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Seasonal incidence of tomato fruit borer, *Helicoverpa armigera* (Hubner) on tomato, *Lycopersicon esculentum* (Mill) under protected cultivation

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Abstract

The investigations on seasonal incidence of *Helicoverpa armigera* (Hubner) on tomato under protected cultivation were conducted on research farm Department of Horticulture, VNMKV, Parbhani during *Kharif* 2017-18. Seasonal incidence of *H. armigera* the population started during 35th SMW (0.5 larvae/plant) and there after the population reaches 2.8 larvae plant in the 47th SMW and the highest population recorded during fruiting stage of the crop in the range of 4.2 larvae per plant. Whereas average of percent damage of fruit 41.44 percent due to *H. armigera* were found in total six picking.

Keywords: Seasonal incidence, fruit borer *H. armigera*, tomato, protected cultivation

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) [10]. 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, besides other insect pests causing considerable damage, fruit borer *Helicoverpa armigera* Hubner (Lepidoptera: Noctuidae) is the serious one which causes considerable losses in quantity as well as quality of tomato fruits (Singh and Chahal, 1978; Tewari and Moorthy, 1984; Reddy and Zehrm, 2004) [13, 18, 12]. Early instar larvae feed on flower buds and foliage while matured instars bore into fruit resulting in yield reduction (Rath and Nath, 1997) [11]. Considerable economical losses due to *Helicoverpa armigera* reported by many workers to the extent of about 50-60% fruits (Singh and Singh, 1977) [15] and 25.99 to 41.34% fruits in Chhattisgarh (Singh, 1997) [15]. Whereas, yield losses to the extent of 42.50 percent (Dhandpani and Balasubramaniam, 1984) [4], 42.55 percent (Kashyap and Verma, 1986) [6] and 51.20 percent (Singh and Narang, 1990) [14]. Hence, the investigation was undertaken to study the seasonal incidence of major insect pests, tomato fruit borer *Helicoverpa armigera* on tomato under protected cultivation.

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 treatments. 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.

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Weekly observations of fruit borer larvae on 10 randomly selected and tagged plants was recorded and percent fruit damage was worked out by observing the total number of fruits and number of damaged fruits due to fruit borer at each picking on 10 randomly selected and tagged plants.

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

Results and discussion

The seasonal incidence of *H. armigera* on tomato were observed during *khariif* 2017-18. The data recorded on population of fruit borer presented in Table 1 and graphically

depicted in Figure 1 percent of damaged fruits in Table 2 and graphically depicted in Figure 2.

The population of *H. armigera* was recorded from 27th August to 16th December (35th SMW to 50th SMW) during 2017-18. The population ranged from 0.5 larvae per plant in the initial to 4.2 larvae per plant in the peak level of infestation. The incidence started during 35th SMW (0.5 larvae/plant) and there after the population reaches 2.8 larvae plant in the 47th SMW and the highest population recorded during fruiting stage of the crop in the range of 4.2 larvae per plant. Overall view of the objective reveals that the infestation of *H. armigera* was severe from October month onwards and yield loss of tomato would be more in *rabi* tomato.

Table 1: Seasonal incidence of tomato fruit borer *H. armigera* (Hubner)

Sr. No	Meteorological Week	Period	Number of larvae/ plant
1	31	30 Jul - 05 Aug	00
2	32	06 Aug - 12 Aug	00
3	33	13 Aug - 19 Aug	00
4	34	20 Aug - 26 Aug	00
5	35	27 Aug - 02 Sept	0.5
6	36	03 Sept - 09 Sept	1.6
7	37	10 Sept - 16 Sept	2.1
8	38	17 Sept - 23 Sept	2.4
9	39	24 Sept - 30 Sept	2.6
10	40	01 Oct - 07Oct	2.6
11	41	08 Oct - 14Oct	2.8
12	42	15 Oct - 21Oct	3.1
13	43	22 Oct - 28Oct	3.5
14	44	29Oct - 4 Nov	3.8
15	45	05 Nov - 11 Nov	4.2
16	46	12 Nov - 18 Nov	3.5
17	47	19 Nov - 25 Nov	2.8
18	48	26 Nov - 02 Dec	2.1
19	49	03 Dec - 09 Dec	1.8
20	50	10 Dec - 16 Dec	1.0

The above findings are in confirmation with the earlier research workers like Chavan *et al.*, (2016) [3] investigated the population density and infestation percentage of *H. armigera* on tomato, population was higher during 42nd SMW at Parbhani. Meena *et al.*, (2014) [8] reported the incidence of *H. armigera* was observed throughout the cropping season from 18.10.2011 to 25.02.2012. Nadaf and Kulkarni (2006) [9] recorded peak incidence of larvae during November first fortnight. Kamble *et al.*, (2005) [5] reported that first incidence of *H. armigera* on 35th SMW. The peak larval population coincided with the flowering and fruiting season. Thus the above reports are more or less corroborated with the present findings.

