*J. Patuakhali Sci. and Tech. Uni. 2018, 9 (1&2): 77-88* ISSN 1996-4501

# SCREENING OF SALT TOLERANT JUTE GENOTYPES FOR AEZ-13

**A. K. Chowdhury[1], M. M. I. Rashad[1*], L. Farzana[1]**

## Abstract

An experiment was conducted to screen out salt tolerant jute (*Corchorus capsularis*) genotypes at the Genetics and Plant Breeding laboratory of Patuakhali Science and Technology University (PSTU) and substations of BJRI, namely Pakhimara, Kolapara, Patuakhali during the period from mid-March to mid-July 2016. The single factor experiment was laid out in a Completely Randomized Design (CRD) with three replications for laboratory test and Completely Randomized Block Design (RCBD) with three replications for field investigation. To obtain salt tolerant jute genotypes, ten genotypes were evaluated by relative salt harm rate (RSHR) during germination stage at 7$^{th}$ day and by index of salt harm rate (ISHR) during seedling stage at 3 weeks, respectively. The data were collected on plant height (cm), base diameter (mm), green weight with and without leaves (g plant$^{-1}$), stick weight (g plant$^{-1}$), and fiber weight (g plant$^{-1}$) at harvest. Results revealed that the growth character viz. plant height and base diameter varied significantly among the varieties. Among the varieties, the variety C-3465 produced the tallest plant (300.0 cm) and higher base diameter (18.93 mm) at harvest while genotype C-3465 also had higher green weight with leaves (whole plant) (260.0 g plant$^{-1}$), green weight without leaves (231.70 g plant$^{-1}$), stick weight (38.40 g plant$^{-1}$) and fiber weight (13.83 g plant$^{-1}$). After screening for salt tolerance, the genotype C-3465 recorded the lowest average index salt harm rate (10.75%) during germination, maximum number of seedlings (36) showed adaptability in salinity affected soil on the 6$^{th}$ day of transplanting as level Grade 1 or highly salt tolerant. In this research, it is clear that the genotype C-3465 had more efficient on the growth, yield, and yield attributing traits. From this experiment, it is also observed that the Jute genotype C-3465 would be most suitable productive genotype against the salinity affected soil of AEZ-13.

**Key Words:** Jute, Relative salt harm rate, Index of salt harm rate, Salt tolerant.

## Introduction

Jute (*Corchorus capsularis*) is an herbaceous annual plant from the family Tiliaceae, mostly grown in Southeast Asian countries of the world (Jose *et al.,* 2009). The worldwide two cultivated jute species are *Corchorus capsularis,* which is known as (Deshi jute) and *Corchorus olitorius* which is known as (Tossa jute). The commercial product of the fiber derived from these two species of genus *Corchorus* among 40 species (Alim, 1978). Jute grows under wide variation of climatic conditions and stress of tropic and subtropics. It is grown in Bangladesh, India, Myanmar, Nepal, China, Taiwan, Thailand, Vietnam, Cambodia, Brazil and some other countries. Jute and kenaf are cultivated almost exclusively in developing countries of East Asia and in some parts of Latin America. Jute producing five countries, namely Bangladesh, China, India, Nepal, and Thailand account for about 95% production. These countries also account for 90% of export of jute products (Khatun, 2010).

[1]Department of Genetics and Plant Breeding, Patuakhali Science and Technology University, Patuakahali, Bangladesh. *Corresponding author email: mainul_gpb@pstu.ac.bd

Salt stress is a worldwide major abiotic stress in agriculture. It is estimated that about 20% of the earth's land mass and nearly half of all irrigated land are affected by salinity. Increased salinization of arable land is expected to have devastating global effects, with prediction of 30% land loss within the next 25 years, and up to 50% by the year 2050 (Wang *et al*., 2008).

