have been graded in to four grades viz. excellent, good, Average, Poor on a 100 point score card basis. The scores have been assigned on relative importance and weightage of the six fibre properties, viz. fibre length, strength, fineness, softness, colour and defects. The grading system will help the farmers, industry and other stakeholders in marketing and specific utilization of the fibre in diversified areas.

**Keywords:** Ramie, grading, score card, decorticated fibre

Ramie fibre is obtained from the stalk of the stemmed of *Boehmeria nivea* (L) Gaud. It is a perennial crop with stems 1 to 2.5 m high, originating from a root stock and having a few branches. The yield of the fibre is 4 to 5 percent by green weight of the plant. Ramie fibre is not separated from the plant by retting in water like jute. Extraction of fibre is done by decorticator<sup>2</sup>. The decorticator is used for extraction of fibre from green stems. The decorticated fibre is washed to remove the water soluble gums and dried in air. In a plantation, the plant can effectively survive for 6 to 7 years after which the growth declines and new plantation is necessary. China is the leading producers of the fibre followed by the Philippines and Brazil. In India ramie cultivation is restricted to the North-Eastern States only due to agro-climatic conditions<sup>3</sup>. The Government of India initiated programmes<sup>4</sup> for this crop promotion under Jute Technology Mission in view of rural employment generation and diversified application of the fibre.

There is no internationally accepted grading system of ramie fibre. Different countries are using their

own grading system like China<sup>5</sup>, Philippines<sup>6,7</sup>, and Japan<sup>8</sup> etc. The grading system helps in marketing and proper utilization of the fibre.

To prepare this grading system some significant steps are followed. To get relative importance of different physical parameters for the proposed jute grading system feed back from farmers, mill personnel followed by analysis of comparative grading systems followed by different ramie growing countries were taken into account. Samples of different fibres collected from different places were tested.

All the accumulated data were analyzed thoroughly and determined grades and sub-groups of each parameter. Based on relative importance of parameters score weightage were distributed. The grades proposed would help to minimize subjective assessment (prone to under estimate/over estimate), quality based price fixation for both farmers as well stake holder to develop quality product. The proposed grading system would help the growers and users for multidimensional applications are now being encouraged.

At present in India there is no BIS grade for ramie fibre. Other countries like China<sup>5</sup>, Philippine<sup>6,7</sup>, Japan<sup>8</sup> etc. have developed their own grading system for use and marketing of the fibre. China<sup>5</sup> has introduced five grade based on fibre qualities like length, colour, softness, cleanliness and defects. In Philippine<sup>6,7</sup> decorticated ramie fibre has eight grade system and degummed ramie is classified into five grades on the basis of fibre qualities considering colour, reed length, cleanliness etc. Japan<sup>8</sup> has introduced five grades of ramie considering mainly on length, cleanliness and colour of the fibre.

In the present paper, the quality parameters of ramie recommended for commercial transaction based on score card of 100 points basis assigning scores on the quality parameters according to their importance in deciding grade of the fibre. Fibres are graded into four categories viz., Excellent Good, Average and Poor on the basis of six physical properties of fibre i.e., length, strength, fineness, softness, colour, and defects.

**MATERIALS AND METHODS**

Decorticated ramie fibres are collected from Ramie Research Station, Sorbhog, Assam and from farmers also. The quality of decorticated fibre produced by the farmers varies considerably depending on variety, agronomical conditions and cutting age.

At farmers’ level “hand & eye” method for decorticated fibre grading is appropriate and quick also. Testing of fibre is done by hand and a close

look at the fibre. But for setting the parameters fibre was tested in testing instruments and compares the results with hand & eye method. Accordingly appropriate score marks are assigned on these properties based on a 100 point score card and the total score indicates the grade of fibre.

**Measurement of fibre parameters for grading**

**Length:** Length of the fibre reed was measured with scale. Good length has some value in industrial handling because it helps good feeding on breaker card. Moreover, it helps to maintain uniformity and regularity in the sliver. Reed length depends on harvesting time. The average reed length is 50 cm to 150 cm as per harvesting time. Score marks and sub-groups of parameters are given in Table 1.

