Biological Forum – An International Journal 15(10): 1675-1685(2023)

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Population Dynamics of *Maruca vitrata* Fabricius on Vegetable cowpea Genotypes during Summer, 2021 and *kharif,* 2021

Mirala Sruthi[1*], Pravasini Behera[2], S.K. Mukherjee[3], J. Padhi[4], P. Tripathy[5] and K.C. Samal[6]
[1]Ph.D. Scholar, Department of Entomology, College of Agriculture, OUAT, Bhubaneswar (Odisha), India.
[2]Assistant Entomologist, Department of Entomology, College of Agriculture, OUAT, Bhubaneswar (Odisha), India.
[3]Former Professor and Head, Department of Entomology, College of Agriculture, OUAT, Bhubaneswar (Odisha), India.
[4]Professor and Head, Department of Entomology, College of Agriculture, OUAT, Bhubaneswar (Odisha), India.
[5]Professor and Head, Department of Vegetable Science, College of Agriculture, OUAT, Bhubaneswar (Odisha), India.
[6]Professor, Department of Biotechnology, College of Agriculture, OUAT, Bhubaneswar (Odisha), India.

(Corresponding author: Mirala Sruthi)*
(Received: 22 August 2023; Revised: 28 September 2023; Accepted: 08 October 2023; Published: 15 October 2023)
(Published by Research Trend)

ABSTRACT: The present study was conducted to study the population dynamics of spotted pod borer, *Maruca vitrata* Fab. in vegetable cowpea for two consecutive seasons *viz.*, summer and kharif 2021. The highest number of larval population was recorded during 15th Standard Meteorological Week (SMW) in summer 2021 and 36th Standard Meteorological Week (SMW) in *kharif* 2021, coinciding with the peak flowering stage (days to 50% flowering) of vegetable cowpea. The results indicate the key pest the population dynamics and seasonal abundance status of this pod borer species in the region.

Keywords: *Maruca vitrata*, population dynamics, seasonal abundance, vegetable cowpea.

INTRODUCTION

For the formulation of an appropriate management strategy with lowest pesticide usage, required fundamental knowledge on population dynamics of insect pests. From a pest management standpoint, the population dynamic is extremely significant to identify the most sensitive stage of the pest and would be the most opportune period to apply the management strategy by implementing the integrated pest management (IPM) recommendations (Price *et al.*, 2011).

During the summer and kharif seasons, the frequency and population dynamics of *Maruca vitrata*, often known as the legume pod borer, provide considerable issues for agricultural professionals. This pest is notorious for causing devastation on a variety of leguminous crops, including cowpea, pigeon pea, soybean, chickpea, black gram, and mung bean. The warm and dry summer conditions, along with the warm and humid climate of the kharif season, offer perfect breeding grounds for the fast reproduction and spread of *M. vitrata* populations.

The larval stage of *M. vitrata* is very damaging because it voraciously feeds on tender shoots, flowers, and developing pods of host plants, leading in significant output losses and crop quality degradation. Understanding *M. vitrata's* incidence and population dynamics over both seasons is critical for creating effective management techniques to reduce its influence on agricultural production.

Temperature fluctuations, relative humidity, rainfall patterns, crop varieties, and cultural practices all have a substantial impact on *M. vitrata* population trends over the summer and kharif seasons. Farmers confront continual problems in combating this insect, which need prompt measures and integrated pest control approaches suited to the environmental circumstances and crop growth phases of each season.

This comprehensive overview emphasizes the significance of investigating and understanding the incidence and population dynamics of *Maruca vitrata* across the seasons, demonstrating the significance for adaptable and targeted approaches to pest management to protect leguminous crop yields during summer and kharif cropping periods.

The density of larvae is controlled by alterations in weather patterns and other biotic parameters. Understanding the population dynamics of insect pests in response to weather parameters aids in pest control management. The objective of this present study was to examine the trend of *Maruca vitrata* larval population during both summer and kharif seasons.

Jayabal and Kennedy (2022) examined the fluctuation in population levels of *M. vitrata* on lablab bean during three successive cropping seasons in 2019, namely summer, kharif, and rabi. Flower samples exhibited a greater larvae abundance compared to pod samples. The peak larval population in flowers and pods occurred between the 48th and 50^{th} SMW of rabi 2019, with abundances of 14.60 and 13.40 larvae, respectively. This corresponds to 8^{th} to 10^{th} WAS for flowers and 10^{th} to 12^{th} WAS for pods.

Singh *et al.* (2022) discovered that the occurrence of the spotted pod borer in the mungbean variety NDM-1 reached its highest point during the 19^{th} SMW, with an average of 4.20 larvae per plant. Conversely, the lowest incidence was seen during the 22^{nd} SMW, with an average of 0.60 larvae per plant.

Pandit and Dwivedi (2021) opined that *M. vitrata* is a significant obstacle to the growth of pulses, resulting in harm to commercially important plant components such as flower buds, blooms, and pods. The number and degree of *M. vitrata* infestation were the highest in flower buds, followed by open flowers, mature pods, and immature pods, which had the lowest infestation rate. The larvae feed on a total of 39 distinct types of legume crops. The occurrence of the spotted pod borer differed according to the specific crop and season. Conversely, the highest occurrence of larvae was reported specifically during the period of flowering and pod formation in various legume crops.

In their study, Shejulpatil *et al.* (2020) examined the occurrence of spotted pod borer on the pigeonpea variety ICPL 87. They found that the infestation of this pest started in the second week of August. The researchers also observed a significant population of the spotted pod borer larvae during the flowering and pod development stage of the pigeonpea crop.

In their study done in 2015-16, Sreekanth *et al.* (2019) investigated the seasonal abundance of *M. vitrata* in redgram. The larval population of *M. vitrata* was the highest during the 48^{th} SMW, which corresponds to the peak flowering stage of the crop. The population reached 15.6 larvae per plant, which also coincided with the peak flowering period of the crop.

Biswas and Banerjee (2019) reported that *M. vitrata* population has been recorded in summer green gram in both the varieties of green gram for 6 weeks after sowing (WAS). The pest population has been continued up to 9 WAS in both the test varieties, however, the peak population (5.4 per plant in Sonali and 4.4 per plant in IPM 99-125) was found at 9 WAS. During *kharif* season, the pest infestation was recorded from 7 WAS. The pest population has been continued upto 9 WAS in both the test varieties, however, the peak population (6.0 per plant in Sonali and 4.6 per plant in IPM 99- 125) was found at 9 WAS.

Kapoor and Shankar (2019) conducted a field experiment to investigate the occurrence of *M. vitrata* on blackgram during the summer of 2018. The data about the seasonal variations in the population of *M. vitrata* larvae was initially recorded during the 10^{th} SMW. The initial population densities were 0.36 larvae per square metre. The highest documented larval population of *M. vitrata* was 12.53 larvae per square metre, observed during the 15^{th} SMW. Subsequently, the number of larvae declined until the 23^{rd} week, reaching a density of 4.42 larvae per square metre.

In their study, Kumar *et al.* (2019) found that the greatest abundance of Maruca larval population per plant occurred during the 40^{th} SMW across all three seasons. This coincided with the peak blooming period of pigeon pea.

According to Reddy *et al.* (2017), their study on the occurrence of *M. vitrata* in dolichos bean during the kharif season of 2015-16 found that the largest number of Maruca larvae per plant was observed between the 47^{th} and 49^{th} standard weeks, with 3.2 and 3.6 larvae per plant, respectively. The infestation of *M. vitrata* on lablab bean began in the 45^{th} week of the *kharif* season 2016-17 and lasted until the 49^{th} week.

In their study, Sujatha and Bharpoda (2017) examined the occurrence of *M. vitrata* infestation in the summer and kharif seasons of 2015 in greengram. The infestation of *M. vitrata* began on the 13^{th} SMW, with an average of 0.50 larvae per plant. The infestation persisted until the 18^{th} SMW. The peak larval population of *M. vitrata* was recorded during the 15^{th} SMW, with an average of 1.40 larvae per plant. Subsequently, there was a progressive decline in larval numbers over the next three weeks. In the kharif season of 2015, the infestation began in the 34^{th} SMW and reached its first peak in the 37^{th} SMW, with an average of 1.04 larvae per plant. The second peak occurred in the 40^{th} SMW.

