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Incidence of major insect pest infesting tomato in low and mid hills of Himachal Pradesh

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Abstract

The present investigation “Incidence of major insect pest infesting tomato in low and mid hills of Himachal Pradesh” was conducted during 2019 and 2020. During the surveys, whitefly (*Trialeurodes vaporariorum*), aphids (*Myzus persicae* and *Macrosiphum euphorbiae*), serpentine leaf miner (*Liriomyza trifolii*), and fruit borer (*Helicoverpa armigera*) were recorded during both years. The aphid species *M. persicae* was recorded in low hills, whereas, *M. euphorbiae* was found to infest tomato in mid hills. Higher pest infestations were recorded on tomato in mid hills as compared to low hills of Himachal Pradesh.

Keywords: Tomato, incidence, fruit borer, low and mid hills, H.P

Introduction

Tomato (*Solanum lycopersicum* L.) belonging to Solanaceae family is an important and remunerative vegetable crop grown around the world for fresh market and processing. It is also closely related to many commercially important plants such as potato, eggplant, peppers and tobacco. It is widely cultivated in tropical, sub-tropical and temperate climates and thus ranks third in terms of world vegetables production. Global tomato production is currently around 130 million tons, of which 88 million are destined for the fresh market and 42 million are processed (FAO, 2015) [4]. India is one of the largest producers of tomatoes in the world, second only to China. Around 11 per cent of the total world produce of tomatoes is cultivated in India. All nutrients especially vitamin C, B and K have good source in tomato (Pal *et al.* 2018) [7]. It also contains a large quantity of water (75%), calcium (20%) and Niacin all of which are of great importance in the metabolic activities of man. Lycopene is a carotenoid that is present in tomatoes, processed tomato products and other fruits. It is one of the most potent antioxidants among dietary carotenoids. Dietary intake of tomatoes and tomato products containing lycopene is associated with a decreased risk of chronic diseases, such as cancer and cardiovascular disease (Agarwal and Rao, 2000) [1]. Tomato is affected by several biotic, physio-chemical and mesobiotic factors. Among the biotic factors, insect pests are predominant and occur regularly at different stages of crop growth. A number of insect pests i.e., about 100 and 25 non insect pest species are reported to ravage the tomato fields. Almost all plant parts provide food, shelter as well as oviposition sites for insects. Insects can cause deformed growth, even death of the tomato plant and damage to fruit in the form of scarring, tissue destruction, and aberrations in shape or colour. Fruit can become contaminated by whole insects, insect excreta, and insect parts. Insects can also damage indirectly by exposing fruits to decay organisms or may be the vectors of several plant pathogens that cause growth disorders or death of the plant (Lange and Bronson, 1981) [6].

In Himachal Pradesh, the major insect pests of tomato includes fruit borer, serpentine leaf miner, aphid and whitefly which are commonly observed in field and poly-houses. Most of these pests are polyphagous in nature and thereby have wide host range also (Vashisth *et al.* 2013) [9]. Keeping in view the above facts, the present study has been planned to study various insect pests infesting tomato in low and mid hills of Himachal Pradesh.

Material and Methods

Field surveys, to record the incidence of various insect pests on tomato were conducted in 2019 and 2020 in different locations covering Zone I and Zone II of Himachal Pradesh. Roving survey was carried out at randomly selected locations. From each location, ten plants were selected randomly to record incidence of pests. The samples were also brought to the Department of Entomology, Dr. Y. S. Parmar UHF., Nauni, Solan for further identification.

Table 1: Villages surveyed to record incidence of different insect pests of tomato in Zone I

| S.No. | Location | Altitude (m amsl) | Latitude (°N) | Longitude (°E) |
|-------|----------|-------------------|---------------|----------------|
| 1 | Raili | 663 | 31°25'48" | 76°36'21" |
| 2 | Jajri | 692 | 31°26'20" | 76°35'52" |
| 3 | Loharli | 661 | 31°26'01" | 76°34'22" |
| 4 | Nalwar | 668 | 31°25'17" | 76°34'27" |
| 5 | Kotlu | 773 | 31°36'38" | 76°26'11" |
| 6 | Daslerha | 599 | 31°24'58" | 76°33'04" |
| 7 | Riana | 630 | 31°24'49" | 76°37'11" |
| 8 | Jukhala | 810 | 31°17'48" | 76°49'14" |

Methodology for recording pest incidence

1. Sucking and miner pests: Populations of whitefly, aphid and leaf mining insects were recorded on 3 leaves basis (two upper, two middle and two lower plant canopies) on 10 randomly selected plants in a field.

