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Full length Research paper

Comparative Seed Yield and Quality Performance of Different Dark (*Corchorus olitorius*L.) jute varieties

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Jute is the world's second-largest source of fiber, and the major in Bangladesh. Jute is a completely eco-friendly fiber that is naturally renewable, biodegradable, and compostable. Jute (Corchorus spp.) has more than 100 species, but only the white (C. capsularis) and dark (C. olitorius) varieties are grown as diploid (2n = 2x = 14) crops. Corchorus olitorius, one of two species, occupies around 85% of Bangladesh's total arable jute field. Every year, Bangladesh needs roughly 6000 tons of jute seed. O-9897, JRO-524 and BJRI tossa pat- 8 are prominent jute varieties in Bangladesh. Three different varieties (BJRI tossa pat-8, O-9897 and JO 524) were used in this experiment. BJRI tossa pat-8 had the largest plant population/m2 (5.74), plant height (3.16 m), capsules per plant (95.40), capsule length (6.29 cm), 1000 seed weight (1.86 g), and seed yield (0.67 t/ha), according to the findings. O-9897 had the maximum number of branches per plant (10.27) and seeds per capsule (218.85). For seed quality metrics, O-9897 had the highest germination % (95.67), field emergence percentage (90.33), CVG percentage (72.25), and seed vigor percentage (42.72). Result showed that BJRI tossa pat-8 had a larger seed production than the other two varieties; however O-9897 had superior seed quality.

Keywords: Jute, varieties, Morpho-physiological characters, seed yield, seed quality

INTRODUCTION

Importance of jute in the agrarian economy of Bangladesh is well known. Jute is one of nature's strongest vegetable fibres and second important fibre source after cotton in terms of production (Mahapatra et al., 2012; Saleem et al., 2019). It is perhaps the most spinnable of all natural fibres, 100 % biodegradable and recyclable (Palit and Meshram, 2010). It is an important cash crop in Bangladesh and India, which together accounts for about 84% of world production of jute fibre (Islam, 2009; kumari et al., 2020). Jute is a completely biodegradable, recyclable and eco-friendly lingo-cellulose fiber (Mir et al., 2008; Islam, 2019). Global awareness on 'save the environment` increases the demand of jute. Jute and jute products not only retard ecological degradation but also conserve green environment and atmosphere as a whole (Ghosh et al., 2013; Mamun et al., 2017). The genus Corchorus belongs to the family Malvaceae, which is composed of approximately 100 species (Saunders, 2001; Islam et al., 2017). Of these, two species (*Corchorus olitorius* L. and *Corchorus capsularis* L.) are widely cultivated for natural fiber in areas distributed throughout the tropical and sub-tropical regions of the world, particularly in Asia, Africa and Latin America (Saleem et al. 2020**)**. In Bangladesh *Corchorus olitorius* L. (dark jute) covers about 85% of total jute cultivable area. Bangladesh requires about 5500-6000 tons jute seeds in every year, of which only 10-15% is produced and distributed by the BADC (Al mamun and saha, 2017, Islam and Uddin, 2019). For dark jute seed Bangladesh mainly depend on neighboring country. As a result, every year a huge amount of dark jute seeds are introducing through official and unofficial trades from neighboring country (karim et al., 2020). Unofficial imports of jute seed have no guarantee of its quality and

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are one of the major causes of low yield (Islam, 2009). Due to supply of insufficient quantity seed from the public sector and due to high demand of jute seed, sometimes unauthorized traders are taking the opportunity of introducing poor quality seeds in the market. So it is necessary to check unauthorized traders by increasing jute seed production in the country. For higher fibre production timely confirmed supply of quality jute seed is necessary because quality seed of improved variety itself control about 20% of yield (Hossain et al., 1994: Mollah et al 2017). Therefore, with an aim to produce quality jute seed in Bangladesh and to enhance farmer's profitability, the present studies on feasibility of growing jute seed of dark jute varieties were tried.