**Strength:** Bundle strength<sup>9</sup> of fibre is measured in hand & eye method by gripping a bundle of 10-15 fibres from the middle of the reed between the thumb and forefinger of both hands and broken longitudinally without jerk. It gives an idea of fibre strength. Instrument was also developed for strength test. Strength has four sub-groups i.e. high, medium, average, & weak and score marks are 30, 20, 13, and 7 respectively.

**Fineness:** It is a measure of diameter or thickness of the fibre. Fineness is expressed by mass per unit length in tex (gm/km) unit. Fineness of the fibre can be measured by Air-flow Fineness Tester<sup>10</sup>. The finer the fibre better is the quality. For lighter count yarns, finer fibre will help to maintain the

**Table 1:** Range of sub-groups of different parameters

Parameters	Range & Score marks of different sub-groups			
Strength (gm/tex)	High ( ≥ 28 )	Medium (< 28 – 22)	Average (< 22 – 16)	Weak (< 16)
Fineness (tex)	Very Fine (<1.0)	Fine (> 1.0 – 1.5)	Coarse (> 1.5)	

**Table 2:** Score marks and sub-groups of different parameters

Parameters	Sub-groups of parameters and score marks in parenthesis			
<b>Length (cm)</b>	<b>Excellent</b> ≥ 120(20)	<b>Very Good</b> < 120 to 90(15)	<b>Good</b> < 90 to 60(10)	<b>Average</b> < 60(5)
Strength	High (30)	Medium (20)	Average (13)	Weak (7)
Defects	High (15)	Medium (10)	Average (5)	—
Fineness	Very Fine (15)	Fine (10)	Coarse (5)	—
Colour	Good (10)	Average (7)	Poor (3)	—
Softness	Soft (10)	Hard (5)	—	—

**Table 3:** Ramie grading score and grade

Grade	F. Length	Strength	Defects	Fineness	Colour	Softness	Grade
Special	20	30	15	15	10	10	100
R-1	15	20	10	10	10	10	75
R-2	10	13	10	5	7	5	50
R-3	5	7	5	5	3	5	30

spinning performance at a desired level. In hand & eye method, fibre fineness can be estimated simply by a close look at the fibre. Fineness has three sub-groups i.e. very fine, fine, & coarse and score marks are 15, 10 and 5 respectively.

**Colour:** Colour is the property of the fibre which distinguishes its appearance and imparts the aesthetic appeal of fibre. Different varieties of ramie fibre are found in different colour shades like light brown, brown etc. Colour can be measure by Fibre Colour Meter<sup>11</sup>. Colour of the fibre can be determined through visual assessment. Colour has three sub-groups i.e. good, fair average and average and the score marks are 10, 7, and 3 respectively.

**Softness:** Softness of fibre is an approximate measure of the gum content of fibre that can be evaluated qualitatively by touch and feeling by hand. Softness has two sub-groups i.e. soft and hard and score marks are 10 and 05 respectively.

**Defects:** Factors causing serious or partial damage to the quality of fibre are commonly known as defects. It can be estimated through visual look at the fibre bundle. Minimum defects contain in the fibre is the better quality. The defects may originate in the field during growth, processing of plant to fibre, and during transit and storing. Defects have three sub-groups i.e., less, medium and high and score marks are 15, 10, and 05 respectively. The main defects are:

- ♦ *Specks:* Spots of dry bark adhering to the body of the fibres are called specks.
- ♦ *Knots:* These are stiff spots often barky in the body of the fibre strand, which break continuity of the fibre, when opened in the machine.
- ♦ *Sticks:* Small pieces of sticks adhering to the fibre strand and it create problem during processing.
- ♦ *Leaf:* Spots of dry leaf, which sometimes appear in the fibre strand, may create problem during processing.