Table 2: Villages surveyed to record incidence of different insect pests of tomato in Zone II

| S.No. | Location | Altitude (m amsl) | Latitude (°N) | Longitude (°E) |
|-------|-------------|-------------------|---------------|----------------|
| 1 | Mariog | 924 | 30°52'21" | 77°12'47" |
| 2 | Neri jagela | 1324 | 30°53'26" | 77°13'24" |
| 3 | Dharja | 1151 | 30°51'41" | 77°12'05" |
| 4 | Rajgarh | 1682 | 30°53'15" | 77°16'07" |
| 5 | Jatoli | 1550 | 30°52'50" | 77°07'34" |
| 6 | Bharti | 1150 | 30°59'45" | 77°01'08" |
| 7 | Ghatti | 1340 | 30°55'21" | 77°04'48" |
| 8 | Ranga | 1180 | 30°51'58" | 77°11'26" |
| 9 | Bagar | 1440 | 30°51'30" | 77°04'07" |
| 10 | Kailar | 1450 | 30°54'46" | 77°04'46" |
| 11 | Kandaghat | 1480 | 30°57'20" | 77°06'47" |
| 12 | Nauni | 1250 | 30°51'33" | 77°10'30" |

Table 3: Incidence of important insect pests on tomato at different locations in agroclimatic Zone I and II of Himachal Pradesh during 2019

| Zone | District | Location/Village | Altitude | Whitefly (No./leaf) | Serpentine leaf miner (Mines./leaf) | Aphid (No./leaf) | <i>H. Armigera</i> | |
|------|----------|------------------|----------|---------------------|-------------------------------------|------------------|---------------------|---------------------|
| | | | | | | | No. of larvae/plant | % fruit infestation |
| I | Hamirpur | Raili | 663 | 1.10 | 1.00 | 1.70 | 0.50 | 4.75 |
| | Hamirpur | Loharli | 661 | 1.90 | 2.30 | 1.30 | 0.10 | 5.39 |
| | Hamirpur | Nalwar | 668 | 1.70 | 1.80 | 3.00 | 0.50 | 5.23 |
| | Bilaspur | Kotlu | 773 | 0.80 | 1.30 | 0.00 | 0.90 | 3.90 |
| | Bilaspur | Daslehra | 599 | 1.20 | 2.10 | 1.50 | 0.00 | 4.36 |
| | Bilaspur | Namhol | 992 | 2.90 | 2.40 | 2.60 | 1.30 | 7.42 |
| II | Solan | Nauni | 1275 | 3.70 | 3.50 | 4.30 | 1.70 | 16.60 |
| | Solan | Kailar | 1450 | 3.10 | 3.00 | 3.90 | 1.10 | 9.90 |
| | Solan | Ranga | 1180 | 3.40 | 4.20 | 2.70 | 1.10 | 16.20 |
| | Solan | Jatoli | 1550 | 1.40 | 2.50 | 1.30 | 0.70 | 13.20 |
| | Solan | Bagar | 1440 | 1.70 | 3.00 | 2.60 | 2.00 | 12.10 |
| | Solan | Dharja | 1151 | 1.70 | 2.00 | 1.60 | 0.20 | 10.40 |

Serpentine leafminer, *L. trifolii*

The infestation of leaf miner was maximum in Jajri with 2.2 mean number of mines per leaf, followed by 1.8, 1.2 and 1.1 mines per leaf in Raili, Riana and Daslehra, respectively. In Zone II, incidence of leaf miner was recorded maximum in Mariog and Bairti villages with 3.0 number of mines per leaf, followed by 2.9, 2.7, 2.0, 1.9, 1.7, 1.3 and 1.3 number of mines per leaf in Kandaghat, Nauni, Dharja, Jatoli, Neri jagela and Rajgarh, Ghatti, respectively.

