Journal of Crop and Weed, 13(2): 68-72 (2017)

Adjustment of date of sowing and topping to improve seed yield of *Olitorius* jute in New Alluvial Zone of West Bengal

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Received : 31-03-2017 ; Revised : 20-08-2017 ; Accepted : 28-08-2017

ABSTRACT

A field experiment was conducted during two consecutive kharif seasons of 2015 and 2016 at the Instructional Farm of Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal, India with an objective to maximize the seed yield of Corchorus olitorius cv. JRO-8432 (Shakti Tossa) by adjusting dates of sowing and topping. The experiment was conducted in a split plot design with 3 main plot treatments of dates of sowing (D_1-19th June, D_2-19thJuly,and D_3-19th August) along with 4 subplot treatments of topping operation (T_1-No topping, T_2-Topping at 30 DAS, T_3-Topping at 45 DAS, T_4-Topping at 60 DAS) and each treatment was replicated thrice. Irrespective of topping operation, the 19th June sown crop was found superior over other sowing dates with the highest seed yield of 240.46 kg ha^{-1}. In topping treatments, topping at 45 DAS was always found superior to other topping dates in both the years when the highest pooled seed yield of 220.74 kg ha^{-1}was recorded. The 19th June sown crop that experienced topping at 45 DAS recorded the highest seed yield in both the years.

Keywords: Date of sowing, jute, seed yield, topping

Jute in West Bengal is a prospective fiber crop as well as one of the most important cash crops covering vast area in the country of about 519 thousand ha with a production of 8075 thousand bales (Anonymous, 2016). In West Bengal, it is mainly grown for fiber production in the alluvial tract. Besides, the leaves and soft stems are also consumed as vegetables as they supplies energy, minerals, vitamins and many more (Antia *et al*., 2006). Emergence of technologies for quality improvement and diversification of jute includes blending of jute with other natural or man-made fibers for furnishing, interior decoration, garments, dress materials, geotextiles, agrotextiles, handicrafts, soft luggage *etc*. It is 100% biodegradable and recyclable and can be disposed in an environment friendly way. In recent years, jute has been used for making pulp and papers in the paper industry (Mohiuddin *et al*., 2005). This accounted for 67 per cent of jute production in the country covering 63 per cent of jute growing area.

Quality seed is an important input for higher fiber production. It has been found that the fiber production can be boosted up more than sixteen percent if quality seeds are used over local seeds. But, these quality seeds are generally unavailable to the jute growers of the West Bengal. Before independence, there was no organized jute seed production unit or division. Seeds were mostly produced in Murshidabad (Lalgola), the northern parts of Bengal, Bihar and Bangladesh by the own efforts of the farmers. They used to harvest the crop at physiological maturity, so that they could get fiber too, which caused substandard seeds as well as fibre. Only 72per cent quality jute seed is supplied by national and state agencies. To fulfill 100 per cent target, emphasis on quality seeds production should be given. National Seed Corporation had initiated organized jute seed production in Maharashtra in 1968 with introduction of varieties JRO 524. Recently released varieties like JRO 66 (Golden Jubilee), JRO 8432 (Shakti Tossa), JRO 128 (Surya), and S-19 are gradually gaining importance among the farmers of West Bengal. The farmers of West Bengal do not grow a separate jute crop for seed production as it requires long crop period (April to December-January) which hampers transplanting of *aman* rice and *rabi* crops (Roy, 2013). The farmers usually met up their requirement by the N.S.C where the seeds are grown under its supervision in the states like Bihar, Andhra Pradesh and Maharashtra which in turn increases the cultivation cost significantly.

Jute seed production can be increased significantly by adopting improved agronomic techniques like optimum sowing time as jute requires a well distributed monsoon rains during the vegetative period and a rain free period during ripening to harvesting and processing for its seed production. Another important factor is topping (clipping of apical buds). When the apical buds are clipped off and at the correct stage (after six weeks of sowing), the auxiliary buds develop lateral branches which in turn increases the seed yield by producing more number of pods. When the crop is sown at its optimum time, there is a synchronization of the growth phases of the crop with the optimum environmental condition which ultimately leads to better expression of the crop in terms of growth and yield (Salmasi *et al*., 2006). For improvement of fibre yield covering the vast area the necessary steps must be taken for production of quality seed which remained at present behind the satisfactory

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Table 1: Effect of dates of sowing and topping on yield attributes of JRO-8432