*Dazed Fibre:* If the fibre is stored with excess of moisture without proper sun drying, the fibre will have a dazed appearance.

## RESULTS AND DISCUSSION

Tested 100 different Ramie samples received from different places. It was found that reed length of the fibre varies widely and accordingly divided the length parameter into four sub-groups and score marks were allotted accordingly. Because good length has some value in industrial handling since a 'morah' of good length requires less operatives to handle and it also helps goods feeding on breaker card. In case of strength which measures the ability of fibre to withstand stress in the longitudinal direction is an important factor. Studies showed that strength varies from 15 g/tex to 30 g/tex and divided the strength parameter into four sub-groups and score marks were allotted accordingly.

Irregularity of yarn is dependent on fibre fineness and its variation. For making yarns of finer count this characteristic of fibre is gradually becoming more important. So fineness has been taken into account and divided the parameter into three sub-groups and score marks were allotted accordingly. Generally ramie fibre is available in three colours like brownish, light brownish and light grey. Score marks were given accordingly. Serious or partial damage to the quality of fibre are commonly known as defects. Basically defects were measured by close look to the fibre reed. Five to six types of defects were observed and identified which is given in the defects parameter. Defects were divided into three sub-groups like, high, medium and average and score marks were allotted accordingly.

After decortications high percentage of gums were there. It varies from 20 to 30 percentages. By hand estimation one can identify the stiffness of the fibre due to gum. Accordingly two sub-groups were identified for gum and allotted score

marks accordingly. Range of different sub-groups, Total score marks and Grading has been given in Table 1, 2&3. Weightage for each of the six parameters of ramie fibre mentioned above were given according to their importance with reference to end product quality. Total score marks of 100 have been distributed for the six parameters accordingly. The best quality fibre of ramie fibre i.e., R-special have been awarded total score 100. Distribution of 100 marks for each of the six quality parameters have been given and grade accordingly for R-1, R-2, and R-3 given in Table 3.

## CONCLUSION

In India, the ramie production is scanty but the growing concern for environment protection has led to renewed interest in promotion of ramie cultivation beyond the traditional North Eastern States. Due to its superior quality, eco-friendliness and biodegradability its application is increasing day by day in textile and non-textile fields. In view of the above prospects of increased production and utilization of the fibre, a grading system for the decorticated and degummed fibres has been devised on the basis of fibre qualities which mainly decide the grade of fibre. The grading system of

the fibre will help the farmers as well as the users and other stakeholders in the industry in marketing and specific utilization of the fibre in diverse areas.

## REFERENCES

- Bandyopadhyay, S.B. 1965. *Jute Bulletin*, **27**, page 278.
- Bhaduri, S.K., Saha, S.C. and Mojumdar, P. 2009. *Jr. of the Textile Association*, September-October, 93-98.
- Chakraborty, A.C., 1973. *Invention Intelligence*, July, 261-262.
- Dowgiehewicz, S.1954. *Roslinne Surowce Wlokiennicze*, Warsaw, PWN.
- Jute Technology Mission*, Ministry of Textiles, Govt. of India, Udyog Bhavan, New Delhi, 2003.
- Kirby, R.H. 1963. *Vegetable Fibres*, London, (1963).
- Luniak, B. 1954. *Textile Quarterly*, **4**(1): 57.
- Saha, M.N. and Sen, H.S. 2007. *Bulletin No. 16/2007*, central research Institute for Jute & Allied Fibres (ICAR), Barrackpore.
- Saha, M.N., Samaddar, M. and Ghorai, D. *Bulletin No.8/2006*, 5, Central Research Institute for Jute & Allied Fibres (ICAR), Barrackpore.
- Sinha, N.G. and Bandyopadhyay, S.B. 1968. *Jr. of the Textile Institute*, **59**: 148.
- Techno guide on Ramie *Boehmerianivea* (L) Gaud., Fibre Industry and Development Authority, 1424, Quezon Avenue, Quezon City, Philippines, 2003.