Interaction effect among the different types of containers, used for storing seed, seed treatments and locations in jute variety O-9897 on disease incidence, seed quality and yield

Abstract

The present study was carried out with the objective to to identify suitable seed management practices that permit maximal fiber production. 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. Six different types of containers viz. tin pot, plastic pot, poly bag, gunny bag lined with polyethylene, cloth bag, and the IRRI poly bag, two different seed treatments viz. Provax-200 and BAU- Biofungicide and two locations viz. JAES and KRS were used for the present study. The highest disease incidence (10.86%) was encountered in case of interaction among plastic pot storing seeds and control condition. Interaction between different types of containers and seed treatments, the highest germination (68.17%) was recorded in interaction effect of tin pot storing seeds and BAU- Biofungicide treated seeds. The stick yield/ha (11.4ton) and fiber yield/ha (6.81ton) were recorded in interaction effect of plastic pot storing seeds and BAU- Biofungicide treated seeds. Highest seed yield/ha (422.44kg) was observed in the interaction of tin pot storing seeds and BAU- Biofungicide treated seeds. The highest disease incidence (12.84%) was encountered in interaction effect of plastic pot storing seeds, control condition and KRS. Highest fiber yield/ha (6.81ton) and stick yield/ha (11.4ton) were recorded in interaction of plastic pot storing seeds, BAU- Biofungicide treated seeds and JAES. Highest seed yield/ha (422.44kg) was recorded in the interaction of tin pot storing seeds, BAU- Biofungicide treated seeds and JAES. So, the following recommendation may be drawn quality of jute seeds can be maintained with BAU Biofungicide and storage in tin pots.

Keywords: interaction, containers, seed treatments, locations, disease incidence, seed quality, yield, O-9897

Abbreviations: B, BAU-Biofungicide; P, Provax 200 WP

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 socioeconomic 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 mainly grown in the Indo-Bangladesh region and in some countries of Southeast Asia. Among the jute growing countries of the world, Bangladesh was second position in respect of production. The land and climatic conditions of Bangladesh are congenial for the production of high quality jute. In Bangladesh, about 0.709 million hectares of land were under jute cultivation and the total yield was 8.40 million bales. As per Khandakar, Bangladesh annually needs about 4000 metric tons 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 requirements, are produced and managed by farmers. Jute suffers from more than 13 different diseases, and 10 of them are seed borne. Sowing of infected seeds may cause the death of seedlings and often plants escaping early infection succumb to death due to different diseases. Seed germination decreases with the increase of the seed borne infection. The Seeds having higher seed borne infection results to significantly higher amount of disease development in the field. The rate of transmission of these pathogens from infected seeds for the growing plants and finally to the harvested seeds was relatively low. Among the seed-borne fungal diseases, stem-rot, black-band, and anthracnose caused by Macrophomina phaseolina (Tassi, Goid), Botryodiplodia theobromae and Colletotrichum corchori, respectively, are frequently transmitted through jute seeds. Macrophomina phaseolina alone can cause 10% yield loss. Stem rot, black band, anthracnose, foot rot and wilt (Rhizoctonia solani) and leaf mosaic virus are responsible for seed rot, pre and post emergence damping off seedlings, the spread of the diseases to standing crops and loss and deterioration of quality of fiber. Soft rot, foot rot and wilt caused by Sclerotium rolfsii and Rhizoctonia solani, respectively, also cause considerable yield losses to the crop. Cercospora leaf spot and target spot caused by Cercospora chichorii and Corynespora cassicola, respectively, are not so important, though these two pathogens are frequently transmitted through jute seeds. The pathogens like Fusarium spp. (Fusarium semitectum and Fusarium oxysporum), Curvularia lunata and Phomopsis spp., are responsible for causing germination failure and seed rot. Yield loss due to seed borne diseases of jute is 8-20%,
depending on the severity of jute diseases from year to year. Infected jute seed fails to germinate or the young seedlings emerging from the infected seed die. Infection of jute seed causes germination failure, post emergence damping off and seedling blight. Jute seedlings or growing plants produced in the field from the infected seeds and escaping early infection may often be infected at the later stages of their growth by the primary seed borne inocula grown and multiplied on the infected dead seeds and seedlings. Seed borne pathogens causing diseases on the growing jute plants in the field quite often attack the capsules or pods and subsequently infect the seed, resulting in production of infected or unhealthy seeds. Therefore, proper disease control measures should be taken for the production of quality jute seeds. Considering the above facts, the present study was carried out with the objective was to find out suitable seed management for quality jute seeds and fiber production.

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 O-9897 was selected for this study.

