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## Screening of tomato cultivars against fruit borer, *Helicoverpa armigera* (Hubner) infesting tomato

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### Abstract

The present investigation entitled "Screening of tomato cultivar against fruit borer, *Helicoverpa armigera* (Hubner) (Lepidoptera: Noctuidae) infesting tomato" was carried out during *rabi* season of 2015-16 at Central Experimental Station, Wakawali, Dist.-Ratnagiri. The study revealed that none of the cultivars was found to be free from the infestation of fruit borer. The percent fruit infestation ranged from 15.75 to 42.53 percent. The maximum (42.53%) mean percent fruit infestation was recorded in cultivar Arka Alok, while minimum (15.75%) percent fruit infestation was observed in cultivar BT 105 followed by BT-1 (18.59%). The results revealed that only three cultivars *viz.*, Arka Alok, Thrissur and BL-142 were highly susceptible. The cultivars *viz.*, TH-802, LE-626, LE-1-2, Sonali Sel-1, WKT-2, WKT-3 and WKT-5 were found to be susceptible to fruit borer. The moderately susceptible cultivars were BT-317, BT-105, BT-102-2-2-1, LE-415, SUN-7611, BMZ-21, Sonali, Arka Alok Sel-1, WKT-1, WKT-4, and WKT-6. None of the cultivars found to be resistant to fruit borer, *H. armigera* infesting tomato. It was revealed that cultivar BT 105 was found to be better cultivar against fruit borer, *H. armigera* infesting tomato.

**Keywords:** *Helicoverpa armigera*, tomato, screening, fruit borer

### Introduction

Tomato (*Solanum lycopersicon* L.) is one of the major and remunerative vegetable crops which have achieved tremendous popularity over the last century. It is grown worldwide either in the field, green houses or net houses. It is one of the most important protective crops. It is grown either for fresh fruits or for processing. Tomatoes provide an excellent amount of vitamin C, a very good amount of the mineral manganese and vitamin E. In terms of phytonutrients, it includes flavanones, flavonols and carotenoids like lycopene, zeaxanthin and beta-carotene. Reduced risk of heart disease is an area of health benefits in which tomatoes truly excel. There are two basic lines of research that have repeatedly linked tomatoes to heart health. The first line of research involves antioxidant support and the second line involves regulation of fats in the blood stream (Mateljan, 2006) [6].

India ranks second in tomato production after China. The total area of various vegetables in India is 92.05 million hectares with production of 162.18 million tonnes, of which tomato is cultivated in an area of 882,000 hectares with total production of 18735.9 MT and average productivity of 21.2 tonnes per hectare in 2013-14. It contributes 9.4 percent of total vegetable area and 11.5 percent of total vegetable production. The major tomato producing states are Andhra Pradesh (17.90%), Karnataka (11.04%), Madhya Pradesh (10.34%), Maharashtra (6.40%), Bihar (5.67%), Uttar Pradesh, Orissa and Assam. In Maharashtra, tomato is grown over an area of 50,000 hectares with a production of 1200 metric tons and productivity is 24 tons per ha during 2013-14 (Anon., 2014) [1].

More than 100 insect pests and 25 non-insect pests are reported to ravage the tomato fields (Lange and Bronson, 1981) [5] and among them, fruit borers are of much significance and causes extensive damage to fruits. Among fruit borers, *Helicoverpa armigera* (Hubner) is responsible for considerable losses in quantity as well as quality of tomato fruits (Reddy and Zehr, 2004) [7]. *H. armigera* is a cosmopolitan, polyphagous pest. Fruit borer infesting tomato has been found to cause a yield loss of up to 35 percent in tomato and up to 37.79 percent loss in Karnataka (Dhandapani *et al.*, 2003) [2].

Reducing the chances of chemical residues that may remain in the crop due to indiscriminate insecticide application by growing pest resistant cultivars which are effective and environmentally safe component of IPM programme should be given importance.

Success of such programs depends up on the extent of genetic variability for resistance in the germplasm. If a variety could be searched out for any region possessing resistance or even tolerance, it may be well utilized in an integrated pest management.

By keeping above views in mind to find out the resistant cultivars, the present investigation were undertaken.

### Materials and Methods

To study the response of some promising tomato cultivars against *H. armigera*, a field experiment was carried out at Central Experiment Station, Wakawali, from October 2015 to April 2016.

### Method of recording observations

Seedlings of the tomato cultivar, Arka Alok (25 days old) were transplanted in the well prepared field. All the recommended package of practices was followed. All cultivars were kept unsprayed through the cropping season.

