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POPULATION DYNAMICS OF TOMATO FRUIT BORER *HELICOVERPA ARMIGERA*

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ABSTRACT

In order to gain a better understanding of the seasonal development and dynamics of tomato fruit borer (*Helicoverpa armigera*) on tomato in the Zaid season 2022, an experimental study was carried out in the state of Punjab. The population distribution of fruit borer pest is influenced during the growth season of the crop by abiotic conditions, and these factors can have either a favourable or negative effect. As a result of the fact that tomatoes can be cultivated during a variety of seasons, one can see vivid population dynamics in case of fruit borer during the Standard Meteorological Weeks (SMW). In the current experiment, the first occurance of a fruit borer was noticed during the 11th standard meterological week (the second week of March), and the population reached its highest peak during the 18th and 19th SMW (the first week of May). According to the findings of the correlation studies, maximum and minimum temperature have a significant positive relationship in either enhancing or lowering the population of fruit borers.

Key words: Fruit borer population dynamics, weather parameters, incidence, abiotic, factors

Tomato fruit borer *Helicoverpa armigera* (*Hübner*) is polyphagous pests of tomato. Tomato is infested by many insect pests of which the estimated loss caused by tomato fruit borer *Helicoverpa armigera* (Hbn) is Rs. 1000 crores annually (Kumar et al., 2017). Tomatoes grown in Punjab faces losses as high as 51.20% (Dilbagh and Narang, 1990). The most quick and common method used by farmers are the use of insecticides. Trap cropping or intercropping methods are also used by many progressive farmers. Weather parameters like temperature (maximum and minimum), relative humidity, rainfall etc. has either positive or negative impact on the occurance and distribution of this pest. This study evaluates the influence of abiotic factors on the population dynamics of tomato fruit borer on tomato in Punjab.

MATERIALS AND METHODS

During 2021-2022, the field experiment was carried out at the Research Farm of the School of Agriculture, Lovely Professional University Jalandhar, Punjab (31.24N, 75.69E, 225 masl). Tomato variety EZ-9003, a semi determinate type with a duration of 120-145 days was transplanted on 10th Feb 2022. RBD (randomized block design) was followed, with 7 treatments and three replications. Spacing was 60x 45 cm with plot size of 15 m^2. The crop was grown following the prescribed agronomic practices. Maximum and minimum temperature, relative humidity, and rainfall data were used. Early in the morning, when insect activity is low, we took a count of the pest population on 5 plants at random. The crop was monitored regularly after transplantation to ensure the presence of *H. armigera* (Hubner). Weekly data collection began after the pest first appeared and continued through crop harvest. Using SPSS version (26), the incidence data of *H. armigera* was corelated with maximum and minimum temperature, relative humidity, and rainfall.

RESULTS AND DISCUSSION

The data reveal that incidence of *H. armigera* began on the 11th standard week (second week of March 2022) and lasted until the 23rd standard week (second week of June, 2022), with populations ranging from 0.80 to 2.33 larvae/ plant. The peak incidence was recorded during 19th SMW (first week of May, 2022); maximum density was 5.87 larvae/ plant (Fig. 1) were confirmed by Harshita et al. (2018), observed a similar pattern of population. Bisht et al. (2014) observed this pest first appearing in the 7th and 9th standard meteorological weeks (SMW), i.e. (February and March), and peaking in the 16th and 15th SMW (April). Except for a significant positive association with daylight hours and a significant negative correlation with evening relative humidity, other factors revealed nonsignificant correlation Renu et al. (2017), observed average population of 2.2 larvae/ plant. Temperature [highest (r=0.623) and lowest (r=0.662)], wind velocity

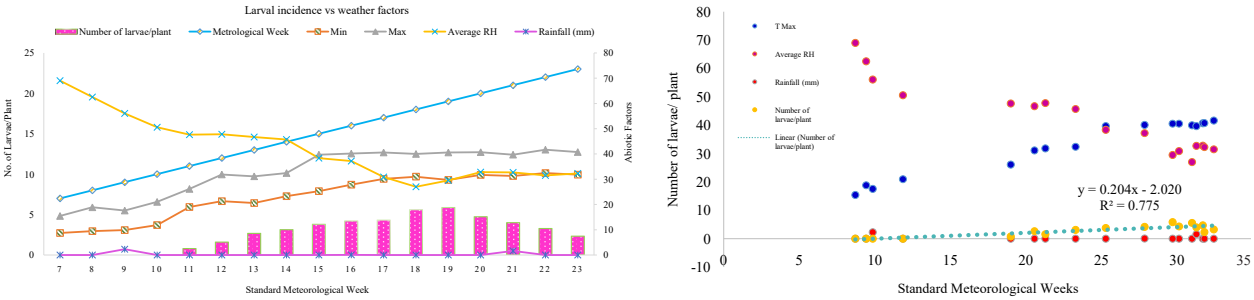

Fig. 1. Population dynamics of *H. armigera* on tomato (Zaid, 2022)

(r=0.512), and sunshine hours (r=0.733) were found to have a significant positive relationship. Relative humidity exhibited a non-significant negative link with fruit borer population [morning (r=-0.138) and lowest (r=-0.382), although rainfall had a non-significant positive correlation (r=0.083). Vikram et al. (2018) investigated the effect of weather variables on the occurrence of *H. armigera* tomatoes. Singh et al. (2017) observed the seasonal occurrence of *H. armigera* (Hubner) and observed that it began in the last week of December. Pest population, maximum and minimum temperature, and average relative humidity had a substantial positive corelation, whereas average relative humidity had a non-significant positive correlation. A non-significant negative correlation was noticed. The correlation coefficient with rainfall was (r=-0.193) negatively non-significant, positively significant with maximum temperature (r=0.898), positively significant with minimum temperature (r=0.880) and negatively significant with average relative humidity (r=-0.881). The correlation coefficient determined between the occurrence of fruit borer and abiotic factor revealed both positive and negative correlations. The above findings were at par as recorded by Bhanuprakash et al. (2019) and Kumar (2014).

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AUTHOR CONTRIBUTION STATEMENT

All the authors contributed significantly. Shimpy Sarkar has stated the idea of the paper, Arshdeep Singh has worked on the methodology and Anita Jaswal has arranged the references and figures.

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CONFLICT OF INTEREST

No conflict of interest.

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