



International Journal of Biological Innovations

Available online: <http://ijbi.org.in> | <http://www.gesa.org.in/journals.php>

DOI: <https://doi.org/10.46505/IJBI.2020.2217>



Research Article

E-ISSN: 2582-1032

STUDY OF FEEDING BEHAVIOUR AGAINST GROWTH AND DEVELOPMENT PARAMETERS OF *Heliothis armigera* ON TOMATO

Ankita Awasthi* and Sangeeta Avasthi

Department of Zoology

A.N.D.N.N.M. Mahavidyalaya Kanpur (U.P.), India

*Corresponding author: ankitaawasthi88@rediffmail.com

Received: 31.07.2020

Accepted: 20.08.2020

Published: 02.09.2020

Abstract: *Heliothis armigera* is an economically important, polyphagous pest. It feeds on wide range of crops such as tobacco, tomato, cauliflower, peas, maize, brinjal, groundnut, soya bean, cotton etc. It affects the quantitative and qualitative fruit production in more than 157 plant species. Damage is caused by larval stages. Larva bores deeply in the fruit and causes severe damage. The pest *Heliothis armigera* feeding on five tomato varieties (Pant Bahar, Ratna, Arka Saurabh, Pusa Gaurav and Arka Abha) was analyzed for different growth parameters such as adult emergence, sex ratio and longevity. In the present study, maximum adult emergence (74.33%) was recorded in Pusa Gaurav, followed by Pant Bahar (72.65%) while minimum emergence (62.62%) was noticed in Arka Saurabh tomato variety. The maximum longevity of male *Heliothis armigera* was recorded on tomato variety Pant Bahar (24.33 days), followed by Pusa Gaurav (19.50 days), Ratna (20.30 days) and Arka Abha (22.65 days) while minimum in Arka Saurabh (18.55 days). The maximum female longevity (31.67 days) was recorded on Pant Bahar while minimum on Arka Saurabh (22.93 days). Observation recorded on tomato varieties indicated that sex ratio was maximum on Pant Bahar (1:1.85) which was at par with Arka Abha (1:1.46), Ratna (1:1.29), Pusa Gaurav (1:1.06) and Arka Saurabh (1:0.98) respectively.

Keywords: Adult emergence, Arka Abha, Arka Saurabh, *Heliothis armigera*, Ratna, Sex Ratio.

INTRODUCTION

Tomato, *Lycopersicon esculentum* belonging to family Solanaceae, is one of the most popular and widely grown vegetable in our country. The tomato is grown in almost all the countries of the world and it ranks second in the yield of fruit production and area after potato and sweet potato and tops in the list of canned vegetables. Tomato is especially raised for its mature fruits, which

have specific taste and are used directly as cutlery and processed preparations. The tomato contains vitamin A, vitamin C, potassium, minerals, fibers, lycopene and acts as good antioxidant. Horned melon is also having antioxidant property (Rani *et al.*, 2019).

Tomato is a warm season crop and thrives well in those regions that are free from frost. During

adverse climatic conditions, monetary return from tomato crop is most fluctuating depending on the season of production and ruling market price because of the genetic potential of the germplasm material. Tomato production is greatly influenced by environmental factors and cultural practices (Chauhan *et al.*, 2013). Qualitative and quantitative production of tomato fruit is affected by several pests, infesting at different stages of crop growth, which are the main constraints in its profitable commercial production (Jadhav *et al.*, 2016). Pests cause losses in uncounted ways. The infestations reduce the yield of crops, lower the quality, increase the cost of production and thus require outlay for materials and equipments to apply control measures to prevent the damage by insect pests to various crops in the field and storage.

Heliothis armigera is a polyphagous pest belongs to class Insecta of phylum Arthropoda. The latter is the largest phylum of Animal Kingdom (Verma and Prakash, 2020). This pest attained the status of most serious pest in recent years in terms of economic damage caused to different agricultural crops (Carneiro *et al.*, 2014). It feeds on soya bean, sorghum, sunflower, corn, maize, flax and okra etc. (CABI, 2013; Multani and Sohi, 2002). *Helicoverpa armigera* is the most destructive pest causing the loss in tomato yield up to 50%-70% (Chandra and Rai, 1974; Gahukar, 2002; Kakimoto *et al.*, 2003). The damage is caused by the larval stages. The tomato fruit worm is active year-round but is typically more abundant in tomato and pepper during warmer months of both the spring and fall. Larvae bore deeply into fruit, usually at or near the calyx. The success of this pest can be derived from its life history characteristics such as polyphagy, high mobility, high fecundity and facultative diapauses. Management strategies have been proposed for *H. armigera*, such as use of biological control, pest monitoring and chemical control etc. However, chemical control is still the form of control mostly used by the producers.