Table 2: Seasonal incidence of tomato fruit borer *H. armigera* (Hubner) in percent of damaged fruits.

Number of picking	Date of picking	Total number of fruits/10 plants	Damaged fruits by <i>H. armigera</i> (%)
1 st	15 th Sept	80	30.23
2 nd	30 th Sept	110	37.39
3 rd	10 th Oct	140	41.21
4 th	20 th Oct	160	44.84
5 th	30 th Oct	190	46.87
6 th	10 th Nov	210	48.13
Average		148	41.44

The seasonal incidence of *H. armigera* on tomato were observed during *khariif* 2017-18. The data recorded on percent 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 percent of damaged fruits 41.44 percent and during six picking percent of damaged fruits ranged from 30.23 to 48.13 percent due to *H. armigera*. The peak level of percent of fruits damage coincided with the flowering and fruiting stage of crop. Overall view of the objective reveals that the infestation of *H. armigera* was severe from October month onwards and yield loss of tomato more in *rabi* tomato.

In the case of *H. armigera* above findings are in confirmation with the research workers like Kumar *et al.*, (2013) [7] observed that 40 to 60 percent tomato fruits losses between 21th - 25th standard weeks. Singh, (2013) [16]. Noticed the population gradually increased during fruiting stage and attained its peak in 15th standard week 55.75 percent and fruit infestation gradually declined after 15th standard week. Chakraborty *et al.*, (2011) [2] observed the highest level of damage 18.45 to 24.43 percent in timely sown and late sown crop respectively. Thus the above reports are more or less corroborated with the present findings.