In Bangladesh, about 2.8 million hectares constitute coastal and offshore areas (Karim *et al*., 1982) including Patuakhali region. The total coastal saline area covers one third of the nine million hectares of total cultivated area in Bangladesh. These areas are affected by different degrees of salinity. The salinity developed in soil adversely affects the growth and yield of different crop plants. Morphological characters decrease progressively with increase in salinity level. Seed germination is affected by the increase in salinity. Soil salinity may affect the germination of seeds either by creating osmotic potential external to the seeds preventing water uptake or through the toxic effects of $Na^+$ and $Cl^-$ ions on germinating seeds. The main salt-induced physiological disorder is diminished seed imbibition because of the low solute potential within the saline growth medium. There adverse physiological effects of salinity may be attributed to non-availability of water (Singh *et al.* 2001), reduction in photosynthesis through loss of turgidity (Gufran, 1994). It is urgently needed to extent the cultivation of jute to all possible areas of Bangladesh for increasing jute production. But the cultivation of jute crop in the study area (Patuakhali) is not easy because of the lack of salinity tolerant varieties. So, we need to screening out the genotypes for salt tolerance while it will help the greater yield in salinity affected areas. Use of salt-tolerant varieties is considered the most economical and most effective way of increasing crop production on saline soils. Attempts to improve the salt tolerance of crops through conventional breeding programs have very limited via phenotypic ally or physiology assisted procedure for its limited success. However, molecular marker technology recently used and more successive techniques for screening the varieties for any soil condition but this technology is more expensive. From the above facts, the present study was undertaken to find out the most suitable salt tolerant genotypes.

## Materials and Methods

### Experimental site and period

The experiment was conducted at the Bangladesh Jute Research Institute, Jute Research Substation, Pakhimara, Kolapara, Patuakhali and Genetics and Plant Breeding laboratory at Patuakhali Science and Technology University during the period from mid-March to mid July 2016.

**Plant materials:** Ten jute genotypes, namely C-2760, CVL-1, C-83, C-12221, C-12033, D-154, C-3467, C-3465, C-2753, and C-2197 were collected from Bangladesh Jute Research Institute (BJRI), Dhaka which have been used in this study for determination of relative and index salt harm rate and grade at germination and seedling period. In field study, 50 jute genotypes were used including germination tested 10 genotypes.

**Experimental design**

The experiment was conducted in a Completely Randomized Design (RCD) with three replications. The experiment was set in a separated petridish for each replication.

**Seeds germination at 8 dSm$^{-1}$ salt solution as treatment and distilled water as control**

Seeds were heated for 10 days in an oven at 30$^{0}$C to break seed dormancy. Healthy, uniform seeds of all genotypes were selected for the experiment. Hundred-seed of each genotype were allowed to germinate on a filter paper in separate petridish. The petridishes were arranged in RCBD design with three replications. Germination of seeds was count at three days after sowing for two times and expressed as percentage. This experiment was done eight days and changed filter papers with 8 dSm$^{-1}$ solution and distilled water.

**Determination of relative salt harm rate (RSHR) and grade of salt tolerance during germination period**

Germination test of 10 genotypes were done under 8dSm$^{-1}$ salt water and distilled water. Each treatment was done by three replications. After germination, both treatments with salt water and distilled water were observed and calculated germination percentages of each genotype and grade of salinity tolerant genotypes by the following modified standard evaluation. Measurement of relative salt harm rate and grade of salt tolerance was performed according to Bagci *et al*. (2003) with some modification. The grade of salt tolerance of each genotype at germination stage was determined (Table 1).

**Table 1. Grade standard of salt tolerance of jute for RSHR (%) and AISH (%)**

| Grade | Salt tolerance | RSHR (%) | AISH (%) |
|---|---|---|---|
| 1 | highly tolerant | 0-20.0 | 0-20.0 |
| 2 | Tolerant | 20.1-40.0 | 20.1-40.0 |
| 3 | Moderately tolerant | 40.1-60.0 | 40.1-60.0 |
| 4 | Susceptible | 60.1-80.0 | 60.1-80.0 |
| 5 | Highly susceptible | 80.1-100.0 | 80.1-100.0 |

**Seedling test**

Ten jute genotypes collected from BJRI and cultivated in 8.0 dSm$^{-1}$NaCl contained nutrient solution were used as treatment, and nutrient solution was used as control. The experiment was conducted in a Completely Randomized Design (RCD) with three replications.

**Handling of seedlings**

For screening techniques, breaking of seed dormancy is essential. Seeds were treated for 10 days in an oven at 30°C for breaking the seed dormancy. The seeds were soaked in tap water for 24h. Then the seeds were washed and rinsed with tap water and placed on petridishes with moistened filter papers and incubated for 48 hours at room temperature (about $30^0$C) to germinate. One pre-germinated seed was sown per hole on the Styrofoam seedling float. The radicles were carefully inserted through the nylon mesh with the forceps. The Styrofoam seedling float was then floated on the tray filled with water (normal tap water) and the plants were allowed to grow for three weeks. Then the distilled water was replaced with salinized nutrient solution.

**Determination of index of salt harm and grade of salt tolerance during seedling period**

The modified standard evaluation score (Table 2) was used to assess the visual symptoms of salt toxicity (Hongyu Ma *et al*., 2011; Yoshida *et al*., 1976).