Mahalakshmi *et al.* (2016) reported that the spotted pod borer is a significant biotic limitation for pulses production, since it may inflict harm on economically important plant components such as flower buds, blooms, and pods. The larvae consume 39 different host types of legume crops. The occurrence of spotted pod borer varied depending on the specific crop and season. Nevertheless, the highest occurrence of larvae was noted during the flowering and pod development phase in several legume crops.

Pandey *et al.* (2015) conducted a study on the seasonal patterns of insect pests in pigeon pea during the kharif season of 2010-11. They found that the activity of *Maruca vitrata*, started in the 44^{th} SMW and lasted till the 50^{th} SMW. The peak population was seen on two occasions, during the 46th and 48th standard meteorological weeks, with a density of 0.30 larvae per plant in both seasons.

In their study, Sujithra and Chander (2014) examined the fluctuations in population of *M. vitrata* on the pigeonpea cultivar, Pusa-992, across the kharif seasons of 2011 and 2012. The spotted pod borer began its activity during the 36^{th} SMW and persisted until the 46^{th} SMW. The 38^{th} and 39^{th} SMWs were found to be favourable for the proliferation of Maruca on red gram plants. The larval population of spotted pod borer reached a maximum range of 8.10 to 17.77 larvae per plant.

The survey conducted by Rani *et al.* (2013) found that the larval incidence of *M. vitrata* ranged from 05 to 15 larvae per 25 plants during the bud initiation, flowering, and podding stages in greengram.

According to Sharanabasappa *et al.* (2013), the number of legume pod borer larvae per meter row varied between 0.40 and 4.20 during the third week of July. There was a progressive increase in the population, reaching its highest level during the first week of August (4.20 larvae per meter row). Subsequently, the population began to decrease gradually, showing minimal activity during the third week of September, with a larval count of 0.40 larvae per meter row in groundnut.

According to Umbarkar *et al.* (2010), the occurrence of spotted pod borer, *M. testulalis* in green gram during the kharif season of 2008 in Junagadh was documented. The pest emerged with a density of 0.75 larva per plant in the 5th week after planting (32nd SMW) and reached its highest population of 3.81 larvae per plant in the 34th SMW (7th week after planting).

Sonune *et al.* (2010) conducted a study on the population dynamics of the spotted pod borer in blackgram. They found that the infestation of this pest started in the 2nd week of August and continued until the 1st week of October. The pest had a single peak in its population, reaching a density of 3.84 larvae per plant during the 4th week of August.

During *kharif* 2010, Gopali and his coworkers reported that Maruca larval incidence started in the month of September the infestation was at peak during the middle of October continued till the December 2010 at Gulbarga in pigeonpea crop.

According to Hinsu (2005), the occurrence of spotted pod borer on green gram began in the second week of August and continued until the end of September. The pest had a maximum population density, reaching 3.80 larvae per plant during the 4th week of August.

In their study, Akhauri and Yadav (2002) examined the population growth and relative abundance of pod borer species over the main season on pigeonpea. They found that the larval population of *M. vitrata* was only observed in small amounts in March, when the pigeonpea crop was nearing maturity. An increased occurrence of *M. vitrata* was noted during a period of 155 days following seeding, with the highest level of infestation recorded at 125 days.

According to Virani (2000), *M. testulalis* infested black gram crops in the 4th week after planting. The infestation reached its highest level with an average of 5.59 larvae per plant during the 9th week after planting, namely in the 5th week of August.

In a study conducted by Pachani (2000), it was shown that the spotted pod borer, *M. testulalis*, infested cowpea crop starting from the 6th week after sowing, which corresponds to the 1st week of August. The infestation continued throughout the crop cycle and reached its highest point in the 7th week after sowing, with an average of 2.51 larvae per plant. After that, the population of larvae gradually dropped.

Bajpai *et al.* (1995) examined the seasonal occurrence of *M. testulalis*, which started in early September, reached its highest point in mid-October, and then decreased towards the end of that month in pigeonpea.

Srivastava *et al.* (1992) reported that the *M. vitrata* activity was recorded between the 37th and 43rd standard weeks, namely from mid-September to mid-October. The highest level of activity occurred during this period, and no further peaks were seen afterwards. The highest points seen between the 40th and 42nd SMW were in sync with the blooming of medium and long duration varieties of pigeonpea that were planted in the first two weeks of June.

MATERIAL AND METHODS

The present investigation was carried out in the Entomology Department Farm at the Odisha University of Agriculture and Technology, Bhubaneswar, conducted two concurrent seasonal screening experiments on 60 breeding lines of vegetable cowpea in the summer 2021 and in kharif of 2021. The standard package of practices was followed to raise the crop. The data on the larval density per flower and pod was recorded on five tagged plants involving 25 flowers and pods at weekly intervals during summer, 2021 and kharif, 2021 and pooled as larval population per plant. The larval count data was transformed into square root transformation and conducted ANOVA and the means of treatments were separated by DMRT. The weekly data on larval density per plant were averaged over two replications in each season of study period (summer 2021 and kharif 2021) to obtain mean values.

RESULTS AND DISCUSSION

A. Population dynamics and Seasonal incidence of M. vitrata during summer 2021

At 28 DAS (during 12 SMW), none of the genotypes of vegetable cowpea showed infestation by *Maruca* larvae (Table 1).

B. Larval density per plant during peak infestation (15 SMW) during summer, 2021

The highest larval density per plant was recorded in EC 738119 with 5.5 larvae per plant but it is statistically at par with EC 724591 (5.42), EC 724907 (5.44), IC 249141 (5.38), IC 2574563 (5.26), EC 724805 (5.18), EC 724742 (5.02), EC 724471 (5.02), EC 724346 (5.02), EC 367692 (4.94), IC 201098 (4.96), Bhagyalakshmi (4.90), EC 244018 (4.86), EC 390225 (4.8), IC 333106 (4.80), Kashi Kanchan (4.8), Kashi Nidhi (4.8), EC 738122 (4.74), EC 390264 (4.66), EC 725167 (4.64), IC 20720 (4.64), IC 202813 (4.58), EC 101994 (4.44), EC 724791 (4.42), IC 202824 (4.46), EC 390266 (4.46), EC 390231 (4.38), EC 724418 (4.42), EC 724384 (4.38), EC 390219 (4.26), IC 97806 (4.24), IC 202827 (4.24), EC 724805 (4.14), EC 723987 (4.14), IC 257449 (3.98), EC 309233 (3.96), IC 202100 (3.80), EC 723784 (3.80), EC 725153 (3.78), IC 259069 (3.76), and EC 724391 (3.74). The lowest larval density per plant was recorded in EC 390204 (0.82) whereas EC 390219 (0.95), Arka Suman (0.98), IC 214751 (1.00), EC 390207 (1), IC 20645 (1.10), IC 202796 (1.46), EC 343057 (1.62), EC 724547 (1.64), and IC 202924 (1.72) are statistically at par with EC 390204 (Table 1).

C. Mean larval density per plant during summer, 2021

The highest larval density per plant was recorded in EC 724591 with 3.18 larvae per plant but it is statistically at par with EC 390264 (3.02), EC 724471 (3.01), IC 202813 (2.95), Bhagyalakshmi (2.93), Kashi Kanchan (2.89), EC 724742 (2.82), IC 2574563 (2.82), EC 724791 (2.82), IC 249141 (2.79), EC 738119 (2.78), EC 390225 (2.78), Kashi Nidhi (2.78), EC 724346 (2.78), and EC 724805 (2.72). The lowest larval density per plant was recorded in EC 390204 (0.48) whereas Arka Suman (0.52), EC 390219 (0.52), IC 20645 (0.52), IC 214751 (0.52), EC 390207 (0.62) are statistically at par with EC 390204 (Table 1).

D. Population dynamics and Seasonal incidence Maruca vitrata during kharif, 2021

At 28 DAS (during 33 SMW), none of the genotypes of vegetable cowpea showed infestation by *Maruca* larvae (Table 2).

