Bangladesh Agron. J. 2019, 22(2): 83-89

GENOTYPE AND SOWING DATE EFFECTS ON SEED YIELD OF OLITORIUS JUTE IN LATE SEASON

A.T.M.M. Alam and M.M. Haque[1]

Principal Scientific Officer
Bangladesh Jute Research Institute, Manik Mia Avenue, Dhaka-1207
[1]Professor, Bangabandhu Sheikh Mujibur Rahman Agricultural University, Gazipur-1706
Corresponding E-mail: morshedbjri@gmail.com

(Received: 06 January 2020, **Accepted:** 11 February 2020**)**

Keywords: Genotype, sowing date, seed yield, jute, late season

Abstract

Feld experiments were conducted at four locations of Bangladesh (Manikgonj, Cumilla, Dinajpur and Joshore) to optimize sowing date for higher seed yield of jute in late sown condition. The experimental variables constituted with three genotypes (O-72, O-3820 and Acc.4311) and three sowing dates (31 July, 15 August and 30 August).Each experiment was laid out in a randomized complete block design with three replications. The treatment combinations were assigned randomly and afresh randomization was followed in each replication. Results showed that the genotype Acc.4311, O-72 and O-3820 produced maximum number of branches (5.40, 4.90 and 4.40, respectively) plant^{-1} on 15 August sowing at Manikgonj. The genotype Acc.4311 produced higher number of pods plant^{-1} than other two genotypes (O-72 and O-3820) in all sowing dates andat all the locations. The highest number of seedspod^{-1} (220.80) was found from the genotype Acc.4311grown at Manikgonj which was statistically similar (196.90) with that of the same genotype sown on the same date at Joshore. The highest thousand seed weight (2.478 g) was recorded from the seeds of genotype Acc.4311 sown on 15 August at Manikgonj followed by same genotype at Joshore.Finally, the genotype Acc.4311 sown on 15 August produced the highest seed yield (2.478 t ha^{-1}) at Manikgonjwhich was significantly higher than those of sown on 31 July and 30 August at the same location. As the genotype Acc.4311 was found outstanding sown on 15 August over locations, this genotype may be considered promising for higher seed yield of olitorius jute in late season.

Introduction

Jute is the prime fibre crop in Bangladesh although its productivity is much low due to varied reasons. One of the key reasons is use of poor quality seed. High quality jute seed can be produced by sowing the crop in optimum time. Sowing time is one of the important production components and sowing before or after optimum date produces lower yield with poor seed quality. Sowing time is specifically important for late sown jute as it is short day photoperiod sensitive. The critical photoperiod of *Corchorusolitorius* L. is 12.5 hours (Johansen *et al*., 1985) although it may vary over the genotypes and other environmental parameters prevailing during whole growing season. Extreme late sowing, short photoperiod hastens flowering, reduces seed maturation period and provides adverse effect upon seed quality. Because of late sowing, temperature below 15^0C usually causes flower bud injury, restricts its number and affects on pod formation (Hossain *etal.,* 1999). Further, high temperature convergently hastens maturity of seeds; pods turn brown and dry quickly before seeds attain proper physiological maturity. These plants produced more unfilled seeds with smaller seed size and low

germination percentage. At extreme early sowing, anthesis period is prolonged (Talukder and Akanda, 1994), but there is every possibility to damage seed crop by natural hazards during rainy season.
Seed quality of jute further depends on harvesting stage of the crop. Harvesting the crop at an early stage makes relative losses due to threshing and gives enormous unfilled seeds. Besides, mature seeds store better than the immature seeds. Harvesting at a late stage may result in increased weather damage and losses due to shattering of seeds. Further, prevalence of weather damage is frequent in early planted crop, still, persistent foggy weather affects late jute seed crop and often contains pathogens and deteriorates health status of seed (Islam *et al*., 2007). As sowing time regulates appropriate stage of seed maturity,the present study was undertaken to optimize sowing date for higher seed yield of different genotypes of jute in late sown condition.

