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Short communication

Antibiosis mechnism of resistance in some selected tomato genotypes to tomato fruit borer *(Helicoverpa armigera)*

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Tomato, *(Lycopersicon esculentum)* Mill is one of the most popular and widely grown vegetables all over the world. In India it is cultivated on 0.54 million hectares of area with a total production of about 7.70 million tones. One of the major threats to this crop is the damage by tomato fruit borer *(Helicoverpa armigera* (Hubner)) during fruiting period. Use of various insecticides to control this insect has become fruitless as misuse and overuse of many insecticides has developed resistance in this insect (Krishna Kumar and Krishnamoorthy, 2001). Therefore, host plant resistance is the only avenue left with the farmers and plant protectionists to combat with this insect successfully. Keeping this in view, 35 tomato genotypes were field evaluated during Rabi, 2004 against tomato fruit borer and based on per cent fruit infestation both on number and weight basis.

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The matured larvae of the test insect were collected from the gram field and reared in the laboratory. The larvae were kept individually in separate test tubes containing soaked gram seeds. The larvae after being converted to pupae were kept enmass in Petri plates which were placed in rearing cages. The rearing cage was made up of wood having bottom wooden platform fitted with wire net mesh below. The top and the three sides of the cage were fitted with fine mesh wire net. The front of the cage had a door and both the frames of the door were also fitted with same mesh wire net. The pupae kept in petriplates were kept inside the cage for adult emergence. Cotton swabs soaked in 10% honey solution and water separately were also kept for adult feeding in separate petriplates. A black cloth piece was tied inside the cage to prevent excess light. The emerged female adults after copulation laid eggs on black cloth and on cotton swabs. The young larvae were collected and reared in separate glass vials with soaked gram seeds as food till pupation. The pupae were collected and kept in Petri plates for adult emergence. The adult insects were allowed to copulate inside the rearing cages.

The seedlings of selected tomato genotypes (30 d old) were planted in earthen pots separately which were covered by Mylar cages. For oviposition study, a gravid female collected from rearing cage was released to each caged plant. After 4 days, the female was taken out and the number of eggs laid on the plants variety-wise was recorded. The eggs were also observed for hatching on the respective genotype and by this the per cent sterility in eggs (the eggs which did not hatch were considered as sterile eggs) laid on different genotypes was also ascertained. There were a total of 5 replications under the study.

The newly hatched 1st instar larvae collected from rearing cages were released @ 10 larvae per plant on 30 d old potted plants of selected tomato genotypes and were

caged thereafter. Larvae were observed daily on each genotype till they were converted to pupae. By this way the total larval duration was studied on each genotype. This experiment also had 5 replications.

The pupae collected from the above experiment were kept separately being numbered in individual Petri plates. The duration of pupal period was computed when the adults emerged and the average pupal duration genotype wise was calculated.

From the above experiment the adults which were produced were sexed and male and female longevity was analyzed variety wise keeping them separately in glass jars supplied with cotton swabs soaked with 10% honey solution. The adults which emerged and sexed from the above experiment were taken into consideration for determination of male:female ratio which was expressed in numerical. The data collected from various experiments were analyzed as per standard randomized block design procedure (Gomez and Gomez, 1984).

The data on oviposition rate and various biometric observations like larval, pupal and adult duration along with sex ratio of the test insect on respective test tomato genotypes are presented in Table 1. It is denoted from Table 1 that the female insect laid lowest number of eggs (45.02) on BT 10 which was statistically different from rest of the genotypes. BT 12 which supported 60.4 eggs was found to be at par with moderately susceptible genotypes like Rishi 7 (64.4 eggs) and T 35 (68.2 eggs). The high susceptible genotypes harboured 87.2 to 92.6 eggs. As regards to egg sterility, it was visualized that the high susceptible genotypes like Century 12 and H Cross 17 accounted for 8.8 to 9.6% whereas, the moderately and low susceptible genotypes accounted for 13.8 to 16.2% egg sterility. Low susceptible genotypes supporting less oviposition than moderately and high susceptible genotypes that supported higher oviposition has been earlier studied by Sivaprakasam (1996).

