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Seasonal incidence of tomato leaf miner, *Tuta absoluta* (Meyrick) on tomato, *Lycopersicon esculentum* (Mill) under protected cultivation

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Abstract

The investigations on seasonal incidence of Leaf miner, *Tuta absoluta* (meyrick) on tomato under protected cultivation were conducted on research farm Department of Horticulture, VNMKV, Parbhani during *Kharif* 2017-18. Seasonal incidence of *T. absoluta* observed that maximum incidence to the tune of 3.6 larvae per plant and 28.2 mines per plant at 41th SMW. Whereas average of percent damage of fruit 10.93 per cent due to *T. absoluta* were found in total six picking.

Keywords: Seasonal incidence, leaf miner *Tuta absoluta*, tomato, protected cultivation

1. Introduction

Tomato (*Lycopersicon esculentum* Mill.), belonging to family Solanaceae is the most important vegetable grown widely both for fresh market and processing. It is said to be a native of tropical America. Tomato is the world's largest vegetable crop after potato and sweet potato and it tops the list of canned vegetables and occupies an area of 4.5 mha in world with an annual production of 130 mt. (Anonymous, 2016) [1]. The productivity of tomato in India is very low (15.60 t/ha) compared to the global average (25.09 t/ha). Tomato is one of the important vegetable grown in India with 774 ('000 ha) area with a production of 18732 ('000 mt) (NHB, 2016) [8]. The production and quality of tomato fruits are considerably affected by array of insect pests infesting at different stages of crop growth. Though there are dozens of pests on tomato, recently a serious invasive insect pest known as South American tomato pinworm, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) also known as tomato leaf miner *Tuta absoluta* has several common names like tomato borer, South American tomato moth, tomato leaf miner and South American tomato pinworm. Since the 1960s, this moth has become one of the key pests of tomato in South America (Garcia and Espul, 1982) [5]. In Europe, *T. absoluta* presence was initially reported in the Eastern Spain in the late 2006 (Urbaneja *et al.*, 2007) [11], thereafter, it was recorded in Morocco, Tunisia, France, Italy, Netherlands, Albania, Portugal, Bulgaria, Cyprus, Germany, Israel, Hungary, Greece, Bahrain, Iraq, Isreal, Japan, Jordan, Kuwait, Qatar, Saudi Arabia, Syria, Turkey, Yemen, Ukraine and other countries (CABI, 2014) [3]. Hence, the investigation was undertaken to study the seasonal incidence of newly invasive insect pests, tomato leaf miner *Tuta absoluta* on tomato under protected cultivation.

2. Materials and Methods

The experiment was carried out with tomato crop using variety Pusa Ruby were conducted at research farm Department of Horticulture, VNMKV, Parbhani during *Kharif* 2017-18. The experiment was conducted in a randomized block design (RBD) with three replications and eight treatment. Two raised beds were prepared in poly house having 0.4 meter height, 1 meter width and 17 meter length. They were prepared by applying well decomposed farm yard manure. Seedling preparation tomato seeds were sown in portrays (98 cell) on June 30th using coco peat as growing media for nursery production. The seedlings of 30 days old, vigorous and uniform size were selected and transplanted on 29-07-2017 with a spacing 60x45 cm² at a shallow depth of 2-2.5 cm in paired row on a bed. Weekly observations of leaf miner larvae and leaf mines on 10 randomly selected and tagged plants was recorded and per cent fruit damage was worked out by observing the total number of fruits and number of damaged fruits due to leaf miner at each picking on 10 randomly selected and tagged plants.

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$$\text{Per cent fruit damage} = \frac{\text{Number of damaged fruits}}{\text{Total number of fruits}} \times 100$$

3. Results and Discussion

The seasonal incidence of *T. absoluta* on tomato were observed during *kharif* 2017-18. The data recorded on population of leaf miner presented in Table 1 and graphically depicted in Figure 1 per cent of damaged fruits in Table 2 and graphically depicted in Figure 2.

The population of *Tuta absoluta* was recorded from 27th August to 16th December (35th SMW to 50nd SMW) during

2017-18. The population ranged from 0.8 larvae per plant in the initial to 3.6 larvae per plant in the peak level of infestation and 1.4 leaf mines per plant in the initial to 28.2 leaf mines in the peak level of infestation. The incidence started during 35th SMW (0.8 larvae/plant) and there after the population reaches 3.0 larvae plant in the 44th SMW and the highest population recorded during fruiting stage of the crop in the range of 3.6 larvae per plants and 28.2 leaf mines per plant. Overall view of the objective reveals that the infestation of *Tuta absoluta* was severe from October month onwards and yield loss of tomato would be more in *rabi* tomato.