The observations were recorded when incidence was noticed on fruits. Observations were recorded in each cultivar on all the plants. The number of healthy and infested fruits was counted at each picking to work out the percent fruit infestation.

Percent fruit infestation was calculated by the following formula:

$$\text{Percent fruit damage (\%)} = \frac{\text{No. of infested fruit}}{\text{Total number of fruits}} \times 100$$

| Sr. No. | Mean rating                           | Reaction               |
|---------|---------------------------------------|------------------------|
| 1       | No damage                             | Highly resistant       |
| 2       | 0- 10.0 percent fruits damaged        | Resistant              |
| 3       | 10.1- 20.0 percent fruits damaged     | Moderately resistant   |
| 4       | 20.1- 30.0 percent fruits damaged     | Moderately susceptible |
| 5       | 30.1- 40.0 percent fruits damaged     | Susceptible            |
| 6       | 40.1 percent fruits damaged and above | Highly susceptible     |

### Results and Discussion

The data on screening of cultivars against fruit borer infestation on number basis are presented in Table 1. During present investigation, no infestation of fruit borer was observed on all screened cultivars after germination of seeds up to fruit setting. Failure of fruit borer incidence during present studies might be due to lack of favourable environmental condition for incidence of the pest.

From the data, it could be seen that none of the cultivars was found to be free from the infestation of fruit borer *H. armigera*. All the varieties recorded more than 15 percent fruit infestation.

During present study the highest (42.53%) mean percent fruit infestation was recorded in cultivar Arka Alok, while minimum (15.75%) percent fruit infestation was observed in cultivar BT 105 followed by BT-1 (18.59%). The remaining cultivars were BT-1 (18.59%), SUN 7611 (22.39%), WKT-1 (22.87%), Arka Alok Sel-1 (23.69%), BMZ-21 (25.14%), BT-317 (25.97%), BT-102-2-2-1 (25.97%), LE 415 (26.21%), Sonali (26.99%), WKT-6 (28.10%), WKT-4 (28.39%), TH-802 (31.09%), Sonali Sel-1 (31.36%), LE-1-2 (31.44%), LE-626 (33.74%), Thrissur (42.37%), WKT-5 (35.55%), WKT-2 (36.13%), WKT-3 (37.88%) and BL-142 (42.05%).

The data on distribution of tomato cultivars based on mean

### The experimental details

|      |                       |       |                                |
|------|-----------------------|-------|--------------------------------|
| 1)   | Number of cultivars   | :     | Twenty two                     |
| 2)   | Size of the plot      | :     | 87.12 m <sup>2</sup>           |
| 3)   | Spacing               | :     | 60 cm × 60 cm                  |
| 4)   | Method of planting    | :     | On ridges and furrows          |
| 5)   | Date of transplanting | :     | 8 <sup>th</sup> November, 2015 |
| 6)   | Cultivars             | :     |                                |
| i    | Arka Alok             | xii   | BMZ-21                         |
| ii   | BT-1                  | xiii  | Sonali                         |
| iii  | BT-317                | xiv   | Sonali Sel-1                   |
| iv   | BT-105                | xv    | Arka Alok Sel-1                |
| v    | BT-102-2-2-1          | xvi   | Thrissur                       |
| vi   | TH-802                | xvii  | WKT-1                          |
| vii  | LE-626                | xviii | WKT-2                          |
| viii | LE 415                | xix   | WKT-3                          |
| ix   | LE-1-2                | xx    | WKT-4                          |
| x    | SUN 7611              | xxi   | WKT-5                          |
| xi   | BL-142                | xxii  | WKT-6                          |

The relative resistance of cultivars against fruit borer, *H. armigera* was judged on the basis of a rating system for fruit damage developed by Kashyap and Verma (1986)<sup>[3]</sup>, which is given below.

### Mean rating system for fruit borer infestation in tomato (number basis)

rating system of fruit borer infestation (number basis) are presented in Table 2.

The results revealed that only three cultivars viz., Arka Alok, Thrissur and BL-142 were highly susceptible. The cultivars viz., TH-802, LE-626, LE-1-2, Sonali Sel-1, WKT-2, WKT-3 and WKT-5 were found to be susceptible to fruit borer. The moderately susceptible cultivars were BT-317, BT-105, BT-102-2-2-1, LE-415, SUN-7611, BMZ-21, Sonali, Arka Alok Sel-1, WKT-1, WKT-4, and WKT-6. None of the cultivars found to be resistant to fruit borer, *H. armigera* infesting tomato.

The results obtained during the investigation showed wide variation among different varieties for their resistance to fruit borer, *H. armigera* infesting tomato.