**Table 2. Modified standard evaluation score (SES) germination and seedling stage of visual nail injury at germination and seedling stage**

| Score | Observations |
|---|---|
| 0 | Seedling grows normally without any injury |
| 1 | The edge of one or two leaves of seedling turns yellow and presents some black spots or withers. |
| 2 | One whole leaf of seedling turning yellow withers, bestrewing with black spots, or falls off. |
| 3 | Seedling growth is restrained with 2 or 3 leaves severely withering, turning yellow or falling off. |
| 4 | Seedling growth is severely restrained with many leaves severely withering and falling off or the whole seedling on the verge of death. |

**Performance of Field Study**

**Experimental materials**

As planting materials, the seeds of 50 jute genotypes were used for this study which was collected from Bangladesh Jute Research Institute (BJRI), Farmgate, Dhaka.

**Experimental design and layout**

Fifty genotypes of jute were used as planting materials. The single factor experiment was laid out in a Randomized Complete Block Design (RCBD) with three replications. Fifty Jute genotypes were used as treatments in 150 plots randomly where three plots were used for each jute genotype. The unit plot size was 4.0 m x 2.5 m. The block to block and plot to plot spaceings were 1.0 m and 0.60 m, respectively. The nutrient solution used for cultivation of jute seedlings was prepared according to Yoshida *et al.* (1976). Seeds of each jute genotype were also sterilized with 0.1 % sodium dodecyl sulphate (SDS) solution on a magnetic stirrer for 15 min and thoroughly washed with deionized water. The nutrient solution was replaced once a week. Water lost by evapotranspiration was compensated by daily addition of deionized water. Three weeks after transplant, the seedlings of one group of each genotype were imposed salt stress for six days by cultivation in the full-strength nutrient solution containing 8.0 $dSm^{-1}$ NaCI. Nutrient solution without NaCl addition served as control group. 50 seedlings of each group were investigated for their appearance at 3rd and 6th day, respectively.

**Land preparation**

The experimental field was first opened on 26 March, 2016 with a power tiller. Thereafter, the land was ploughed and cross-ploughed to obtain good tilth. Laddering was done in order to break the soil clods into small pieces followed by each ploughing. All the weeds and stubbles were removed from the experimental field. Standard agronomic practices were done and the recommended fertilizer doses were applied.

**Seed sowing**

The collected seeds of Jute were broadcasted in the field on 29 March 2016. The seed rate was 15 g plot$^{-1}$ of each genotype for getting proper population in the plot.

**Data Collection**

After harvest, firstly 10 random selected plants of each plot were cut at the ground level with sickle then bundled the jute and tagged carefully for recording necessary some morphological parameters. After cutting the plants of individual plot and bundle, the plants are kept for fall leaves. The plants of the plots were bundled as per treatments and soaking in pond water for 10 days while rotted fiber would be separated easily from the stick. Finally, fiber weights were taken on individual plot basis at moisture content of 12% and converted into g plant$^{-1}$.

**Calculation of data**

The following data were collected during germination and seedling period on the aspect of relative salt harm rate and grade of salt tolerance and also on index of salt harm rate and grade of salt tolerance at three weeks after sowing. The calculating data were recorded by the following procedure. Then, the average index of salt harm (AISH) of each genotype was calculated by the following formula.

$$\text{AISH (\%)} = \frac{\sum[(\text{No. of '0'} \times 0)] + [(\text{No. of } 1 \times 1)] + [(\text{No. of } 2 \times 2)] + [(\text{No. of } 3 \times 3)] + [(\text{No. of } 4 \times 4)]}{4 \times 50} \times 100$$

Where "number of '0' represents the seedling number of Grade 0, and so forth.

**Statistical analysis**

The data obtained from experiment on various morphological and yield contributing characters were statistically analyzed by MSTAT-C computer program (Russel, 1986). The mean values for all the parameters were calculated and the analysis of variance for the characters was accomplished by Duncan's Multiple Range Test (DMRT) and the significance of difference between pair of means was tested by the Least Significant Differences (LSD) test at 5 % levels of probability, respectively (Gomez and Gomez, 1984).

## Results and Discussion

Result of relative salt harm rate significantly influenced the jute genotypes, which is presented in Table 3. Screening for salt tolerance, jute genotype C-3465 showed average index salt harm rate (10.11%) during germination, and maximum number of seedlings showed high salt tolerance (36) at 6th day after three weeks of transplanting and showed high salt tolerance as level Grade 1, whereas D-154 produced higher index of salt harm (16%) during germination, and minimum number of seedlings (34) for salt tolerance at 6th day after three weeks of transplanting. However, relative salt harm rate had lower in CVL-1 (7.56%) during germination while it was higher (14.55%) in C-12221, but they were classified into Grade 1 and showed high salt tolerant ability.