E. Larval density per plant during peak infestation (36 SMW) during kharif, 2021

The highest larval density per plant was recorded in EC 724907 with 6.64 larvae per plant but it is statistically at par with EC 724471 (5.56), EC 724591 (5.48), EC 101994 (5.2), IC 2574563 (5.16), IC 202824 (5), IC 202827 (4.86), EC 738122 (4.84), EC 724805 (4.8), EC 724805 (4.76), EC 724391 (4.78), Kashi Kanchan (4.68), EC 390264 (4.64), EC 725167 (4.58), Kashi Nidhi (4.62), IC 202100 (4.48), EC 724742 (4.52), EC 724791 (4.4), IC 202813 (4.4), EC 738119 (4.38), IC 20720 (4.34), IC 259069 (4.24), IC 201098 (4.24), EC 724346 (4.2), EC 244018 (4.16), EC 390266 (4.18), EC 725153 (4.12), IC 249141 (4.02), EC 723987 (3.98), EC 724418 (3.96), Bhagyalakshmi (3.96), EC 367692 (3.96), IC 257449 (3.98), and IC 97806 (3.94). The lowest larval density per plant was recorded in Arka Suman with 0.98 larvae per plant whereas IC 214751 (1.18), IC 20645 (1.18), EC 390219 (1.3), IC 202796 (1.46), EC 390207 (1.54), EC 390230 (1.74), EC 390204 (2.04), EC 367694 (1.94), IC 202924 (2.06), EC 724547 (2.1), EC 724552 (2.14), EC 724296 (2.16), IC 206240 (2.26), EC 343057 (2.26), EC 724390 (2.38), and EC 724897 (2.46) are statistically at par with IC 214751 (Table 2).

F. Mean larval density per plant during kharif, 2021

The highest larval density per plant was recorded in EC 724591 with 3.12 larvae per plant but it is statistically at par with EC 724471 (3.05), Kashi Kanchan (3.00), EC 724346 (2.90), EC 390264 (2.88), EC 724791 (2.89), IC 2574563 (2.87), Bhagyalakshmi (2.79), EC 725167 (2.76), EC 738122 (2.76), EC 724805 (2.77), EC 367692 (2.64), IC 202824 (2.66), EC 390225 (2.62), IC 333106 (2.61), EC 244018 (2.65), Kashi Nidhi (2.69), IC 202827 (2.61), EC 101994 (2.59), EC 309233 (2.53), EC 724384 (2.51), IC 249141 (2.51), IC 97806 (2.49), IC 20720 (2.51), EC 723987 (2.52), IC 202100 (2.49), EC 390266 (2.5), IC 202813 (2.53), EC 738119 (2.51), EC 724805 (2.47), EC 724742 (2.44), EC 725153 (2.38), EC 724418 (2.37), IC 259069 (2.41), IC 257449 (2.38), and EC 390231 (2.28). The lowest larval density per plant was recorded in EC 390219 with 0.58 larvae per plant whereas IC 20645 (0.59), Arka Suman (0.61), EC 390207 (0.68), IC 214751 (0.69), EC 390204 (0.82), and IC 202796 (0.96) are found to be statistically at par with IC 20645 (Table 2).

The similar results were reported by Jayabal and Kennedy (2022), Reddy *et al.* (2017) in dolichos bean; Pachani (2000) in cowpea; Singh *et al.* (2022), Biswas and Banerjee (2019), Sujatha and Bharpoda (2017), Rani *et al.* (2013), Umbarkar *et al.* (2010), Hinsu (2005) in greengram; Pandit and Dwivedi (2021) reviewed in various legume crops; Mahalakshmi *et al.* (2016) reviewed in various legume crops; Shejulpatil *et al.* (2020), Kumar *et al.* (2019), Sreekanth *et al.* (2019), Pandey *et al.* (2015), Sujithra and Chander (2014), Gopali *et al.* (2010), Bajpai *et al.* (1995), Srivastava *et al.* (1992), Akhauri and Yadav (2002) in pigeonpea; Kapoor and Shankar (2019), Sonune *et al.* (2010); Virani (2000) in blackgram; Sharanabasappa *et al.* (2013) in groundnut.

Table 1: Larval density per plant from 12th to 19th SMW during summer, 2021-22.

Sr. No.	G. No.	12 SMW	13 SMW	14 SMW	15 SMW	16 SMW	17 SMW	18 SMW	19 SMW	Mean
1.	IC 202796	0 (0.71)	0.38 (0.93)klmno	0.62 (1.05)nopqr	1.46 (1.4)hijkl	1.36 (1.36)jklm	1.3 (1.34)mno	1.2 (1.3)ijkl	1.04 (1.24)nopqr	0.92 (1.17)o
2.	EC 724591	0 (0.71)	1.52 (1.42)abcdefg	2.18 (1.64)abcdef	5.42 (2.43)a	5.02 (2.35)a	4.76 (2.30)a	3.82 (2.08)a	2.72 (1.79)abcdef	3.18 (1.84)a
3.	IC 202827	0 (0.71)	1.36 (1.35)abcdefghi	2.14 (1.63)abcdef	4.24 (2.17)abcd	4 (2.12)abcdefg	3.42 (1.98)bcdefghij	3.2 (1.92)abcd	3.08 (1.89)abc	2.68 (1.72)abcdefghi
4.	EC 738122	0 (0.71)	1.14 (1.28)abcdefghijkl	2.2 (1.64)abcdef	4.74 (2.29)ab	4.08 (2.14)abcdefg	3.7 (2.05)bcdefghi	3.02 (1.87)abcdef	2.32 (1.68)abcdefgh	2.65 (1.71)abcdefghij
5.	IC 202813	0 (0.71)	2.08 (1.61)a	2.54 (1.74)abc	4.58 (2.25)ab	4.08 (2.14)abcdefg	3.8 (2.07)abcdefgh	3.3 (1.95)abc	3.22 (1.93)ab	2.95 (1.8)abc
6.	EC 724346	0 (0.71)	1.88 (1.55)ab	2.26 (1.66)abcdef	5.02 (2.34)ab	4.32 (2.19)abcdefg	3.3 (1.95)bcdefghijk	2.92 (1.85)abcdef	2.54 (1.75)abcdefgh	2.78 (1.75)abcdefgh
7.	EC 724390	0 (0.71)	0.44 (0.97)ijklmno	0.8 (1.14)lmnopqr	2.72 (1.80)defg	2.54 (1.74)hi	2.38 (1.7)kl	1.64 (1.46)ghi	1.64 (1.46)ghijklmno	1.52 (1.37)m
8.	EC 724552	0 (0.71)	0.2 (0.83)no	0.44 (0.97)opqr	2.88 (1.84)cdef	2 (1.58)ij	1.7 (1.48)lm	0.86 (1.16)klmno	0.56 (1.03)qrst	1.08 (1.2)no
9.	EC 724384	0 (0.71)	1.26 (1.33)abcdefghij	1.8 (1.52)abcdefgh	4.38 (2.2)abc	4.1 (2.14)abcdefg	2.8 (1.82)ijk	2.62 (1.77)cdef	2.4 (1.7)abcdefgh	2.42 (1.65)efghijkl
10.	IC 2574563	0 (0.71)	0.76 (1.13)cdefghijklmno	2 (1.58)abcdef	5.26 (2.4)a	5.08 (2.36)a	3.9 (2.1)abcde	3.14 (1.9)abcde	2.42 (1.71)abcdefgh	2.82 (1.74)abcdefghi
11.	IC 202100	0 (0.71)	1.58 (1.44)abcdef	1.84 (1.53)abcdefg	3.8 (2.07)abcd	3.56 (2.01)cdefgh	3.04 (1.88)cdefghijk	2.64 (1.78)cdef	2.58 (1.76)abcdefg	2.38 (1.65)efghijkl
12.	IC 97806	0 (0.71)	1.34 (1.36)abcdefghi	1.98 (1.58)abcdef	4.24 (2.17)abcd	3.62 (2.03)cdefgh	3.16 (1.91)bcdefghijk	2.82 (1.82)abcdef	2.2 (1.65)abcdefghi	2.42 (1.66)defghijkl
13.	IC 259069	0 (0.71)	1.48 (1.4)abcdefg	1.68 (1.48)cdefghij	3.76 (2.06)abcd	3.64 (2.03)bcdefgh	3 (1.87)defghijk	2.6 (1.76)cdef	2.4 (1.71)abcdefgh	2.32 (1.63)fghijkl
14.	IC 202924	0 (0.71)	0.82 (1.15)cdefghijklmno	1.04 (1.24)ghijklmnop	1.72 (1.49)fghijkl	1.58 (1.44)jkl	1.4 (1.38)m	1.34 (1.36)ijkl	1.22 (1.31)klmnopq	1.14 (1.26)mno
15.	IC 20645	0 (0.71)	0.14 (0.8)o	0.26 (0.87)r	1.1 (1.27)ijkl	0.9 (1.18)klmn	0.76 (1.12)op	0.62 (1.06)mno	0.38 (0.94)t	0.52 (0.99)p
16.	EC 390264	0 (0.71)	1.8 (1.52)abc	2.8 (1.82)a	4.66 (2.27)ab	4.26 (2.18)abcdefg	3.86 (2.09)abcdefg	3.48 (1.99)abc	3.3 (1.95)a	3.02 (1.82)ab
17.	IC 249141	0 (0.71)	0.98 (1.22)abcdefghijklmn	1.44 (1.39)efghijklm	5.38 (2.42)a	4.96 (2.34)ab	3.98 (2.12)abcd	3.26 (1.94)abc	2.32 (1.68)abcdefgh	2.79 (1.73)abcdefghi
18.	EC 244018	0 (0.71)	1.08 (1.25)abcdefghijklm	1.34 (1.34)fghijklmn	4.86 (2.31)ab	4.42 (2.22)abcdef	4 (2.12)abcd	3.4 (1.97)abc	1.86 (1.54)efghijklm	2.62 (1.68)cdefghijkl
19.	EC 101994	0 (0.71)	0.82 (1.15)cdefghijklmno	1.84 (1.51)abcdefghi	4.44 (2.22)ab	4.16 (2.16)abcdefg	3.58 (2.02)bcdefghij	3.1 (1.9)abcdef	1.9 (1.53)fghijklmn	2.48 (1.65)defghijkl
20.	EC 390231	0 (0.71)	1.04 (1.24)abcdefghijklm	2.14 (1.62)abcdef	4.38 (2.21)abc	3.56 (2.01)cdefgh	2.84 (1.83)hijk	2.62 (1.77)cdef	2.46 (1.72)abcdefgh	2.38 (1.64)fghijkl
21.	EC 309233	0 (0.71)	0.74 (1.11)defghijklmno	2.26 (1.66)abcdef	3.96 (2.11)abcd	3.66 (2.04)bcdefgh	2.88 (1.84)fghijk	2.58 (1.76)cdef	2.48 (1.73)abcdefgh	2.32 (1.62)ghijkl
22.	EC 390230	0 (0.71)	0.4 (0.94)jklmno	0.6 (1.04)nopqr	2 (1.58)fghij	1.72 (1.49)ij	1.46 (1.4)m	0.9 (1.17)jklmno	0.76 (1.11)pqrst	0.98 (1.18)no
23.	EC 390239	0 (0.71)	1.38 (1.37)abcdefgh	1.48 (1.41)defghijklm	3.5 (2)bcde	3.42 (1.98)efgh	2.66 (1.78)jk	2.52 (1.74)cdef	2 (1.58)defghijkl	2.12 (1.57)jkl
24.	EC 390219	0 (0.71)	0.48 (0.99)hijklmno	0.96 (1.21)hijklmnopq	4.26 (2.19)abc	3.6 (2.02)cdefgh	2.96 (1.86)efghijk	2.74 (1.8)bcdef	2.2 (1.64)bcdefghi	2.15 (1.55)l