Table 1: Seasonal incidence of tomato leaf miner *T. absoluta* (Meyrick)

Sr. No	Meteorological Week	Period	Number of larvae/ plant	Number of mines/plant
1	31	30 Jul - 05 Aug	00	00
2	32	06 Aug - 12 Aug	00	00
3	33	13 Aug - 19 Aug	00	00
4	34	20 Aug - 26 Aug	00	00
5	35	27 Aug - 02 Sept	0.8	1.4
6	36	03 Sept - 09 Sept	1.2	2.0
7	37	10 Sept - 16 Sept	1.4	3.0
8	38	17 Sept - 23 Sept	1.8	5.4
9	39	24 Sept - 30 Sept	2.8	5.8
10	40	01 Oct - 07Oct	3.0	17.4
11	41	08 Oct - 14Oct	3.6	28.2
12	42	15 Oct - 21Oct	3.4	23.4
13	43	22 Oct - 28Oct	3.4	23.2
14	44	29Oct - 4 Nov	3.0	23.6
15	45	05 Nov - 11 Nov	2.4	24.2
16	46	12 Nov - 18 Nov	2.0	25
17	47	19 Nov - 25 Nov	2.6	25
18	48	26 Nov - 02 Dec	2.0	25.4
19	49	03 Dec - 09 Dec	1.8	26.2
20	50	10 Dec - 16 Dec	1.8	26.2

The above findings are in confirmation with the earlier research workers like Assaf *et al.*, (2013) [2] investigated the population density and infestation percentage of *Tuta absoluta* on tomato under plastic houses conditions in two locations at Duhok province of Iraq in 2012. The average number of mines per leaflet and larvae per leaf during the study season were 1.36 and 0.42 respectively. Harizanova *et al.* (2009) [6] revealed that glasshouse with tomatoes near Plovdiv observed a severe infestation by the pest which has rapidly spread after the last treatment with pesticides at the end of August. The leaves were the most heavily damaged plant parts with an average of 9.42 and 8.75 mines per leaflet on the middle and upper layer of the canopy respectively followed by the fruits. No damage on the stems was observed. Hemalata and Maheshwari (2004) [7] studied the seasonal incidence and biology of *L. trifoli* on tomato. Initially leaf miner incidence on tomato was found during first week of July (27th standard week) and its peak was noticed during the first week of October and January (40th and first standard week). The pest was completely absent during April and May. The population declined during November-December. Pazhanisamy *et al.*, (2014) [9] indicated that the *Aproaerema modicella* was noticed from 5th SMW (Standard Meteorological Week) to 14th SMW (28% to 88.5%) and 33rd week to 42nd standard week (10.5% to 92%), during the *rabi* and *kharif* season of 2010, respectively. Maximum larval population were recorded on 9th standard week (7.4 larvae/plant) and 38th standard week (4.8/larvae/plant) and also it was coincided with highest per cent infestation of *A.*

modicella during *kharif* and *rabi* season, respectively. Thus the above reports are more or less corroborated with the present findings.

Table 2: Seasonal incidence of tomato leaf miner *T. absoluta* (Meyrick) in per cent of damaged fruits.

Number of picking	Date of picking	Total number of fruits/10 plants	Damaged fruits by <i>T. absoluta</i> (%)
1 st	15 th Sept	80	8.13
2 nd	30 th Sept	110	9.56
3 rd	10 th Oct	140	10.81
4 th	20 th Oct	160	11.51
5 th	30 th Oct	190	12.5
6 th	10 th Nov	210	13.08
Average		148	10.93

The seasonal incidence of *T. absoluta* on tomato were observed during *kharif* 2017-18. The data recorded on per cent of damaged fruits presented in Table 2 and graphically depicted in Figure 2.

The damaged fruits was recorded picking wise from 15th Sept to 10th Nov (38th SMW to 45th SMW) during 2017-18. The average per cent of damaged fruits 10.93 per cent and during six picking per cent of damaged fruits ranged from 8.13 to 13.08 per cent due to *T. absoluta*. The peak level of per cent of fruits damage coincided with the flowering and fruiting stage of crop. Overall view of the objective reveals that the infestation *T. absoluta* was severe from October month

onwards and yield loss of tomato would be more in *rabi* tomato.

In the *T. absoluta* above findings are in confirmation with the research workers like Saad Mousa (2013) [10] reported that pest causes severe damage to foliage and fruit, shows that

degree of infestation was 21%, 48%, 28%. Desneux (2010) [4] reported that rapidly invaded pest cause up to 80-100% yield loss. Thus the above reports are more or less corroborated with the present findings.