Containers used

For this experiment six different types of storage containers were used, viz. T1=Tin pot, T2=Plastic pot, T3=Poly bag having 25µm thickness, T4=Gunny bag lined with polyethylene, T5=Cloth bag and T6=IRRI (International Rice Research Institute) Poly bag (Super Grain bag II Z) having 78µm thickness.

Seed Management

i. Seed treated with P (0.4% of seed weight)
ii. Seed treated with B @ 3% of seed weight (Hossain, 2011b)
iii. Control (Untreated)

Seed treated with Provax -200 WP

Seeds were treated with P(5,6- dihydro -2-Methyl-1, 4-oxathin-3-carboxinilide, Group: Oxathin) @ 0.4% of seed weight in a 250ml Erlenmeyer flask and shaken thoroughly for proper coating of the seeds with the fungicides.

Seed treated with BAU- Biofungicide

Seeds were treated with B @ 3% of seed weight in a 250ml Erlenmeyer flask and shaken thoroughly for proper coating of the seeds. The treated seeds were kept inside the brown paper bags so that seeds remain in dry condition till for further use.

Experimental design

The experiments were conducted following Randomized Block Design (RCBD) having three replications. The size of the unit plot was 10m² (5mx2m) and the distance between plots and replications were 1.0m and 1.0m, respectively.

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.

Application of fertilizers

During final land preparation Urea 60kg, Triple Super Phosphate 50kg and Muriate of Potash 25kg per hectare were applied. After 15-20 days of seed germination first top dressing with the urea @ 60kg and again another 15 days later of first top dressing, the 2nd top dressing was given with 60kg per hectare. Top dressing of urea was done very carefully so that it will not come in contact with the plant parts. To meet sulfur and zinc deficiency, gypsum and zinc oxide @ 45kg and 5kg per hectare were applied.

Sowing of seeds

Seeds were sown in line on 20 April, 2012 in Kishoregonj Regional Station (KRS), Kishoregonj and 2nd May, 2012 in Jute Agriculture Experimental Station (JAES), Manikgonj. Row to row and plant to plant distance were maintained as 1M and 1M, respectively. The seed rate for O-9897 was 4kg per hectare.

Data collection

Data on different parameters were collected as shown below

a) Field emergence (germination %)

b) Plant stand/plant population
c) Incidence of diseases (%)
d) Plant height (M)
e) Base diameter (mm)
f) Fiber yield per plant (gm)
g) Fiber yield per hectare (ton)
h) Stick yield per plant (gm)
i) Stick yield per hectare (ton)
j) Average number of branche per plant
k) Average number of fruits per plant
l) Seed yield per plant (gm)
m) Seed yield per hectare (kg)
n) Weight of 1000- seeds (gm)

Some plots were kept un-harvested for seed production.

Statistical analysis

Data were analyzed statistically and treatments effects were compared by Duncan’s Multiple Range Test (DMRT). The relation between seed borne fungal pathogens and germination was observed with regression equations. Relationships between disease severity and

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results of the different types of containers, used for storing seed, seed treatments and locations in jute variety O-9897 on disease incidence, seed quality and yield.

Table 2

<table>
<thead>
<tr>
<th>Container Type</th>
<th>Disease Incidence (%)</th>
<th>Seed Yield (ton)</th>
<th>Stick Yield (ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>XD1</td>
<td>20.50</td>
<td>3.08</td>
<td>55.00</td>
</tr>
<tr>
<td>XD2</td>
<td>19.30</td>
<td>3.20</td>
<td>56.83</td>
</tr>
<tr>
<td>XD3</td>
<td>21.00</td>
<td>3.05</td>
<td>54.50</td>
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<tr>
<td>XD4</td>
<td>22.50</td>
<td>3.17</td>
<td>57.67</td>
</tr>
<tr>
<td>XD5</td>
<td>23.00</td>
<td>3.10</td>
<td>56.17</td>
</tr>
<tr>
<td>XD6</td>
<td>24.00</td>
<td>3.15</td>
<td>58.50</td>
</tr>
</tbody>
</table>

Results

Interaction effect among the different types of containers used for storing seed, seed treatments and locations in jute variety O-9897 on disease incidence, seed yield, stick yield and fiber yield following line sowing method in the field

Interaction effects between different types of containers and seed treatments on germination were found significant (Table 2). But there was no significant differences among T XD1 (68.17%), T XD2 (64.33%), T XD3 (66.67%), T XD4 (65.17%), T XD5 (65.83%) and T XD6 (66.67%). Again, there was no significant variation among T XD1 (64.33%), T XD2 (65.17%), T XD3 (61.17%), T XD4 (59.67%), T XD5 (62.33%), T XD6 (61.00%), T XD1 (56.67%) and T XD2 (55.83%), T XD3 (58.00%), T XD4 (55.50%), T XD5 (57.67%), T XD6 (54.50%), T XD1 (53.83%) and T XD2 (57.67%). The highest result was found in T XD3 and T XD4 (68.17%) followed by T XD5 (66.76%). The lowest result was found in T XD6 (53.83%) preceded by T XD2 (54.50%).