Dates of sowing (D)	No. of primary branches plant^{-1}			No. of pods plant^{-1}			No. of seeds pod^{-1}			Test weight (g)		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
D_1	4.42	6.72	5.67	37.90	41.80	39.97	248.18	261.49	254.84	2.28	2.28	2.28
D_2	3.8	4.85	4.34	31.57	35.57	33.57	241.55	255.08	246.69	2.26	2.27	2.27
D_3	3.20	4.01	3.46	26.70	28.55	27.25	220.23	233.59	226.91	2.25	2.27	2.26
LSD (0.05)	**0.53**	**0.64**	**0.59**	**3.13**	**3.37**	**3.29**	**15.23**	**16.09**	**15.96**	**NS**	**NS**	**NS**
Topping (T)												
T_1	2.80	3.60	3.00	24.1	28.43	26.27	231.14	242.71	236.93	2.27	2.28	2.27
T_2	4.06	5.67	5.01	33.80	37.20	35.67	238.84	253.85	245.00	2.26	2.28	2.27
T_3	5.17	7.01	6.09	38.40	41.80	40.10	245.67	257.32	250.66	2.28	2.28	2.28
T_4	3.20	4.50	3.86	31.93	33.80	32.37	230.97	246.34	238.67	2.26	2.27	2.27
LSD (0.05)	**0.22**	**0.37**	**0.30**	**1.61**	**1.85**	**1.78**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Note: D_1-19th June, D_2-19thJuly, D_3-19thAugust and T_1-No topping, T_2-Topping at 30 DAS,T_3-Topping at 45 DAS, T_4-Topping at 60 DAS

Table 2: Interaction effect of dates of sowing and topping on yield attributes of JRO-8432

DOS & Topping	No. of primary branches plant^{-1}			No. of pods plant^{-1}			No. of seeds pod^{-1}			Test weight (g)		
	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
D_1T_1	3.5	3.9	3.70	30.2	34.0	32.10	241.92	253.12	247.52	2.28	2.30	2.29
D_1T_2	4.2	7.0	6.00	40.4	44.0	42.70	250.00	266.00	258.00	2.26	2.28	2.27
D_1T_3	6.0	10.0	8.00	43.0	47.2	45.10	260.00	270.67	265.33	2.29	2.27	2.28
D_1T_4	4.0	6.0	5.00	38.0	42.0	40.00	240.80	256.20	248.50	2.29	2.27	2.28
D_2T_1	2.5	3.5	3.00	24.1	28.5	26.30	235.66	247.52	241.59	2.27	2.25	2.26
D_2T_2	4.0	5.6	4.80	32.2	36.4	34.30	245.64	259.10	248.33	2.26	2.28	2.27
D_2T_3	5.0	6.1	5.55	39.0	42.2	40.60	247.34	261.00	251.67	2.28	2.30	2.29
D_2T_4	3.7	4.2	4.00	31.0	35.2	33.10	237.56	252.70	245.17	2.26	2.28	2.27
D_3T_1	2.4	3.4	2.30	18.0	22.8	20.40	215.84	227.50	221.67	2.25	2.27	2.26
D_3T_2	4.0	4.4	4.23	28.8	31.2	30.00	220.89	236.45	228.67	2.27	2.29	2.26
D_3T_3	4.5	4.9	4.72	33.2	36.0	34.60	229.67	240.30	234.98	2.26	2.28	2.27
D_3T_4	1.9	3.3	2.60	26.8	24.2	24.00	214.54	230.12	222.33	2.24	2.26	2.25
LSD (0.05)												
D × T	**1.84**	**1.99**	**1.92**	**5.41**	**5.55**	**5.48**	**32.56**	**32.73**	**32.65**	**NS**	**NS**	**NS**
T × D	**0.47**	**0.59**	**0.53**	**3.05**	**3.11**	**3.08**	**NS**	**NS**	**NS**	**NS**	**NS**	**NS**

Note: D_1-19th June, D_2-19thJuly, D_3-19thAugust and T_1-No topping, T_2-Topping at 30 DAS,T_3-Topping at 45 DAS, T_4-Topping at 60 DAS

Table 3: Effect of dates of sowing and topping on seed and stalk yield of JRO-8432