25	EC 390204	0 (0.71)	0.3 (0.90)lmno	0.38 (0.94)pqr	0.82 (1.15)l	0.64 (1.07)n	0.62 (1.06)p	0.58 (1.04)no	0.50 (1.00)rst	0.48 (0.98)p
26	EC 390207	0 (0.71)	0.32 (0.9)lmno	0.6 (1.05)nopqr	1 (1.23)jkl	0.84 (1.16)mn	0.78 (1.13)op	0.74 (1.12)lmno	0.68 (1.09)pqrst	0.62 (1.05)p
27	EC 390266	0 (0.71)	1.32 (1.35)abcdefghi	1.98 (1.58)abcdef	4.46 (2.22)abc	3.12 (1.9)gh	2.88 (1.84)ghijk	2.3 (1.67)defg	2.10 (1.62)cdefghi	2.27 (1.61)hijkl
28	EC 343057	0 (0.71)	0.32 (0.9)lmno	0.96 (1.21)hijklmnopq	1.62 (1.46)ghijkl	1.56 (1.44)jkl	1.44 (1.39)m	1.34 (1.36)ijkl	1.24 (1.32)jklmnop	1.06 (1.22)no
29	IC 259063	0 (0.71)	0.48 (0.99)hijklmno	0.82 (1.15)klmnopqr	2.32 (1.68)efgh	2.14 (1.63)ij	1.86 (1.54)lm	1.64 (1.46)ghi	1.1 (1.27)mnopqr	1.295 (1.31)mn
30	IC 206240	0 (0.71)	0.66 (1.07)efghijklmno	0.92 (1.19)ijklmnopq	2.1 (1.61)fghi	1.62 (1.46)jk	1.38 (1.37)mn	1.36 (1.37)ijk	1.32 (1.35)ijklmnop	1.17 (1.27)mno
31	EC 367692	0 (0.71)	0.96 (1.19)bcdefghijklmno	1.52 (1.42)defghijkl	4.94 (2.33)ab	4.74 (2.28)abcde	4.06 (2.13)abc	2.9 (1.84)abcdef	2.08 (1.61)cdefghij	2.65 (1.69)bcdefghijkl
32	EC 390219	0 (0.71)	0.34 (0.92)lmno	0.44 (0.97)opqr	0.95 (1.21)kl	0.81 (1.15)mn	0.6 (1.05)p	0.54 (1.02)no	0.48 (0.99)rst	0.52 (1)p
33	EC 390225	0 (0.71)	1.28 (1.34)abcdefghij	1.72 (1.49)bcdefghi	4.8 (2.3)ab	4.04 (2.13)abcdefg	3.88 (2.09)abcdef	3.72 (2.05)ab	2.80 (1.82)abcdef	2.78 (1.75)abcdefgh
34	IC 214751	0 (0.71)	0.26 (0.87)mno	0.32 (0.9)qr	1 (1.23)jkl	0.88 (1.17)lmn	0.82 (1.15)nop	0.48 (0.99)o	0.40 (0.95)st	0.52 (1)p
35	EC 367694	0 (0.71)	0.54 (1.02)ghijklmno	0.7 (1.1)mnopqr	2.24 (1.65)efgh	1.58 (1.45)jkl	1.48 (1.41)m	1.18 (1.29)ijklm	1.00 (1.23)opqrs	1.09 (1.23)no
36	EC 724897	0 (0.71)	0.66 (1.08)efghijklmno	0.92 (1.19)ijklmnopq	1.84 (1.53)fghijk	1.62 (1.46)jkl	1.5 (1.42)m	1.48 (1.41)hij	1.34 (1.36)ijklmnop	1.17 (1.27)mno
37	EC 724742	0 (0.71)	1.4 (1.37)abcdefghi	1.7 (1.47)cdefghij	5.02 (2.35)ab	4.2 (2.17)abcdefg	3.84 (2.08)abcdefgh	3.38 (1.97)abc	3.02 (1.88)abcd	2.82 (1.75)abcdefg
38	IC 20720	0 (0.71)	1.12 (1.27)abcdefghijkl	1.72 (1.49)bcdefghi	4.64 (2.26)ab	4 (2.12)abcdefg	3.28 (1.94)bcdefghijk	2.22 (1.64)fgh	2.06 (1.60)cdefghijk	2.38 (1.63)fghijkl
39	IC 333106	0 (0.71)	0.82 (1.12)cdefghijklmno	1.66 (1.47)cdefghij	4.8 (2.3)ab	3.88 (2.09)abcdefg	2.92 (1.85)efghijk	2.82 (1.82)abcdef	2.46 (1.72)abcdefgh	2.42 (1.64)fghijkl
40	EC 724907	0 (0.71)	0.4 (0.95)jklmno	0.88 (1.17)jklmnopqr	5.44 (2.43)a	4.42 (2.22)abcdef	3.18 (1.91)bcdefghijk	2.64 (1.77)cdef	1.6 (1.45)hijklmno	2.32 (1.58)jkl
41	EC 724791	0 (0.71)	1.3 (1.33)abcdefghij	2.74 (1.8)ab	4.42 (2.22)ab	4.22 (2.17)abcdefg	3.54 (2.01)bcdefghij	3.38 (1.97)abc	2.96 (1.86)abcd	2.82 (1.76)abcdef
42	EC 724805	0 (0.71)	1.52 (1.42)abcdefg	1.7 (1.49)bcdefghi	5.18 (2.38)ab	3.96 (2.11)abcdefg	3.5 (2)bcdefghij	3.48 (1.99)abc	2.42 (1.71)abcdefgh	2.72 (1.73)abcdefghi
43	EC 724471	0 (0.71)	1.78 (1.49)abcd	2.24 (1.66)abcdef	5.02 (2.35)ab	4.74 (2.29)abc	4.06 (2.13)abc	3.26 (1.94)abc	2.98 (1.87)abcd	3.01 (1.81)abc
44	EC 724547	0 (0.71)	0.64 (1.06)fghijklmno	1.08 (1.26)ghijklmno	1.64 (1.47)ghijkl	1.5 (1.42)jklm	1.36 (1.37)mn	1.24 (1.32)ijkl	1.18 (1.3)lmnopq	1.08 (1.24)no
45	EC 724805	0 (0.71)	1.68 (1.48)abcd	2.3 (1.68)abcde	4.14 (2.16)abcd	3.62 (2.03)cdefgh	3.52 (2)bcdefghij	3.14 (1.91)abcde	2.56 (1.75)abcdefgh	2.62 (1.72)abcdefghi
46	EC 724391	0 (0.71)	1.64 (1.46)abcde	2.08 (1.61)abcdef	3.74 (2.06)abcd	3.5 (2)cdefgh	3.18 (1.92)bcdefghijk	2.94 (1.86)abcdef	2.76 (1.81)abcdef	2.48 (1.68)cdefghijkl
47	EC 724418	0 (0.71)	1.06 (1.24)abcdefghijklm	1.5 (1.4)defghijklm	4.42 (2.21)abc	3.96 (2.11)abcdefg	3.56 (2.01)bcdefghij	2.6 (1.76)cdef	1.94 (1.54)efghijklm	2.38 (1.62)ghijkl
48	EC 723987	0 (0.71)	1.5 (1.41)abcdefg	1.64 (1.46)cdefghijkl	4.14 (2.16)abcd	3.9 (2.1)abcdefg	3 (1.87)defghijk	2.56 (1.75)cdef	1.82 (1.52)fghijklmn	2.32 (1.62)ghijkl

