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AN EVALUATION OF JUTE IS AN IMPORTANT NATURAL FIBRE CROP IN INDIA

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Abstract:

Raw jute plays an important role in the country's economy. jute fibre and allied fibre crops constitute a formidable group of vegetatable fibres catering to various requirements of people, apart from generating sizable employment and contributing significantly to the nation exchequer of growing countries through the export of jute goods. based on botanical origin, the two cultivated species of jute out of eight species discovered so far - corchorus oliotorius L.(Tossa jute) and corchorus capsularies L. (white jute) constitute the worlds foremost bast fibre cash crops and the second most important textile fibre next to cotton. in the present article we are going to discuss the area, production, yield of jute.climate for jute, soil, method of sowing etc.

Keyword : versatile , environment, natural, cultivation, production, ecology, crop .

1. Introduction

Jute is an important natural fibre crop in India next to cotton. In trade and industry, jute and mesta crop together known as raw jute as their uses are almost same. Raw jute plays an important role in the country's economy. Raw jute was originally considered as a source of raw material for packaging industries only. But it has now emerged as a versatile raw material for diverse applications, such as, textile industries, paper industries, building and automotive industries, use as soil saver, use as decorative and furnishing materials, etc. Raw jute being biodegradable and annually renewable source, it is considered as an environment friendly crop and it helps in the maintenance of the environment and ecological balance. Jute as a natural fibre has some definite inherent advantages. Its silky lusture, high tensile strength, low exhaustibility, considerable heat resistance and long staple length are the qualities that cannot be matched by synthetic fibre. Further attraction of Jute lies in its easy availability, inexhaustible quantity at a comparatively cheaper rate. Moreover, it can easily be blended with other natural and man-made fibres. Jute cultivation is mainly concentrated in the eastern and north eastern India while that of Mesta cultivation is spread almost throughout the country. It is estimated that the jute industry provides direct employment to 0.37 million workers in organized mills and in diversified units including tertiary sector and allied activities and supports the livelihood of around 4.0 million farm families. In addition there are a large number of persons engaged in the trade of jute. There are around 94 composite jute mills out of which the state of West Bengal has 70 jute mills, Andhra Pradesh 10 mills, Uttar Pradesh 3 mills, Bihar 3 mills, Orissa 3 mills, Assam 2 mills, Chhattisgarh 2 mills and Tripura 1 Jute Mill.

2. Area, Production & Yield of Jute & Mesta

Area, production and yield of jute & mesta in major States during last 6 years & current year is at Annexure I. State wise normal area, production and yield of jute & mesta is at Annexure II. Area, production & yield of major jute growing countries during 2010-2013 is at Annexure III. 3. Climatic and Soil Requirement

3.1 Climatic requirement for cultivation of Jute/Mesta:

Jute is a crop of humid tropical climates. It thrives well in areas with well distributed rainfall of 2,500 mm spread over vegetative growth period of the crop with no cloudiness. Locations with a mean rainfall of <1,000 mm, incessant rainfall and water logging are not suitable for its cultivation. For better growth, a mean maximum and minimum temperature of 34oC and 15oC and a mean relative humidity of 65% are required. Temperatures below 15oC and above 43oC during growth are not suitable for jute crop. Corchorus olitorius (Tossa jute) cannot withstand water logging, however, C. capsularis (White jute) can withstand water logging, but its fibre quality is impaired with prolonged water stagnation. At a temperature below 10oC, no germination occurs in both the species. C. capsularis can withstand higher temperature at germination (up to 32oC), while C. olitorius is sensitive to such high temperatures.

Warm and humid climate are best suited to both the species of mesta i.e. Hibiscus cannabinus and Hibiscus sabdariffa. Cannabinus mesta is of short duration and suitable for higher rainfall areas and has got less drought tolerance capacity. Sabdariffa mesta is of longer duration and got better drought tolerance capacity. The crop can grow in temperature range of 20oC to 40oC but optimum temperature for its growth is 30oC to 34oC. The crop can grow in high rainfall areas provided good drainage is there. On the other hand it can grow in low rainfall areas to the tune of even 500 mm rainfall per annum. However, a rainfall of about 125 to 150 mm per month distributed well is required during the growth period. Alternate rain and sunshine is good for better growth.

