

Evaluation of jute mutants/varieties for resistance to jute yellow mite under field and net house condition

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Abstract: Experiment were conducted in the field laboratory to evaluate thirteen mutants of jute namely- CM-80, CM-83, CM-84, CM-86, CM-87, CM-88, CM-89, CM-92, CM-94, CM-96, CM-102, CM-107, CM-78 along with their mother variety D-154 and check variety BINA DESHI PAT-2 for their resistance against major pests of jute, jute yellow mite (*Polyphagotarsonemus latus* Banks) during the period from April to August, 2015. Evaluation was made on the basis of percentage of plants and leaves attacked/ consumed by jute yellow mite. The mutants CM-80, CM-83, CM-84, CM-87, CM-88, CM-89, CM-92, CM-94, CM-96, and CM-78 were observed moderately susceptible; CM-86, CM-102, CM-107, mother variety D-154 and the check variety BINA DESHI PAT-2 were found susceptible to jute yellow mite.

Key words: Jute yellow mite, mutants, net house.

Introduction

Jute is a member of the family Tiliaceae and the genus *Corchorus*. The genus *Corchorus* comprises 40 species out of them two species namely *Corchorus capsularis* L. or deshi jute which originated in India and Myanmar and *Corchorus olitorius* L. or tossa jute which originated in Africa are commercially cultivated for fiber production. Jute constitutes a major tropical fiber crop of considerable economic significance to Bangladesh. Jute fiber is extensively used in the manufacture of different types of packing materials for various agricultural and industrial products. Insect pests along cause about 12% yield loss (Anon, 1987). The jute yellow mite, *Polyphagotarsonemus latus* Banks is also a potentially destructive pest and attacks both the cultivated jute species. It damage is generally known as a disease called 'Telenga or Telchita'. The fibre yield and quality is greatly reduced by the attack. A reduction of 10% and 17% fiber yield was reported when infestation of plants ranged from 50-70% and 80-90% respectively (Ahmed and Jalil, 1993). In view of this requirement, the present experiment was undertaken to evaluate several mutant(s)/variety (ies) of jute against jute yellow mite, to test the level of resistance of several jute mutants to jute yellow mite under field and laboratory condition.

Materials and Methods

The experiment was carried out at the Central experiment farm of Bangladesh Institute of Nuclear Agriculture (BINA), Mymensingh. The laboratory experiments were also set up at Entomology Division, BINA, Mymensingh. The experimental site is located approximately between the latitudes of 24°26' to 24°54' north and between the latitude of 90°15' to 90°30' East and about 7.9 to 9.1 meter above the sea level. The site belongs to the Old Brahmaputra Flood Plain under Agro-Ecological Zone (AEZ) 9. The experimental plots were prepared by proper ploughing and laddering. The land was leveled properly. The seeds were sown after final land preparation at the rate of 6.0-7.5 kg per hectare (Gaffer *et al.*, 1989). Plant to plant spacing was 0.1m and row to row distance was 0.3 m. Sowing was done at a depth 1.25 to 2.5 cm and the seeds were covered with loose soil. The experiment was laid out in a Randomized Complete Block Design (RCBD)

with three replications. Fertilizers were applied once at the time of final land preparation at the rate of 67.5, 25.0 and 30.0 kg Urea, TSP and MOP per hectare respectively. In addition, 5000 kg cowdung per hectare were applied. 37 kg per hectare urea was also applied as top dressing at six weeks after sowing. Test materials- The experimental materials include fifteen jute mutants/varieties belonging to the species *Corchorus capsularis* and their mother varieties CVL-1 and D-154. The mutants/varieties were CM-78, CM-80, CM-83, CM-84, CM-86, CM-87, CM-88, CM-89, CM-92, CM-94, CM-96, CM-102, CM-107, BINA DESHI PAT-2 and D-154. All the mutants were developed from varieties CVL-1 and D-154 through the use of gamma radiation. The adult jute yellow mites, *Polyphagotarsonemus latus* Banks are minute in size, newly emerged females are whitish, dorsoventrally flat and round in shape, gradually turning to yellowish-brown and elliptical in shape (Karmakar, 1997). Jute yellow mite attacks the tender leaves and deposits their eggs singly on the ventral surface of leaves. Inter cultural operations- Necessary intercultural operations were carried out as and when necessary. The plots were exposed to natural infestation and no protective measures were taken against any insect pest. Jute yellow mite data were recorded at 60, 90 and 120 days after sowing (DAS). The total number of infested and uninfested plants and leaves were collected from two randomly selected rows of each plot to determine the level of infestation by jute yellow mite. The total number of plants and leaves were counted and percentage of infested plants and leaves by a particular pest species was calculated. The percentage of infestation was calculated by formula. Percentage of plants or leaves infested = $(B/A \times 100)$, where, A = Number of total plants/leaves, B = Number of infested plants or leaves. The damaged plants or leaves were then graded by using the formula (Lateef and Reed, 1983). Per resistance percentage = $\{(X - Y/X) \times 100\}$. Where, X = Percentage of infested plants or leaves, Y = Percentage of infested plants or leaves. The pest resistance percentage was then converted to a 1-9 rating (Reed and Lateef, 1980) according to the scale. Reaction of jute mutants to jute yellow mite, an experiment was also carried out in net house. Infestation percentage of jute plant by jute yellow mite was recorded at 90 DAS. The percentage of

infestation was calculated by the formula. Percentage of plants or leaves infested = (B/A×100). Where, A = Number of total plants or leaves B=Number of infested plant or leaves. Data of different parameters were analyzed statistically. Data obtained from experiments established in net house were analyzed in the computer for one factor Completely Randomized Design (Gomez and Gomez, 1984).

