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Response of Radiation Induced Jute (*Corchorus olitorius* L.) Mutants Against Jute Stem Weevil, *Apion corchori* Marshall

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Abstract: Experiments were conducted in the field to response five radiation induced jute (*Corchorus olitorius* L.) mutants against jute stem weevil, *Apion corchori* Marshall. Evaluations were made on the basis of percentages of plants infested by weevil and number of knots found on each mutant. It was found that the significantly difference between five jute mutants with respect to infestation by jute stem weevil. The mutant OM-48 and OM-51 recorded higher percentages of infested plants and increased number of knots than the check variety O-9897. Mutant OM-1, OM-42, OM-47 and check variety O-9897 were rated as moderately resistant (with 1.88 to 3.31 knots/plant) to jute stem weevil. It was also found that the lower parts of the plants (1-30 cm) had more number of knots than the upper parts.

Key words: Response, radiation, jute mutant, *Apion corchori*

Introduction

The jute stem weevil, *Apion corchori* Marshall (Coleoptera: Curculionidae) commonly known as jute apion is the serious pest of jute from seedling (12-15 cm tall) to maturation stage. The adult weevil feeds on tender leaves making pinholes. This pest is mainly damage to the quality of fiber while making oviposition holes. A female may make a number of holes before laying an egg, thus damaging numerous stems in her life. It bore holes in the stem, preferably at the nodal region near the base of the petiole for oviposition with its rostrum in the jute stem and the grub feeding inside the stem and damage the fiber bundles. As a result of injury, mucilaginous and gummy substances accumulated around the wound, which cement the larval excreta with the adjacent tissues. Thus a knot is produced in the fibers and black hole in the jute sticks (Kabir, 1966). By forming knots in stem thus disrupting the fiber continuity and the uniformity in yarn thickness (Miah and Husain, 1980; Ahmed and Jalil, 1993) ultimately resulting in poor quality fiber and economic loss. Conventional insecticides mainly control this pest. Because of the concealed nature of the feeding habit, the use of jute stem weevil resistant cultivars would be practical and economical methods of control (Collins and Mendoza, 1991). In this study, some radiation-induced mutants of tossa jute, *Corchorus olitorius* was investigate to find out source of resistance to jute stem weevil, *Apion corchori*.

Materials and Methods

Experiments were conducted under field condition during the period from March to August 2000. Five radiation induced mutants/varieties of tossa jute (*Corchorus olitorius* L.) namely, OM-1, OM-42, OM-47, OM-48 and OM-51 were used with O-9897 as the check variety against jute stem weevil, *Apion corchori* Marshall. The experiment was conducted in a randomized complete block design (RCBD). The plot size was 5.0 X 3.0 m^2 and spacing between plots, rows and plants were 0.5, 0.3m and 0.1 m respectively. The soil is a typically sandy loam in texture and having pH value of 6.5. Previous crop of the plot was sesame. The plots were fertilized with urea, TSP, MP, gypsum and zinc sulphate @ 100, 50, 90, 90 and 22 kg ha^{-1} respectively. The entire amount of TSP, MP, gypsum, zinc sulphate and half of urea were applied at the time of final land preparation. The remaining half of urea was applied at two equal installation as top dressing 40 and 60 days after sowing (DAS). The seeds of the mutants were sown in row with hand as uniformly as possible and there were 10 rows in each plot. Normal agronomic practices were followed. The plots were exposed to natural infestation and no protective measures were taken against *A. corchori.* Number of infested and un-infested plants were collected and counted at 60, 90 and 120 DAS from two randomly selected rows of each plot and percent of infestation were calculated. The damaged plants were then graded using the formula developed by Lateef and Reed (1983). Next the pest resistance percentage was converted to rating scale (Reed and Lateef, 1980) as follows:

Plant resistance percentage	Rating scale	Relative resistance/susceptibility
100	1	Increasing resistance
75 to 99	2	
50 to 75	3	
25 to 50	4	
10 to 25	5	
- 10 to 10	6	Equal to check
- 25 to – 10	7	
- 50 to – 25	8	
- 50 to less	9	Increasing susceptibility

For counting the number of knots per plant, twenty-five plants from each plot were harvested at 60, 90 and 120 DAS. The plants were brought to the laboratory and were split longitudinally with a knife to count the number of knots formed by the jute stem weevil. Numbers of knots formed by the weevil at different height (1-30 , 31-60 , 61-90 and 91 cm above) of the plants were also recorded. For the purpose, data were recorded only after harvesting.

Results and Discussion

The varieties/mutants had differential response against the attack of jute stem weevil and mutants had significant variation in the level of infestation at different growth stages. At 60 days after sowing (DAS) the check variety O-9897 had the lowest weevil infested plant (16.00%) followed by OM-47 (18.66%). The highest weevil infested plant was found in the mutant OM-1 (40.00%) , which was statistically identical to OM-51 (37.33%) and OM-48 (33.33%). Weevil infested plant in OM-42 (25.33%) differed significantly from all other mutants. At 90 DAS, the maximum infestation was recorded in the mutant OM-51 (73.33%) followed by OM-1 (64.00%) and the minimum infestation was found in the mutant OM-47 (44.00%), which was statistically different from other mutants/varieties except the mother variety O-9897 (46.66%). The mutant OM-42 and OM-48 had higher percentage of infested plants than the check variety and difference was

