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EFFECT OF DIFFERENT SOURCES OF JUTE (*Corchorus capsularis* L.) SEEDS ON GERMINATION, VIGOUR AND EMERGENCE ATTRIBUTES

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ABSTRACT

A series of experiments were conducted to assess the germination, vigour and emergence of jute seeds collected from five different sources of Bangladesh. The seed germination and vigour estimation experiments were laid out at the Agronomy laboratory, Bangladesh Jute Research Institute (BJRI), Dhaka in completely randomized design with four replications and the emergence experiments were conducted at greenhouse of BJRI, Dhaka and field of Jute Agriculture Experimental Station (JAES), Manikganj in randomized complete block design with four replications during March to June 2004. The treatments consisted of five different seed sources viz., i) Bangladesh Jute Research Institute (BJRI), ii) Bangladesh Agricultural Development Corporation (BADC), iii) Farmers of Manikgonj, iv) Farmers of Kishoregonj and v) Local market. The variety CVL-1 of the *Corchorus capsularis* L. was used as study material. The results revealed that the germination, vigour index and coefficient of germination of CVL-1 varied significantly due to seed sources. Germination, vigour, co-efficient of germination observed better in BJRI seeds followed by BADC. Emergence, survivability and relative field emergence varied significantly for seed sources. BJRI seeds performed better in these respects while grown under greenhouse and field conditions. Significantly positive correlations were observed among germination, vigour index and emergence.

Key words: White jute, *Corchorus capsularis* L., germination, vigour, emergence, survivability

INTRODUCTION

Seed quality is an important consideration comprising several components. The components are: analytical purity, species purity, freedom from weed seed, germination capacity, viability, vigour, seed size, seed health, moisture content etc. Unless, the seeds have better quality, the use of other inputs or management of crop production will become meaningless (Thomson, 1979). A germination test is always advisable before planting to determine seed viability. A simple germination test could not quantify the quality of seed and not always determine the field planting value of a seed lot. High germination percentage may not necessarily shows good stand establishment in the field. Seed vigour test often gives better predictability of field performance (Marshall and Naylor, 1984). Freshly harvested jute seeds contain about 20%-25% moisture and possess no dormancy. Therefore, it is highly essential to dry the jute seed in sun for at least 4 days to reduce the moisture content to about 7-9%. Jute seed quality does not vary only from farmer to farmer, but also from source-to-source (Mollah *et al.*, 2002). Since there is no other way to produce or procure jute seed and no suitable method is known for their proper quality potential, the seedsmen and growers frequently face a heavy loss by using lower grade seeds. Information relating to such viability, vigour and emergence of jute seed are very scanty under Bangladesh condition. Moreover, the category and extent of jute seed quality and emergence of different sources and their relationship are yet to be elucidated. The present study was, therefore, undertaken to assess the germination, vigour and emergence of white jute seed sources.

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MATERIALS AND METHODS

The laboratory experiments were conducted at the Crop management laboratory, Agronomy division of Bangladesh Jute Research Institute (BJRI). The emergence experiment was conducted at greenhouse of Central Station, Dhaka and in the field of Jute Agriculture Experimental Station, BJRI Jagir, Manikgonj during March to June 2004. The treatments consisted of five seed sources of the variety CVL-1 viz., i.) BJRI, ii.) Bangladesh Agricultural Development Corporation (BADC), iii.) Farmers of Manikgonj, iv) Farmers of Kishoregonj and v.) Local market. Primary seed samples of 250 g each from 20 farmers of each location were collected randomly. All the primary seed samples were mixed thoroughly to make a composite sample of each location. From the composite samples 500g seeds were taken and was regarded as submitted sample. The submitted seed samples were kept in brown paper bags. Local market seed samples were collected and processed as similar method of farmer source of each location. All the seed samples collected from the different seed sources were labeled properly and preserved in Gene Bank of BJRI at 20°C till the samples were used for conducting respective research. Working seed samples were taken from the preserved seed samples as per requirement. Total procedure was maintained following the rules of ISTA (ISTA, 1999). The laboratory experiments were conducted by using Completely Randomized Design and; greenhouse and field experiments by Randomized Complete Block Design with four replications. After collection of seed samples the seeds were used for following tests.