Index of salt harm and grade of salt tolerance of 10 jute genotypes during seedling period under 8.0 $dSm^{-1}$NaCl with nutrient solution were investigated at two times viz., 3rd and 6th days after three weeks of germination and the results are presented in Table 5. Table 5 indicated significant differences among the genotypes. From the present research, it was found that genotype C-12221 had higher relative salt harm rate (14.55%) than other genotypes while it was statistically lower in C-3465. So, C-3465 would be higher salt tolerant genotype compared to other genotypes of jute. During seedling test for screening of salt tolerant genotypes under 8.0 $dSm^{-1}$ NaCl with nutrient solution, investigation was carried out at two times viz., 3rd and 6th day after three weeks of germination. The present research showed that the genotype C-3465 recorded higher salt tolerance ability at 6th day (36 seedlings among the fifty seedlings) compared to other genotypes. So, the genotype C-3465 will be high salt tolerant among the genotypes and this genotype also showed better field performance.

Field performance of jute genotypes differed significantly among them in respect of plant height and base diameter, and the genotype C-3465 showed better performance (Table 6). It was found that the genotype C-3465 gave higher plant height (300 cm) and base diameter (18.93 mm). These findings are in agreement with that of Pervin and Haque (2012) who observed that the height of plant significantly differed among the genotypes. The variation was also found due to its genetic makeup. Similarly, genotypic performances vary on various growth and yield characters of jute. Base diameter is also important character for yield of jute genotypes since it ensures better thickness of fiber which ultimately gave better production of fiber.

**Table 3. Relative salt harm rate (RSHR) and grade of salt tolerance of 10 jute genotypes during germination period**

| Genotypes | RSHR (%) | Grade |
|---|---|---|
| C-2760 | 13.35 b | 1 |
| CVL-1 | 7.56 h | 1 |
| C-83 | 9.89 f | 1 |
| C-12221 | 14.55 a | 1 |
| C-12033 | 11.19 d | 1 |
| D-154 | 10.68 de | 1 |
| C-3467 | 8.42 g | 1 |
| C-3465 | 10.11 ef | 1 |
| C-2753 | 8.39 g | 1 |
| C-2197 | 12.41 c | 1 |
| Sig. level | ** | ** |
| LSD (0.05) | 0.582 | - |
| CV (%) | 3.18 | - |

**= significant at 1% level of probability; Figures followed by same letter(s) are statistically similar as per DMRT at 5% level of probability

**Table 4. Index of salt harm rate (ISHR) and grade of salt tolerance of ten Jute genotypes during seedling period**

| Genotypes | Index of salt harm rate (%) at | | |
|---|---|---|---|
| | 3rd day | 6th day | Average |
| C-2760 | 10.00 de | 16.50 b | 13.25 ab |
| CVL-1 | 11.50 bc | 15.00 cd | 13.25 b |
| C-83 | 14.50 a | 16.50 b | 15.5 a |
| C-12221 | 9.50 e | 14.50 de | 12.00 b |
| C-12033 | 12.50 b | 19.00 a | 15.75 a |
| D-154 | 15.50 a | 16.50 b | 16.00 a |
| C-3467 | 11.00 cd | 14.00 e | 12.50 b |
| C-3465 | 9.50 e | 12.00 f | 10.75 c |
| C-2753 | 12.00 bc | 15.50 c | 13.75 b |
| C-2197 | 12.00 bc | 15.50 c | 13.75 b |
| Sig. level | ** | ** | ** |
| $LSD_{(0.05)}$ | 1.266 | 0.886 | 0.974 |
| CV (%) | 6.25 | 3.33 | 4.16 |

**= significant at 1% level of probability; Figures followed by same letter(s) are statistically similar as per DMRT at 5% level of probability