Sr. No.	G.No.	12 SMW	13 SMW	14 SMW	15 SMW	16 SMW	17 SMW	18 SMW	19 SMW	Mean
49	EC 724296	0 (0.71)	0.4 (0.95)jklmno	0.64 (1.07)nopqr	2.1 (1.62)fghi	1.66 (1.47)jk	1.28 (1.33)mno	1.06 (1.25)ijklmn	0.70 (1.10)pqrst	0.98 (1.19)no
50	EC 723784	0 (0.71)	1.26 (1.33)abcdefghij	1.54 (1.43)cdefghijkl	3.8 (2.07)abcd	3.5 (2)cdefgh	2.86 (1.83)hijk	2.3 (1.67)defg	1.7 (1.48)ghijklmno	2.12 (1.57)kl
51	IC 257449	0 (0.71)	0.84 (1.16)bcdefghijklmno	1.44 (1.39)efghijklm	3.98 (2.12)abcd	3.88 (2.09)abcdefg	3.16 (1.9)bcdefghijk	2.26 (1.66)efg	1.64 (1.46)ghijklmno	2.15 (1.56)l
52	IC 202824	0 (0.71)	1.02 (1.23)abcdefghijklm	2.04 (1.58)abcdef	4.46 (2.22)ab	3.78 (2.07)abcdefg	3.26 (1.94)bcdefghijk	3.08 (1.89)abcdef	2.20 (1.64)bcdefghi	2.48 (1.66)defghijkl
53	IC 201098	0 (0.71)	0.86 (1.17)bcdefghijklmno	1.46 (1.4)defghijklm	4.96 (2.33)ab	3.2 (1.92)fgh	2.88 (1.84)fghijk	2.2 (1.64)fgh	1.8 (1.52)fghijklmn	2.17 (1.57)kl
54	EC 725153	0 (0.71)	1.14 (1.28)abcdefghijkl	1.48 (1.4)defghijklm	3.78 (2.07)abcd	3.44 (1.98)defgh	3.34 (1.96)bcdefghij	2.74 (1.8)bcdef	2.24 (1.66)abcdefgh	2.27 (1.61)ijkl
55	EC 738119	0 (0.71)	1.36 (1.36)abcdefghi	1.98 (1.58)abcdef	5.5 (2.43)a	4.76 (2.29)abcd	3.42 (1.98)bcdefghij	2.8 (1.81)bcdef	2.42 (1.71)abcdefgh	2.78 (1.73)abcdefghi
56	EC 725167	0 (0.71)	1.32 (1.35)abcdefghi	1.56 (1.44)cdefghijkl	4.64 (2.27)ab	4.12 (2.15)abcdefg	3.82 (2.08)abcdefgh	3.7 (2.05)ab	1.88 (1.54)efghijklm	2.63 (1.7)bcdefghijk
57	Kashi Kanchan	0 (0.71)	1.8 (1.51)abc	2.44 (1.72)abcd	4.8 (2.3)ab	4.04 (2.13)abcdefg	3.78 (2.07)abcdefghi	3.38 (1.97)abc	2.88 (1.84)abcde	2.89 (1.78)abcde
58	Kashi Nidhi	0 (0.71)	1.24 (1.32)abcdefghijk	1.64 (1.46)cdefghijk	4.8 (2.3)ab	4.58 (2.25)abcde	4.12 (2.15)ab	3.34 (1.96)abc	2.52 (1.73)abcdefgh	2.78 (1.74)abcdefghi
59	Arka Suman	0 (0.71)	0.26 (0.87)mno	0.42 (0.96)opqr	0.98 (1.22)jkl	0.82 (1.15)mn	0.62 (1.06)p	0.58 (1.04)no	0.48 (0.99)rst	0.52 (1)p
60	Bhagyalakshmi	0 (0.71)	1.8 (1.51)abc	2.16 (1.63)abcdef	4.9 (2.32)ab	4.66 (2.27)abcde	3.74 (2.06)abcdefghi	3.24 (1.93)abc	2.94 (1.86)abcd	2.93 (1.79)abcd

Values in parentheses are square root transformed values. The letters followed by numbers are DMRT letters
G.No. indicates genotype number; SMW indicates standard meteorological week

Table 2: Larval density per plant from 33th to 40th SMW during kharif, 2021-22.