MATERIALS AND METHODS

Experimental site and soil:

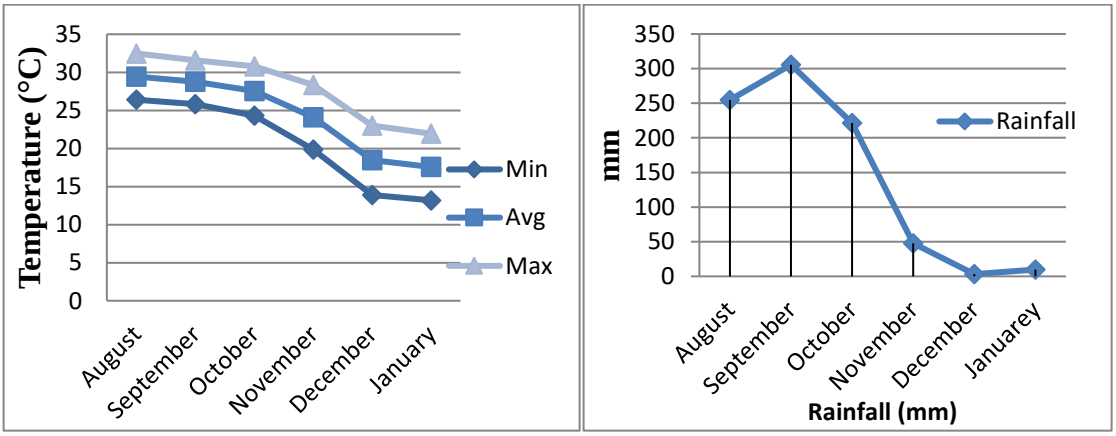
The experiment was conducted at the research field in Jute Agriculture Experimental Station, Manikganj, during the month of August to December, 2019 in order to study the seed yield and quality performance of three jute varieties.

Table 1: Physio-chemical properties of experimental field soil.

Properties	Average content
Soil texture	Silt loam
Soil pH	6.5
Organic matter	1.6%
Total Nitrogen (%)	0.08%
available P	7.65 ppm
K (100g-1)	0.23meq
available S	12.87 ppm

Weather Condition

The weather conditions during the crop growing season, monthly mean minimum, maximum and average temperatures of the field site are presented in Figure 1a. Monthly rainfall of the experiment site is presented in Figure 1b.



1a 1b

Figure 1a: Weather conditions (1a. monthly mean of minimum, maximum and average temperatures and 1b. rainfall) at the field sites in Manikganj, Bangladesh.

Experimental treatments and design

The experiment was conducted with three dark jute varieties viz., BJRI Tossa Pat-8, JRO-524 and O-9897. The experimental field was prepared with three ploughing and cross ploughing followed by laddering. A randomized complete block design (RCBD) was used for this experiment with three replications. The unit plot size was 3m X 4m. The cutting was sown on 11th August, 2019. 100 days old mother plant were used as cutting because in previous study showed 100 days old mother plant gave better yield (Alam et al., 2019). The crop was fertilized with recommended doses of fertilizer. All intercultural operations were done as per requirement.

Harvesting and Plant sampling

When the matured seed (about 80% seed matures) of jute turned into blackish in color the plant sample were collected from each plot in treatment wise with proper tagged. Ten randomly selected plants were taken from each plot for getting accurate data. After threshing of capsule, seeds were cleaned and sun dried.

Morpho-physiological characters yield & yield attributes

Morpho-physiological characters namely plant height (m) was measured with the help of scale meter. Morpho-physiological characters were analyzed by standard method. On the other hand yield and yield attributes *viz.* capsule length (mm), capsule plant-^{1,} seeds capsule-^{1}, 1,000 seed weight and seed yield (ton ha-1) were determined by the standard method. Any height, length, number and yield were measured by using the manual count and scale meter.

Seed quality

After threshing, sun dried seed were taken for quality testing with 9% moisture. For germination seeds were surface-sterilized first by a fungicide treatment (1 g L^{-1} Benlate) for 30 min, immersed in 6% calcium hypochlorite solution for 5 min, and then rinsed in 70% ethanol for 5 min and thoroughly washed with sterilized distilled water. Seeds were plated onto glass petri dishes (9 cm in diameter) containing sterile perlite and placed in a growth chamber where the temperature and humidity were 25 °C and 80%, respectively, with a photoperiod of 16 h day^{-1}. Lighting was provided by OSRAM L36W/77 type lamps (FLUORA, white fluorescent tubes) providing an intensity of 1500 µmol h^{-1} photon^{-1}. Each petri dish contained 100 seeds.
The parameters of the germination capacity (GC), seed vigour and field emergence were determined by following formulas.
1. Germination capacity (GC): GC (%) = n/N* 100
Here, n is the total number of germinated seeds and N is the total number of tested seeds.
2. **Field Emergence (%):** FE(%)=n/N* 100
Here, n is the total number of germinated seeds in field condition and N is the total number of tested seeds
3.Vigour test: The test was conduct in laboratory with the same procedure as laboratory standard germination test. Vigour (Vigour value) was calculated following V=a/1+b/2+c/3+…..where V= Vigour value and a, b and c are the number of seed germinated after 1, 2 and 3 days. The final count was made at the end of 6th days.