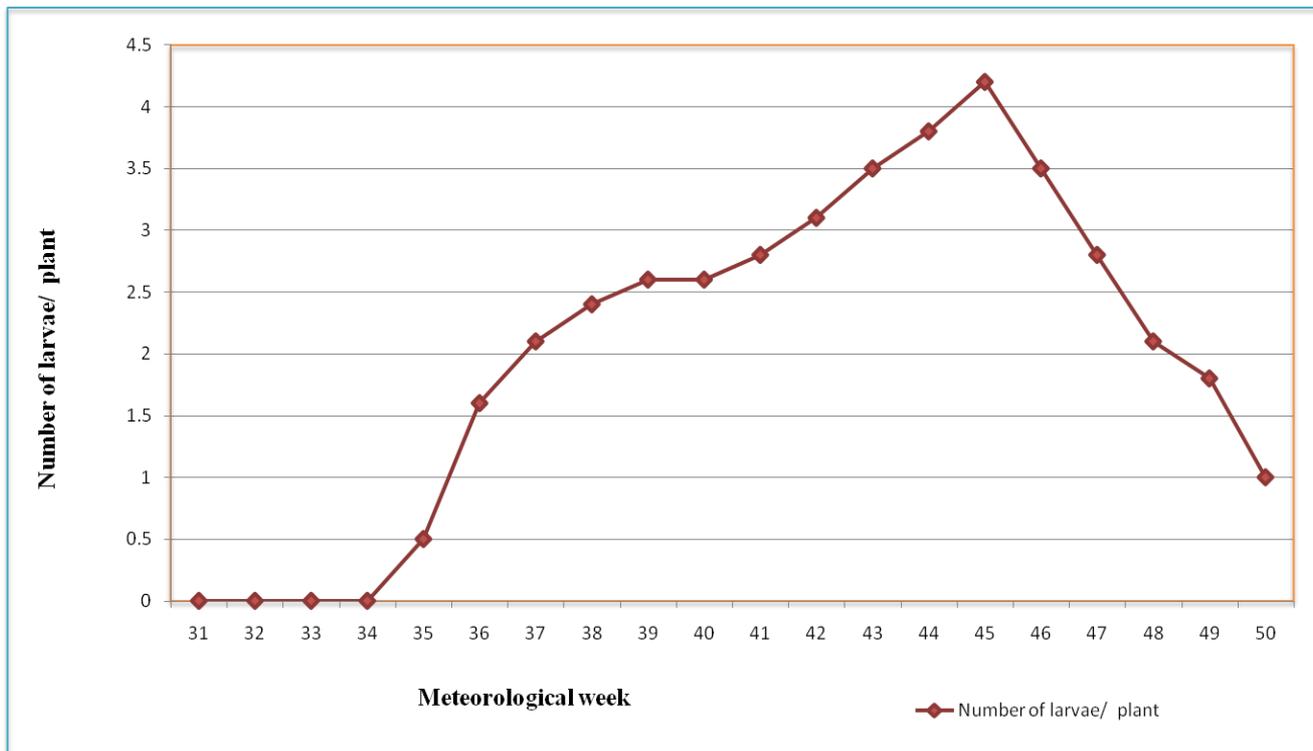


Fig. 1: Seasonal incidence of tomato fruit borer *H. armigera* (Hubner)

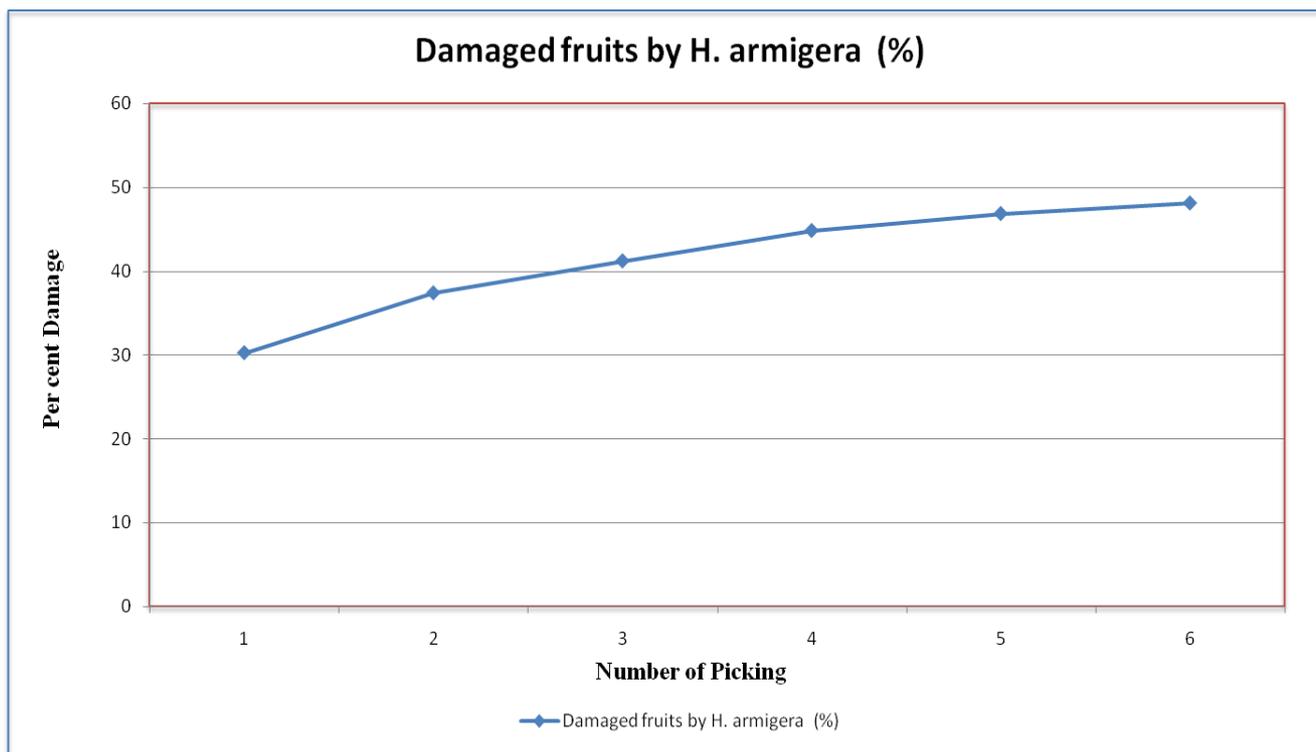


Fig. 2: Seasonal incidence of *H. armigera* (Hubner) in percent of damaged fruits.

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