The results of the present studies are in conformity with the findings of Kashyap and Verma (1986)<sup>[3]</sup>. They revealed that none of the tomato genotypes was immune to the damage by *H. armigera* and also reported 42 to 55 percent fruit damage in susceptible varieties, while it was only 1.7 to 2.9 percent in resistant varieties. Lal *et al.* (1999)<sup>[4]</sup> noticed that all the varieties revealed more than five percent fruit infestation and maximum fruit damage recorded was 40.71 percent. Usman *et al.* (2013)<sup>[8]</sup> found that the genotypes R 165 and GS 5575 had maximum (39.40% and 40.47%) number of infested fruits.

**Table 1:** Mean percent fruit infestation of fruit borer, *H. armigera* on some cultivars of tomato

| S. No | Cultivars       | Mean percent fruit infestation |
|-------|-----------------|--------------------------------|
| 1     | Arka Alok       | 42.53                          |
| 2     | BT-1            | 18.59                          |
| 3     | BT-317          | 25.97                          |
| 4     | BT-105          | 15.75                          |
| 5     | BT-102-2-2-1    | 26.04                          |
| 6     | TH-802          | 31.09                          |
| 7     | LE-626          | 33.74                          |
| 8     | LE 415          | 26.21                          |
| 9     | LE-1-2          | 31.44                          |
| 10    | SUN 7611        | 22.39                          |
| 11    | BL-142          | 42.05                          |
| 12    | BMZ-21          | 25.14                          |
| 13    | Sonali          | 26.99                          |
| 14    | Sonali Sel-1    | 31.36                          |
| 15    | Arka Alok Sel-1 | 23.69                          |
| 16    | Thrissur        | 42.37                          |
| 17    | WKT-1           | 22.87                          |
| 18    | WKT-2           | 36.13                          |
| 19    | WKT-3           | 37.88                          |
| 20    | WKT-4           | 28.39                          |
| 21    | WKT-5           | 35.55                          |
| 22    | WKT-6           | 28.10                          |

**Table 2:** Distribution of tomato cultivars based on mean rating system of fruit borer infestation (number basis)

| S. No | Reaction               | Tomato cultivars  |
|-------|------------------------|---|
| 1     | Highly resistant       | -   |
| 2     | Resistant              | -   |
| 3     | Moderately resistant   | BT-1 and BT-105   |
| 4     | Moderately susceptible | BT-317, BT-102-2-2-1, LE 415, SUN 7611, BMZ-21, Sonali, Arka Alok Sel-1, WKT-1, WKT-4 and WKT-6 |
| 5     | Susceptible            | TH-802, LE-626, LE-1-2, Sonali Sel-1, WKT-2, WKT-3, and WKT-5                                   |
| 6     | Highly susceptible     | Arka Alok, Thrissur and BL-142  |

## Conclusion

During present investigation, twenty two tomato cultivars were screened against fruit borer, *H. armigera*. There was no infestation of *H. armigera* observed on all screened cultivars after germination of seeds up to fruit setting. All the varieties recorded more than 15 percent fruit infestation. The maximum (42.53%) mean percent fruit infestation was recorded in cultivar Arka Alok, while minimum (15.75%) percent fruit infestation was observed in cultivar BT 105 followed by BT-1 (18.59%). The remaining cultivars were BT-1 (18.59%), SUN 7611 (22.39%), WKT-1 (22.87%), Arka Alok Sel-1 (23.69%), BMZ-21 (25.14%), BT-317 (25.97%), BT-102-2-2-1 (25.97%), LE 415 (26.21%), Sonali (26.99%), WKT-6 (28.10%), WKT-4 (28.39%), TH-802 (31.09%), Sonali Sel-1 (31.36%), LE-1-2 (31.44%), LE-626 (33.74%), Thrissur (42.37%), WKT-5 (35.55%), WKT-2 (36.13%), WKT-3 (37.88%) and BL-142 (42.05%). The results revealed that only three cultivars viz., Arka Alok, Thrissur and BL-142 were highly susceptible. The cultivars viz., TH-802, LE-626, LE-1-2, Sonali Sel-1, WKT-2, WKT-3 and WKT-5 were found to be susceptible to fruit borer. The moderately susceptible cultivars were BT-317, BT-105, BT-102-2-2-1, LE-415, SUN-7611, BMZ-21, Sonali, Arka Alok Sel-1, WKT-1, WKT-4, and WKT-6. None of the cultivars found to be resistant to fruit borer, *H. armigera* infesting tomato. From

investigation it was revealed that cultivar BT 105 was found to be better cultivar against fruit borer, *H. armigera* infesting tomato.

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