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Effect of Bau-Biofungicide and Provax-200 on Mortality, Viability, Seed Quality and Seed Yield Following Top Cutting Method in CVL-1 Variety

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ABSTRACT

The experiments were conducted in the field of Jute Agriculture Experimental Station (JAES), Manikgonj and Kishoregonj Regional Station (KRS), Kishoregonj of BJRI. The experiments were conducted during the period April 2012 to January 2013. Top cutting method in respect of different parameters of seed quality differed significantly under different treatments in the present study. Here, before planted cuttings were treated with Dithane M-45 and BAU-Biofungicide. In top cutting method, lowest mortality 4.76% of cuttings were found with BAU-Biofungicide treated cuttings while, highest mortality 8.03% of cuttings were found under control condition. The highest seed yields 709.09 kg ha^{-1} was obtained with BAU-Biofungicide treated cuttings and lowest seed yields 600.35 kg ha^{-1} was recorded under control treatment.

Key words: Effect, cutting treatment, mortality, viability and seed yield

INTRODUCTION

Jute is one of the major cash crops of Bangladesh. Its influence on ecology and economy is so intimate that it's effects are significantly related to the agro-ecology and the socio-economic life of the people. Jute crop is also cultivated in different countries. The jute crop also greatly improves the soil fertility status by incorporating organic matter to the soil through decomposition of shaded leaves and plant residues and helps in breaking plough-pans through its long taproots. Also, jute and jute goods have been recognized as being friendly to the environment. Jute is mostly grown in the Indo-Bangladesh region and in some countries of Southeast Asia. Among the jute growing countries of the world, Bangladesh had second position in respect of production (Islam, 2007). The land and climatic conditions of Bangladesh are congenial for the production of high quality jute. In Bangladesh, about 0.709 M ha of land was under jute cultivation and the total yield was 8.40 M bales (BBS, 2012; http://jute.org/). As per Khandakar (1987), Bangladesh annually needs about 4000 mt of jute seeds of which only 12-15% is produced and supplied by the Bangladesh Agricultural Development Corporation (BADC). The rest of the seeds, about 85% or more of the requirement, are produced and managed by farmers (Hossain *et al*., 1994). Seed is the basic input for crop production. Seed quality of a variety is the key to better crop establishment and better yield. The conventional method of jute seed production is not enough at all to meet the demand of the farmer. Jute in Bangladesh is not grown for seed purpose as it requires long time from March-December and this hampers cultivation of transplant amon rice and rabi crops. The farmers

usually keep a small portion of crop at one corner or any suitable place of the field to produce seed and rest of the crop is harvested for fibre. This traditional system of seed production is characterized by low yield and poor quality seed. Two species of jute (*Corchorus capsularis* and *Corchorus olitorius*) are cultivated in Bangladesh. The farmers of the country often have to depend on market seeds having poor quality. Hence, the production of quality healthy jute seed as well as its quality storage is highly essential to ensure the higher yield of quality fibre in order to meet the challenging need for natural fibre in Bangladesh. Considering the above facts, the present study was carried out with the objective to find out suitable cutting treatment for quality and high production of jute seeds.

MATERIALS AND METHODS

Experimental sites and period: The experiments were conducted in the field of Jute Agriculture Experimental Station (JAES), Manikgonj and Kishoregonj Regional Station (KRS), Kishoregonj of BJRI. The experiments were conducted during the period April 2012 to January 2013.

Varieties used: Seed of CVL-1 was selected for this study.

Collection of top cuttings: Top shoots of the jute plants were collected from the separate jute plots for production of jute seed crop. Care was taken so that every shoot was collected from disease free jute plants. Jute plants 100-120 days old were used for the preparation of top cutting. A sharp knife was used for the preparation of top cuttings from the collected top shoots of jute plants. There were slant cuts at 45° angles on both ends of each cutting and each cutting was 25 cm long.

Cuttings treated with Dithane M-45: Dithane M-45 (Mancozeb 80%) was sprayed at 2 g L^{-1} (0.2%) water as a preventive measure against the diseases of cuttings. Before transplanting, the cuttings were treated with Dithane M-45 solution water.