Interaction effects between different types of containers and seed treatments on a plant stand/m² were found significant. But there were no significant differences among T XD1, T XD2, T XD3 (26.60) and T XD4, T XD5, T XD6 (23.33) The highest result was found in T XD1 (40.60) followed by T XD3 (37.33). The lowest result was found in T XD5 (21.93) preceded by T XD2 (22.40).

Interaction effects between different types of containers and seed treatments on plant height were found significant. The highest result was found in T XD1 (1.49m) followed by T XD3 (1.45m) and T XD5 (1.46m). Again, there was no significant variation among T XD1 (1.67m), T XD2 (1.55m), T XD3 (1.45m) and T XD4 (1.68m). The highest result was found in T XD5 (1.45m) followed by T XD1 (1.75m). The lowest result was found in T XD3 (1.12m) preceded by T XD2 (1.15m) (Table 2). In case of KRS, interaction effect among Tin pot and seed treated with B resulted lower disease incidence (2.35%). The highest disease incidence (12.84%) was encountered in case of interaction among plastic pot and control condition.

Interaction effects between different types of containers and seed treatments on 1000-seed weight were found significant. T XD1 (356.32kg), T XD2 (344.65kg), T XD3 (327.67kg), T XD4 (356.25kg), T XD5 (335.66kg), T XD6 (342.46kg), T XD1 (348.75kg), T XD2 (334.25kg), T XD3 (337.56kg) and T XD4 (327.67kg), T XD5 (323.43kg), T XD6 (314.34kg), T XD1 (304.55kg), T XD2 (313.65kg). The highest result was found in T XD4 (422.44kg) followed by T XD1 (403.12kg). The lowest result was found in T XD5 (304.55kg) preceded by T XD6 (313.65kg).

Interaction effects between different types of containers and seed treatments on seed yield/ha were found significant. But there was no significant differences among T XD1 (6.07ton), T XD2 (5.64ton), T XD3 (5.80ton), T XD4 (5.97ton), T XD5 (6.14ton), T XD6 (6.21ton). The lowest result was found in T XD2 (2.19ton) preceded by T XD4 (2.33ton). The interaction effects between different types of containers and seed treatments on stick yield/ha were found significant. But there was no significant differences among T XD1 (10.76ton), T XD2 (11.14ton) and T XD3 (11.04ton). Again, there was no significant variation among T XD1 (5.58ton), T XD2 (6.14ton), T XD3 (5.05ton), T XD4 (4.95ton) and T XD5 (5.63ton). The highest result was found in T XD1 (11.14ton) followed by T XD2 (11.04ton). The lowest result was found in T XD4 (4.95ton) preceded by T XD5 (5.05ton).

Interaction effects between different types of containers and seed treatments on yield following line sowing method in the field

Results

Interaction effect among the different types of containers, used for storing seed, seed treatments and locations in jute variety O-9897 on disease incidence, seed quality and yield.
Interaction effect among the different types of containers, used for storing seed, seed treatments and locations in jute variety O-9897 on disease incidence, seed quality and yield

T XD 1 (2.73M), T XD 2 (2.73M), T XD 3 (2.76M), T XD 4 (2.76M) and T XD 5 (2.69M), T XD 6 (2.65M), T XD 7 (2.67M). The highest result was found in T XD 1 (3.14M) followed by T XD 2 (3.08M). The lowest result was found in T XD 3 (2.65M) preceded by T XD 1 (2.67M).

In cases of base diameter there was no significant differences among T XD 1 (15.47mm), T XD 2 (15.23mm), T XD 3 (15.89mm), T XD 4 (15.65mm), T XD 5 (15.47mm), T XD 6 (15.31mm) and T XD 7 (14.35mm). Again, there was no significant variation among T XD 1 (13.93mm), T XD 2 (14.18mm), T XD 3 (14.25mm), T XD 4 (14.45mm), T XD 5 (13.95mm), T XD 6 (14.23mm) and T XD 7 (13.76mm). The highest result was found in T XD 1 (19.57mm) and lowest result was found in T XD 7 (13.76mm).