These results indicate that the base diameter among the genotypes in field level were significant. Similar findings were obtained by Pervin and Haque (2012); Islam (2001, 2004, 2007); Islam *et al.* (2007); Azad-ud-doula Prodhane *et al.* (2001) in Jute. Variety C-3465 showed higher green weight with leaves (260.0 g $plant^{-1}$) and higher green weight without leaves (231.70 g $plant^{-1}$) followed by the variety C-2753 (Table 6). Pervin and Haque (2012); Islam (2007) reported that the green weight data were statistically similar among the jute varieties. Lorenzo *et al.* (2011) also found similar results where they found that whole-plant biomass differed significantly among the varieties. Similar findings were reported by Pervin and Haque (2012); Islam (2007) and Lorenzo *et al.* (2011). From Table 6, it was observed that the variety C-3465 recorded higher stick weight (38.40g $plant^{-1}$), which was statistically close by C-2753 (35.33 g $plant^{-1}$) but they differed significantly at 5% level. Fiber yield is the main yield components of the jute varieties because of the main economic return come out from the fiber yield. Fiber yield showed significant difference among the genotypes. Fiber yield was higher in C-3465 (13.83 g $plant^{-1}$) which was closely followed by that of C-2753 (12.83 g $plant^{-1}$) and C-1221 (12.60 g $plant^{-1}$) (Table 6). Pushpa *et al.* (2013a and 2013b) also found that fiber yield differed significantly among the varieties. The better performance of jute genotypes depends on its green weight with leaves, green weight without leaves, higher stick weight, and fiber yield. From the results, it was found that the genotypes C-3465 had good performance in adaptability in salt stress condition and gave higher yield and yield contributing characters. Lorenzo *et al.* (2011) also found that whole plant biomass differed significantly among the genotypes

**Table 5. Evaluation of seedlings after transplantation**

| Genotypes | No. of seedlings | No. of seedlings for salt tolerant at different grade at 3rd day of transplant | | | | | No. of seedlings for salt tolerant at different grade at 6th day of transplant | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **0** | **1** | **2** | **3** | **4** | **0** | **1** | **2** | **3** | **4** |
| C-2760 | 50 | 40.0 a | 4.0 e | 3.0 c | 2.0 b | 1.0 b | 35.0 b | 5.0 d | 4.0 c | 4.0 b | 2.0 a |
| CVL-1 | 50 | 38.0 c | 5.0 d | 4.0 b | 2.0 b | 1.0 b | 36.0 a | 5.0 d | 4.0 c | 3.0 c | 2.0 a |
| C-83 | 50 | 37.0 cd | 6.0 c | 3.0 c | 3.0 a | 2.0 a | 34.0 c | 7.0 b | 3.0 d | 4.0 b | 2.0 a |
| C-12221 | 50 | 39.0 b | 6.0 c | 3.0 c | 1.0 c | 1.0 b | 35.0 b | 7.0 b | 3.0 d | 4.0 b | 1.0 b |
| C-12033 | 50 | 38.0 c | 4.0 e | 5.0 a | 1.0 c | 2.0 a | 34.0 c | 5.0 d | 5.0 b | 5.0 a | 2.0 a |
| D-154 | 50 | 36.0 e | 4.0 e | 5.0 a | 3.0 a | 2.0 a | 34.0 c | 5.0 d | 6.0 a | 4.0 b | 1.0 b |
| C-3467 | 50 | 37.0 d | 7.0 b | 4.0 b | 1.0 c | 1.0 b | 35.0 b | 7.0b | 5.0 b | 1.0 d | 2.0 a |
| C-3465 | 50 | 39.0 b | 6.0 c | 3.0 c | 1.0 c | 1.0 b | 36.0 a | 7.0 b | 5.0 b | 1.0 d | 1.0 b |
| C-2753 | 50 | 38.0 c | 6.0 c | 2.0 d | 2.0 b | 2.0 a | 35.0 b | 6.0 c | 4.0 c | 3.0 c | 2.0 a |
| C-2197 | 50 | 36.0 e | 8.0 a | 3.0 c | 2.0 b | .0 b | 34.0 c | 8.0 a | 3.0 d | 3.0 c | 2.0 a |
| Sig. level | - | ** | ** | ** | ** | ** | ** | ** | ** | ** | ** |
| LSD (0.5) | - | 0.829 | 0.414 | 0.489 | 0.172 | 0.153 | 0.177 | 0.398 | 0.328 | 0.214 | 0.119 |
| CV (%) | - | 1.28 | 4.31 | 8.22 | 5.56 | 5.63 | 2.96 | 3.4 | 4.55 | 3.90 | 4.07 |

**=--- significant at 1% level of probability; Figures followed by same letter(s) are statistically similar as per DMRT at 5% level of probability.

