

Seed production technology

of jute for non-traditional western plateau region of Odisha

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Jute (Corchorus olitorius) significantly contribute in the agrarian economy as well as social life of vast farming community of eastern Indian states, viz. West Bengal, Bihar, Assam, Meghalaya, Odisha and Tripura. Around 5,000 tonnes of quality seed are required for sowing about 8 lakh ha of jute area, now under cultivation in India, while the annual seed production of certified seeds is only to the tune of 1,500-2,000 tonnes and it can cover only around 35% of total jute acreage.

Key words: Jute, *Olitorius*, Seed Production, Weed management

IN INDIA, jute seed is traditionally produced in the drier areas of Andhra Pradesh, Maharashtra and Karnataka states. Whereas, the same seed is transported to the jute fibre growing states like West Bengal, Bihar, Odisha, Assam and other north-eastern states. Timely availability of jute seed in the fibre producing states is not ensured; moreover, long distance transportation cost adds to the price of jute seed which often goes beyond the purchasing power of common farmers. The jute area in Odisha is about 11,880 ha with a lower productivity of 17.4 q/ha. Besides other factors, unavailability of quality certified seeds of improved varieties in time results lower fibre productivity. So, Odisha at present level of acreage, needs about 83,160 kg of jute seed every year for which it depends on jute seed producing southern or western states. The western part of Odisha might be suitable for jute seed production, at least up to the extent to meet own requirement initially and later for commercial venture. Moreover, to achieve higher jute fibre productivity for Odisha (>25 q/ha), timely ensured supply of quality jute seed of improved varieties is required. But so

far, there were no effort to study the feasibility of producing jute seeds in the state itself particularly in the drier plateau areas of western Odisha. In spite of varied topography, soil condition and rainfall variability during the monsoon, traditionally only paddy is grown by the farmers of western Odisha region, which is mostly low-productive resulting non-profitability. Therefore, with an aim to produce quality jute seed in western Odisha and to enhance farmers profitability through field experimentations, an improved production technology developed for producing quality jute seed of improved *Olitorius* varieties (since *Olitorius* areas are more than 90% of total jute area) in Sambalpur, Sundargarh and Jharsuguda districts of western Odisha. The improved production technology for jute seed in western Odisha comprises (i) selection of area/land, (ii) certified seed of improved varieties, (iii) appropriate sowing time and method of sowing, (iv) weed management, (v) nutrient and irrigation management, (vi) topping management, (vii) insect pest and disease management, (viii) harvesting, (ix) seed threshing, processing and storage, (x) seed yield,

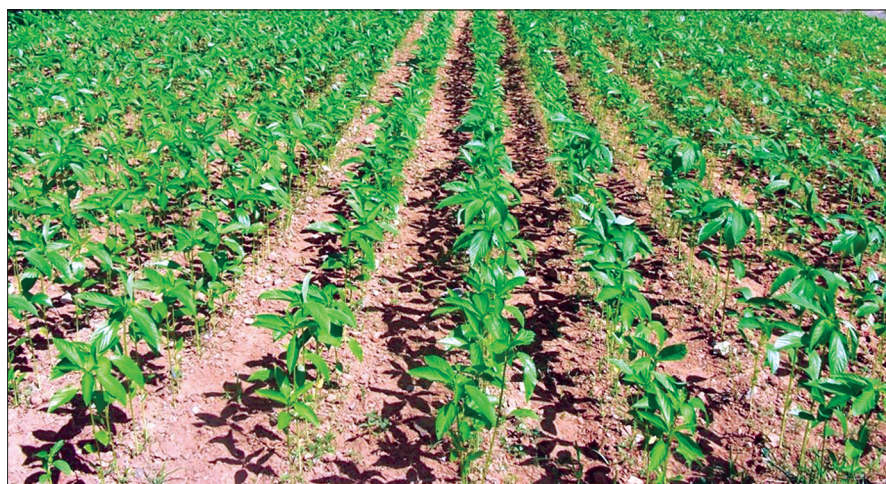
(xi) seed quality and (xii) profitability.