Germination test

One hundred seeds of each and every source were evenly distributed on the top of filter paper placed with 5ml tap water in plastic petridishs. The tests were carried out in an incubator at 30±1°C temperature. The germinations were recorded after 5 days and then calculated the germination percentages following ISTA (1999).

Speed of germination test (Vigour)

This test was conducted in laboratory with the same procedures as germination test. Vigour index were calculated for every sources by following Jain and Saha (1971).

Vigour Index (VI) = a/1 + b/2 + c/3 + ……,

Where, a, b and c were the number of seeds germinated after 1, 2 and 3 days. The final count was made at the end of 5th day.

Co-efficient of germination was calculated using the formula of Copeland (1976).

$$\text{Co-efficient of germination} = \frac{100\,(A_1+A_2+\ldots\ldots+A_x)}{A_1T_1+A_2T_2+\ldots\ldots+A_xT_x}$$

Where, A = number of seed germinated, T = time corresponding to A and
x = number of days to final count.

Emergence test

This test was conducted in two conditions: 1) Greenhouse and 2) Crop field to find out the emergence performance in micro and macro management areas, respectively. The tests took 10 days to complete from sowing to final recording of data. Two hundred seeds per replicate for each source were sown in the each soil of greenhouse and field at the same time for emergence tests. The first count of emergence was made at 2nd day but no seeds emerged within this time. From 2nd to 4th day seeds emerged. However, from 4th day after sowing, the death of emerged seeds occurred continuously up to 10th day. A seed was considered emerged when its first two leaves protruded out about 2.5 cm above

the soil. Final emergence was recorded at 10 days after sowing. No further emergence occurred after this period.The emergence was counted on the 4th day under green house and on the 5th day under the field for CVL-1. The survivability means the first stage of plant stand under field conditions. After emergence on the 4th to 5th day all seedlings did not survive. After death of some percentage of seedlings of CVL-1 from 4 to 8 days at green house and 5 to 10 days under field conditions were determined. On the 8th day under green house and 10th day under field, the percentages of survived seedlings were presented as survivability percent or plant stand at first stage or seedling stage. The survivability stands were calculated on the 8th day under green house and 10th day under field condition.

Relative emergence (R.E.) were calculated by following Egli and Tekorny (1995).

$$R.E. = \frac{\text{Field emergence}}{\text{Laboratory germination}}$$

Data was compiled and analyzed statistically; and means were separated following DMRT method (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

The germination percent, vigour and coefficient of germination differed significantly due to seed sources (Table 1). The highest germination and vigour index of 89% and 76.35 were found in BJRI sources followed by BADC 87%, where vigour index differed. The lowest values of germination percent and vigour index 81% and 64.02 were observed in farmer's seeds of Manikgonj and farmer's seeds of Kishoregonj locations, respectively. In case of germination, farmer's seed of both areas showed similar performance to local market but it differs statistically between the farmers sources. It was observed that the germination percent had no real difference between two sources of BJRI and BADC. The highest value of coefficient of germination 80.86 was found in the seeds collected from BJRI. The least coefficient of germination (67.40) was recorded with seeds from farmers of Kishoregonj followed by local market (75.38) and farmer's seeds of Manikgonj sources (79.24) (Table 1).

Table 1. Quality parameters of CVL-1 seeds of different sources

Seed sources	Germination (%)	Vigour index	Coefficient of germination
BJRI	89.00a	76.35a	80.86a
BADC	87.00ab	73.52b	78.60a
Farmer of Manikgonj	81.00d	71.03c	79.24a
Farmer of Kishoregonj	85.00bc	64.02e	67.40c
Local market	82.00cd	68.56d	75.38b
Sx	84.80	71.27	75.81
CV%	3.16	2.55	3.63

In a column figures having common letter(s) do not differ significantly at 1% level

