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Seasonal Incidence of South American Tomato Moth, *Tuta absoluta* (Meyrick) (Gelechiidae: Lepidoptera) on Tomato Ecosystem

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ABSTRACT

Tomato leaf miner, Tuta absoluta is one of the serious pest of tomato crop, has the capacity of causing yield loss upto 100%. So studies were initiated using pheromone traps to monitor the seasonal incidence of this pest. Pheromone traps were placed in the tomato fields during summer, kharif and rabi seasons. Examination of the traps was carried out at weekly intervals. The pheromone lure was replaced every 15 days. There was a linear increment in the number of captured moths on tomato crop. The number of moths captured ranged from 03-352 in the field conditions. The larvae of the tomato leaf miner inflicted a heavy damage on young tomato plants. As a result, young plants died before flowering. The pest is likely to cause heavy losses to tomato crop on an unprecedented scale in India. The highest numbers of moths caught in traps were recorded between March and April. Similarly, the highest levels of tomato borer infestation were observed during January to May and, to a lesser extent, during October to November @ 6 moths/trap. In fact, while during March - April T. absoluta frequency reached maximum densities of 30-100 larvae/plant, during October to November infestation did not exceed 25 larvae/plant. Therefore, monitoring the pest in all tomato producing regions of the country is a vital step towards early detection and decision making for integrated management.

Key words: *Monitoring, Pheromone trap, Seasonal incidence, Tuta absoluta, Tomato*

INTRODUCTION

Tuta absoluta is a major pest of solanaceous crops, its primary host is tomato (*Solanum lycopersicum*). Apart from tomato it also attacks eggplant (*S. melongena* L.), potato (*S. tuberosum* L.), pepper (*Capsicum annum*) and other solanaceous crops[7,11]. In India, at first it was reported from Karnataka [9] and then in Maharashtra region[8] and in the recent days it is spreading all over Indian subcontinent and records of its infestation being reported from many parts of India. It has the capacity to `develop on major economically important horticultural crops[10].

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This pest has a capacity to cause yield loss up to 100% in the tomato ecosystem, both in open and green house conditions [6,9]. As it is a new pest to India, many things yet to be revealed with respect to this pest. This study has been carried out to know the intensity and seasonality of *T. absoluta* in tomato ecosystem using pheromone traps.

MATERIALS AND METHODS

Cropping- The experiment is carried out at ICAR-Indian Institute of Horticultural Research, Bengaluru ($13^0$8.12"N, $77^0$29.45"E, altitude 890m) during January 2015 to October 2016, so that we can able to differentiate three agro-climatic seasons *viz.*, Kharif, Summer and Rabi. The tomato crop (cv. NS 501) was grown by following all recommended package of practices.

Pheromone traps- For the present study wota-T traps supplied by Biocontrol Research Laboratory, Pest Control India were used, along with their TLM© lure for the catching of moths. The trap is filled with the mixture of water and kerosene, to avoid the escape of trapped moth. Traps were installed in the corners of tomato plot. Pheromone lures were refreshed at every 15 days intervals to get the accurate results.

Evaluation and monitoring: For more accurate evaluation of the pest's population dynamics, number of moths trapped was recorded on the daily basis and every month we determined the percentage of active infestation on samples of 50 randomly selected plants per site, as well as the mean number of live larvae per plant.

RESULTS

In general, the number of adults caught by wota-T traps baited with the *T. absoluta* sex pheromone lure (Fig. 5) varied markedly indifferent agro-climatic seasons. For the period between January 2015 to October 2016, trends of male catches were found to be very similar up to the month of July to December, and then to diverge notably. Our investigations revealed that the maximum number of male moth catches (352 adult moths/traps) was recorded in the month of March, 2016 and least number of moths catches were observed in the month of November 2015 (Fig. 1).