Selection of area/land

Except very low-lying areas/land, the jute seed crop can be raised successfully in medium to high land situations. It is to be ensured that the selected land should not be inundated by rain water during the monsoon months. However, seasonal rainfall of about 750-900 mm during 4th Jute to 7th October (i.e., 23-40 standard meteorological weeks) is congenial for successful raising of jute seed crop in those areas. Generally land with medium fertility status, neutral soil reaction and up to soil acidity of pH>5.8 can be deployed for growing jute seed in western Odisha areas.

Improved varieties

Earlier the farmers' preferred variety was JRO 524 (Navin), which was released in 1977 and still cultivated in some jute growing areas. However, recently released and recommended better improved *olitorius* jute varieties are suitable for seed production programme. Therefore, varieties like JRO 8432 (Shakti Tossa), JRO 128 (Surya tossa), JRO 204 (Suren), S 19



Jute seed crop at early stage in western Odisha

(Subala), JBO 2003H (Ira) can be considered for seed production. As there is still some demand of JRO 524 variety, the seed of this variety may be produced in limited scale to meet the local requirement.

Sowing time and method of sowing

As the jute seed crop is primarily rainfed, the sowing of the jute seeds is to be adjusted with the appropriate availability of rhythmic and assured rainfall. It was found from field trials that the ideal sowing time of jute seed crop is between 1-7 July for the non-traditional western Odisha plateau region. However, the actual sowing date may slightly vary (± 7 days) depending upon the fulfilment of rainfall for a particular year. Jute seed crop need to be sown in line with a spacing of 40-45 cm between the rows. Multirow (4-5 rows) jute seed drill machine with adjusted seed-drum position may be used for sowing of jute seed crop in line. A plant population of about ± 2.5 lakh/ha encourages growth and produce higher seed yield in western Odisha condition.

Weed management

In the initial 6 weeks, the jute seed crop is infested by grass, broadleaved weeds and some sedge (*Cyperus rotundus*) weeds. Among the all three types of weeds, the grassy weeds such as Shyama (*Echinochloa colona*), Scrab grass (*Digitaria sanguinalis*), goose grass (*Elusine indica*), Bermuda grass (*Cynodon dactylon*), crow foot weed (*Dactyloctenium aegyptium*) etc. are dominant. If the weeds are not

controlled within the economic threshold level of duration and degree, there is a loss of seed yield as high as 50-70%. So, it is always advised to manage the weeds within the initial critical period of 2-4 weeks of crop age. For jute seed crop, management of weeds through mechanical means are better than other measures such as manual or herbicidal methods. In mechanical method, use of 'CRIJAF Nail weeder' or 'Single wheel jute weeder' twice at 2 and 4 weeks after sowing (WAS) in between the jute rows could be sufficient to control most of the weeds in jute seed crop of the western Odisha situation. However, if any of the weeding machines is not available with the farmer, he may go for post emergence application of herbicide like quizalofop ethyl twice (a grass weed killer) @2 ml/l at 2-3 leaf stage of weeds (i.e., 2 WAS) and

again at 4-5 WAS @2.5 ml/l. In case of higher infestation of other than grassy weeds, one manual weeding may be necessary besides application of quizalofop ethyl.

Nutrient and irrigation management

As the average organic carbon content of the western Odisha soil seldom goes higher than 0.5%, it is advised to apply organic manure for production of quality jute seed. It is suggested that at the time of final land preparation, cow dung manure @5 t/ha (or 5 kg/m²) or other organic manure locally available needs to be applied. In pocket areas of western Odisha, where sisal (*Agave sisalana*) compost is available, may be applied @5 t/ha instead of FYM. For medium fertile soil condition, out of the total recommended dose of N (60 kg/ha), P₂O₅ (60 kg/ha) and K₂O (60 kg/ha), full dose of P₂O₅ and K₂O are to be applied as basal at the time of final land preparation. Nitrogen to be applied in 3 equal split doses of 20 kg/ha coinciding final weeding (4 WAS), just after topping (6-7 WAS) and at the time of active branching (9 WAS). Generally, the jute seed crop can be grown as rainfed crop, however, only one light irrigation (if available and affordable) may be given at the time of pod formation stage.