**Table 6. Effect of genotypes on different yield contributing characters at harvest against salinity**

| Genotypes | Plant height (cm) at harvest | Base diameter (mm) | Green wt with leaves (g plant$^{-1}$) | Green wt with leaves (g plant$^{-1}$) | Stick wt (g plant$^{-1}$) | Fiber wt (g plant$^{-1}$) |
|---|---|---|---|---|---|---|
| C-2760 | 278.0 a-g | 17.90 a-g | 183.3 e-n | 188.3 b-f | 31.33 b-g | 11.60 b-e |
| CVL-1 | 276.3 a-h | 17.97 a-f | 213.3 b-f | 188.3 b-f | 33.20 b-d | 10.20 d-k |
| C-83 | 281.0 a-f | 17.90 a-g | 200.0 c-j | 176.7 c-i | 29.90 d-i | 10.17 d-k |
| C-12221 | 279.3 a-f | 18.40 a-c | 223.3 b-d | 196.7 b-d | 34.77 a-c | 12.60 a-c |
| C-12033 | 287.3 a-d | 18.33 a-d | 200.0 c-j | 175.0 c-i | 30.07 d-i | 10.13 d-k |
| D-154 | 277.3 a-g | 18.13 a-e | 178.3 f-o | 160.0 e-l | 24.50 j-o | 9.567 e-m |
| C-3467 | 279.0 a-f | 18.07 a-e | 196.7 c-k | 175.0 c-i | 28.83 d-j | 10.50 d-i |
| C-3465 | 300.0 a | 18.93 a | 260.0 a | 231.7 a | 38.40 a | 13.83 a |
| C-2753 | 298.0 ab | 18.70 ab | 240.0 ab | 216.7 ab | 35.33 ab | 12.83 ab |
| C-2197 | 286.7 a-e | 18.37 a-c | 203.3 c-i | 183.3 c-g | 32.33 b-e | 11.30 bf |
| C-45 | 291.3 a-c | 17.33 b-j | 210.0 b-g | 186.7 b-f | 32.07 b-e | 11.67 b-e |
| C-3466 | 273.0 a-h | 17.33 b-j | 213.3 b-f | 188.3 b-f | 30.50 c-h | 11.00 b-g |
| C-2738 | 273.0 a-h | 16.90 c-l | 205.0 b-h | 184.3 c-g | 30.27 c-h | 11.00 b-g |
| C-2737 | 260.0 d-m | 16.17 h-n | 188.3 d-I | 165.0 d-k | 28.27 e-k | 9.933 d-l |
| C-2734 | 241.0 j-n | 15.67 k-n | 148.3 n-r | 121.7 n-p | 23.33 m-p | 8.067 k-m |
| C-2759 | 235.3 l-o | 16.00 h-n | 150.0 m-r | 123.3 n-p | 23.50 l-p | 8.200 k-m |
| C-2750 | 219.7 no | 16.40 g-m | 141.7 o-r | 116.7 p | 22.40 m-p | 7.900 lm |
| C-2752 | 219.410 p | 15.87 i-n | 161.7 k-r | 133.3 k-p | 24.00 k-p | 8.800 h-m |
| C-2763 | 219.397 p | 17.17 c-k | 166.7 i-q | 150.0 h-o | 24.00 k-p | 9.200 f-m |
| C-2757 | 219.410 p | 17.17 c-k | 175.0 g-p | 156.7 f-m | 25.50 i-n | 9.000 g-m |
| C-2761 | 219.627 p | 17.93 a-f | 200.0 c-j | 180.0 c-h | 28.17 e-l | 10.43 d-j |
| C-2765 | 219.470 p | 17.83 a-g | 183.3 e-n | 161.7 e-k | 27.00 f-m | 9.567 e-m |
| C-2762 | 219.483 p | 16.03 h-n | 146.7 n-r | 128.3 l-p | 23.50 l-p | 8.633 i-m |
| C-2726 | 244.7 i-n | 15.77 k-n | 145.0 o-r | 125.0 m-p | 23.17 m-p | 8.533 i-m |
| C-2596 | 270.0 b-i | 16.83 d-m | 200.0 c-j | 176.7 c-i | 30.00 d-i | 10.60 c-i |
| C-2597 | 248.7 h-m | 16.00 h-n | 156.7 l-r | 133.3 k-p | 23.83 k-p | 9.033 g-m |
| C-2589 | 266.0 c-j | 16.70 e-m | 153.3 l-r | 135.0 k-p | 24.87 j-o | 10.03 d-i |
| C-2594 | 250.3 g-m | 15.77 k-n | 156.7 l-r | 136.7 k-p | 22.90 m-p | 8.733 i-m |
| C-2598 | 244.3 i-n | 15.33 mn | 160.0 l-r | 141.7 j-p | 23.50 l-p | 8.567 i-m |