Materials and Methods

Field experiments were conducted at four locations of Bangladesh viz. Jute Agriculture Experimental Station, Manikgonj; Jute Research Regional Station, Chandina, Cumilla; Jute Seed Production andResearch Station, Noshipur, Dinajpur and Jute Research Sub Station, Monirampur, Joshore during 2011-12 late jute seed growing season. The climate of the experimental site was sub-tropical in nature having very little rainfall in the mid October and mid November with gradual fall in temperature from last week of October. Treatments consisted of three genotypes which were evaluated at three sowing dates (31 July, 15 August and 30 August) over four locations. Among these three genotypes, O-72 was a released variety but O-3820 and Acc.4311 were advanced breeding lines. The experiment was laid out in a randomized complete block design with three replications. The treatment combinations were assigned randomly and afresh randomization was followed in each replication. The size of each unit plot was 3 m x 3 m. Each unit plot and blocks were separated by 1.0 m and 2.0 m, respectively.

At each location and each sowing date, seeds were sown in lines at the rate of 3.0 kg ha^{-1} in 30 cm apart furrows made with country plough. Seeds were then properly covered with soil. The crop was fertilized with urea, triple super phosphate, muriate of potash, gypsum and zinc sulphate at the rate of 200, 100, 60, 100 and 10 kg ha^{-1} as per recommendation of BJRI (2006). One third of urea and whole amount of other fertilizers were applied as basal during final land preparation and rest of the nitrogen was top dressed in two equal splits at 20 and 40 days after sowing. First weeding and thinning were done at 25 days after sowing when the plants attained a height of about 8 to 10 cm. Second weeding was done at 45 days after sowing just before the top dressing of urea. Miticide, insecticide and fungicide were sprayed as precautionary measure by using recommended doses to protect the crop from insect-pests.

For determination of yield contributing characters of jute seed crop, ten plants were randomly selected from each plot and branch $plant^{-1}$, pod $plant^{-1}$, seed pod^{-1} and 1000 seed weight were recorded. For yield, the crop was harvested by whole plot basis and dried in the sun for 5 days. Jute seeds were then threshed out by beating the pods with bamboo stick. It was cleaned and dried in the sun on the cemented floor. Yield of jute seed was converted into kg ha^{-1} at 9% moisture content.

All data were subjected to statistical analysis by analysis of variance (ANOVA). Microsoft EXCEL and MSTAT software programs were used wherever appropriate and the means were compared according to Duncan's Multiple Range Test (Gomez and Gomez, 1984). Functional relationships among the parameters were established through correlation and regression analysis.

Resultsand Discussion

Yield attributes and seed yield

Genotype and sowing dates interacted significantly in yield components and seed yield of late season jute and accordingly those parameters were discussed in subsequent headings.

Number of branch

Number of branch plant^{-1}of jute was significantly influenced by sowing date (Table 1). The genotype Acc.4311, O-72 and O-3820 produced maximum number of branches (5.40, 4.90 and 4.40, respectively) plant^{-1} on 15 August sowing at Manikgonj. The intermediate number of branches plant^{-1}(4.90, 4.40 and 3.80, respectively at Manikgonj; 4.50, 4.00 and 3.50, respectively at Joshore; 4.30, 3.80 and 3.30 respectively at Dinajpur and 3.70, 3.20 and 3.00, respectively at Cumilla) were observed in crops sown on 31 July and the lowest number of branches plant^{-1}(3.60, 3.20 and 2.70, respectively at Manikgonj; 3.20, 2.70 and 2.20, respectively at Joshore; 2.30, 2.40 and 2.80 respectively at Cumilla; 1.80, 1.90 and 2.30, respectively at Dinajpur) were found from the crops sown on 30 August. The branching of jute plant occurred normally through bifurcation of plant top at the time of flower bud induction. Branching also occurs when plant top get injured at the early stage of the crop. At present study, the crops of 15 August sowing might have chances of producing higher number of branches because of better interception of sunlight and soil moisture and thus provided maximum number of branches plant^{-1}.