Cuttings treated with BAU-Biofungicide: BAU-Biofungicide was sprayed at 2% in water as a preventive measure against the diseases of cuttings. Before transplanting, the cuttings were treated with BAU-Biofungicide solution water.

Transplanting of top cuttings: Top cuttings were planted on the same day of collection of cuttings. Cuttings were planted in lines maintaining the spacing 30×10 cm. Each cutting was planted in soil to a depth of 5 cm at an angle about 45°. Transplantation of prepared top cuttings was done on 14 July and 16 July, 2012 for both varieties at KRS and JAES locations, respectively.

Application of fertilizers: During final land preparation Urea 60, Triple Super Phosphate 50 and Muriate of Potash 25 kg ha^{-1} were applied (Islam, 2009; Islam and Rahman, 2008). After 15-20 days of seed germination first top dressing with the urea at 60 kg and again another 15 days later of first top dressing, the 2nd top dressing was given with 60 kg ha^{-1}. Top dressing of urea was done very carefully so that it will not come in contact with the plant parts. To meet sulphur and zinc deficiency, gypsum and zinc oxide at 45 kg and 5 kg ha^{-1} were applied (Islam, 2009; Islam and Rahman, 2008).

Experimental design: The experiments were conducted following Randomized Block Design (RCBD) having three replications. The size of the unit plot was 10 m^2 (5×2 m) and the distance between plots and replications were 1.0 and 1.0 m, respectively.

Table 1: Soil characteristics and nutrient status of the two experimental locations in 2012

		Soil characteristics			Nutrient status			
Experimental location	AEZ	Land type	Soil type	pH	OM (%)	N (%)	P (ppm)	K (meq/100 g)
Jute Agriculture Experimental Station (JAES), Manikgonj, BJRI	Active Brahmaputra and Jamuna Flood Plain (AEZ-7)	Medium land	Sandy and Silty	6.69	1.79	0.35	14.38	0.138
Kishoregonj Regional Station (KRS), BJRI	Old Brahmaputra Flood Plain (AEZ-9)	Medium land	Loam	6.11	1.24	0.39	14.98	0.15

Soil characteristics and nutrient status: The soil characteristics and nutrient status of the two experimental stations (JAES, Manikgonj and KRS, Kishoregonj) are shown in Table 1.

Data collection: Data on different parameters were collected as shown in follows:

- Mortality and Viability (%)
- Average number of branch per plant
- Average number of fruits per plant
- Seed yield per plant (g)
- Seed yield per hectare (kg)
- Weight of 1000 seeds (g)

Statistical analysis: Data was analysed statistically and treatments effects were compared by Duncan's Multiple Range Test (DMRT). Relation between seed borne fungal pathogens and germination was observed with regression equations. Relationships between disease severity and seed, fibre and stick yield were also observed by linear regression lines and equations (Gomez and Gomez, 1984).

RESULTS

Mortality and viability (%) recorded in CVL-1 at JAES and KRS, BJRI: Different types of cutting treatments viz., BAU-Biofungicide and Provax-200 differed significantly in respect of mortality and viability in CVL-1 grown at JAES and KRS of BJRI following top cutting method (Table 2). The highest viability (95.24%) of CVL-1 was recorded under BAU-Biofungicide treated cuttings at JAES and lowest viability (89.34%) at KRS was recorded under control treatment. The highest mean viability of cuttings (93.98%) and lowest mean viability of cuttings (90.66%) of two locations were recorded under BAU-Biofungicide treated cuttings and control treatment, respectively. Highest mortality (10.66%) at KRS and lowest mortality (4.76%) at JAES were observed under control condition and BAU-Biofungicide treated cuttings, respectively. The highest mean mortality of cuttings (9.34%) and lowest mean mortality of cuttings (6.02%) of two locations were recorded under control treatment and BAU-Biofungicide treated cuttings, respectively.