**Table 6. Cont'd.**

| Genotypes | Plant height (cm) at harvest | Base diameter (mm) | Green weight with leaves (g plant$^{-1}$) | Green weight with leaves (g plant$^{-1}$) | Stick weight (g plant$^{-1}$) | Fiber weight (g plant$^{-1}$) |
|---|---|---|---|---|---|---|
| C-2611 | 235.0 m-o | 15.33 mn | 138.3 p-r | 118.3 op | 23.33 m-p | 7.967 lm |
| C-2610 | 240.0 j-n | 16.00 h-n | 160.0 l-r | 141.7 j-p | 24.30 j-p | 8.467 i-m |
| C-3070 | 257.7 f-m | 17.00 c-l | 198.3 c-j | 173.3 c-j | 29.73 d-i | 10.57 c-i |
| C-3069 | 266.0 c-j | 17.50 a-h | 210.0 b-g | 185.0 c-f | 32.57 b-e | 10.50 d-i |
| C-7370 | 276.7 a-h | 16.13 h-n | 220.0 b-e | 195.0 b-d | 33.13 b-d | 11.83 b-d |
| C-2234 | 263.7 c-l | 16.47 f-m | 226.7 bc | 203.3 bc | 31.67 b-f | 10.93 b-h |
| C-2242 | 236.3 I-o | 15.77 k-n | 146.7 n-r | 126.7 m-p | 22.00 n-p | 8.833 h-m |
| C-2142 | 280.3 a-f | 17.37 b-i | 196.7 c-k | 175.0 c-i | 28.83 d-j | 10.13 d-k |
| C-2186 | 237.7 j-o | 15.67 k-n | 135.0 qr | 118.3 op | 20.67 op | 8.067 k-m |
| C-2295 | 219.253 p | 14.67 n | 126.7 r | 113.3 p | 19.50 p | 7.433 m |
| C-2281 | 242.0 i-n | 16.17 h-n | 141.7 o-r | 121.7 n-p | 20.33 op | 7.900 lm |
| C-2593 | 265.0 c-k | 16.83 d-m | 196.7 c-k | 175.0 c-i | 26.40 h-n | 10.17 d-k |
| C-2749 | 258.3 e-m | 16.00 h-n | 210.0 b-g | 190.0 b-e | 30.90 b-h | 11.33 b-f |
| C-2730 | 239.7 j-n | 16.00 h-n | 156.7 l-r | 135.0 k-p | 22.20 m-p | 8.333 j-m |
| C-3468 | 265.3 c-k | 17.83 a-g | 203.3 c-i | 178.3 c-h | 33.07 b-d | 11.20 b-f |
| C-3464 | 250.3 g-m | 17.50 a-h | 175.0 g-p | 150.0 h-o | 26.53 h-n | 8.233 k-m |
| C-3476 | 237.3 k-o | 15.57 l-n | 156.7 l-r | 138.3 k-p | 22.77 m-p | 8.467 i-m |
| C-3473 | 277.7 a-g | 17.83 a-g | 186.7 d-m | 161.7 e-k | 26.80 g-n | 10.13 d-k |
| C-3472 | 238.0 j-o | 15.73 k-n | 163.3 j-r | 145.0 i-p | 23.83 k-p | 8.267 k-m |
| C-3478 | 240.0 j-n | 15.83 j-n | 168.3 h-q | 151.7 g-n | 22.23 m-p | 8.833 h-m |
| C-2591 | 211.7 o | 16.50 f-m | 165.0 j-q | 156.7 f-m | 24.73 j-o | 11.60 b-e |
| Sig. level | ** | ** | ** | ** | ** | ** |
| CV (%) | 5.60 | 4.52 | 10.16 | 10.27 | 8.85 | 10.84 |

## Conclusion

From this experiment, it was proved that the genotype C-3465 was less affected at saline condition and more efficient on the growth. So, the jute variety C-3465 is the most suitable to be cultivated under the AEZ-13. So, it is recommended that the jute genotypey C-3465 would be more successful productive genotype in AEZ-13 or the regional conditions of Bangladesh Jute Research Institute and Jute Research Sub-stations, namely Kolapapra, Pakhimara, Patuakhali..

## References

Alim, A. (1978). A Hand Book of Bangladesh Jute. Associated Printer Ltd. 311 Johnson Road, Dhaka.

Azad-ud-doula Prodhan, A. K. M., Rahman, M. L. and Haque, M. A. (2001). Effect of water stresses on growth attributes in jute II. Plant based diameter. *Pak. J. Biol. Sci*., **4:** 660-664.

