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Screening of tomato cultivars against leafminer, *Liriomyza trifolii* (Burgess) infesting tomato in mid-hills of Meghalaya, India

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Abstract

The present investigation entitled "Screening of tomato cultivars against leafminer, *Liriomyza trifolii* (Burgess) infesting tomato in Mid-hills of Meghalaya" was carried out at the Entomology Research Farm, ICAR Research Complex for NEH Region, Umiam, Meghalaya during 2016 and 2017. Eleven tomato cultivars were screened against leaf miner, *L. trifolii* infesting tomato. The maximum (38.67% and 39.00%) leaf miner infestation were recorded on cultivar Mahy Gotya, while minimum (18.34% and 19.00%) leafminer infestation was recorded on cultivar MT-2 and Selection-1 during the year 2016 and 2017 respectively. None of the cultivars was found to be free from the infestation of leafminer. It was further revealed that MT-2 and Selection-1 were found to be better cultivar against leafminer infesting tomato.

Keywords: Tomato, cultivars, screening, *Liriomyza trifolii*

Introduction

Tomato, *Lycopersicon esculentum* (Miller) is a popular vegetable for its outstanding antioxidant content. It is one of the most important "protective foods" because of its special nutritive value, as the pulp and juice are digestible, mild aperients, promoter of gastric secretion and blood purifier. In India, tomato is cultivated in an area of 882 thousand ha with an average annual production of 18736 thousand tones and productivity of 21.2 t ha^{-1} during 2013- 14 (National Horticulture Board, 2015). Meghalaya is known for production of good quality vegetables among north eastern states (Kumar and Badal, 2004). However, the productivity of tomato is low due to several reasons; the main being the damage caused by insect pests and diseases. Tomato is more prone to insect pests and diseases mainly due to its tenderness and softness as compared to other crops. It is devastated by an array of pests like jassids, aphids, tobacco caterpillar, leafminer, flea beetles, spider mites, and fruit borer (Katroju *et al.,* 2014).

Among the several problems that created obstacles for tomato productivity and quality fruits, insect pests caused heavy losses.

Among them, American serpentine leafminer, *Liriomyza trifolii* Burgess (Diptera: Agromyzidae), a notorious polyphagous pest has recently attained a serious pest status on tomato. The serpentine leafminer is a polyphagous pest feeding on seventy-nine host plants belonging to various vegetables, ornamentals and field crops (Srinivasan *et al.*, 1995). Its severe infestation starts from nursery and continues till fruiting stage resulting in severe yield loss. Its extensive leaf mining activity reduces the photosynthetic rate to about 62% as compared with unmined leaves, leading to adverse effects on young shoot growth and fruit formation which ultimately reduce the yield (Johnson *et al*., 1983). When one fourth of the leaf area was mined, photosynthesis decreased by <1% (Martens and Trumble, 1987). The genus *Liriomyza* contains more than 300 species known in the world. In which, approximately 23 species of *Liriomyza* have been reported as being economically important in which *L. trifolii* is very dominating in vegetable crops like tomato, cucumber, vegetable pea etc. This insect has potential to infest on 250 crop species in India (Sharma and Devindra, 1994). Management of this pest becomes very difficult due to internal mining activity of larvae within the leaf. Nearly 100 per cent leaf miner control is necessary to produce cosmetically marketable crops (Sher *et al*., 2000).

To control these insect pests and to save the crop, pesticides are being used in large quantities. But the continuous and enormous use of same or similar groups of pesticides causes problem of pesticide residues in foodstuff and other environmental contamination. Reducing the chances of chemical residues that may remain in the crop due to excessive use of insecticide is by growing pest resistant cultivars which are effective and environmentally safe component of IPM programme. Host resistance is one of the components in any pest management programme which is economical and safest method for pest management. Hence, development of resistant varieties and their incorporation in IPM schedule is a viable alternative for management of this pest. Keeping the above view in mind, the collected tomato genotypes were screened for their resistance/susceptibility against the leaf miner.

Materials and Methods

To study the response of some promising tomato cultivars against *L. trifolii* a field experiment was conducted at Entomology Experimental field of Indian Council of Agricultural Research (ICAR) Complex for NEH Region, Umiam, Meghalaya during 2016-2017.In this experiment eleven tomato varieties/cultivars were used which were obtained from ICAR-RC for NEH Region, Meghalaya.

Varietal screening

Seeds of eleven varieties, namely, Megha Tomato-2 (MT-2), Megha Tomato-3

(MT-3), H-86, VL-Tomato-4, Selection-1, Selection-2, Selection-3, Arka Vikash, Mahy Gotya, Badshah and Rocky were sown in first week of January in nursery and seedlings were transplanted 45 days after sowing in the main field. Only healthy seedlings were transplanted. The experiment was replicated three times with plot size of 1 m x 3m. No plant protection measures were applied in the experimental field.