3.2 Soils :

Jute can be raised on all kinds of soils from clay to sandy loam, but loamy alluvial are best suited. Laterite and gravel soils are not suitable for this crop. The new grey alluvial soils of good depth, receiving silt from the annual floods are the best for jute cultivation. A soil pH of 5.0-7.4 is within the tolerable limit of soil reaction. Soils with acidic pH (<4.5), effective soil depth <50 cm, electrical conductivity >2 dS/m and exchangeable sodium percentage >15 are not suitable for the crop. The crop is raised successfully on old alluvial soils of Bihar, mild acidic soils of Assam, Orissa, and light alkaline soils of tarai districts of Uttar Pradesh. It has been observed that clay loam for C. capsularis and sandy loam for C.olitorius aremost suitable soil types.

4. Crop Production Practices:

4.1 Time of sowing:

Sowing time of jute may differ from area to area on the basis of the receipt of pre-monsoon showers, availability of residual moisture and variety. Generally, sowing in middle of March is optimum for all Capsularis varieties and the Olitorius varieties like JRO524, JRO878 and JRO7835 while JRO632 should be sown only after middle of April. Olitorius sowing may be staggered upto May. In Bihar and Uttar Pradesh, sowing is done up to mid June or some time upto end June as per the onset of monsoon.

The recommended sowing for mesta crop is May-June for main season crop. However, in some areas particularly in some areas of Andhra Pradesh, rabi mesta is also raised. Sowing time for rabi mesta is February-March and usually sown with the subsoil moisture. Sowing should be done when there is sufficient moisture in the soil. A minimum of 21 per cent soil moisture content is required for germination.

4.2. Methods of sowing:

Sowing of jute can be done either by broadcast method or by line sowing method. For line sowing, the land is prepared well and sowing is done with row to row spacing of: Capsularis – 30 cm, Olitorius– 25 cm and plant to plant spacing is maintained at 5 to 7 cm and this is done by mechanical means i.e. seed drill. The depth of sowing is maintained at 2.5 to 3 cm. Mesta is usually sown by broadcasting method. But as criteria of improved production technology, it is advocated to sow the crop in line. Line sowing can be undertaken with the help of seed drill. Line sowing has got certain advantages over broadcasting method such as i) Plant growth is uniform since uniform spacing is maintained, ii) Intercultural operation like weeding, hoeing, etc. become easier and cheaper. iii) Application of pesticides and top dressing of fertilizer is easier, iv) Yield is higher by about 15-20%, v) Requirement of seed is less etc.

4.3. Land preparation:

Jute seeds being small require very fine tilth. The land can be prepared by ploughing and cross-harrowing 3-5 times followed by planking. In acidic soils (pH <6.0), incorporation of 1-1.5t/ha of lime, 30-40days before sowing is necessary for better crop performance. Soil moisture between 21-45% is considered ideal for proper germination. Mesta being a rainfed crop, land preparation is usually done with the receipt of pre-monsoon showers. However, in Andhra Pradesh, for raising rabi mesta, the land preparation is done early in February for sowing the crop with the help of subsoil moisture.

4.4. Seeding technologies:

Depending upon the species of jute and method of sowing, the seed rate of the two species recommended is under: Species Broadcast Line Sowing

C. capsularis 10kg/ha 7kg/ha

C.olitorius 7kg/ha 5kg/ha

The seeds are sown in row 20 cm (olitorius) and 30 cm (capsularis) apart. The plants within the row should be thinned manually at two stages. First thinning is done 20 days after sowing (DAS), when the plants are of 5-10 cm height . At this stage, plants are thinned to a distance of 5 cm. In second and final thinning 35 DAS, when plants are of 12-15 cm height, and are thinned to a distance of 10 cm. Thus the optimum population varies from 3.33 (capsularis) to 5.0 lakh/ha (olitorius).