Bagci, S. A., Ekiz, H. and Yilmaz, A. (2003). Determination of the salt tolerance of some barley genotypes and the characteristics affecting tolerance. *Turk. J. Agric. For.,* **27***: 253-260.*

Gomez, K. A. and Gomez, A. A. (1984). Statistical Procedures for Agricultural Research. 2nd Edn. John Willey and Sons, New York. pp. 97-411.

Gufran, K. M. (1994). Effect of salt stress on nitrate reductase activity in some leguminous crops. *Indian J. Plant Physiol*., **37**: 185-187.

Hongya Ma, Yang, R., Wang, Z., Yu, T., Jia, Y., Gu, H., Wang, X. and Ma, X. 2011. Screening of salt tolerant jute (*Corchorus capsularis* & *Corchorus olitorius*) genotypes via phenotypic and physiology-assisted procedures. *Pak. J. Bot*., **43**(6): 2655-2660.

Islam, M. S., Nasreen, A., Begum, S. and Haque, S. (2004). Correlated response and path analysis in tossa jute (*Corchorus olitorius* L.). *Bangladesh J. Bot*., **33** (2): 99-102.

Islam, M. S., Uddin, M. N., Haque, M. M. and Islam, M. N. (2001). Path coefficient analysis for some fibre yield related traits in white jute (*Corchorus capsularis* L.). *Pak J. Biol. Sci.* **4** (1): 47-49.

Islam, M. Z., Baset Mia, M. A., Akter, A. and Rahman, M. H. (2007). Biochemical attributes of mutant rice under different saline levels. *International Journal of Sustainable Crop Prodn.,* **2** (3): 17-21.

Islam, M. M. (2007). Variability and path coefficient analysis in jute (*Corchorus olitorius* L.) of indigenous origin. Digital Archive on Agricultural Theses and Journal. Catalog: SAU200701_112. Sher-E-Bangla Agricultural University, Sher-E-Bangla Nagar, Dhaka.

Jose, C. R., Gisela, M., Isabel, M. R. and Ana, G. (2009). Chemical composition of lipophilic extractives from Jute (*Corchorus capsularis*) fibers used for manufacturing of high-quality paper pulps. *Ind. Crop. Prodn*., **30** (2): 241-249.

Karim, Z., Saheed, S. M., Salahuddin, A. B. M., Alam, M. K. and Haque, A. (1982). Coastal saline soils and their management in Bangladesh; BARC Publication No. 8.

Khatun, A. (2010). Recent agricultural developments in jute, kenaf and mesta through traditional and biotechnological approaches. Genetic Resources and Seed Division, Bangladesh Jute Research Institute, Manik Mia Avenue, Dhaka 1207, Bangladesh.

Lorenzo, B., Virgilio, N. D. and Gianpietro, V. (2011). Effects of plant density, seeding and harvest time on the growth of two kenaf (*Hibiscus Cannabinus* L.) Varieties. *Italian J. Agron.,* **127** (11): 335-337.

Pervin, N. and Haque, G. K. M. N. (2012). Path coefficient analysis for fiber yield related traits in Deshi jute (*Corchorus capsularis* L.). *Intl. Res. J. App. Life Sci*., **1** (3): 72-77.

Pushpa, K., Krishna Murthy, N. and Krishna Murthy, R. (2013a). Growth and yield parameters of mesta varieties as influenced by spacing and nutrient sources. *J. Agril. Sci.,* **5** (3): 105-110.

Pushpa, K., Krishna Murthy, N. and Krishna Murthy, R. (2013b). Dry accumulation studies at different stages of crop growth in mesta (*Hibiscus cannabinus*). *J. Agril. Sci*., **5** (3): 332-338.

Russell, D. F. 1986. MSTAT-C computer based data analysis software. Crop and Soil Science Department, Michigan State University, USA.

Singh, R. A., Roy, N. K. and Hoque, M. S. (2001). Changes in growth and metabolic activity in seedlings of lentil (*Lens culinaris* Medie) genotypes during salt stress. *Indian J. Plant Physiol.,* **6:** 406-410.

Wang, M. C., Peng, Z. Y., Li, C. L., Li, F., Liu, C. and Xia, G. M. (2008). Proteomic analysis on a high salt tolerance introgression strain of *Triticum aestivum*/Thinopyrumponticum. *Proteomics.* **8**: 1470-1489.

Yoshida, S. (1976). Routine Procedure for Growing Rice Plants in Culture Solution. In: Yoshida, S., Forno, D.A. and Cock, J.H., Eds., Laboratory Manual for Physiological Studies of Rice. International Rice Research Institute, Los Banos, the Philippines 61-66