Topping management

Number of branches is directly proportional to the number of pods and thereby seed yield in jute. For



Jute seed crop at active branching stage in western Odisha

encouraging branching in jute seed crop by breaking the apical dominance, the top apical bud is removed manually, this is known as 'topping'. Topping is to be done at 6-7 WAS depending on the general growth of the jute seed crop reaching knee height (approximately 50 cm or 20 inch). However, if the general vegetative growth of the jute seed crop at 6-7 WAS is not very impressive, in such cases topping is not advised.

Insect pest and disease management

In the active monsoon phase of jute seed crop season, the crop may be attacked by jute semi looper, a green soft and loop bodied insect feeds the young leaves from the edges. If the infestation is not very high, it can be controlled by two spraying of neem oil @4 ml/l at 10 days interval. But in case of severe infestation, spraying of cypermethrin @100 g a.i./ha or lamda cyhalothrin (5EC) @1.0-1.5 ml/l of water is required. If warm humid weather prevails for longer period during the mid-growing season, the jute seed crop may be infested by Bihar hairy caterpillar. In case of heavy infestation, it may be controlled by spraying lamda cyhalothrin (5 EC) @1.5 ml/l once or twice at 10-12 days interval. The jute seed crop in western Odisha may be affected by stem rot disease from early to mid-growing stage. For controlling the disease, treatment of seed before sowing by carbendazim @2 g/kg of seed is necessary. Moreover, if the infestation spreads, spraying of blitox @5 g/l or carbendazim @2.5 g/l of water is recommended. Sometimes, the jute seed crop may be affected by viral mosaic and chlorosis disease. In most of the cases, the infestation may not be very alarming, so need not be controlled. But in case of severe infestation, it will affect the general growth of the seed crop and eventually deteriorate the seed quality. As the viral disease is spread through insect vector (white fly), the disease can be checked by controlling the vector through spraying of imidachlorpid @1 ml/4 l of water (or 0.25 ml/l water).

Harvesting

It was recorded that the total duration of jute seed crop in western Odisha may vary between 120 and 135 days depending on the actual sowing time and cessation of active monsoon rain in a particular year. Higher soil moisture content at the later phase of crop growth prolongs the crop duration. In general, it was recorded that the jute seed crop was ready for harvest during 2nd to 3rd week of November. Brownish dried stem with mature and dried pods is the indication of appropriate harvesting time for jute seed crop. Such a mature jute seed crop is harvested manually by cutting the dried stems using sickle close to the ground (say 2-3 inch above the actual ground surface) and is carried to the threshing floor.

Seed threshing, processing and storage

The harvested jute seed plants along with seed pods are laid under the direct sunlight on the drying cum threshing floor for 3-4 days for proper drying. After that the plants are beaten by wooden bars or sticks which shatters the dried pods and releases the seeds on the floor. The seed detached jute plant stems are removed and the threshed seeds are further dried and cleaned by natural directional wind or artificial air flow of fan. When the cleaned seeds attain moisture content of about 10-11%, it is stored in polythene lined gunny bags or (as far as practicable) airtight

polycarbonate containers. Appropriate storage condition supporting to maintain the desired seed moisture content of 10-11% gives longer viable shelf life of 6-8 months for the jute seeds produced at western Odisha. Higher moisture content in the produced seed at the time of final processing or gaining of moisture during storage due to faulty storage condition leads to quick deterioration of seed viability resulting in poor seed quality, making the seeds unsuitable for sowing.

Seed yield

In medium fertile area of western Odisha, the *Olitorius* jute seed yield can be 725 to 930 kg/ha depending upon varieties grown (Table 1). Although JRO 8432 produced the highest seed yield of 930 kg/ha, this variety is not very popular among the majority of jute growing farmers. Whereas, JRO 204 (733 kg/ha), S 19 (725 kg/ha), JBO 2003H (751 kg/ha) are better suited variety for the area; hence, suitable for seed production in western Odisha condition.