The optimum plant population for mesta is about 4 to 5 lakh per hectare. The recommended row to row spacing is 25 to 30 cm and plant to plant spacing is 7 to 10 cm. For maintaining optimum plant population the seed rate for the two species varies. However, the recommended seed rate is higher than the actual requirement for maintaining the desired plant population. This is done because of getting uniform plant population. After emergence, the excess plants are thinned out to get desired spacing. The seed rate of the two species in two method of sowings are as under:

Species Broadcast Line Sowing

H. cannabinus 15-17 kg/ha 13-15 kg/ha

H. sabdariffa 13-15 kg/ha 11-13 kg/ha

4.5. Fertilizer management:

In general, the nutrient requirement of capsularis is more than that of olitorius. In soils with low organic carbon content, FYM application @ 5-10t/ha, a month prior to crop sowing is recommended. The leaf fall from the standing crop and also root stubbles left in the soil after harvest results in recycling of handsome amount of nutrients besides organic matter in intensive cropping systems. The recommended doses of fertilizers are 40 to 80, 20 to 40, 20 to 40 kg/ha (olitorius) and 60 to 80, 30 to 40, 30 to 40 kg/ha (capsularis) of N:P:K respectively (as per

CRIJAF). In heavy soils with low to moderate rainfall, all nutrients are applied as basal. In light soils and high rainfall situations, N is applied in 2 equal splits, ½ basal and ½ top dressing, i.e. preferably after weeding and thinning operations. Seed inoculation with Azotobacter chroococum and Azospirillum brasilense has been found promisin to supplement part of N fertilizer. Foliar application of 20 kg N through urea solution with teepol as sticker at pre-flowering stage is promising. In acid soils and regions with high rainfall, calcium and magnesium deficiency is common. Liming of soil @ 2-5t/ha, once in 4 years or Dolomite application (40 kg/ha) is found promising as it supplies both calcium and magnesium.

In a medium fertile soil, the recommended dose of fertilizer for mesta is N40kg/ha, P – 20 kg/ha and K-20kg/ha. Since, mesta is raised mainly under rainfed condition, the recommended dose of N in such cases is 25 kg/ha and it is mainly recommended for Andhra Pradesh.

4.6. Water management:

Jute requires about 50 cm water for its growth and development. In India about 15% jute area is irrigated and the remaining area is rainfed. If the rainfall is not sufficient, the water requirement has to be supplemented through irrigation. For germination of jute seed, about 18-20% soil moisture is required. At sowing time, if the soil moisture is not sufficient, then one pre-sowing irrigation is to be given. After sowing, usually one or two irrigations at an interval of about 20 days is required at the initial stages of growth. Jute is sensitive to both drought and water logging. At germination and knee-high stages, adequate soil moisture must be ensured by irrigation. During rainy season, the crop experiences water logging that adversely affects fibre quality. Provision of quick drainage in uplands will be beneficial to the crop. However, in lowlands, it may not be feasible. In India, mesta is mainly raised as a rainfed crop. Since the pattern of rainfall during the sowing and growth period is highly erratic, desired yield is not obtained in mesta crop. For obtaining good yield, along with other inputs, the water requirement of the crop is to be fulfilled. The water requirement of mesta is about 50 cm, if the rainfall is highly uncertain, in that case it is desirable to give one or two irrigation to mesta crop at an interval of 15 to 20 days.