The observations were taken by counting the number of infested leaves per plant from randomly selected five tagged plants per plot. The leaf miner infestation was converted into percent infestation by using the formula:

$$\text{Percent infestation (\%)} = \frac{\text{Number of infested leaves}}{\text{Total number of leaves}} \times 100$$

A rating system for fruit damage developed by Kashyap and Verma (1986) was followed for estimating relative resistance/ susceptibility.

Results and Discussions

For the present study, eleven cultivars of tomato *viz*. MT-2, MT- 3, H-86, VL-Tomato- 4, Selection-1, Selection-2, Selection-3, Arka Vikash, Mahy Gotya, Badshah, and Rocky were selected for screening of tomato against major pest of tomato. The data on screening of cultivars against leafminer infestation on number basis are presented in the table below. From the data, it can be seen that none of the cultivars was found to be free from the infestation of leafminer, *L. trifolii*. All the varieties recorded more than 15 percent leafminer infestation for both the years (2016 and 2017) which is similar to the findings of Yadav (2009) who reported that the mean incidence of leafminer *L. trifolii* in different tomato genotypes differed significantly and ranged between 15.25 and 28.51 percent.

During the year 2016, it was found that six cultivars *viz*., MT-3, H-86, Selection-1, Selection-2, Selection-3 and Rocky were moderately susceptible to leafminer infestation with percent damage of 22.50%, 26.33%, 24.67%, 29.34%, 24.00% and 22.67% respectively and four cultivars *viz.*, VL-Tomato-4, Arka Vikash, Mahy Gotya and Badshah were susceptible to leafminer infestation with percent damage of 31.34%, 32.66%, 38.67% and 37.00% respectively. One cultivar MT-2 (18.34%) was found to be moderately resistant to leafminer infestation as shown in table 2. This is similar to the findings of Sarkar *et al*. (2017) who reported that genotype Patherkuchi showed the lowest percentage of leafminer damage with damage percent of 18.11%.

During the year 2017, it was found that four cultivars *viz*., MT-2, VL-Tomato- 4, Selection-3 and Rocky were moderately susceptible to leafminer infestation with percent damage of 23.67%, 29.68%, 26.33%

and 25.68% respectively. This is similar to the findings of Yadav, (2009) who reported that genotypes To - 1831, Swarnalalima and Naina registered leafminer incidence ranging between 25.2 and 28.51 percent. Five cultivars *viz.*, H-86, Selection-2, Arka Vikash, Mahy Gotya and Badshah were susceptible to leafminer infestation with percent damage of 31.33%, 32.67%, 37.67%, 39.00% and 39.34% respectively. Two cultivars *viz*., MT-3 (20.00%) and Selection-1 (19.00%) were found to be moderately resistant to leafminer infestation as shown in table 3. Reddy and Kumar (2004) also reported *L. trifolii* as a major pest of tomato.

From the present study, it can be concluded that none of the tomato genotypes were found to be free from the infestation of tomato leaf miner. However, cultivars MT-2 and Selection-1 were t promising (Tables 2 & 3) and further studies can be initiated to explore their potentiality.

Table 1. Rating system for estimating relative resistance/susceptibility (Kashyap and Verma, 1986)

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

Table 2. Screening of tomato germplasm/varieties against tomato leafminer (2016).

Sl. No.	Genotypes/Varieties	Per cent damage (Mean of 10 weeks)	Index of infestation (Plant reaction)
1.	MT-2	18.34	Moderate Resistant
2.	MT-3	21.66	Moderate Susceptible
3.	H-86	26.33	Moderate Susceptible
4.	VL-Tomato-4	31.34	Susceptible
5.	Selection-1	24.67	Moderate Susceptible
6.	Selection-2	29.34	Moderate Susceptible
7.	Selection-3	24.00	Moderate Susceptible
8.	Arka Vikash	32.66	Susceptible
9.	Mahy Gotya	38.67	Susceptible
10.	Badshah	37.00	Susceptible
11	Rocky	22.67	Moderate Susceptible

Table 3. Screening of tomato germplasm/varieties against tomato leafminer (2017).

Sl. No.	Genotypes/Varieties	Per cent damage (Mean of 10 weeks)	Index of infestation (Plant reaction)
1.	MT-2	23.67	Moderate Susceptible
2.	MT-3	20.00	Moderate Resistant
3.	H-86	31.33	Susceptible
4.	VL-Tomato-4	29.68	Moderate Susceptible
5.	Selection-1	19.00	Moderate Resistant
6.	Selection-2	32.67	Susceptible
7.	Selection-3	26.33	Moderate Susceptible
8.	Arka Vikash	37.67	Susceptible
9.	Mahy Gotya	39.00	Susceptible
10.	Badshah	39.34	Susceptible
11.	Rocky	25.68	Moderate Susceptible

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