Dates of sowing	Seed yield (kg ha^{-1})			Stalk yield (t ha^{-1})			Harvest Index		
(D)	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
D_1	230.59	250.33	240.46	7.40	7.64	7.52	0.030	0.031	0.031
D_2	180.29	204.56	192.42	6.10	6.52	6.31	0.028	0.030	0.029
D_3	132.42	150.74	141.58	3.98	4.71	4.35	0.030	0.031	0.030
LSD (0.05)	**14.17**	**14.56**	**14.31**	**0.41**	**0.72**	**0.51**	**-**	**-**	**-**
Topping (T)									
T_1	167.58	188.11	177.84	5.41	5.96	5.68	0.029	0.030	0.029
T_2	192.90	213.68	203.29	5.84	6.21	6.03	0.031	0.033	0.032
T_3	209.28	232.21	220.74	6.16	6.64	6.40	0.033	0.034	0.033
T_4	154.65	173.51	164.08	5.91	6.36	6.13	0.026	0.027	0.026
LSD (0.05)	**10.94**	**11.26**	**11.11**	**0.35**	**0.57**	**0.47**	**-**	**-**	**-**

Table 4: Interaction effect of dates of sowing and topping on seed and stalk yield of JRO-8432

DOS &	Seed yield(kg ha^{-1})			Stalk yield(t ha^{-1})			Harvest Index		
Topping	2015	2016	Pooled	2015	2016	Pooled	2015	2016	Pooled
D_1T_1	215.34	240.00	227.67	7.15	7.39	7.27	0.029	0.031	0.030
D_1T_2	240.40	259.34	249.87	6.95	7.19	7.07	0.033	0.034	0.033
D_1T_3	256.87	273.79	265.33	7.56	7.80	7.68	0.033	0.035	0.034
D_1T_4	209.74	228.20	218.97	7.95	8.19	8.07	0.026	0.027	0.026
D_2T_1	160.20	178.86	169.53	5.52	5.99	5.76	0.028	0.029	0.029
D_2T_2	200.40	225.60	213.00	6.39	6.75	6.57	0.030	0.032	0.031
D_2T_3	220.56	253.24	236.90	6.42	6.92	6.67	0.033	0.034	0.033
D_2T_4	140.00	160.54	150.27	6.07	6.43	6.25	0.023	0.024	0.023
D_3T_1	127.20	145.46	136.33	3.55	4.50	4.03	0.030	0.031	0.030
D_3T_2	137.90	156.10	147.00	4.17	4.70	4.44	0.031	0.032	0.031
D_3T_3	150.40	169.60	160.00	4.50	5.20	4.85	0.032	0.032	0.032
D_3T_4	114.20	131.80	123.00	3.70	4.45	4.08	0.030	0.029	0.029
LSD (0.05)									
D × T	**9.70**	**9.46**	**9.58**	**0.90**	**1.21**	**1.14**	-	-	-
T × D	**12.55**	**12.38**	**12.46**	**0.77**	**0.83**	**0.80**	-	-	-

level. At present to cover the jute production area the total requirement is 55 thousand quintal. But at present the country's production capacity is limited to 15-20 thousand quintals. The huge gap in quality seed production can be successfully checked by extending seed production area in our country including different districts of West Bengal like Bankura, Purulia, Medinipur and parts of Birbhum and Burdwan where agro-climate conditions are congenial for production of quality seed of the crop. 'The Red and Laterite zone' of West Bengal has been identified as a favorable area for production of quality seed of *olitorius* species and with some agronomic practices like sowing at optimum time, proper spacing, pruning, proper field management, *etc*. an enhanced production of quality seed can be achieved from the same area. This present experiment was designed to find out the suitable date of sowing and appropriate time of topping to get maximum seed yield from tossa jute cultivation in new alluvial zone of West Bengal.

MATERIALS AND METHODS

The impact of date of sowing and topping operation on production of seed yield in *tossa* or *olitorius* jute (cv. JRO 8432) was studied following field experiment during *kharif* season of 2015 and 2016 at the Instructional Farm,

BCKV, Jaguli, Nadia, West Bengal, India. The farm is situated very close to Tropic of Cancer having approximately 22.93º N latitude and 88.53º E Longitude with an average altitude of 9.75 meters above mean sea level.

The soil of the experimental field was sandy loam in texture (sand, silt and clay content is 56.2, 20.3 and23.5% respectively as determined by the International Pipette Method; Piper, 1966) having good water holding capacity. Fertility status of the experimental soil was medium having pH of 6.9 with 0.54% organic carbon, 0.057% total nitrogen, 16.45 kg ha^{-1}available phosphorus and 186.33 kg ha^{-1} available potassium.