Table 1: Percentage of plants of different mutants infested by jute stem weevil

	Per cent of infested plants				
Mutants	60 DAS	90 DAS	120 DAS	Mean	Relative resistance/ susceptibility rating
OM-1	40.00a (39.74)	64.00ab (55.47)	94.66 a (77.02)	66.22a (55.62)	8
OM-42	25.33bc (30.21)	53.33c (46.91)	68.00bc (55.54)	48.89b (44.36)	6
OM-47	18.66cd (25.58)	44.00d (41.55)	58.26 c (50.00)	40.32b (39.37)	5
OM-48	33.33ab (35.25)	61.33b (51.56)	97.33 a (81.13)	63.99a (53.14)	8
OM-51	37.33a (37.66)	73.33a (58.93)	90.67 a (72.35)	67.11a (55.02)	8
O-9897	16.00d (24.30)	46.66cd (43.09)	77.33 b (61.59)	46.66bc (43.09)	6
Probability	0.01	0.01	0.01	0.01	

Table 2: Number of knots found in different mutants formed due to jute stem weevil infestation

	Number of knots per plant			
Mutants	60 DAS	90 DAS	120 DAS	Grading
OM-1	1.44b	1.98b	3.13c	3
OM-42	1.00d	1.67c	2.31d	5
OM-47	1.10cd	1.31d	1.88e	6
OM-48	2.19a	4.17a	5.25a	1
OM-51	1.25c	1.78bc	4.13b	2
O-9897	1.00d	1.04e	2.54b	4
Probability	0.01	0.01	0.01	

*Means in a column followed by same letter (s) are not significantly different at 1 % level by DMRT
*Figures within parentheses are transformed arc sine values
*DAS= Days After Sowing

Table 3: Number of knots found at different heights of jute mutants formed due to jute stem weevil infestation

	Average number of knots per plant at different height (cm)				
Mutants	1-30cm	31-60cm	61-90cm	91-120cm	Probability
OM-1	1.58	0.98	1.67	0.33bc	NS
OM-42	1.20	0.83	0.67	0.33bc	NS
OM-47	1.24A	1.17A	1.00A	0.0cB	0.01
OM-48	1.58	1.33	1.33	1.67a	NS
OM-51	1.42	0.89	1.50	1.00ab	NS
O-9897	1.00	0.67	0.50	0.67bc	NS
Probability	NS	NS	NS	0.05	

*Means in a column followed by same letter (s) are not significantly different at 5% level by DMRT
*Means in a row followed by the same capital letter are not significantly different at 1% level by DMRT, *NS = Non-significant
*DAS = Days After Sowing

significant. At 120 DAS, the weevil infestation was very high at ranging from 58.26 to 97.33%. Lowest infestation was also observed in the mutant OM-47 followed by OM-42. Mutant OM-1, OM-48 and OM-51 were statistically identical with respect to infested plants. The highest infestation was found in OM-48, which was significantly different from OM-42, OM-47 and O-9897 (Table 1). Mean lowest percentage of infestation was observed in OM-47 (40.32%), which was significantly different from other mutants. The highest 67.11 % infestation was found in OM-51 followed by OM-1 and OM-48. Bhuiyan and Kabir (1986) recorded about 30-40% infestation in some jute strains and no resistant strain to jute stem weevil was detected. Mohapatra and Patnalik (1995) rated fourteen jute genotypes as moderately resistant to the stem weevil with infestation percentage of 10.54 to 19.30. No significant differences were observed between OM-42 and check variety as regarded the mean percentages of infested plants. Therefore both the mutants had almost the same damage grade can be regarded as susceptibility. The mutant OM-47 was found to less susceptible than the check variety. The mutant OM-1, OM-48 and OM-51 can be classified as more susceptible to jute stem weevil under field condition. The infestation of jute stem weevil was observed to increase gradually with the progress of time. This is because the population of weevils increased gradually in later part of the season. The cause of such increase is due to the fact that the weevils complete their life cycle within 20-24 days. The adults have a pretty long life (around 206 days) and the female have a prolonged ovipositional period of about 124 days (Hazarika, 1952), which lays about 624 eggs throughout the lifetime.

The number of knots per plant was found to vary among different mutants/varieties and knots formed by stem weevil were with the advancement of time (Table 2). The mutants were graded following the data recorded at 120 DAS. The maximum number of knots was observed in the mutant OM-48 (5.25) and the differences among the mutant were significant. The minimum number of knots formed in OM-47 (1.88), which was also significantly different from other mutants. Zaman and Banu (1993) recorded 2.69 to 7.92 bore per plant in *C. capsularis*. Jalil and Zaman (1991) observed that jute stem weevil infestation was very high in *C. olitorius* compared to *C. capsularis* and also found the number of bores per plant varied 2-10 in different areas of Bangladesh. The mutants OM-48, OM-51 and OM-1 had more number of knots than their check variety O-9897. This means that these are less tolerant to jute stem weevil than their mother variety. Similarly the mutants OM-47 and OM-42 are more tolerant than O-9897. Kalita *et al*. (1994) seven entries of *C. olitorius* were found to resistant (0-1 holes/plant) against stem weevil. In this result none of the mutant were found to be resistant to the pest with respect to the number of knots formed per plant. The mutant OM-1, OM-42, OM-47 and check variety O-9897 may be designated as moderately resistant to jute stem weevil (Table 2). Miah (1980) and Husain *et al*. (1991) designated the mutants having less than 4 knots per plant as moderately resistant to jute stem weevil. The damage may still be considered tolerable if there are 1-2 knots per 'reed' and if there are four or more knots per 'reed' the infested fiber is usually graded as X- bottom (Ahmed and Jalil, 1993). So, the mutant OM-48 and OM-51 may be regarded as susceptible to jute stem weevil.

The mutants/varieties did not vary significantly in the level of attack in all the plant heights except in 91-120 cm. No significant difference was recorded among different heights of plant within the same mutants except OM-47. It was found that the lower parts of the plants (1-30 cm) had more number of knots than the upper parts. The number of knots decreased gradually towards the apex of plants. In the mutant OM-47, no knot was observed beyond 90 cm (Table 3).

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