Effect of BAU-Biofungicide and Provax-200 on number of branch and capsule per plant in CVL-1 at JAES and KRS, BJRI following top cutting method in the field: BAU-Biofungicide and Provax-200 differed significantly in respect of number of branch and capsule per plant in CVL-1 grown at JAES and KRS of BJRI (Table 3). The highest branch (7.51) of CVL-1 was recorded under BAU-Biofungicide treated cuttings at JAES. The highest

Table 2: Effect of BAU-Biofungicide and Provax-200 on viability and mortality in CVL-1 at JAES and KRS, BJRI following top cutting method in the field

	Viability (%)			Mortality (%)		
Treatments	JAES	KRS	Mean	JAES	KRS	Mean
T_1	95.24	92.72^{a}	93.98^{a}	4.76^{b}	7.28^{b}	6.02^{b}
T_2	93.05	90.59^{b}	91.82^{b}	6.95^{ab}	9.41^{a}	8.18^{a}
T_3	91.97	89.34^{b}	90.66^{b}	8.03^{a}	10.66^{a}	9.34^{a}
Level of significance	NS	0.05	0.05	0.05	0.05	0.05

T_1: Cutting treated with BAU, Biofungicide (3%), T_2: Cutting treated with Provax-200 (0.4%), T_3: Control (Untreated), JAES: Jute Agriculture Experimental Station (JAES), Manikgonj, KRS: Kishoregonj Regional Station (KRS), BJRI, Data in column having common letter(s) do not differ significantly at 5% level of significance, NS: Not Significant

Table 3: Effect of BAU-Biofungicide and Provax-200 on number of branch and capsule per plant in CVL-1 at JAES and KRS, BJRI following top cutting method in the field

	No. of branch/plant			No. of capsule/plant		
Treatments	JAES	KRS	Mean	JAES	KRS	Mean
T_1	7.51^{a}	6.67^{a}	7.09^{a}	93.09^{a}	83.92^{a}	88.50^{a}
T_2	7.01^{ab}	5.95^{ab}	6.48^{ab}	88.18^{b}	78.25^{b}	83.22^{b}
T_3	6.58^{b}	5.30^{b}	5.94^{b}	64.06^{c}	60.71^{c}	62.39^{c}
Level of significance	0.05	0.05	0.05	0.05	0.05	0.05

T_1: Cutting treated with BAU- Biofungicide (3%), T_2: Cutting treated with Provax-200 (0.4%), T_3: Control (Untreated), JAES: Jute Agriculture Experimental Station (JAES), Manikgonj, KRS: Kishoregonj Regional Station (KRS), BJRI, Data in column having common letter(s) do not differ significantly at 5% level of significance, NS: Not Significant

capsule/plant (93.09) at JAES was recorded under BAU-Biofungicide treated cuttings. The lowest branch (5.30) and capsule/plant (60.71) at KRS were recorded under control condition. The highest mean branch (7.09) and capsule/plant (88.50) of two locations were recorded under BAU-Biofungicide treated cuttings. The lowest mean branch (5.94) and capsule/plant (62.39) of two locations were recorded under control treatment.

Effect of BAU- B iofungicide and Provax-200 on seed yield per plant and per hectare in CVL-1 at JAES and KRS, BJRI following top cutting method in the field: BAU-Biofungicide and Provax-200 differed significantly in respect of cutting yield in CVL-1 grown at JAES and KRS of BJRI (Table 4). The highest seed yield/plant (7.10 g) and seed yield per hectare (709.09 kg) at JAES were recorded under BAU-Biofungicide treated seed. The lowest seed yield/plant (6.19 g) and seed yield per hectare (600.35 kg) at KRS were recorded under control treatment. The highest mean seed yield per plant (6.79 g) and seed yield per hectare (703.11 kg) of both locations were recorded under BAU-Biofungicide treated cuttings.