Seed quality

Parameters like seed boldness (or 1000 seed weight), germination (%), speed of germination, seedling dry matter (SDM), seedling vigour index (SVI) etc. are the measures of jute seed quality (Table 2). In western Odisha condition S 19 produced the boldest seed (1.962 g/ 1000 seeds)

Table 1. Yield parameters and seed yield of different varieties of *Olitorius* jute at western Odisha

Varieties	Plant height at maturity (cm)	No. of pods/plant	No. of seeds/pod	1000 seed weight (g)	Seed yield (kg/ha)
JRO 524	245	29.7	227	1.902	875
JRO 8432	225	30.5	214	1.837	930
JRO 128	213	27.0	251	1.747	767
JRO 204	237	27.0	223	1.842	733
S 19	236	26.0	217	1.962	725
JBO 2003H	254	30.0	247	1.847	751

Table 2. Seed quality of different varieties of *Olitorius* jute produced at western Odisha

Varieties	Germination (%)	Speed of germination	Seedling weight (mg)	Vigour index
JRO 524	98.33	90.57	17.0	1672
JRO 8432	85.00	49.87	17.0	1445
JRO 128	85.83	64.35	12.0	1030
JRO 204	97.50	67.17	19.0	1853
S 19	97.50	61.62	20.0	1950
JBO 2003H	99.00	91.83	18.0	1782

Table 3. Seed production economics of different varieties of *Olitorius* jute at western Odisha

Varieties	Cost of cultivation (₹ ha ⁻¹)	Gross return (₹ ha ⁻¹)	Profit (₹ ha ⁻¹)
JRO 524	42,685	87,500	44,815
JRO 8432	42,685	93,300	50,615
JRO 128	42,685	73,300	30,615
JRO 204	42,685	76,700	34,015
S 19	42,685	72,500	29,815
JBO 2003H	42,685	75,100	32,415

followed by JRO 204 (1.902 g). The highest germination (%) was recorded in JBO 2003H (99%), JRO 524 (98.33%) and JRO 204 (97.50%). In case of JRO 8432 and JRO 128, the germination % was comparatively lower (85.8-85.0%). The observed germination percentage of all the varieties were well above the minimum standard germination percentage of 80% prescribed for jute. Speed of germination of jute seeds varied significantly among the different *Olitorius* varieties (Table 2). The jute seeds produced in western Odisha revealed that there are 3 distinct groups of jute seed belonging to 3 speed of germination groups. In the 'fast germinating group', the varieties are JBO 2003 H (91.83) and JRO 524 (90.57); in the 'medium germinating group', the varieties are JRO 204 (67.17), JRO

128 (64.35) and S 19 (61.62). JRO 8432 (49.87) belongs to the 'slow germinating group'.

The highest 20 seedlings weights were recorded in S 19 (20 mg) closely followed by JRO 204 (19 mg). Whereas, the lowest seedling weight was recorded in JRO 128 (12 mg). The maximum vigour index was recorded in S 19 (1950), followed by JRO 204 (1853). The lowest vigour index was recorded in JRO 128 (1030).

Profitability

The total cost of production for 1 ha of jute seed was ₹ 42,685/ha in western Odisha (Table 3). The highest profit was obtained in case of JRO 8432 (₹ 50,615/ha) followed by JRO 524 (₹ 44,815/ha) due to higher seed yield and assuming that

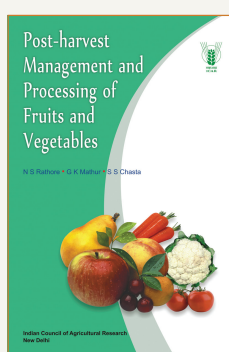
the price of jute seed for all the varieties are same (i.e. ₹ 100/kg). The profit obtained from jute seed cultivation is much higher than growing traditional paddy (₹ 11,250/ha) in these areas. However, in the days to come the price of jute seed may vary according to the variety preferred by the farmers due to specific traits in a variety. Therefore, the profitability might increase even if the total seed yield of other varieties may be comparatively lesser than JRO 8432.

SUMMARY

Quality *Olitorius* jute seed production can be taken up by the farmers in western Odisha region owing to congenial climatic condition during July-November and the endeavour of jute seed production is much better and remunerative than the traditional paddy cultivation for western Odisha farmers.

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