



## Field screening of certain tomato varieties for their resistant reaction against *Helicoverpa armigera* (Hubner) in Manipur valley, India

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### Abstract

Relative performance of 13 tomato hybrid varieties against the fruit borer, *Helicoverpa armigera* (Hubner) infestation was studied during 2010-2011. None of the varieties was found to be highly resistant. Two varieties, viz., NS-538 (Namdhari seed) and Shaktiman were least infested and classified as resistant varieties. Nine varieties viz., NS-501 (Namdhari seed), Lakshmi, Shahenshah, NS-815 (Namdhari seed), All rounder, Manithoibi, Manileima, Ms (Marglobe supreme) and American Apple were graded as moderately resistant. Two varieties viz., Dev and Manikhumnu were rated as moderately susceptible. The study indicated that the varieties as promising source of resistance may be incorporated in the integrated pest management.

**Keywords :** Tomato hybrid, Resistance, Screening, *Helicoverpa armigera*.

### 1. Introduction

The damage caused by insect-pests is one of the main constraints which limits the production of tomato. Among the various insect pests responsible for lowering the yield of tomato crop, the fruit borer, *Helicoverpa armigera* (Hubner), is highly destructive pest causing serious damage (Srinivasan, 1959; Tewari and Krishnamoorthy, 1984; Krishnamoorthy and Mani, 1996, Lal *et al.*, 1999, Bhatt and Patel, 2001). The monetary loss due to this pest in the country has been estimated over Rupees one thousand crores per year (Jayaraj *et al.*, 1994). It is also a fact that, farmers have to depend upon synthetic insecticides, the pest has developed resistance to many recommended insecticides like endosulfan (Basson *et al.*, 1979), pyrethroids (McCaffery *et al.*, 1986), cypermethrin and fenvalerate. The ultimate solution to manage this pest lies in evolving and using insect resistant varieties which has been recognized to be of immense value in the IPM programme (Painter, 1986). Therefore, it was considered desirable to screen some of the tomato varieties for their tolerance or resistance to the fruit borer.

### 2. Materials and Methods

An experiment was conducted to screen tomato hybrids against fruit borer *Helicoverpa armigera* (Hubner) at the Research Farm of Central Agriculture University, Imphal-Manipur during 2010-2011 under pesticide free conditions. The experiment was laid out in a Randomised Block Design (RBD) having three replications. Thirteen tomato varieties including one susceptible check variety were used for screening their reaction to *Helicoverpa armigera* (Hubner) infestation. Each variety was raised in plot size of 4 m × 3m with the inter and intra-row spacing of 60 cm and 45 cm. The hybrid varieties were evaluated under natural infestation. The observations on total number of tomato fruits and infested fruits were recorded at each harvesting stage from 10 randomly selected plants in each plot. The damage of fruit borer was judged on the basis of percentage fruit infestation, which was worked out on number and weight basis. A rating system for fruit damage developed by Kashyap and Verma (1986) was followed for estimating relative resistance/susceptibility.

Sl. No.	Damage level	Rating
1.	No damage	Highly Resistant
2.	0 - 10.0 per cent fruits damaged	Resistant
3.	10.1- 20.0 per cent fruits damaged	Moderately Resistant
4.	20.1 - 30.0 per cent fruits damage	Moderately susceptible
5.	30.1 - 40.0 per cent fruits damaged	Susceptible
6.	40.1 per cent fruits damaged & above	Highly susceptible

### 3. Results and Discussion

The data presented in Table 1 indicated that all the screened hybrids were infested by *H. armigera* (Hubner). None of the screened hybrids was found highly resistant to the fruit borer, *H. armigera* (Hubner). All the varieties revealed more than 8 percent fruit infestation. However NS-538 (Namdhari seed) and Shaktiman were least infested and classified as resistant varieties. These showed 8.47 and 8.57 percent fruit infestation, respectively. The varieties NS-501 (Namdhari seed), Lakshmi, Shahenshah, NS-815 (Namdhari seed), All rounder, Manithoibi, Manileima, Ms (Marglobe supreme) and American Apple were graded as moderately resistant showing 10 -20 percent fruit infestation. These showed 10.26, 11.11, 11.67, 12.37, 12.50, 14.89, 15.15, 15.56 and 17.11 percent fruit infestation respectively. Two tomato hybrids viz., Dev and

Manikhumnu showed 20.51 and 22.83 percent fruit damage and these were rated as moderately susceptible. The Dev variety recorded highest fruit infestation of 20.51 which was almost at par with susceptible check Manikhumnu variety.