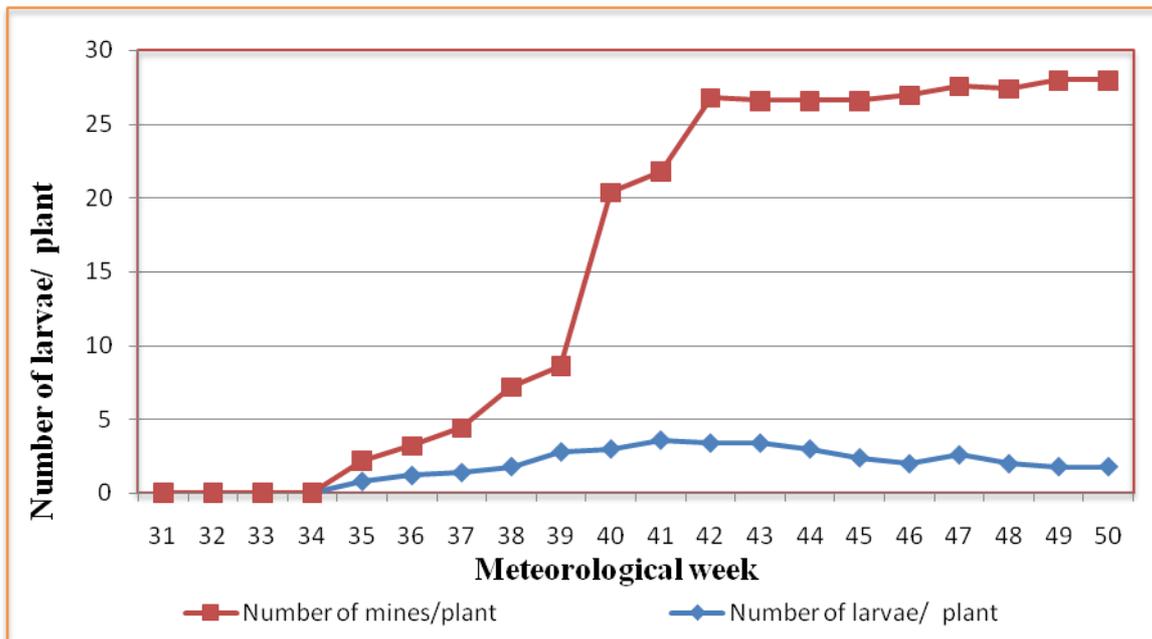


Fig 1: Seasonal incidence of tomato leaf miner *T. absoluta* (Meyrick)

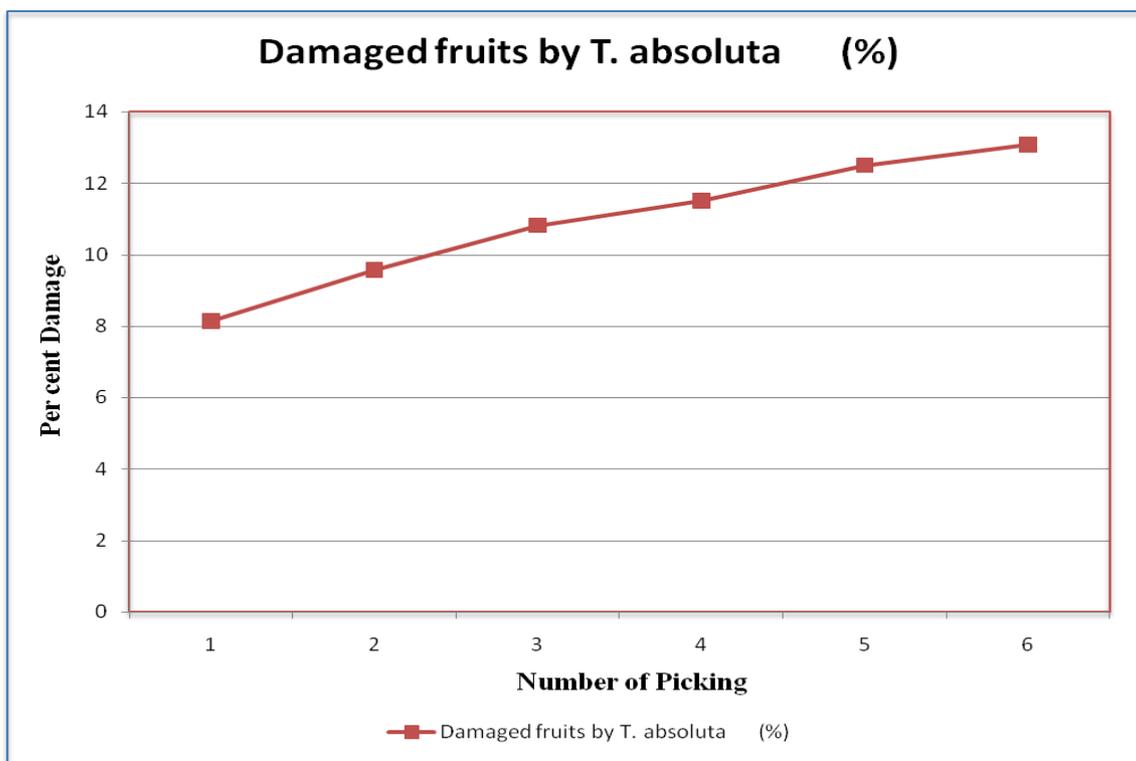


Fig 2: Seasonal incidence of tomato leaf miner *T. absoluta* (Meyrick) in per cent of damaged fruits.

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