2. Fruit infestation: Observations on fruit infestation by fruit borer and tomato pinworm were recorded on number basis and per cent fruit damage was worked out as.

$$\text{Per cent fruit damage} = \frac{\text{No. of damaged fruits}}{\text{Total number of fruits}} \times 100$$

Results and Discussion

The results obtained from the present investigation as well as relevant discussion are summarized under following heads:

Incidence of important insect pests on tomato crop in agroclimatic Zone I and II of Himachal Pradesh during 2019

Whitefly, *T. vaporariorum*

To record the incidence of whitefly infesting tomato in Zone I, six villages were surveyed during 2019. The highest incidence of whitefly, *T. vaporariorum* i.e. 2.9 numbers per leaf was recorded in Namhol, followed by 1.9, 1.7, 1.2, 1.1 and 0.8 whiteflies per leaf in Loharli, Nalwar, Daslehra, Raili and Kotlu, respectively (Table 3). Whereas, in Zone II, incidence of whitefly was recorded highest in Nauni village with 3.7 number of whiteflies per leaf, followed by 3.4, 3.1, 1.7, 1.7 and 1.4 in Ranga, Kailar, Bagar, Dharja and Jatoli, respectively.

Aphid, *M. persicae* and *M. euphorbiae*

The incidence of aphid was recorded maximum in Nalwar with 3.0 aphids per leaf, followed by Namhol (2.6 aphids/leaf), Raili (1.7 aphids/plant), Daslehra (1.5 aphids/plant) and Loharli (1.3 aphids/leaf). In Zone II, aphid population was recorded maximum in Nauni with 4.3 number of aphids per leaf, followed by 3.9, 2.7, 2.6, 1.6 and 1.3 mean number of aphids in Kailar, Ranga, Bagar, Dharja and Jatoli, respectively.

Fruit borer, *H. armigera*

The maximum number of fruit borer larval per plant (0.9 larvae /plant) in Raili village, followed by 0.8 and 0.3 numbers of larvae per plant in Jajri and Daslehra, respectively. The fruit infestation was also found maximum in Raili (6.90%), followed by Jajri (5.0%) and Daslehra (4.30%). In Zone II, the maximum number of fruit borer larval was recorded in Mariog (2.3 larvae per plant), followed by Nauni, Neri jagela, Jatoli, Dharja, Ghatti, Rajgarh and Jatoli with 1.9,

1.7, 1.0, 0.8, 0.8, 0.7 and 0.6 numbers of larvae per plant. The fruit infestation was maximum in Nauni with 15.3 per cent of the infested fruits, followed by Kandaghat, Mariog, Ghatti, Dharja, Jatoli, Bairti, Neri jagela and Rajgarh with 14.5, 12.2, 11.5, 11.4, 10.9, 9.7, 8.9 and 5.3 per cent fruit infestations, respectively.

In present findings, we surveyed 20 villages in Zone I and Zone II of Himachal Pradesh during 2019 and 2020 to record major insect pests infesting tomato. In mid hill conditions of Himachal Pradesh, *T. vaporariorum*, *L. trifolii* and *H. armigera* as major insect pest of tomato have been reported by Dhillon (1999) [3], Thakur (2004) [8] and Kumar (2019) [5]. The aphid species *M. persicae* was found to infest tomato in low hills whereas, *M. euphorbiae* was recorded from mid hills on tomato crop which also gets support from Balaso (2020) [2] who reported the same aphid species from tomato. As found in present studies, Vashisth *et al.* (2013) [9] also reported lower population of *T. vaporariorum*, *M. persicae*, *H. armigera* and *L. trifolii* on tomato in low hills of Himachal Pradesh.

Conclusion

On the basis of results and discussion of the present investigation it is concluded that during the surveys, whitefly (*Trialeurodes vaporariorum*), aphids (*Myzus persicae* and *Macrosiphum euphorbiae*), serpentine leaf miner (*Liriomyza trifolii*), and fruit borer (*Helicoverpa armigera*) were recorded during both years. The aphid species *M. persicae* was recorded in low hills whereas, *M. euphorbiae* was found to infest tomato in mid hills.

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