The larval duration was found to be highest on low susceptible genotype BT 10 (21.3 days) followed by BT 12 (19.6 days) which did not vary from the former genotype. In moderately susceptible genotypes the larval duration varied from 17.2 days in T 35 to 17.7 days in Rishi 7. However, these two moderately susceptible genotypes did not differ from highly susceptible varieties i.e. H Cross 17 and Century 12 which were responsible for relatively shorter life span of the larvae (16.4 and 16.9 days, respectively). The present finding draws ample support from the findings of Kashyap (1983) and Rath (1994).

The pupal duration was noticed to be highest (10.26 days) on BT 10 followed by BT 12 (9.98 days) having no difference between themselves. Similarly the moderately susceptible genotypes i.e. Rishi 7 and T 35 recorded a pupal duration of 9.12 and 8.67 days having significant difference among them. The high susceptible genotypes like H Cross 17 (8.12 days) and Century 12 (7.53 days) having a distinct difference among themselves also remained different from the former genotypes. The present finding lies in conformity with the findings of Kashyap (1983) and Rath (1994).

The adult male duration was not at all influenced by the relative resistance of the test varieties. Because the low susceptible genotype BT 12 recorded a male duration of 4.36 days followed by BT 10 (4.29 days).The male life span ranged from 3.27 days in H Cross 17 to 4.02 days in other test genotypes. However, the adult female duration varied among the genotypes. The female duration was witnessed to be 10.69 days in BT 10 which was at par with BT 12 (10.87 days), T 35 (9.47 days)

Table 1. Antibiosis in some selected tomato genotypes for oviposition and other biometrical parameters of tomato fruit borer, *Helicoverpa armigera* (Hubner) at Bhubaneswar

Genotypes	Eggs / female (number)	Egg sterility (%)*	Larval duration (days)	Pupal duration (days)	Adult duration (days)		Sex ratio (M:F)
					Male	Female	
BT 10	45.02	16.2 (4.01)	21.3 (4.60)	10.26 (3.27)	4.29 (2.14)	10.69 (3.33)	0.87 (0.93)
BT 12	60.40	14.8 (3.82)	19.6 (4.47)	9.98 (3.23)	4.36 (2.18)	10.87 (3.35)	0.92 (0.95)
Rishi 7	64.40	15.4 (3.91)	17.7 (4.26)	9.12 (3.09)	4.02 (2.11)	9.29 (3.12)	0.98 (0.98)
T 35	68.20	13.8 (3.70)	17.2 (4.19)	8.67 (3.01)	3.81 (2.07)	9.47 (3.14)	1.06 (1.02)
H Cross 17	87.20	9.60 (3.08)	16.9 (4.16)	8.12 (2.94)	3.27 (1.95)	9.13 (3.09)	1.10 (1.04)
Century 12	92.60	8.80 (2.95)	16.4 (4.10)	7.53 (2.82)	3.43 (1.97)	8.67 (3.02)	1.12 (1.05)
SE (m) ±	2.37	0.11	0.08	0.02	0.08	0.07	0.03
CD (P=0.05)	6.99	0.32	0.23	0.06	0.24	0.21	0.09

The figures in parentheses are square root values

and Rishi 7 (9.29 days), respectively. The high susceptible genotypes like H Cross 17 (9.13 days) and Century 12 (8.67 days) were also at par with moderately susceptible genotypes but not with the low susceptible genotypes. Rath (1994) has also studied that the female duration was less on resistant variety (HT 64) and more on susceptible variety (HS 173) which corroborate with present finding.

The sex ratio (male: female) was also found to vary among the genotypes. There was no significant difference in sex ratio among the low and moderately susceptible genotypes (ratio ranged from 0.87 in BT 10 to 1.06 in T 35). However, the ratio was found to be 1.10 for H Cross 17 and 1.12 for Century 12 which did not differ among them. The present finding depicted the production of comparatively more female forms on high susceptible genotypes than on other genotypes tested which may be attributable to preferred nutritional status of the high susceptible genotypes. Kashyap (1983) and Rath (1994) have also witnessed a similar effect.

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