Results and Discussion

The results generated out of the experiments on the comparative effect of different jute mutants/varieties for resistance of jute yellow mite.

Percentage of plants of different mutants infested by jute yellow mite: The percentage of plants infested by jute

yellow mite in different mutants/varieties at different plant growth stage is presented in Table 1. The percentage of jute yellow mite infested plants ranged from 7.39 (BINA DESHI PAT-2) to 20.01 (CM-86) at 60 DAS, 36.59 (CM-80) to 55.51 (BINA DESHI PAT-2) at 20.01 (CM-86) at 60 DAS, 36.59 (CM-80) to 55.51 (BINA DESHI PAT-2) at 90 DAS, 56.62 (CM-87) to 70.54 (CM-86) at 120 DAS. Statistically significant variation was found among different mutants with respect to the percentage of plants infested by yellow mite at 60 DAS, 90 DAS and 120 DAS. In all cases the highest yellow mite infestation was observed in the mutant Cm-86 (70.54%) which was found at 120 DAS. Mean, the highest infestation was observed in the mutant CM-86 (47.12%) which was significantly different from the other mutants.

Table 1. Percentage of jute yellow mite infested plants in different mutants/varieties at different days after sowing (DAS)

Mutants/Variety	Percentage of infested plants				Relative resistance/ susceptibility rating
	60 DAS	90 DAS	120 DAS	Mean	
CM-80	13.29 d	36.59 k	59.28 fg	36.39 c	5
CM-83	13.17 d	38.48 j	57.54 g	36.40 c	5
CM-84	10.10 e	40.65 i	57.86 g	36.20 c	5
CM-86	20.01 a	50.80 b	70.54 a	47.12 a	6
CM-87	13.52 d	39.85 ij	56.62 g	36.66 c	5
CM-88	13.63 d	38.56 j	59.15 fg	37.11 c	5
CM-89	14.56 cd	46.52 de	62.2 def	41.03 b	6
CM-92	15.76 bc	43.25 h	63.30 cde	40.77 b	6
CM-94	16.19 bc	44.32 fgh	61.89 def	40.80 b	6
CM-96	17.32 b	43.71 gh	66.40 bc	42.48 b	6
CM-102	17.17 b	45.09 efg	62.89 def	41.72 b	6
CM-107	16.85 b	45.51 ef	59.45 efg	40.60 b	6
CM-78	17.34 b	49.26 c	64.87 c	43.82 b	6
D-154	19.58 a	47.31 d	57.80 g	41.56 b	6
BINA DESHI PAT-2	7.39 f	55.51 a	68.28 ab	43.73 b	6
Probability	0.01	0.01	0.01	0.01	
CV (%)	7.64	2.05	3.41	4.37	
LSD	1.924	1.523	3.523	2.956	

*Mean in a column followed by the same letter (s) is not significantly different at 1% level by DMRT (Duncan's Multiple Range Test)

Table 2. Percentage of jute yellow mite infested leaves in different mutants/varieties at different days after sowing (DAS)

Mutants/Variety	Percentage of infested leaves				Relative resistance/ susceptibility rating
	60 DAS	90 DAS	120 DAS	Mean	
CM-80	17.87 a	35.44 h	60.65b	37.99 cd	5
CM-83	10.55ef	41.79 d	57.68 cd	36.67 cd	5
CM-84	11.85 cd	40.73def	35.89f g	35.39 d	5
CM-86	15.58 b	47.7 b	53.59 a	42.78 ab	6
CM-87	7.21 g	27.62 i	65.05 h	28.28 e	4
CM-88	8.16 g	30.52 i	48.01 h	29.14 e	4
CM-89	9.69 f	40.43 def	54.34 ef	34.82 d	5
CM-92	12.68 cd	40.57 def	57.27 cd	36.84 cd	5
CM-94	9.65 f	41.40 de	55.78 def	35.61 d	5
CM-96	11.49 de	41.12 de	55.43 def	36.01 d	5
CM-102	13.09 c	38.88 fg	51.37 g	34.51 d	5
CM-107	9.83 f	39.73 ef	59.07 bc	36.21 d	5
CM-78	12.47 cd	37.93 g	56.49 de	35.63 d	5
D-154	12.63 cd	43.58 c	65.57 a	40.59 bc	6
BINA DESHI PAT-2	18.21a	50.70 a	64.91 a	44.61 a	6
Probability	0.01	0.01	0.01	0.01	
CV (%)	4.01	3.14	2.17	6.26	
LSD	1.232	1.719	1.505	3.807	