Sr. No.	G. No.	33SMW	34 SMW	35 SMW	36 SMW	37 SMW	38 SMW	39 SMW	40 SMW	Mean
1	IC 202796	0 (0.71)	0.54 (1.02)hijklm	0.66 (1.08)hijk	1.46 (1.40)m	1.46 (1.4)klmn	1.36 (1.36)ij	1.18 (1.30)ijklmn	1.02 (1.23)jkl	0.96 (1.19)klmno
2	EC 724591	0 (0.71)	1.8 (1.5)abcdef	2.22 (1.65)ab	5.48 (2.44)ab	5.24 (2.39)a	4.18 (2.16)ab	3.54 (2.01)abc	2.50 (1.73)abcde	3.12 (1.82)a
3	IC 202827	0 (0.71)	1.50 (1.42)abcdefgh	1.90 (1.55)abcdef	4.86 (2.31)abc	4.48 (2.23)abc	3.72 (2.04)abc	2.32 (1.68)defgh	2.10 (1.62)abcdefghi	2.61 (1.70)abcdefg
4	EC 738122	0 (0.71)	1.68 (1.48)abcdef	1.98 (1.58)abcde	4.84 (2.31)abc	4.38 (2.21)abc	4.06 (2.13)abc	2.80 (1.82)abcdefg	2.34 (1.69)abcdef	2.76 (1.74)abcdef
5	IC 202813	0 (0.71)	1.04 (1.22)abcdefghijkl	1.42 (1.38)abcdefghij	4.40 (2.21)abcde	4.10 (2.14)abcd	3.44 (1.98)abcde	3.10 (1.9)abcdef	2.74 (1.8)abcd	2.53 (1.67)abcdefg
6	EC 724346	0 (0.71)	1.68 (1.47)abcdef	2.72 (1.79)a	4.2 (2.17)abcde	4.02 (2.13)abcd	3.78 (2.07)abc	3.70 (2.05)ab	3.10 (1.9)ab	2.90 (1.79)abcd
7	EC 724390	0 (0.71)	0.74 (1.11)efghijklm	1.48 (1.41)abcdefghi	2.38 (1.70)efghijklm	2.32 (1.68)fghijk	2.00 (1.58)fghi	1.90 (1.55)ghij	1.78 (1.51)cdefghij	1.58 (1.41)hij
8	EC 724552	0 (0.71)	0.54 (1.02)hijklm	0.66 (1.08)hijk	2.14 (1.62)ghijklm	1.90 (1.55)hijklm	1.70 (1.49)ghij	1.28 (1.34)ijklm	1.14 (1.28)ijkl	1.17 (1.26)jklm
9	EC 724384	0 (0.71)	1.74 (1.5)abcdef	2.12 (1.62)abc	3.78 (2.07)bcdefghi	3.68 (2.04)abcdef	3.38 (1.97)abcde	3.06 (1.89)abcdef	2.32 (1.68)abcdef	2.51 (1.69)abcdefg
10	IC 2574563	0 (0.71)	1.30 (1.34)abcdefghi	2.36 (1.69)ab	5.16 (2.38)abc	4.56 (2.25)abc	3.54 (2.01)abcd	3.12 (1.9)abcdef	2.88 (1.82)abcd	2.87 (1.76)abcdef
11	IC 202100	0 (0.71)	1.08 (1.26)abcdefghijk	2.12 (1.61)abcde	4.48 (2.24)abcd	3.64 (2.03)abcdef	3.28 (1.94)abcde	2.80 (1.81)abcdefg	2.52 (1.73)abcde	2.49 (1.67)abcdefg
12	IC 97806	0 (0.71)	1.52 (1.43)abcdefgh	2.08 (1.61)abcd	3.94 (2.11)abcdefg	3.72 (2.05)abcdef	3.48 (1.99)abcde	2.74 (1.8)abcdefg	2.44 (1.72)abcde	2.49 (1.68)abcdefg

Table 2 Contd…

Sr. No.	G. No.	33SMW	34 SMW	35 SMW	36 SMW	37 SMW	38SMW	39 SMW	40 SMW	Mean
13	IC 259069	0 (0.71)	0.44 (0.97)ijklm	2.04 (1.60)abcde	4.24 (2.18)abcde	3.98 (2.12)abcd	3.68 (2.04)abc	2.58 (1.76)abcdefg	2.32 (1.68)abcdef	2.41 (1.63)abcdefg
14	IC 202924	0 (0.71)	0.56 (1.03)hijklm	0.94 (1.2)efghijk	2.06 (1.6)hijklm	2.06 (1.6)ghijkl	1.72 (1.49)ghij	1.16 (1.29)jklmn	1.06 (1.25)jkl	1.20 (1.27)jklm
15	IC 20645	0 (0.71)	0.28 (0.88)jklm	0.34 (0.92)k	1.18 (1.3)m	1.04 (1.24)lmn	0.8 (1.14)j	0.64 (1.07)mn	0.44 (0.97)l	0.59 (1.03)o
16	EC 390264	0 (0.71)	1.78 (1.51)abcdef	2.62 (1.77)a	4.64 (2.26)abc	3.90 (2.1)abcd	3.62 (2.03)abc	3.44 (1.98)abcd	3.04 (1.88)ab	2.88 (1.78)abcde
17	IC 249141	0 (0.71)	1.68 (1.48)abcdef	2.32 (1.68)ab	4.02 (2.12)abcdefg	3.54 (2.01)bcdef	3.20 (1.92)abcdef	2.80 (1.82)abcdefg	2.48 (1.73)abcde	2.51 (1.68)abcdefg
18	EC 244018	0 (0.71)	1.04 (1.24)abcdefghijkl	1.86 (1.52)abcdefg	4.16 (2.16)abcdef	4.06 (2.13)abcd	3.86 (2.09)abc	3.48 (1.99)abcd	2.74 (1.8)abcd	2.65 (1.71)abcdefg
19	EC 101994	0 (0.71)	1.38 (1.37)abcdefghi	2.24 (1.65)ab	5.20 (2.38)abc	3.50 (2)bcdef	3.18 (1.91)abcdef	2.66 (1.78)abcdefg	2.56 (1.75)abcde	2.59 (1.69)abcdefg
20	EC 390231	0 (0.71)	1.16 (1.25)abcdefghijk	2.38 (1.7)ab	3.42 (1.98)bcdefghijk	3.02 (1.88)cdefghi	2.86 (1.84)abcdef	2.84 (1.83)abcdefg	2.56 (1.75)abcde	2.28 (1.62)abcdefg
21	EC 309233	0 (0.71)	1.94 (1.55)abcd	2.56 (1.74)ab	3.56 (2.01)bcdefghij	3.36 (1.96)bcdef	3.12 (1.9)abcdef	3.02 (1.87)abcdefg	2.68 (1.78)abcd	2.53 (1.69)abcdefg
22	EC 390230	0 (0.71)	0.84 (1.15)defghijklm	0.96 (1.2)defghijk	1.74 (1.49)klm	1.64 (1.46)jklmn	1.34 (1.35)ij	1.16 (1.28)jklmn	1.08 (1.25)jkl	1.10 (1.24)jklmn
23	EC 390239	0 (0.71)	1.2 (1.30)abcdefghij	1.94 (1.56)abcde	3.78 (2.07)bcdefghi	3.24 (1.93)bcdefg	2.64 (1.77)cdefgh	2.34 (1.69)cdefgh	2.18 (1.64)abcdefgh	2.17 (1.58)defgh
24	EC 390219	0 (0.71)	1.32 (1.35)abcdefghi	1.76 (1.5)abcdefg	3.3 (1.95)bcdefghijk	3.22 (1.93)bcdefg	2.78 (1.81)bcdefg	2.28 (1.67)defgh	1.90 (1.55)bcdefghij	2.07 (1.56)fgh
25	EC 390204	0 (0.71)	0.16 (0.81)lm	0.30 (0.90)k	2.04 (1.54)jklm	1.46 (1.37)klmn	1.28 (1.32)ij	0.82 (1.15)klmn	0.50 (1)kl	0.82 (1.1)lmno
26	EC 390207	0 (0.71)	0.24 (0.86)klm	0.36 (0.93)k	1.54 (1.43)lm	1.42 (1.39)klmn	0.86 (1.17)j	0.52 (1.01)n	0.46 (0.98)kl	0.68 (1.06)no
27	EC 390266	0 (0.71)	1.24 (1.32)abcdefghi	1.90 (1.55)abcdefg	4.18 (2.16)abcdef	3.74 (2.06)abcdef	3.40 (1.97)abcde	2.84 (1.82)abcdefg	2.66 (1.78)abcd	2.50 (1.67)abcdefg
28	EC 343057	0 (0.71)	0.40 (0.95)ijklm	0.80 (1.14)ghijk	2.26 (1.66)fghijklm	2.02 (1.58)ghijklm	1.70 (1.48)ghij	1.38 (1.37)ijklm	1.20 (1.31)hijkl	1.22 (1.27)jklm
29	IC 259063	0 (0.71)	0.58 (1.04)ghijklm	0.66 (1.08)hijk	3.38 (1.95)bcdefghijk	2.42 (1.71)efghijk	2.20 (1.64)efghi	1.48 (1.41)hijkl	1.28 (1.33)fghijk	1.50 (1.36)ijk
30	IC 206240	0 (0.71)	0.72 (1.1)fghijklm	0.98 (1.22)cdefghijk	2.26 (1.66)fghijklm	1.74 (1.50)jklmn	1.58 (1.44)hij	1.50 (1.42)hijk	1.46 (1.4)efghij	1.28 (1.3)jkl
31	EC 367692	0 (0.71)	1.74 (1.5)abcdef	2.18 (1.64)ab	3.96 (2.11)abcdefg	3.8 (2.07)abcde	3.46 (1.99)abcde	3.06 (1.88)abcdef	2.88 (1.84)abc	2.64 (1.72)abcdef
32	EC 390219	0 (0.71)	0.06 (0.75)m	0.20 (0.84)k	1.30 (1.34)m	1.02 (1.23)mn	0.92 (1.19)j	0.72 (1.1)lmn	0.42 (0.96)l	0.58 (1.01)o
33	EC 390225	0 (0.71)	1.64 (1.47)abcdefg	1.98 (1.57)abcde	3.92 (2.1)bcdefgh	3.74 (2.06)abcdef	3.6 (2.02)abc	3.46 (1.99)abcd	2.58 (1.75)abcde	2.62 (1.71)abcdefg
34	IC 214751	0 (0.71)	0.46 (0.98)ijklm	0.52 (1.01)ijk	1.18 (1.3)m	0.98 (1.22)mn	0.92 (1.19)j	0.86 (1.17)klmn	0.56 (1.03)kl	0.69 (1.08)mno
35	EC 367694	0 (0.71)	0.84 (1.16)cdefghijklm	0.98 (1.22)cdefghijk	1.94 (1.56)ijklm	1.76 (1.51)jklmn	1.60 (1.45)hij	1.38 (1.37)ijklm	1.22 (1.31)ghijkl	1.22 (1.29)jkl
36	EC 724897	0 (0.71)	0.56 (1.03)hijklm	0.82 (1.15)fghijk	2.46 (1.72)defghijklm	1.76 (1.5)jklmn	1.38 (1.37)ij	1.16 (1.29)jklmn	0.94 (1.2)jkl	1.14 (1.25)jklmn