The active infestation was lower than 3. 41 and 3.82 mine with alive larvae/leaf in winter (November, 2015 and 2016 respectively), and rose progressively at the end of Rabi season and start of summer cropping season in India, reached maximum 30.24 mines with alive larvae/leaf (March) (Table 1). During the Kharif season, the number of mines with alive larvae and the total mines per leaf were nearly stationary, indicating a slow development of immature (Table 1) (Fig. 2). Conversely, under summer season due to favorable climatic conditions, the total number of mines increased more than that of mines with alive larvae, suggesting a higher rate of abandoned mines due to a faster development time. The infestation on fruits (Fig. 4) was observed from March onwards, when the leaf infestation exceeded 4 mine with alive larvae/leaf.

DISCUSSION

The population density of *T. absoluta* (Fig. 3) in the surveyed tomato crop was low in winter and showed a sharp increase towards the start of summer season, similarly to population dynamics observed in other winter-spring tomato crops in the Mediterranean area[1,2,4]. Larvae developed on leaves for most of the growing season and infested fruits in spring as a consequence of increased population density. Adults and immature stages were simultaneously present during the entire cultivation period, which indicates the overlapping of generations because of long oviposition period of females (up to 24 days)[5]. Male trapped in pheromone traps showed variation during the growing season with no distinct generation peaks and increased consistently in January-April, as the temperature rose favouring the *T. absoluta* development.

T. absoluta males were continuously captured throughout the year, with a seasonal fluctuation driven by temperature. The capture pattern was largely unimodal with less

population density in winter, increasing captures from January onwards, and highest pest population in summer in conjunction with highest temperature.

In two consecutive winters, *T. absoluta* adults, eggs and larvae were detected at low population density on winter tomato leaves, despite minimum daily temperatures < 5 °C. All life stages were observed at the same time in winter, indicating that the pest slowed down its life cycle but did not enter in diapauses. These results are similar in potato ecosystem[3].

Table 1: Average *Tuta absoluta* larvae infestation on tomato plant

Months	Average Larvae/Plant in 2014-15	Average Larvae/Plant in 2015-16
January	19.42	21.20
February	20.23	23.2
March	24.8	30.24
April	20.80	24.50
May	17.33	20.15
June	15.50	19.20
July	10.52	13.63
August	9.80	13.11
September	4.43	5.96
October	4.39	6.30
November	3.41	-
December	4.20	-