Statistical analysis

The recoded data on different parameters were statistically analyzed and partitioning the variance with the help of “Statistics 10” software.

RESULTS AND DISCUSSION

Plant Population

Treatments BJRI tossa pat-8 had the highest plant population (5.74), which was statistically different from the other two kinds, while JRO-524 had the lowest plant population (3.89) (Table 2).This outcome was caused by the high rate of transplanted cutting fatality, which was pretty acute for JRO-524.Plant population number always remains low in cutting transplanting method compare to the direct seed sowing method.

Plant height

Plant height was not significantly impacted by variety (Table 2). However, quantitatively, JRO 524 had the lowest plant height (3.10 m), and BJRI Tossa Pat-8 had the highest (3.16 m).Similar finding was found by karim et al. (2020a) for BJRI tossa pat 8. Plant height was high because there was little competition for nutrients, water, and air due to the low plant population.

Branch plant-^{1}

In late jute plant branch plant-^{1} showed substantial difference due to variety (table 2). Highest branch/plant was (10.27) was found in O-9897 which was statistically alike to JRO-524 and minimum number (6.95) was found in control plot BJRI tossa pat-8.

Capsule plant-^{1}

It was noticed that the quantity of capsules per plant varied significantly depending on the variety (Table 2). Highest number of capsule per plant (95.40) was recorded in BJRI tossa pat-8 and lowest (73.97) was found in O-9897.

Capsule length

The late jute seed plant's capsule length was not noticeably altered due to variety (Table 3). Numerically maximum capsule length (6.29 mm) was found in BJRI tossa pat-8 and lowest (6.10 mm) for O-9897.

Seed capsule^{-1}

Variety had no discernible impact on the quantity of seed capsules**$^{-1}$**(Table 3). However, BJRI tossa pat-8 produced the most seeds (218.85) for every capsule.

Thousand seed weight

Variety did not even have a massive effect on jute's 1000 seed weight (Table 3). The highest 1,000 seed weight

Table 2: Comparison among different varieties on growth and yield contributing characters of late jute seed.

Treatment	Plant population	Plant height (m)	Branch/plant	Capsule/plant
BJRI tossa pat-8	5.74 a	3.16 a	6.95 b	95.40 a
O-9897	3.59 b	3.13 a	10.27 a	73.97 b
JRO-524	3.89 b	3.10 a	9.89 a	85.65 ab
CV value	10.48	6.35	10.07	9.03

Table 3: Comparison among different zinc treatments on seed/capsule, 1000 seed weight and seed yield (t/ha) of late jute seed**.**

Treatment	Capsule length (cm)	Seed/capsule	1000 seed weight	Seed yield (t/ha)
BJRI tossa pat-8	6.29 a	205.81 a	1.86 a	0.67 a
O-9897	6.10 a	218.85 a	1.79 a	0.47 b
JRO-524	6.13 a	207.56 a	1.81 a	0.62 ab
CV value	0.89	7.81	2.37	5.90

(1.86 g) was obtained in BJRI tossa pat-8, and the lowest (1.79 g) was reported in O-9897..

Seed yield (ton ha^{-1})

Variety has a significant impact on seed productivity of late jute (table 3). Highest seeds were produced (0.67 tons ha-1) in BJRI tossa pat-8, which is statistically equivalent to JRO-524. O-9897 had the lowest seed output (0.47 tons per hectare). Seed yield of BJRI tossa pat-8 was high because maximum seed yield contributing characters such as capsule/plant, capsule length, 1000 seed weight were highest in BJRI tossa pat-8 comparing to other varieties.

Seed quality

Germination and field emergence percentage were not significantly impacted by variety (table 4). O-9897 had the greatest percentage of germination (95.67) and field emergence (90.33). Minimum seed germination and field emergence percentage were found in JRO-524. O-9897 had the highest CVG % (72.25), which is statistically different from the other two varieties. Maximum seed vigour was found in O-9897 that is statistically non-identical to others two varieties.

Table 4: Comparison among different zinc treatments on seed quality attributes of late jute seed.

Treatment	Germination %	Field Emergence %	CVG %	Seed vigour%
BJRI tossa pat-8	95.33 a	89.67 a	59.76 b	39.86 b
O-9897	95.67 a	90.33 a	72.25 a	42.72 a
JRO-524	94.45 a	87.78 a	60.10 b	40.16 b
CV value	1.13	0.45	0.92	1.07

CONCLUSIONS

The findings of this research indicate that the maximum seed yield was in BJRI tossa pat-8. The difference in seed quality among the three varieties was marginal.

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