Experiment having 3 replications were conducted in split plot design with plot size of 4 × 5m with 3 main plots, namely dates of sowing (D_1-19th June, D_2-19th July and D_3-19th August) along with 4 subplots of topping treatments (T_1-No topping, T_2-Topping at 30 DAS, T_3-Topping at 45 DAS and T_4-Topping at 60 DAS) for the jute (*Corchorus olitorius* L.) variety JRO-8432 (Shakti Tossa).

The jute variety, (cv.JRO-8432) was sown in three different dates with the seed rate of 4 kg ha^{-1} with the spacing of 30 × 10cm. The fertiliser dose of 40:20:20 kg N, P_2O_5 and K_2O ha^{-1} was used for the crop. 50% N along with a full dose of P_2O_5 and K_2O were applied as basal at the time of final land preparation and the rest amount of nitrogen was applied at 30 days after sowing (DAS).In order to induce auxiliary branches clipping of the apical portion (topping) was carried out at 30, 45 and 60 DAS on separate plots. All improved package of practices like weeding, irrigation, intercultural operation and pest control were adopted to raise the crop properly.

The yield of jute crop was recorded after harvesting and threshing of crop. Records on yield attributes namely the number of primary branches $plant^{-1}$, number of pods $plant^{-1}$, number of seeds pod^{-1}, test weight (g), seed yield (kg ha^{-1}) and stalk yield (t ha^{-1}) were taken at harvest. For measuring the seed yield of jute, the entire produce from the net plot area (from demarcated portion, leaving the border area) was harvested, threshed, winnowed and weighed after thorough drying under the sun. Seed yield from that area was converted to yield per hectare (kg ha^{-1}). All the yield attributing parameters (pods $plant^{-1}$, seeds pod^{-1}) were measured by randomly taking 10 plants from each plot and finally averaged into a single value.

The all critical difference by (LSD) for estimated treatmentcontrasts was worked out using standard statistical procedures as outlined in Gomez and Gomez (1984). The difference between treatment means werecompared with CD value at 5 per cent level of probability and the treatments with higher effect over others were identified.

RESULTS AND DISCUSSION

Effect of dates of sowing

The pooled value of mean number of branches per plant was 5.67 during the 1st date of sowing (19th June) which was significantly higher over other two dates of sowing. Similarly, the number of pods per plant recorded from the first date of sowing (39.97) was significantly higher than the second date (35.75) and third date of sowing (29.45).The 1st date of sowing (19th June) also recorded significantly higher number of seeds per pod (254.84) than other dates of sowing. Test weight did not vary significantly among the three dates of sowing (Table 1).

JRO-8432 (*tossa* jute variety) recorded the maximum seed yield of 240.46 kg ha^{-1} (pooled value of both the years) on 1stdate of sowing (19th June) followed by seed yield of 2nd (19th July) and 3rd date of sowing (19th August) of 192.42 kg ha^{-1} and 141.58 kg ha^{-1} respectively (pooled value). However, between both the years of experimentation, 2016 recorded the highest seed yield of 250.33kg ha^{-1}. The pooled value of the stalk yield followed the similar trend and recorded that the highest stalk yield (7.52 t ha^{-1}) on first date of sowing (19th June)followed by second date (6.31 t ha^{-1}) and third date (4.35 t ha^{-1}) of sowing. Same trend was also observed in harvest index (HI) where the value of harvest index was higher for first date of sowing (19th June) as compared to other dates of sowing (Table 3). Delayed sowing (July and August) resulted in decreased vegetative growth and early commencement of flowering which reflected in lower number of pods per plant as well as seeds per pod in both the years of experimentation and there was a significant decrease in seed yield as well as stalk yield. Results obtained in the experiment corroborate the findings of Rayhan *et al*. (2008) and Kumar *et al.* (2013).

Effect of topping

Among different topping treatments undertaken, it is evident that topping at 45 DAS resulted in most beneficial effect on seed production. The pooled value of the number of primary branches per plant (6.09) was highest in the treatment of topping at 45 DAS which was statistically significant over other treatments. The pooled value of the highest number of pods per plant (40.10) recorded with topping at 45 DAS was statistically higher than topping at 30 DAS (35.67).However, number of seeds per pod and test weight of seeds did not vary significantly due to topping during both the years of experimentation (Table 1).