n= 50 tomato plants

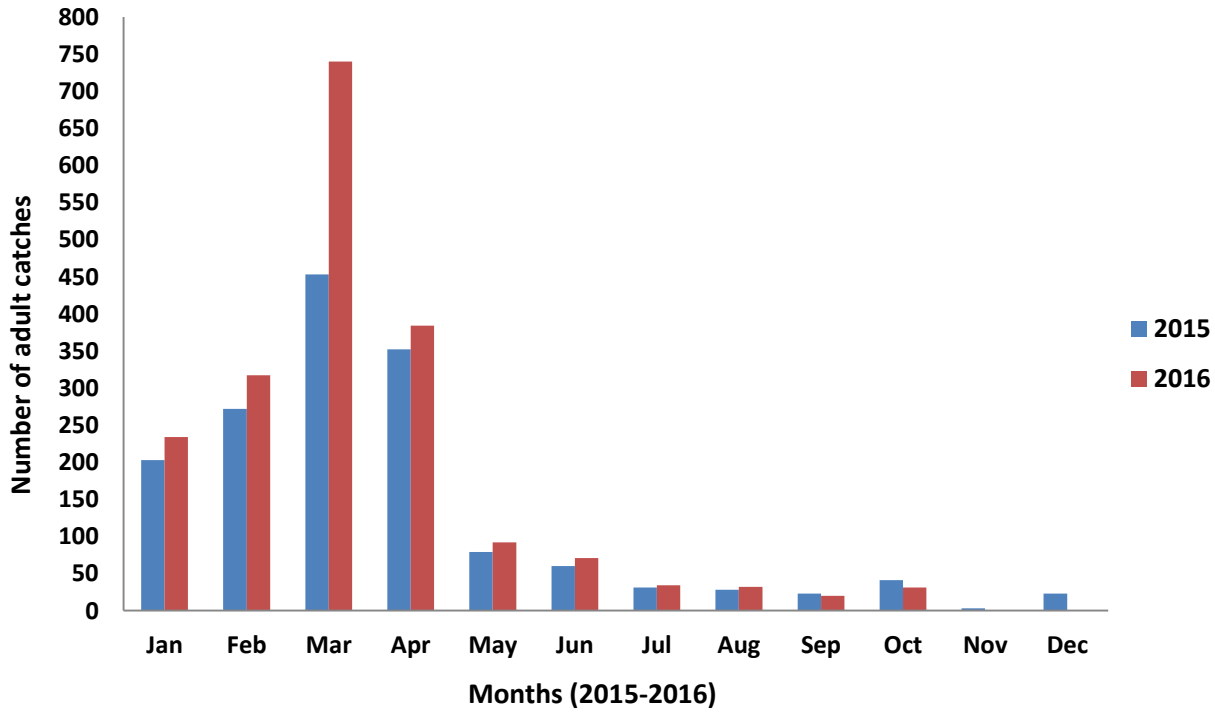

Fig. 1: Monthly *Tuta absoluta* adult traps

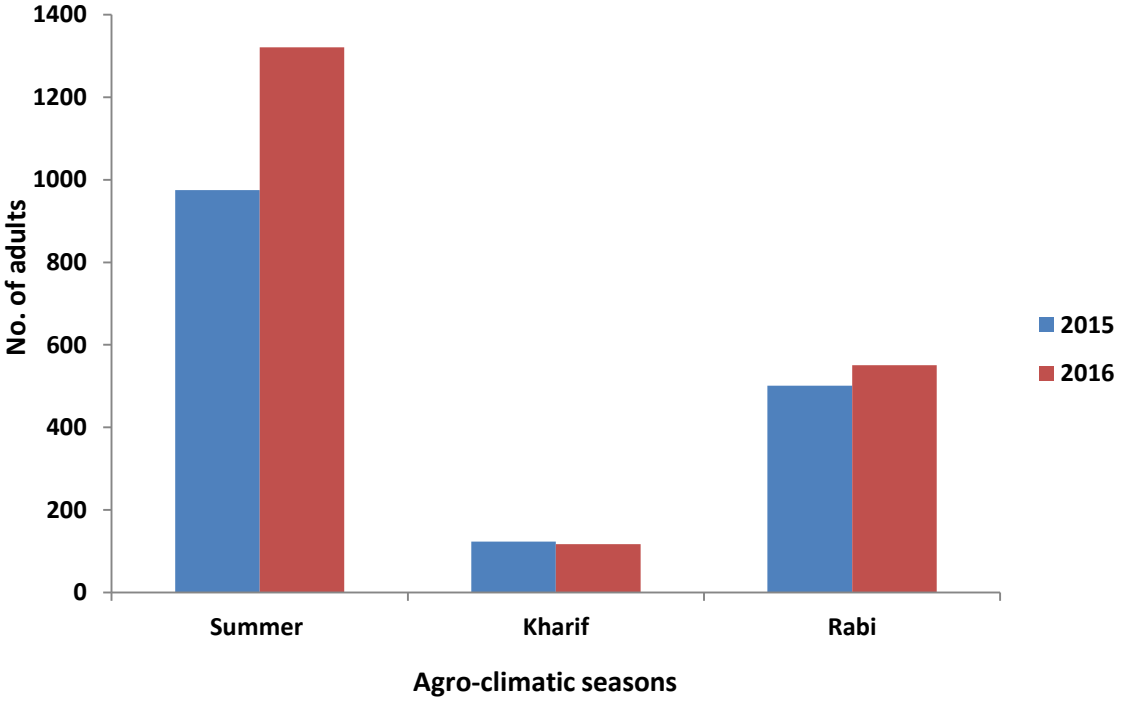

Fig. 2: Season wise *Tuta absoluta* catches

Fig. 3: *Tuta absoluta* adults

Fig. 4: *Tuta absoluta* infested tomato fruits

Fig. 5: *Tuta absoluta* adults trapped in pheromone traps

CONCLUSION

Based on our findings, *T. absoluta* population increases gradually from the start of summer season and one can initiate IPM strategies more vigorously at the onset of summer season and one can reduce pesticide application in the winter season as temperature plays role in manging the population of *T. absoluta.*

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