MATERIALS AND METHODS

1. Nursery Raising: The seeds of tomato varieties, Arka Abha, Arka Saurabh, Pant Bahar, Ratna, Pusa Gaurav obtained from Vegetable Research

Station, Kalyanpur, Kanpur (India) were sown at botanical garden of A.N.D. College, Kanpur. Raised beds of size 31 m and 15 cm in height were prepared. The nursery bed was maintained in such a manner that excess water may drain out easily. Weeding, light and irrigation were provided as and when required, till the seedling became ready for transplanting.

2. Rearing of Pest: To start the culture larvae of *Heliothis armigera* were collected from plots of vegetable research farm, Kalyanpur and reared in a petridish containing fresh food. The food was changed daily. The larvae were kept till they became pupae under the laboratory conditions ($27 \pm 2^\circ\text{C}$ and $75 \pm 5\%$ relative humidity). Sterilized soil was provided for pupation. After pupation, the pupae were collected from the soil and placed inside the cage for the emergence of adults. Cotton soaked with 10% honey solution mixed with a couple of drops of multivitamins was provided for adult feeding to increase the fecundity. They were allowed to mate. The pair of *Heliothis armigera* carefully transferred to fresh plate for egg laying after 24 hours. As soon as hatching starts, the newly hatched larvae were transferred to petridishes and food was kept over moist filter paper (Nunes *et al.*, 2017).

3. Used Tomato Varieties: Following tomato varieties were used in the laboratory experiment:

V1-Pusa Gaurav

V2- Ratna

V3-Arka Saurabh

V4-Pant Bahar

V5-ArkaAbha

V6-Control

4. Application of Treatment: Laboratory reared pupae transferred to the different petridishes containing 100 gm fruit of aforementioned varieties of tomato. Petridishes were covered with muslin cloth. Experiment was set up in three replications with one control for each tomato variety. Adult emergence, longevity of male insect and female insect and sex ratio were recorded.

5. Data Collection: Data collection was taken place on each alternate day.

6. Statistical Analysis: The effect of different tomato varieties on *Heliothis armigera* adult emergence, longevity of adult and sex ratio were analyzed.

RESULTS AND DISCUSSION

The inference on adult emergence from the data is presented in table 1 and figure 1. Maximum emergence (74.33%) was recorded in Pusa Gaurav, followed by Pant Bahar (72.65%). The minimum adult emergence (62.62%) was noticed in Arka Saurabh. The rest of the varieties Ratana (68.33%) and Arka Abha (69.33%) were noticed with significant percentage of adult emergence. Baskar *et al.* (2009) concluded that *Correa* leaf extract reduced adult emergence. Similar results were observed by Lall *et al.* (2014), Jeysankar *et al.* (2012) and Jeyasankar *et al.* (2014).

Authors found the maximum longevity of male *Heliothis armigera* on Pant Bahar tomato variety

(24.33 days), followed by Arka Abha (22.65 days), Ratna (20.30 days), Pusa Gaurav (19.50 days) and minimum in Arka Saurabh (18.55 days). Similarly, authors recorded the maximum female longevity (31.67 days) in Pant Bahar tomato variety. The rest of the varieties showed the significant differences (table 1 and figure 1) with Arka Saurabh (22.93 days), which was followed by Pusa Gaurav (24.33 days), Ratna (25.32 days) and ArkaAbha (28.42 days). Conclusively it is obvious in the present investigation that the female lived longer than the male ones. Similar result was concluded by Kouhi *et al.* (2014) by assessing different tomato cultivars. Observation recorded on tomato varieties indicated that sex ratio was maximum on Pant Bahar (1:1.85), which was at par with Arka Abha (1:1.46), Ratna (1:1.29), Pusa Gaurav (1:1.06) and Arka Saurabh (1:0.98).

Table 1: Adult emergence, longevity of adult and sex ratio of *Heliothis armigera* on tomato varieties.