Table 1. Interaction effect of genotype and sowing dates on the number of branch plant^{-1}of olitorius jute seed crop at four locations

Treatments		Locations			
Genotypes	Sowing dates	Manikgonj	Cumilla	Dinajpur	Joshore
O-72	31 July	4.40 cA	3.20 cdC	3.80 bB	4.00 cA
	15 August	4.90 bA	4.00 bB	3.30 cdC	4.40 bcB
	30 August	3.20 eA	2.40 efB	1.90 efC	2.70 eB
O-3820	31 July	3.80 dA	3.00 dC	3.30 cdBC	3.50 dAB
	15 August	4.40 cA	3.50 cB	3.00 dC	4.20 bcA
	30 August	2.70 fAB	2.80 deA	2.30 eBC	2.20 fC
Acc.4311	31 July	4.90 bA	3.70 bcC	4.30 aB	4.50 bAB
	15 August	5.40 aA	4.50 aB	3.80 bC	5.10 aA
	30 August	3.60 deA	2.30fB	1.80 fC	3.20 dA

Means in a column followed by same small letter and in a row by same capital letter did not differ significantly by DMRT at 0.05 level.

Number of pods

Number of pods plant^{-1}of olitorius jute resembled to that of branch number and it was higher in mid August sowings. In respective of genotypes, the highest number of pods plant^{-1}was observed from the plants sown on 15 August sowing at all locations except Dinajpur (Table 2).

The genotype Acc.4311 produced higher number of pods plant^{-1}than other two genotypes (O-72 and O-3820) in all sowing dates andat all the locations. The genotype Acc.4311 produced the highest number of pods (43.20) plant^{-1}on 15 August sowing at Manikgonj and it was followed by the number of pods plant^{-1}in the same sowing date at Joshore (37.10), Cumilla (33.80) and Dinajpur (27.80). The intermediate number of pods plant^{-1}(37.20, 31.50 and 25.60, respectively at Manikgonj; 33.30, 28.80 and 21.50 respectively at Joshore and 31.50, 25.10 and 18.90 respectively at Cumilla) were observed in crops sown on 31 July for all genotypes at all the locations except Dinajpur. At Dinajpur, higher number of pods plant^{-1}was obtained from the crops sown on 31 July for all genotypes and it decreased gradually with later sowings. The crops sown on 15 August had higher number of branches plant^{-1}which might be contributed to produce higher number of pods plant^{-1}as there is positive relationship between branch number and numerof pods plant^{-1}of jute (Figure1). The findings also accord with those of other authors (Talukder and Hossain, 1989; Khan*et al*.,1997) who reported that number of branch of jute is the main reason of increasing number of pods plant^{-1}of jute.

Table 2. Genotype and sowing date effects on the number of pods plant^{-1} of olitorius jute seed crop at four locations

Treatments		Locations			
Genotypes	Sowing dates	Manikgonj	Cumilla	Dinajpur	Joshore
O-72	31 July	31.50 cA	25.10 bB	28.20 abAB	28.80 bcAB
	15 August	37.60 bA	31.50 aB	25.50 bcC	31.80 bB
	30 August	21.30 deA	15.50 deBC	13.10 dC	19.20 dAB
O-3820	31 July	25.60 dA	18.90 cdB	24.80 bcA	21.50 cAB
	15 August	31.80 cA	25.30 bB	22.10cB	25.90 cB
	30 August	18.10 eA	13.50 eB	14.90 dAB	13.80 eB
Acc.4311	31 July	37.20 bA	31.50 aB	31.30 aB	33.30 abAB
	15 August	43.20 aA	33.80 aB	27.80 abC	37.10 aB
	30 August	23.80 dA	18.20 cdBC	14.70 dC	20.70 dAB

Means in a column followed by same small letter and in a row by same capital letter did not differ significantly by DMRT at 0.05 level.