Thus, it can be concluded that the hybrid NS-538 (Namdhari seed) was found to be most tolerant followed by hybrid Shaktiman.

The results obtained during the investigation showed wide variation among the different hybrid varieties for their resistance to the fruit borer, *H. armigera* (Hubner). Earlier, Kashyap and Verma (1986) recorded 42 to 55 percent damage of tomato fruits in susceptible varieties while it was only 1.7 to 2.9 percent in resistant varieties. The variation in the fruit infestation is not a new phenomenon. In Punjab, Singh and Narang (1990) found 51.2 percent fruit damage by *H. armigera* (Hubner) in unsprayed tomato plants.

**Table - 1 :** Reaction of thirteen tomato varieties to *H. armigera* (Hubner)

Sl. No.	Variety	Mean percent of fruit infestation	Reaction
1	Shaktiman	8.57	Resistant
2	NS -501 (Namdhari seed)	10.26	Moderately resistant
3	Shahenshah	11.67	Moderately resistant
4	Lakshmi	11.11	Moderately resistant
5	All rounder	12.50	Moderately resistant
6	NS -815 (Namdhari seed)	12.37	Moderately resistant
7	NS -538 (Namdhari seed)	8.47	Resistant

8	Dev	20.51	Moderately susceptible
9	American Apple	17.11	Moderately resistant
10	Ms (Marglobe supreme)	15.56	Moderately resistant
11	Manithoibi	14.89	Moderately resistant
12	Manileima	15.15	Moderately resistant
13	Manikhumnu (Check)	22.83	Moderately susceptible

### References

- Basson, N.C.J, Ark, H. V. and Bery, A.V.D., 1979 : On the possible development of resistance to endosulfan by American bollworm on cotton. *J. Entomol. Soc., South Africa*, 42(1) : 61-64.
- Bhatt, N. J. and Patel R. K., 2001 : Screening of chick pea cultivars for their resistance to gram pod borer, *Helicoverpa armigera*. *Indian J. Ent.* 63 (3) : 277-280.
- Jayraj, S., Ananthkrishnan, T. N and Veeresh, G. K., 1994 : *Biological pest control in India:Progress and perspectives*. RGICS Project No.2, Rajiv Gandhi Institute of Contemporary Studies. New Delhi, 101pp.
- Kashyap, R. K. and Verma, A. N., 1986 : Screening of tomato genotypes for susceptibility to fruit borer, *Heliothis armigera* (Hubner). *Indian J. Ent.* 48(1) : 46-53.
- Krishnamoorthy, A and Mani, M., 1996 : Biosuppression of *Helicoverpa armigera* (Hubner) on tomato using two egg parasitoids, *Trichogramma brasiliensis* (Ashm.) and *T. pretiosum* (Riley). *J. Ent. Res.*, 20 (1) : 37-41.
- Lal, S. D., Singh, S. S. Srivastava, P. M. and Phogat, K.P.S. 1999 : Screening of tomato hybrids for resistance against fruit borer, *Helicoverpa armigera* in Kumaon hills (U.P). *Indian J. Ent.*, 61(1) : 48-50.
- McCaffery, A. R., Ahmad,M, Walker, C. H., Gladwell, R. T. and Lee, K. S. 1986 : Studies on resistance to insecticides in the cotton bollworm, *Helicoverpa armigera* with special reference to the pyrethroids. *Proceedings of British Crop Protection Conference, Pest and diseases held at Brighton Matropole, England*. Pp. 17-20.
- Painter, R. H. 1986 : Plant resistance to insects applied to breeding vegetable crops. *Proc. XVII Int. Hort. Congr.*, 3 : 259-273.
- Singh, Dilbagh and Narang, N. D. 1990 : Control of tomato fruit borer, *Helicoverpa armigera* (Hubner) with synthetic pyrethroids. *Indian J. Ent.* 52(4) : 534-540.
- Srinivasan, P. M., 1959 : Control of fruit borer, *Heliothis armigera* (Hubner) on tomato. *Indian J. Hort.*, 16 : 187-188.
- Tewari, G. C and Krishnamoorthy, P. N., 1984 : Yield loss in tomato caused by fruit borer. *Indian J. agric. Sci.*, 54 : 341-343.