Tomato variety	Adult emergence (%)	Longevity (in days)		Sex Ratio
		Male	Female	
Pusa Gaurav (V1)	74.33	19.50	24.33	1:1.06
	(59.54)			
Ratna (V2)	68.33	20.30	25.32	1:1.85
	(55.73)			
Arka Saurabh (V3)	62.62	18.55	22.93	1:1.29
	(52.30)			
Pant Bahar (V4)	72.65	24.33	31.67	1:1.85
	(58.44)			
ArkaAbha (V5)	69.33	22.65	28.42	1:1.46
	(56.35)			
Control (V6)	76.85	25.63	33.68	1:1.89
	(61.21)			
S.E. Difference	1.96	0.89	0.68	
C.D. at 5%	3.62	0.938	1.93	

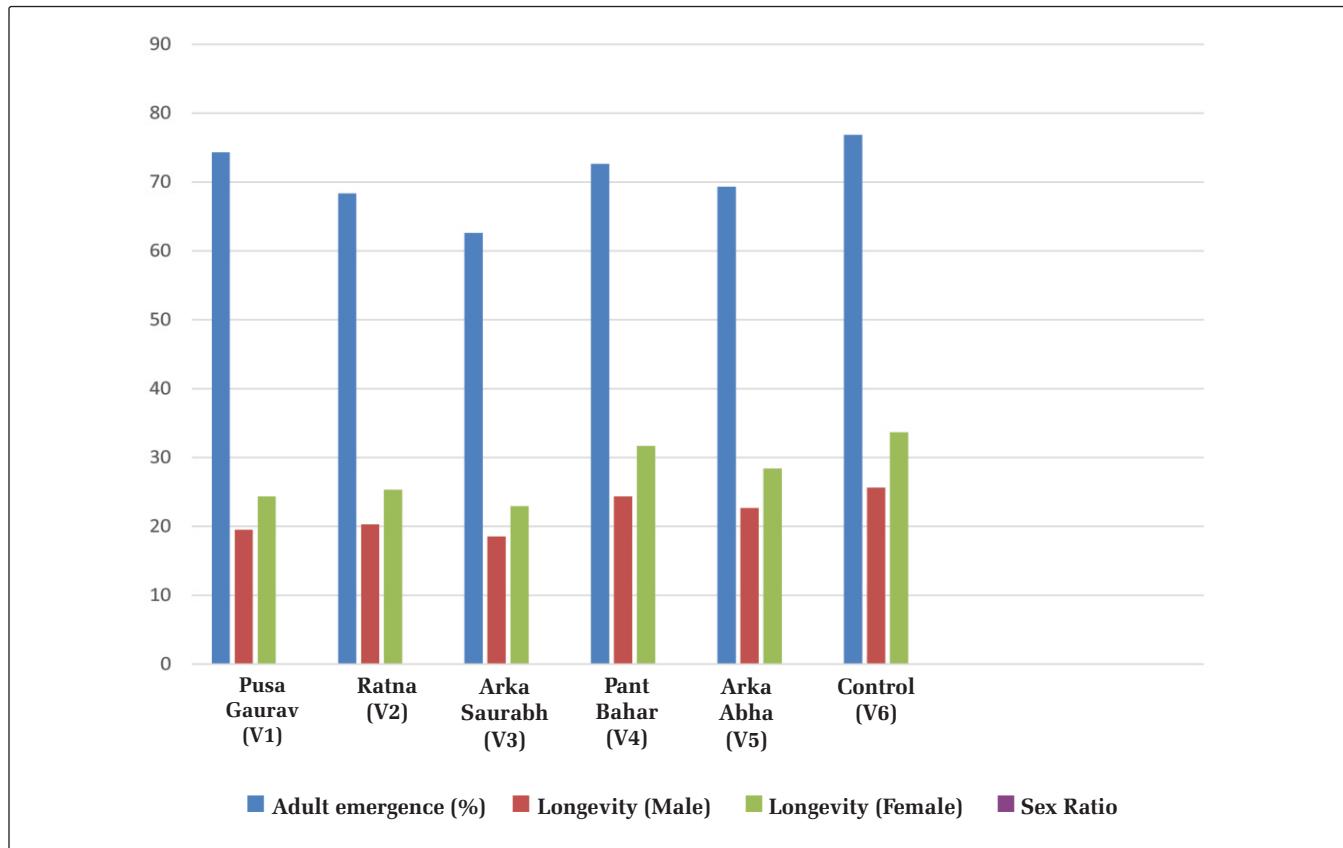


Fig. 1: Adult emergence, longevity of adult and sex ratio of *Heliothis armigera* on tomato varieties.

ACKNOWLEDGEMENT: Authors are thankful to the staff of A.N.D. College, Kanpur, India.

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