Table 2 Contd…

Sr. No.	G.No.	33SMW	34 SMW	35 SMW	36 SMW	37 SMW	38SMW	39 SMW	40 SMW	Mean
37	EC 724742	0 (0.71)	1.08 (1.26)abcdefghijk	1.28 (1.34)bcdefghij	4.52 (2.23)abcd	3.96 (2.11)abcd	3.44 (1.98)abcde	2.96 (1.86)abcdefg	2.28 (1.67)abcdefg	2.44 (1.64)abcdefg
38	IC 20720	0 (0.71)	1.36 (1.36)abcdefghi	2.10 (1.61)abcd	4.34 (2.2)abcde	4.06 (2.14)abcd	3.34 (1.96)abcde	2.6 (1.76)abcdefg	2.24 (1.66)abcdefgh	2.51 (1.67)abcdefg
39	IC 333106	0 (0.71)	2.08 (1.61)ab	2.4 (1.7)ab	3.68 (2.04)bcdefghij	3.54 (2.01)bcdef	3.42 (1.98)abcde	3.24 (1.93)abcd	2.48 (1.73)abcde	2.61 (1.71)abcdefg
40	EC 724907	0 (0.71)	0.88 (1.15)defghijklm	1.54 (1.39)abcdefghij	6.64 (2.62)a	3.14 (1.9)bcdefgh	2.96 (1.86)abcdef	2.18 (1.6)efghi	1.86 (1.51)cdefghij	2.40 (1.60)cdefgh
41	EC 724791	0 (0.71)	1.38 (1.37)abcdefghi	2.08 (1.61)abcde	4.40 (2.21)abcde	4.14 (2.15)abcd	4.10 (2.14)ab	3.72 (2.05)a	3.26 (1.94)a	2.89 (1.77)abcdef
42	EC 724805	0 (0.71)	1.08 (1.26)abcdefghijk	1.96 (1.56)abcdef	4.80 (2.3)abc	4.04 (2.13)abcd	3.94 (2.11)abc	3.40 (1.97)abcd	2.90 (1.85)abc	2.77 (1.74)abcdef
43	EC 724471	0 (0.71)	2.04 (1.60)ab	2.44 (1.71)ab	5.56 (2.45)ab	4.66 (2.27)ab	3.58 (2.02)abc	3.46 (1.99)abcd	2.62 (1.76)abcd	3.05 (1.82)ab
44	EC 724547	0 (0.71)	0.44 (0.97)ijklm	1.00 (1.22)cdefghijk	2.10 (1.62)ghijklm	2.00 (1.58)ghijklm	1.66 (1.47)hij	1.38 (1.37)ijklm	1.14 (1.28)ijkl	1.22 (1.27)jklm
45	EC 724805	0 (0.71)	0.80 (1.11)efghijklm	1.66 (1.44)abcdefgh	4.76 (2.29)abc	3.70 (2.05)abcdef	3.42 (1.98)abcde	3.06 (1.89)abcdef	2.36 (1.69)abcdef	2.47 (1.65)abcdefg
46	EC 724391	0 (0.71)	0.80 (1.14)defghijklm	1.46 (1.4)abcdefghij	4.78 (2.29)abc	4.02 (2.12)abcd	3.16 (1.91)abcdef	2.48 (1.73)bcdefg	1.90 (1.55)bcdefghij	2.33 (1.61)bcdefg
47	EC 724418	0 (0.71)	1.18 (1.30)abcdefghij	1.82 (1.52)abcdefg	3.96 (2.11)abcdefg	3.74 (2.06)abcdef	3.44 (1.98)abcde	2.58 (1.76)abcdefg	2.24 (1.66)abcdefgh	2.37 (1.64)abcdefg
48	EC 723987	0 (0.71)	1.12 (1.26)abcdefghijk	1.88 (1.54)abcdefg	3.98 (2.12)abcdefg	3.58 (2.02)abcdef	3.40 (1.97)abcde	3.38 (1.96)abcd	2.82 (1.82)abcd	2.52 (1.67)abcdefg
49	EC 724296	0 (0.71)	0.82 (1.15)defghijklm	0.96 (1.21)cdefghijk	2.16 (1.62)ghijklm	1.84 (1.52)ijklmn	1.40 (1.37)ij	1.16 (1.29)jklmn	1.06 (1.25)jkl	1.18 (1.27)jklm
50	EC 723784	0 (0.71)	1.34 (1.35)abcdefghi	1.72 (1.49)abcdefg	3.16 (1.9)cdefghijkl	2.74 (1.79)defghij	2.26 (1.66)defghi	1.98 (1.58)fghij	1.92 (1.56)bcdefghij	1.89 (1.5)ghi
51	IC 257449	0 (0.71)	0.92 (1.19)bcdefghijkl	1.84 (1.52)abcdefg	3.98 (2.11)abcdefg	3.72 (2.05)abcdef	3.38 (1.96)abcde	3.02 (1.87)abcdefg	2.18 (1.62)abcdefghi	2.38 (1.63)abcdefg
52	IC 202824	0 (0.71)	1.84 (1.53)abcde	2.40 (1.71)ab	5.00 (2.35)abc	3.90 (2.09)abcd	3.22 (1.92)abcdef	2.48 (1.73)abcdefg	2.44 (1.72)abcde	2.66 (1.72)abcdef
53	IC 201098	0 (0.71)	1.08 (1.26)abcdefghijk	1.46 (1.4)abcdefghij	4.24 (2.17)abcde	3.72 (2.05)abcdef	2.90 (1.85)abcdef	2.36 (1.69)cdefgh	1.64 (1.46)defghij	2.18 (1.57)efgh
54	EC 725153	0 (0.71)	1.40 (1.38)abcdefghi	1.62 (1.46)abcdefgh	4.12 (2.15)abcdef	3.66 (2.04)abcdef	3.04 (1.88)abcdef	2.82 (1.82)abcdefg	2.38 (1.70)abcde	2.38 (1.64)abcdefg
55	EC 738119	0 (0.71)	0.98 (1.2)bcdefghijkl	2.02 (1.57)abcde	4.38 (2.21)abcde	3.72 (2.05)abcdef	3.32 (1.95)abcde	3.18 (1.91)abcde	2.48 (1.71)abcde	2.51 (1.67)abcdefg
56	EC 725167	0 (0.71)	2.14 (1.63)a	2.22 (1.65)ab	4.58 (2.26)abc	3.62 (2.03)abcdef	3.34 (1.96)abcde	3.26 (1.94)abcd	2.92 (1.84)abc	2.76 (1.75)abcdef
57	Kashi Kanchan	0 (0.71)	1.34 (1.35)abcdefghi	2.60 (1.75)ab	4.68 (2.28)abc	4.54 (2.25)abc	4.24 (2.18)a	3.60 (2.02)ab	3.00 (1.87)abc	3.00 (1.8)abc
58	Kashi Nidhi	0 (0.71)	1.28 (1.3)abcdefghij	1.68 (1.45)abcdefgh	4.62 (2.24)abc	4.26 (2.17)abc	3.92 (2.1)abc	3.32 (1.95)abcd	2.44 (1.71)abcde	2.69 (1.71)abcdefg
59	Arka Suman	0 (0.71)	0.28 (0.89)jklm	0.50 (1)jk	0.98 (1.22)m	0.88 (1.18)n	0.86 (1.17)j	0.78 (1.13)klmn	0.56 (1.03)kl	0.61 (1.04)o
60	Bhagyalakshmi	0 (0.71)	2.02 (1.59)abc	2.72 (1.79)a	3.96 (2.11)abcdefg	3.84 (2.08)abcde	3.60 (2.02)abc	3.24 (1.93)abcd	2.94 (1.85)abc	2.79 (1.76)abcdef