4.7 Insect-pests & Diseases of Jute & Mesta and their control measures:

Pest/Disease	Control Measures
Jute Insect/Pest: Jute Semilooper, Stem Weevil, Yellow Mite, Bihar Hairy caterpillar, etc.	Endosulfan @ 2 ml/l or Chlorpyriphos @ 1 ml/l to spray twice. Cypermethrin 25 per cent EC @ 1-1.2 ml/lit, Fenvalerate 20 per cent EC @1 ml/lit
Jute Disease: Seedling Blight, Damping off, Collar Rot, Stem Rot, Root Rot, etc.	Seed treatment with Carbendazim @ 2 g/kg or Mancozeb @ 5 g/kg or T. viridi @ 10 g/kg. In standing crop spraying of Carbedazim 0.2 % or Copper oxychloride 0.75 % may be done.
Mesta Insect/Pest: Jassids, Mealy bug, Semilooper, Spiral borer, etc	Endosulfan @ 2 ml/l or Chlorpyriphos @ 1 ml/l to spray twice. Spray of Neem oil.
Mesta Diseases: Foot Rot, Collar Rot, Stem Rot, etc.	Seed treatment with Carbendazim @ 2 g/kg or Mancozeb @ 3 g/kg or soil drenching with Copper oxychloride @ 5 g/l of water.

4.8. Harvesting and post-harvest operations:

4.8.1. Harvesting:

Jute is a bast fibre crop and can be harvested at any stage after a certain period of vegetative growth, usually between 100 to 150 days. Harvesting of jute crop at pre-bud or bud stage gives best quality fibre; however, the yields are low and older crop yields more quantity of fibre but the fibre becomes coarse and the stem does not ret properly. Hence, as a compromise between quality and quantity, early pod formation stage has been found best

for harvesting. Harvesting is done by cutting the plants at or close to the ground level with sharp sickles. In flooded lands, the plants are uprooted. The harvested plants are left in the field for 2-3 days for the leaves to shed. Next, the plants are tied into bundles 20-25cm of diameter and the branching tops are lipped off to rot in the field.

The best time of harvesting is small pod stage for cannabinus mesta which usually occurs in October while for sabdariffa mesta it is at 50 per cent flowering which occurs in November. If the plants are harvested earlier to this, fibre yield will be low and many of the fibre are immature and soft and may loss at the time of extraction If the harvesting is delayed or it is done at the maturity of the crop, the yield may be more but produces poor quality fibre which is brittle and less flexible as the cellulose reserves decline due to its utilization by developing fruits and seeds.

4.8.2. Retting:

Retting is one of the important operations governing the quality of fibre as prevailed at present. The bundles are kept in 30 cm deep water, and later placed side by side in retting water, usually in 23 layers and tied together. They are covered with water-hyacinth or any other weed that does not release tannin and iron. The float is then weighed down with seasoned logs or with concrete blocks or are kept emerged (at least 10 cm below the surface of water) with bamboo-crating. Clods of earth used as a covering material or as weighing agent produce dark fibre of low value. Retting is best done in slow moving large volume of clean water. The optimum temperature is around 34oC. If fibre comes out easily from the wood on pressure from the thumb and fingers, retting is considered complete. The traditional method of retting is commonly known as Steep method of retting as described above and the same method is being followed widely. Some of the other and improved methods have been developed or are in the stage of development like Ribbon Retting, Dry Retting, Use of Microbial Consortium in retting, etc but these methods are yet to be standardized and to make cost effectivefor adoption by the farmers.

4.8.3. Extraction of fibre:

Two methods of fibre extraction are practiced – single plant extraction method and beat-break-jerk method. Single plant extraction method: In single plant extraction method, four or five reeds are taken out and stripping started from the bottom; the fibre of each of the reeds is slipped out free from the stick up to 8-10 cm, then gripped and pulled out slowly from the rest of the stick. Extracted strips of the bundles are washed in clean water. Beat-break-jerk method: In beat-break-jerk method, a handful retted stems in left hand are gently beaten at the base with a mallet, then the woody core is broken and the extractor twist the bundles at the middle, grips the fibre where the bundle is broken and shakes the bundles vigorously to and fro in water. The broken sticks slip out and water wrung out of the fibre. The fibre is then washed in clean water, rung and eventually spread to dry, preferably in shade or mild sun. The beat-break-jerk method often leaves the broken sticks and make fibre somewhat entangled resulting in sticky fibre. Single plant extraction method is better and recommended for extraction of fibre as it gives better quality fibre. On

the other hand in beat-break-jerk method, the fibre become entangled and as a result the quality of fibre is affected.