Significantly superior seed yield was recorded at topping at 45 DAS over the other three treatments (no

topping, topping at 30 DAS and topping at 60 DAS) with the production of 220.74 kg seed ha^{-1} (pooled). This might be attributed to increased number of branches per plant and more number pods per branch due to clipping at appropriate growth stage. Increment in number of primary branches might be the consequence of induction and growth of new auxiliary branches due to topping. Similar result was also obtained in case of pooled value of stalk yield (6.40 t ha^{-1}) where topping at 45 DAS proved to be superior over other topping treatments in both the years (Table 3).Similar results were also opined by Roy (2013), Sarkar and Sinha (2004) and Salim *et al.* (1998).

Interaction effect

Yield attributing characters like number of primary branches per plant and number of pods per plant recorded significant variation; however number of seeds per pod and test weight didn't vary significantly. First date of sowing (19th June) with topping at 45 DAS was always found to be superior (Table 2).

Interaction effects between the various treatments were analyzed on seed yield per hectare and it was observed that the treatment combination with first sowing date (19th June) and topping at 45 DAS significantly maximized the seed as well as stalk yield. Similar result was also reflected in harvest index too (Table 4). Topping is defined as clipping or pruning of apical portion of plant along with auxiliary buds to induce lateral growth of plants. Topping at 45 days on 1st date of sown plants produced maximum seed yield whereas late sown plants progressively showed significant reduction in seed yield. Following the two agro techniques, substantial improvement was recorded on seed yield along with some component traits. Similarly, Sarkar and Sinha (2004) observed gain in seed yield of jute by clipping on early sown crops.

There is scope to improve total seed yield in jute by adjustment of date of sowing and topping at appropriate stage of growth. Early sowing *i.e*. on or before 19th June and pruning of apical buds at 45 days age of the crop could be recommended for enhancement of total seed yield along with its attributing characters like number of pods $plant^{-1}$, number of seed pod^{-1} and number of primary branches in tossa or *olitorius* jute in new alluvial zone of West Bengal under rainfed situation.

REFERENCES

Anonymous 2016. Estimates of area and production of principal crops in West Bengal-2015-16. Directorate of Agriculture, Government of West Bengal, Kolkata, pp.157.

Antia, B. S., Akpan, E. J., Okon, P. A. and Umoren, I. U. 2006. Nutritive and anti-nutritive evaluation of sweet potatoes (*Ipomoea batatas*) leaves. *Pakistan J. Nutr*., **5**:166-68.

Kumar, N., Srivastava, R. K., Singh, R. K. and Singh, M. V. 2013. Impact of sowing time and varieties on seed yield of jute in subtropical climatic zone of north eastern Uttar Pradesh. *Nat. Acad. Sci. Letters*, **36**:571-73.

Mohiuddin, G., Rashid, M., Hasib, S. A. and Razzaque, A. 2005. Biopulping of whole jute plant in soda-anthraquinion and kraft processes. *Tappi J.*, **4**:23-27.

Rayhan, S. M., Rahman, M. A. and Amin, M. H. A. 2008. Effect of planting time and magnesium on the growth and yield of jute seed. *Bangladesh Res. Publ. J*., **1**:303-11.

Roy, B. 2013. Seed production potential of jute (*Corchorus olitorious*) under different planting techniques. *Agril. Sci. Dig*., **33**: 154-57.

Salim, M., Sarkar, M. A. R. and Hannan, M. A. 1998. Off season seed production of tossa jute as influenced by time of sowing and topping. *Bangladesh J. Train. Dev*., **11**:65-72.

Salmasi, S. Z., Golez, K. G. and Moghbeli, S. 2006. Effect of sowing date and limited irrigation on the seed yield and quality of dill (*Anethum graveolens* L.). *Turkish. J. Agric. Forest.,* **30**:281-86.

Sarkar, A. K. and Sinha, A. C. 2004. Seed production of tossa jute *(Corchorus olitorius L.)* as influenced by time of sowing and clipping apical bud under rain-fed condition in tarai region of West Bengal. *J. Interacad.*, **8**:21-26.

Singh, M. V. Kumar, N. and Prakash, V. 2015. Effect of sowing time, plant geometry and topping on nutrient uptake and productivity of jute. *Ann. Pl. Soil Res*, **17**: 160-62.