Effect of BAU-Biofungicide and Provax-200 on 1000 seed weight in CVL-1 at JAES and KRS, BJRI following top cutting method in the field: BAU-Biofungicide and Provax-200 differed significantly in respect of 1000 seed weight in CVL-1 grown at JAES and KRS of BJRI (Table 5). The highest 1000 seed weight (3.27 g) of CVL-1 was recorded with BAU-Biofungicide treated cuttings at KRS. The lowest 1000 seed weight (3.13 g) was recorded in control treatment

Table 4: Effect of BAU- Biofungicide and Provax-200 on seed yield per plant and per hectare in CVL-1 at JAES and KRS, BJRI following top cutting method in the field

	Seed yield (g/plant)			Seed yield (kg ha^{-1})		
Treatments	JAES	KRS	Mean	JAES	KRS	Mean
T_1	7.10	6.48	6.79	709.09^{a}	697.13^{a}	703.11^{a}
T_2	6.85	6.18	6.51	679.17^{ab}	652.87^{ab}	666.02^{a}
T_3	6.35	6.19	6.27	626.92^{b}	600.35^{b}	613.64^{b}
Level of significance	NS	NS	NS	0.01	0.01	0.01

T_1: Cutting treated with BAU, Biofungicide (3%), T_2: Cutting treated with Provax-200 (0.4%), T_3: Control (Untreated), JAES: Jute Agriculture Experimental Station (JAES), Manikgonj, KRS: Kishoregonj Regional Station (KRS), BJRI, Data in column having common letter(s) do not differ significantly at 5% level of significance, NS: Not Significant

Table 5: Effect of BAU-Biofungicide and Provax-200 on 1000, seed weight in CVL-1 produced at JAES and KRS, BJRI with top cutting method in the field

	1000 seed weight (g)		
Treatments	JAES	KRS	Mean
T_1	3.25	3.27	3.26
T_2	3.22	3.21	3.22
T_3	3.20	3.13	3.17
Level of significance	NS	NS	NS

T_1: Cutting treated with BAU, Biofungicide (3%), T_2: Cutting treated with Provax-200 (0.4%), T_3: Control (Untreated), JAES: Jute Agriculture Experimental Station (JAES), Manikgonj, KRS: Kishoregonj Regional Station (KRS), BJRI, Data in column having common letter(s) do not differ significantly at 5% level of significance, ns: Not Significant

at KRS. The highest mean 1000 seed weight (3.26 g) and lowest mean 1000 seed weight (3.17 g) of two locations were recorded under BAU-Biofungicide treated cuttings and control condition, respectively.

Interaction effect among the locations and BAU-Biofungicide and Provax-200 on cutting quality and seed yield following top cutting method in the field: Interaction effect of locations with different types of cutting treatments viz., BAU-Biofungicide and Provax-200 differed significantly for viability, mortality, number of branch, number of capsule, seed yield and 1000 seed weight (Table 6). Interaction effect between locations and different types of cutting treatments viz., BAU-Biofungicide and Provax-200 on viability were found significant. But there was no significant differences among $L_1 \times T_1$ (95.24%), $L_1 \times T_2$ (93.05%) and $L_2 \times T_1$ (92.72%). Again there was no significant variation among $L_1 \times T_3$ (91.97%) and $L_2 \times T_2$ (90.59%). The highest result was found in $L_1 \times T_1$ (95.24%) followed by $L_1 \times T_2$ (93.05%). The lowest result was found in $L_2 \times T_3$ (89.34%) preceded by $L_2 \times T_2$ (90.59%). Interaction effect between locations and different types of cutting treatments viz., BAU-Biofungicide and Prova×-200 on mortality were found significant. But there was no significant differences among $L_2 \times T_3$ (10.66%) and $L_2 \times T_2$ (9.41%). The highest result was found in $L_2 \times T_3$ (10.66%) followed by $L_2 \times T_2$ (9.41%). The lowest result was found in $L_1 \times T_1$ (4.76%) preceded by $L_1 \times T_2$ (6.95%). Interaction effect between locations and different types of cutting treatments viz., BAU-Biofungicide and Provax-200 on seed yield per hectare were found significant. But there was no significant differences among $L_1 \times T_1$ (709.09 kg), $L_1 \times T_2$ (679.17 kg), $L_2 \times T_1$ (697.13 kg) and $L_2 \times T_2$ (652.87 kg). Again there was no significant variation among $L_1 \times T_3$