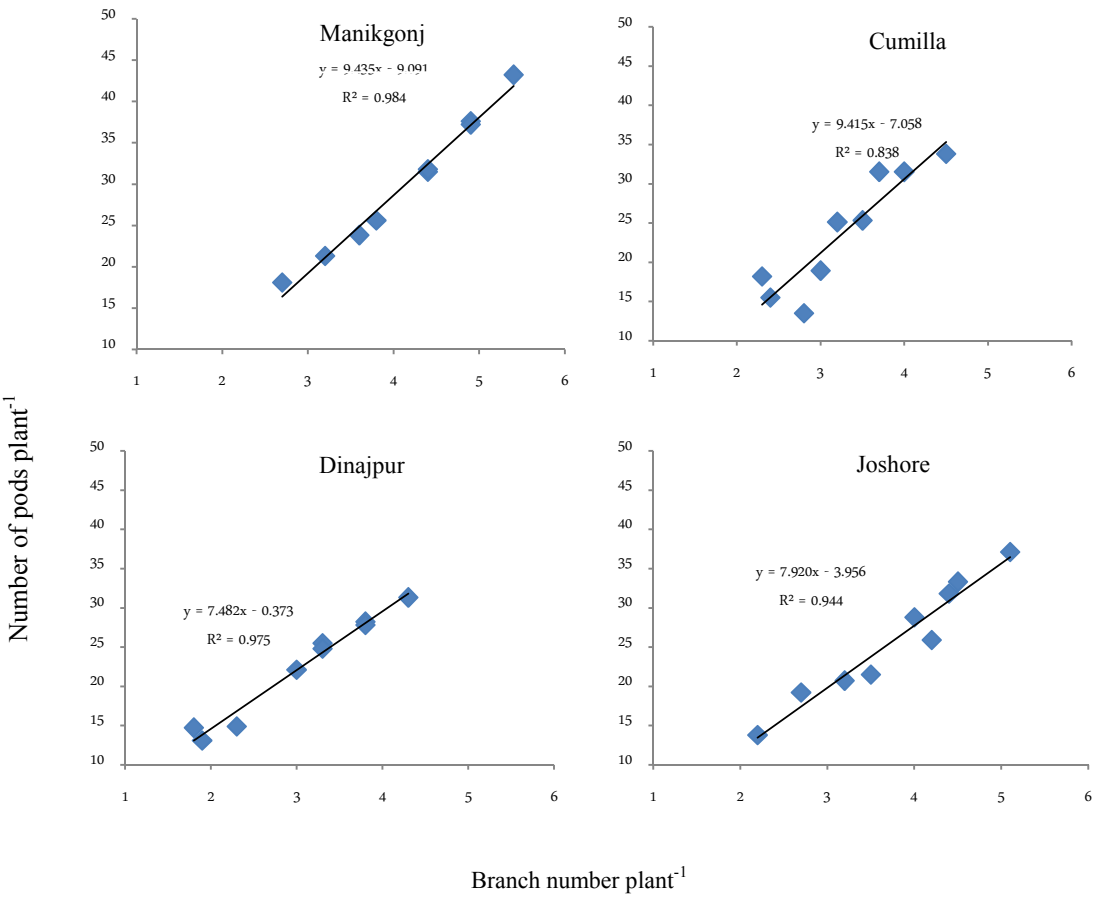

Fig. 1. Relationship between number of branch and pods plant^{-1} of olitorius jute seed crop produced at four locations.

Number of seeds

Number of seeds pod^{-1} of tossa jute was also significantly affected due to the interaction of genotype and sowing date at different locations. Results revealed that number of seeds pod^{-1}was the highest in crops sown on 15 August in all the genotypes (Table 3). As the number of seeds pod^{-1}mostly depends on pod length and pod diameter (Alam*et al*., 2009), and the genotypes O-72, O-3820 and Acc.4311 gave higher number of seeds pod^{-1}, which might be the resultant of long pod length of those genotypes.