5. Cropping system

Jute is one of the most suitable crop to fit in crop rotation. Since the harvesting duration of the crop is variable and accordingly it can be fitted in different crop rotations. Besides, shedding of jute leaves improves the soil fertility. The recommended/common practices of crop rotations with jute are indicated hereunder;

Irrigated condition:	**Rainfed condition:**
Jute-paddy-potato Jute-paddy-gram Jute-paddy-mustard Jute-paddy-wheat	Jute-paddy-pulses Jute-gram Jute-paddy-mustard Jute-mustard Jute-paddy

6. State-wise recommended varieties of Jute and Mesta:

S.N	State	Varety	
		Jute	Mesta
1	Andhra Pradesh		AMV-5 (Durga), GR-27 (Madhuri), MT-150 (Nirmal), JRM-5 (Shrestha)
2	Assam	AAUOJ-1(Tarun), JBO-2003H (Ira), JRO204 (Suren),S-19 (Subala), JRO-8432(Shakti), CO58 (Sourav), JBO-1 (Sudhangshu),JRC-698, JRC-80, JBC-5 (Arpita), RRPS-27-C-3 (Monalisa)	
3	Bihar	JBO-2003H (Ira), JRO-204 (Suren), S-19 (Subala), JRO8432(Shakti),JRO-128 (Surya), JRO-66 (Golden Jubilee Tossa), CO-58 (Sourav), JBO-1 (Sudhangshu), JRC-698, JBC-5 (Arpita), RRPS-27-C-3 (Monalisa)	GR-27 (Madhuri), MT150 (Nirmal), JRM-5 (Shrestha)
4	Meghalaya	AAUOJ-1(Tarun), JBO2003H(Ira), JRO-204 (Suren), S-19 (Subala), JRO-8432 (Shakti), CO58 (Sourav), JBO-1 (Sudhangshu),	GR-27 (Madhuri), MT150 (Nirmal), JRM-5 (Shrestha)

		JBC-5 (Arpita)	
5	Nagaland	AAUOJ-1 (Tarun), JBO-2003H (Ira), JRO-204 (Suren), S-19 (Subala), JRO-8432(Shakti), CO58 (Sourav), JBO-1 (Sudhangshu), JBC-5 (Arpita)	
6	Orissa	JBO-2003H (Ira), JRO-204 (Suren), S-19 (Subala), JRO-8432 (Shakti), JRO-128 (Surya), JRO-66 (Golden Jubilee Tossa), CO-58 (Sourav), JBO-1 (Sudhangshu), JBC-5 (Arpita), RRPS-27-C3(Monalisa)	AMV-5 (Durga), GR-27 (Madhuri), MT-150 (Nirmal), JRM-5 (Shrestha)
7	Tripura	AAUOJ-1 (Tarun), JBO-2003H (Ira), JRO-204 (Suren), S-19 (Subala), JRO-8432 (Shakti), CO58 (Sourav), JBO-1 (Sudhangshu), JBC-5 (Arpita)	GR-27 (Madhuri), MT150 (Nirmal), JRM-5 (Shrestha)
8	Uttar Pradesh	JBO-2003H (Ira), JRO-204 (Suren), S-19(Subala), JRO-8432 (Shakti), JRO-128 (Surya), JRO-66 (Golden Jubilee Tossa), JRC-80, CO-58 (Sourav), JBO-1 (Sudhangshu), JBC-5 (Arpita), NDC 2008 (Ankit)	
9	West Bengal	JBO-2003H (Ira), JRO-204 (Suren), S-19 (Subala), JRO-8432 (Shakti), JRO-128 (Surya), JRO-66 (Golden Jubilee Tossa), JRC-80,JRC-698, CO-58 (Sourav), JBO-1 (Sudhangshu), JBC-5 (Arpita),RRPS-27-C-3 (Monalisa)	

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