Table 6: Interaction effect among the locations and BAU- Biofungicide and Provax-200 in CVL-1 variety on cutting quality and seed yield following top cutting method in the field

Interaction among locations and cutting treatments	Viability (%)	Mortality (%)	No. of branch/plant	No. of capsule/plant	Seed yield (g/plant)	Seed yield (kg ha^{-1})	1000 seed weight (g)
$L_1 \times T_1$	95.24^{a}	4.76^{e}	7.51^{a}	93.09^{a}	7.10^{a}	709.09^{a}	3.25
$L_1 \times T_2$	93.05^{a}	6.95^{d}	7.01^{a}	88.18^{b}	6.85^{ab}	679.17^{ab}	3.22
$L_1 \times T_3$	91.97^{ab}	8.03^{b}	6.58^{b}	64.06^{d}	6.35^{b}	626.92^{b}	3.20
$L_2 \times T_1$	92.72^{a}	7.28^{c}	6.67^{b}	83.92^{b}	6.48^{b}	697.13^{ab}	3.27
$L_2 \times T_2$	90.59^{ab}	9.41^{ab}	5.95^{c}	78.25^{c}	6.18^{b}	652.87^{ab}	3.21
$L_2 \times T_3$	89.34^{b}	10.66^{a}	5.30^{c}	60.71^{e}	6.19^{b}	600.35^{b}	3.13
Level of significance	0.05	0.05	0.05	0.05	0.05	0.05	NS

L_1: JAES, Manikgonj, BJRI, L_2: KRS, Kishoregonj, BJRI, T_1: Cutting treated with BAU, Biofungicide (3%), T_2: Cutting treated with Provax-200 (0.4%), T_3: Control (Untreated), Data in column having common letter(s) do not differ significantly at 5% level of significance, ns: Not significant

(626.92 kg) and $L_2 \times T_3$ (600.35 kg). The highest result was found in $L_1 \times T_1$ (709.09 kg) followed by $L_2 \times T_1$ (697.13 kg). The lowest result was found in $L_2 \times T_3$ (600.35 kg) preceded by $L_1 \times T_3$ (626.92 kg). Interaction effect between locations and different types of cutting treatments viz., BAU-Biofungicide and Provax-200 on 1000 seed weight were found no significant. The highest result was found in $L_2 \times T_1$ (3.27 g) followed by $L_1 \times T_1$ (3.25 g). The lowest result was found in $L_2 \times T_3$ (3.13 g) preceded by $L_1 \times T_3$ (3.20 g) (Table 6).

DISCUSSION

Top cutting method in respect of different parameters of seed quality differed significantly under different treatments in the present study. Here before planted cuttings were treated with Dithane M-45 and BAU-Biofungicide. Lowest mortality of 4.76% of cuttings was found when cuttings were treated by BAU-Biofungicide while the highest mortality of 8.03% of cuttings was found under control condition. The highest seed yield 709.09 kg ha^{-1} were obtained with BAU-Biofungicide (3%) treated cuttings. Lowest seed yield 600.35 kg ha^{-1} was recorded under control treatment. Present study also revealed that germination and seed yield were highest in top cutting method and resulted higher seed yield than line sowing or conventional method. Islam *et al.* (2005) and Sohel (1999) similarly reported that top-cutting method gave highest seed yield compared to that of conventional method in *Corchorus capsularis* L. and their differences were highly significant. This finding is also supported by Das *et al.* (1995) and Sohel *et al.* (2002).

CONCLUSION

Before cutting plantation, cuttings treated with BAU-Biofungicide (2% in water) can perform better for yield production with maximum BCR.

So, the following recommendation may be drawn for quality seed and fibre production from the findings of this study that cutting treated of BAU-Biofungicide enhance the quality and yield of the jute seed in the field.

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