Table 3. Effect of genotype and sowing dates on the seedsnumber pod^{-1}of jute at four locations

Treatments		Locations			
Genotypes	Sowing dates	Manikgonj	Cumilla	Dinajpur	Joshore
O-72	31 July	168.50 cdA	143.40 cdB	150.90 bB	155.40 cAB
	15 August	195.80 bA	170.50 bB	140.70 cdC	178.90 bB
	30 August	145.30 eA	120.30 efB	110.60 eB	124.10 efAB
O-3820	31 July	154.40 deA	133.30 deB	148.00 bcA	140.60 dAB
	15 August	172.30 cA	152.80 cB	133.50 dC	169.00 bA
	30 August	135.70 eA	115.10 fB	117.80 eB	114.20 fB
Acc.4311	31 July	192.70 bA	169.10 bB	165.30 aB	172.40 bB
	15 August	220.80 aA	188.90 aB	157.30 abC	196.90 aB
	30 August	149.70 eA	124.70 efB	110.20 eC	130.10 deB

Means in a column followed by same small letter and in a row by same capital letter did not differ significantly

The highest number of seeds pod^{-1}(220.80) was found from the genotype Acc.4311grown at Manikgonj which was statistically similar (196.90) with that of the same genotype sown on the same date at Joshsore. Seeds pod^{-1}of other two genotypes (O-72 and O-3820) were higher at other locations sown on the 15 August. Lower number of seeds pod^{-1}(110.20 to149.70) of three genotypes was recorded from the crops of 30 August sowing.

Seed weight

The thousand seed weight of tossa jute was significantly differed due to the interaction effect of genotype and sowing date at four locations. The highest thousand seed weight (2.478 g) was recorded from the seeds of genotype Acc.4311sown on 15 August produced at Manikgonj followed by the thousand seed weight (2.391 g) of same genotype at Joshore (Table 4). The genotype O-72 recorded 2.383 g of thousand seed weight from the crops sown on 15 August. The lowest thousand seed weight (1.691 g) was found from the seeds of genotype Acc. 4311 sown on 30 August at Dinajpur. Table 4 revealed that all the three genotypes sown on 30 August produced small sized seeds at all the locations and then thousand seed weight decreased with delayed sowing of crop.

Table 4. Genotype and sowing date effects on seed weight (g) of olitorius jute at four locations

Treatments		Locations			
Genotypes	Sowing dates	Manikgonj	Cumilla	Dinajpur	Joshore
O-72	31 July	2.157 dA	1.880 dC	2.103 aA	1.971 cB
	15 August	2.383 bA	2.128 cB	1.901cC	2.177 bB
	30 August	1.845 fA	1.715eB	1.720 eB	1.832 deA
O-3820	31 July	2.056 eA	1.921 dB	2.036 bA	1.871 dB
	15 August	2.295 cA	2.202 bB	1.835 dC	2.250 bAB
	30 August	1.815 fA	1.732 eB	1.735 eB	1.807 eA
Acc.4311	31 July	2.260 cA	2.175 bcBC	2.132 aC	2.218 bAB
	15 August	2.478 aA	2.304 aC	2.035bD	2.391aB
	30 August	1.897 fA	1.767 eC	1.712 eC	1.859 deA

Means in a column followed by same small letter and in a row by same capital letter did not differ significantly by DMRT at 0.05 level.

Seed yield

The seed yield of three jute genotypes varied from 460 to 1241 kg ha^{-1} over the location and sowing dates (Table 5). The genotype Acc.4311 sown on 15 August produced maximum seed yield at Manikgonjwhich was significantly higher than those of sown on 31 July and 30 August at the same location. Similar trend of yield was observed in the case of genotypesO-72 and O-3820 at all the locations. The lowest seed yield was recorded from the genotype Acc.4311 sown on 30 August at Dinajpur which was statistically similar with the seed yield of genotype O-72 and O-3820 grown at the same location and sown on the same date.

Several authors (Hossain and Wahab, 1980; Talukder and Hossain, 1989; Bhattacharjee *et al*., 2000 and Alam*et al*., 2002) also reported that jute yield primarily dependent on the number of pod bearing branches $plant^{-1}$and then other yield components of crop. Higher seed yield of jute sown on 15 August might have been due to its maximum number of pods $plant^{-1}$and higher number of seeds pod^{-1}.This result also agreed with the findings of Alom *et al*. (2010) who reported that August sowing is better for quality seed production of tossa jute in late season.