Similar results were reported by Khandakar (1983). He stated that the highest (89%) germination of *C. capsularis* L. was found in BJRI followed by BADC (87%). Hossain *et al.* (1994) observed that the jute seed samples collected from different survey sites gave mean germination rate ranging from 31-66 per cent, which was far below than expected or recommended minimum rate of 80 percent germination. Emergence and survivability percentages at greenhouse and field differed significantly

for the seed sources (Table 2). The highest emergence (70.60%) and survivability (63.80%) were recorded in greenhouse and; 64.50 and 58.60, respectively in the field for BJRI seeds. BADC seeds showed statistically similar results with BJRI in both greenhouse and field conditions. The lowest emergence and survivability were observed in farmers' seeds of Manikgonj under greenhouse and field conditions. Seeds of local market showed better performance than seeds of farmer, sources in respect of emergence and survivability.The relative emergence was noticed variable as non significant for all seed sources under greenhouse and field conditions (Table 2). The values of BJRI seeds under both grown conditions were better than that of other sources. The results were in agreement with McDonald (1980) and Islam (1997). They stated that in three soybean seeds showed better indication of final field emergence. Moreover, Egli and Tekrony (1995) reported that standard germination was significantly correlated with field emergence.

Table 2. Emergence, survivability percent and relative emergence of CVL-1 seeds at green house and field conditions as affected by seed sources

Seed sources	Emergence (%)		Survivability (%)		Relative field emergence	
	Green house (4^{th} day)	Field (5^{th} day)	Green house (8^{th} day)	Field (10^{th} day)	Green house (4^{th} day)	Field (5^{th} day)
BJRI	70.60a	64.50a	63.80a	58.60a	0.79	0.72
BADC	66.20a	62.60a	60.00a	57.40a	0.76	0.72
Farmer of Manikgonj	48.20c	41.60d	41.60d	37.00c	0.60	0.51
Farmer of Kishoregonj	51.40c	46.20c	45.80c	40.40c	0.60	0.54
Local market	59.00b	50.80b	53.40b	46.60b	0.72	0.62
Sx	58.80	52.61	52.40	45.50		
CV%	2.36	3.47	2.39	3.42	-	-

In a column figures having common letter do not differ segnificantly at 1% level

Results revealed that the correlation among germination, vigour index, coefficient of germination, emergence, survivability and relative emergence under greenhouse and field conditions were significant and positive (Table 3). The correlations were calculated in greenhouse emergence with germination (r=0.81), greenhouse survivability with germination (r=0.83), relative emergence at greenhouse with germination (r=0.66) and field emergence with germination (r=0.86), field survivability with germination (r=0.84), relative emergence at field with germination (r=0.75). Again, greenhouse emergence with vigour index (r=0.74), greenhouse survivability with vigour index (r=0.81), relative emergence at greenhouse with vigour index (r=0.73) and field emergence with vigour index (r=0.73), field survivability with vigour index (r=0.77), relative emergence at field with vigour index (r=0.76) (Table 3). Similar results were observed by Egli and Tekrony (1995). They reported that the standard germination was significantly correlated with field emergence. Islam *et al.* (2002) reported that highest correlation (r=98**) was found in pot culture with hot temperature treatment germination test of *C. capsularis* L. and in laboratory standard germination with pot-culture of *C. olitorius* L. (r=97**).

Table 3. Correlations among seed quality and emergence attributes of CVL-1

	G	VI	Co of G	GHE	GHS	RE at GH	FE	FS at F
Germination (G)	1							
Vigour index (VI)	0.53*	1						
Coefficient of germination (Co of G)	0.19^{ns}	0.93**	1					
Green house emergence (GHE)	0.81**	0.74**	0.52*	1				
Green house survivability (GHS)	0.83**	0.81**	0.60**	0.98**	1			
Relative emergence at green house (RE at GH)	0.66**	0.73**	0.58**	0.97**	0.94**	1		
Field emergence (FE)	0.86**	0.73**	0.49*	0.99**	0.99**	0.94**	1	
Field survivability (FS)	0.84**	0.77**	0.54*	0.99**	0.99**	0.95**	0.99**	1
Relative emergence at Field (RE at F)	0.75**	0.76**	0.56*	0.99**	0.97**	0.98**	0.98**	0.99**

^{ns} not significant, *Significant at 0.05 level, ** Significant at 0.01 level.

From the above findings it may be concluded that the seeds of jute cv. CVL-1 from Bangladesh Jute Research Institute (BJRI) is superior in respect of germination, vigour, emergence, survivability and relative emergence over other seed sources. Seeds collected from Bangladesh Agricultural Development Corporation (BADC) also have good quality with germination, emergence etc.

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