Interaction effect between different types of containers and seed treatments on fiber yield/ha were found significant. But there was no significant differences among T XD 1 (9.76ton), T XD 2 (9.76ton) and T XD 3 (9.76ton). The lowest result was found in T XD 4 (3.32ton) preceded by T XD 1 (3.32ton). The highest result was found in T XD 1 (9.76ton) followed by T XD 2 (9.76ton). The lowest result was found in T XD 1 (3.93ton) preceded by T XD 2 (1.90ton).

Interaction effects between different types of containers and seed treatments on stick yield/ha were found significant. But there was no significant differences among T XD 1 (15.47ton), T XD 2 (15.23ton), T XD 3 (15.89ton), T XD 4 (15.65mm), T XD 5 (15.47mm), T XD 6 (15.31mm) and T XD 7 (14.35mm). Again, there was no significant variation among T XD 1 (13.93mm), T XD 2 (14.18mm), T XD 3 (14.25mm), T XD 4 (14.45mm), T XD 5 (13.95mm), T XD 6 (14.23mm) and T XD 7 (13.76mm). The highest result was found in T XD 1 (19.57mm) and lowest result was found in T XD 7 (13.76mm).

Interaction effect between different types of containers and seed treatments on 1000-seed weight were found significant. But there was no significant differences among T XD 1 (5.18ton), T XD 2 (5.18ton) and T XD 3 (5.18ton). Again, there was no significant variation among T XD 1 (4.63ton), T XD 2 (4.63ton) and T XD 3 (4.63ton). The highest result was found in T XD 1 (7.04ton) followed by T XD 2 (6.91ton) and T XD 3 (6.82ton). The lowest result was found in T XD 1 (3.17ton), T XD 2 (3.17ton) and T XD 3 (3.17ton). The highest result was found in T XD 1 (418.55kg) followed by T XD 2 (418.55kg) and T XD 3 (418.55kg). Again, there was no significant variation among T XD 1 (322.55kg), T XD 2 (322.55kg) and T XD 3 (322.55kg).

Interaction effect between different types of containers and seed treatments on plant stand/m² were found significant. But there was no significant differences among T XD 1 (25.67), T XD 2 (25.67) and T XD 3 (25.67). The lowest result was found in T XD 1 (19.57mm), T XD 2 (19.57mm) and lowest result was found in T XD 1 (15.46mm), T XD 2 (15.46mm) and T XD 3 (15.46mm). Again, there was no significant variation among T XD 1 (61.17%), T XD 2 (61.17%) and T XD 3 (61.17%). The highest result was found in T XD 1 (68.17%) followed by T XD 2 (68.00%) and T XD 3 (68.00%). The lowest result was found in T XD 1 (53.83%) preceded by T XD 2 (54.50%).

Interaction effect between locations and different types of containers and seed treatments on plant height were found no significant. But there was no significant differences among T XD 1 (25.67), T XD 2 (25.67), T XD 3 (25.67) and T XD 4 (25.67). Again, there was no significant variation among T XD 1 (61.17%), T XD 2 (61.17%), T XD 3 (61.17%) and T XD 4 (61.17%). The highest result was found in T XD 1 (68.17%) followed by T XD 2 (68.00%) and T XD 3 (68.00%). The lowest result was found in T XD 1 (53.83%) preceded by T XD 2 (54.50%).

Interaction effect between locations and different types of containers and seed treatments on seed quality were found no significant. But there was no significant differences among T XD 1 (25.67), T XD 2 (25.67), T XD 3 (25.67) and T XD 4 (25.67). Again, there was no significant variation among T XD 1 (61.17%), T XD 2 (61.17%), T XD 3 (61.17%) and T XD 4 (61.17%). The highest result was found in T XD 1 (68.17%) followed by T XD 2 (68.00%) and T XD 3 (68.00%). The lowest result was found in T XD 1 (53.83%) preceded by T XD 2 (54.50%).

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Conclusion

Therefore, the following conclusion may be drawn for quality seed and fiber production, from the findings of this study:

A. B (3% of seed weight) can successfully be used for treating seeds to avoid P for the production of quality healthy jute seeds with higher seed and fiber yield.

B. Fiber and seed yield were found to decrease with the increase of seed borne infection of fungal pathogens.

C. Seed germination and disease incidence varied significantly with respect to storage container, seed treatment and location.

So, the following recommendation may be drawn for quality seed and fiber production, from the findings of this study:

a) Quality of jute seeds can be maintained by storage in tin pot and seed treated of B enhance the quality and yield of the jute seed and fiber in the field.

Acknowledgments

None.

Conflicts of interest

Authors declare that there is no conflict of interest.

References


3. www.jute.org

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6. Fakir GA. An annotated list of seed borne diseases in Bangladesh. Seed Pathology Laboratory, Department of Plant Pathology: Mymensingh; 2001. 7–8 p.