*Mean in a column followed by the same letter (s) is not significantly different at 1% level by DMRT (Duncan's Multiple Range Test)

Percentage of leaves infested by jute yellow mite in different mutants: The percentage of leaves infested by jute yellow mite in different jute mutants at various plant growth stages is presented in Table 2. The percentage of leaves infested by jute yellow mite ranged from 7.21 (CM-87) to 18.21 (BINA DESHI PAT-2) at 60 DAS, 29.62

(CM-87) to 50.70 (BINA DESHI PAT-2) at 90 DAS and 48.01 (CM-87) to 65.57 (D-154) at 120 DAS. So, a great deal of variation was observed among different mutants with the respect to the percentage of leaves infested by jute yellow mite in the field at 60 DAS,90 DAS and 120 DAS. At 60 DAS, the highest infestation of leaves was

observed in the check variety BINA DESHI PAT-2 (18.21%) which was statistically identical to the mutant CM-80 (17.87%) and lowest infestation in the mutant CM-87(7.21%) which was statistically identical to the mutant CM-88(8.16%). At 90 DAS, the maximum infestation was found in the check variety BINA DESHI PAT-2 (50.70%) and lowest infestation was observed in the mutant CM-87 (29.62%) which was statistically different from other mutants except CM-88 (30.52%). At 120 DAS, the highest infestation was recorded in the variety D-154 (65.57%), which was statistically identical to the check variety BINA DESHI PAT-2 (64.91%) and the mutant CM-86 (65.06%). On an average, the highest infestation was recorded in the check variety BINA DESHI PAT-2 (44.61%), which was statistically similar to the mutant CM-86 (42.78%). This variety had consistently the highest percentage of infested leaves through the whole period. Among the thirteen

mutants of jute, none was found to be resistant to jute yellow mite. The mutants CM-87 and CM-88 had the ranking of 4 and CM-86, D-154 and BINA DESHI PAT-2 had the ranking of 6. The rest of mutants ranked 5.

Percentage of leaves infested by jute yellow mite in net house experiment: Percentage of leaves infested by jute yellow mite in net house experiment is presented in Table 3. The percentage of leaves infested by jute yellow mite ranged from 40.78% to 71.70% (BINA DESHI PAT-2).

The highest percentage of infested leaves BINA DESHI PAT-2 (71.70%) followed by CM-102 (68.89%), CM-88 (67.99%). CM-102 and CM-88 mutants are statistically similar. The lowest infested leaves in the mutant CM-96 (40.78%). Among the mutants of jute, the mutants CM-96 had the ranking of 4 and CM-80, CM-88, CM-102, CM-107, BINA DESHI PAT-2 had the ranking of 6. The rest of mutants ranked 5.

Table 3. Percentage of jute leaves infested by jute yellow mite in different mutants in the net house at 90 DAS

Mutants	Percentage of infested leaves	Relative resistance/susceptibility rating
CM-80	66.42 bc	6
CM-83	62.20 c	5
CM-84	63.47 de	5
CM-86	61.16 e	5
CM-87	54.41 f	5
CM-88	67.99 b	6
CM-89	61.42 c	5
CM-92	62.95 e	5
CM-94	63.74 cde	5
CM-96	40.78 g	4
CM-102	68.89 b	6
CM-107	66.14 bcd	6
CM-78	62.42e	5
D-154	62.57 e	5
BINA DESHI PAT-2	71.70 a	6
Probability	0.01	
CV (%)	5.67	
LSD	2.946	

*Mean in a column followed by the same letter (s) are not significantly different at 1% level by DMRT (Duncan's Multiple Range Test)).

It is obvious from the results that out of thirteen mutants and two variety, CM-86, CM-102, CM-107, D-154 and BINA DESHI PAT-2 are susceptible to jute yellow mite and the rest of mutants are moderately susceptible (Table 4). Similar results were observed by Banu (2004) are reported that none was showed resistant/tolerant.

Table 4. Resistance rating of jute mutants/varieties against jute yellow mite

Mutants/Varieties	Mean rating	Reaction
CM-80, CM-83, CM-84, CM-87, CM-88, CM-92, CM-94, CM-96, CM-78	5	Moderately susceptible
CM-86, CM-102, CM-107, D-154, BINA DESHI PAT-2	6	Susceptible

In present study results showed that regarding jute yellow mite, it was found that the mutants performed better in comparison to their mother variety D-154 and the check variety BINA DESHI PAT-2. None of the mutants showed any resistance to jute yellow mite under field and net house condition. In the field considering plant infection the mutants CM-80, CM-83, CM-84, CM-87, CM-88 showed moderate level of susceptibility to jute mite. In net house condition considering leaf infestation the mutants CM-80, CM-88, CM-102, CM-107 and check variety

BINA DESHI PAT-2 were found susceptible and the rest of the mutants were graded as moderately susceptible to jute yellow mite.

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