Table 5. Effect of different genotypes and sowing dates on the seed yield (kg ha^{-1}) of olitorius jute at four locations

Treatments		Locations			
Genotypes	Sowing dates	Manikgonj	Cumilla	Dinajpur	Joshore
O-72	31 July	1050 dA	910 bB	941 abB	960 cB
	15 August	1161 abA	1031 aB	851 cdC	1060 bB
	30 August	751 gA	551 dC	461 eD	641 fB
O-3820	31 July	950 eA	821 cC	911 bcAB	865 dBC
	15 August	1061 cdA	941 bB	821 dC	1041 bA
	30 August	660 hA	541 dB	530 eB	556 gB
Acc.4311	31 July	1141 bcA	1001 abB	996 aB	1020 bB
	15 August	1241 aA	1061 aC	951 abD	1151 aB
	30 August	841 fA	571 dC	451 eD	730 eB

Means in a column followed by same small letter and in a row by same capital letter did not differ significantly by DMRT at 0.05 level.

Conclusion

From the results it may be concluded that sowing of olitoriusjute seed in the first fortnightof Augustis better for higher seed yield. Among the genotypes, Acc.4311 was found superior in yield and othertraits which can be incorporated into the genetic background of high quality genotypes in order to have good quality seeds and to limit seed deterioration which is very important under tropical climates.

References

Alam, M.J., M.M. Haque and S.M.M. Ali. 2009. Seed viability and vigour of five bush bean genotypes in relation to seed development period. EcofriendlyAgril. J. 2: 624-631.

Alam, M.M., A.T.M.M. Alam, S. Khandker, M.N. Gani, S.A. Ahmed and A. Haque. 2002. Fertilizer management of late jute seed production in different agro-ecological zones of Bangladesh. Pakistan J. Biol. Sci. 5:410-412.

Alom, F.M., A.T.M.M. Alam, R.K. Ghosh, M.I.K. Zia and M.M. Islam. 2010. Planting time and sowing method effects on jute seed yield. Seed Tech. J.1: 55-62.

Bhattacharjee, A.K., B.N. Mttra and P.C. Mttra. 2000. Seed agronomy of jute. II. Production and quality of *Corchorusolitorius* seed as influenced by nutrient management. Seed Sci. Technol. 28: 141-154.

BJRI. 2006. "Nabi Pat BeezFosolerSarBabosthapona" (a Bengali Booklet). Bangladesh Jute Research Institute, Sher-e- Bangla Nagar, Dhaka-1207.

Gomez, K.A. and A.A. Gomez. 1984. Statistical procedure for Agricultural Research. Second edn. John Wiley and Sons. Inc. New York. pp.304-307.

Hossain, M.A., A.T.M.M. Alam, S. Ahmed and A.L. Khandakar.1999. Effect of planting of jute variety O-98797 on seed production. Bangladesh J. Seed Sci. Tech. 3: 43-47.

Hossain, M.A. and M.A. Wahab. 1980. Effect of intercropping aus and kaon (Foxtail millet) with *capsularis* jute seed crop on yield and return. Bangladesh J. Jute Fib. Res. 5:35-40.

Islam, M.M., I. Ahmed, A.T.M.M.Alam, S.M. Moniruzzaman and M.A.Alam. 2007. Production of quality *olitorius* jute seeds by different sowing methods at early season. Int. J. Sustain. Agril. Tech. 3(3): 27-30.

Johansen, C., M. Waseque and S. Begum. 1985. Effect and interaction of photoperiod, water stress on flowering and growth in jute. Field Crop Res.12:397-406.

Khan, M.A., M.A.Samad, M.A. Hossain, M.M. Islam and G. Rabbany. 1997. Effect of sowing date and variety on olitorius jute seed production. Bangladesh J. Jute Fib. Res. 22(1&2): 19-25.

Talukder, F.A.H. and M.A. Hossain. 1989. Response of *Chorcoruscapsiularis* L. to seed yield. Bangladesh J. Fib Res. 14: 31-35.

Talukder, F.A.H. and M.A. Akanda. 1994. Physiological maturity of white jute seeds and its influence on viability. Bangladesh J. Train. Dev. 7(1): 53-57.