Values in parentheses are square root transformed values. The letters followed by numbers are DMRT letters
G.No. indicates genotype number; SMW indicates standard meteorological week

CONCLUSIONS

An analysis of the population dynamics of *M. vitrata*, considering the phenology of crop development, will provide information on the specific time when the presence of this species is at its highest and when its activity is at its lowest. This data may be utilised to modify the duration of agricultural cultivation, determine the optimal dates for planting, and implement plant protection strategies to control insect populations. The highest occurrence of *M. vitrata* was recorded during the period of peak flowering and pod formation stage.

FUTURE SCOPE

Anticipating a rapid spread of pests is advantageous for the first control of agricultural pests. To enhance the efficiency of pest control in vegetable cowpea, information obtained from this research may be utilised to construct a population dynamics model for *M. vitrata.*

Author contributions: All the authors including Mirala Sruthi conceived and designed the analysis; Mirala Sruthi collected the data, contributed data and analysis tools, performed the analysis, and wrote the paper.

Acknowledgement. I extend my sincere thanks to Dr. L. K. Rath, Retd. Head of the Department of Entomology and Dr. T. Samal, Professor and Head, Department of Entomology, College of Agriculture, OUAT, Bhubaneswar, Odisha for their kind support rendered during the research.

Conflict of Interest. None.

REFERENCES

Akhauri, R. K. and Yadav, R. P. (2002). Population dynamics, damage pattern and management of spotted pod borer, *Maruca testulalis* (Geyer.) in early pigeonpea under North Bihar conditions. *Journal of Entomological Research*, *26*(2), 179-182.

Bajpai, G. C., Singh, I. S., Gupta, A. K. and Singh, A. K. (1995). Incidence of *Maruca vitrata* (Geyer) damaging pigeonpea at Pantnagar. *Indian Journal of Pulse Research*, *8*(2), 199-200.

Biswas, S. and Banerjee, A. (2019). Seasonal variation in incidence of insect pests occurring on green gram [*Vigna radiata* (Linn.) Wilczek] in lower gangetic plains of West Bengal. *International Journal of Chemical Studies*, *7*(6), 1583-1588.

Gopali, J. B., Raju, T., Mannur, D. M. and Suhas, Y. (2010). Web-forming lepidopteran, *Maruca vitrata* (Geyer): an emerging and destructive pest in pigeonpea. Karnataka *Journal of Agricultural Sciences*, *23*(1), 35-38.

Hinsu, M. K. (2005). Population dynamics, varietal susceptibility, loss estimation and chemical control of spotted pod borer, *Maruca testulalis* Geyer along with bionomics of *Helicoverpa armigera* Hubner on green gram *Vigna radiata* (I.) Wilczek. M. Sc. (Agri.) thesis submitted to the Junagadh Agricultural University, Junagadh, pp. 108.

Jayabal, T. D. and Kennedy, J. S. (2022). Influence of weather parameters on the seasonal abundance of legume pod borer *Maruca vitrata* (Crambidae: Lepidoptera) on dolichos bean (*Lablab purpureus* var. *typicus*). *Legume Research-An International Journal*, *45*(1), 110-115. DOI: 10.18805/LR-4699.

Kapoor, B. and Shankar, U. (2019). Seasonal incidence of *Maruca vitrata* Geyer and *Helicoverpa armigera* Hubner on black gram (*Vigna mungo* L. Hepper). *Journal of Entomology and Zoology Studies*, *7*(5), 1083-1087.

Kumar, G. T., Singh, R., Kaur, H. C. and Singh, P. (2019). Relative abundance, population dynamics and damage potential of spotted pod borer, *Maruca vitrata* (Fabricius) on early pigeon pea in Punjab. *International Journal of Tropical Insect Science*, *39*(3), 229-234.

Mahalakshmi, M. S., Sreekanth, M., Adinarayana, M., Reni, Y. P., Rao, Y. K. and Narayana, E. (2016). Incidence, bionomics and management of spotted pod borer [*Maruca vitrata* (Geyer)] in major pulse crops in India-A review. Agricultural Reviews, *37*(1), 19-26.

Pachani, B. G. (2000). Biology, population dynamics, varietal susceptibility and chemical control of spotted pod borer, *Maruca testulalis* (Geyer) on cowpea (*Vigna unguiculata* Walper). M. Sc. (Agri.) thesis submitted to the Gujarat Agricultural University, Sardar Krushinagar, pp. 88.

Pandey, A. K., Keval, R. and Yadav, A. (2015). Population dynamics of legume pod borer *Maruca vitrata* (Geyer) and blue butterfly *Lampides boeticus* L. on short duration pigeon pea, *Research in Environment and Life Sciences*, *8*(4), 777-778.

Pandit, T. R. and Dwivedi, S. A. (2021). A study on biology and management of spotted pod borer, *Maruca vitrata* (Geyer) in legumes. *Biological Forum–An International Journal*, *13*(02), 01-09.

Price, P. W., Denno, R. F., Eubanks, M. D., Finke, D. L., and Kaplan, I. (2011). Insect ecology: behavior, populations and communities. Cambridge University Press.

Rani, C. S., Rao, G. R., Chalam, M. S. V., Patibanda, A. K. and Rao, V. S. (2013). Summer season survey for incidence of *Maruca vitrata* (G.) (Pyralidae: Lepidoptera) and its natural enemies on green gram and other alternative hosts in main pulse growing tracts of Khammam District. *The Journal of Research ANGRAU*, *41*(3), 16-20.

Reddy, S. S., Reddy, C. N., Srinivas, C., Rao, A. M. and Reddy, S. N. (2017). Studies on population dynamics of spotted pod borer *Maruca vitrata* in dolichos bean, *Lablab purpureus* L. and their relationship with abiotic factors, *International Journal of Pure and Applied Biosciences*, *5*(4), 1232-1239.

Sharanabasappa, C. M., Kalleshwara Swamy, M. and Shivanna. B. K., (2013). Seasonal incidence of *Maruca vitrata* (Lepidoptera: Pyralidae) on groundnut (*Arachis hypogea*). *Insect Environment*, *19*(2), 126-129.

Shejulpatil, S. J., Kulkarni, S. R., Chavan, A. P., Kute, N. S. and Tambe, A. B. (2020). Seasonal incidence of spotted pod borer, *Maruca vitrata* (Geyer) on pigeonpea. *Journal of Entomology and Zoology Studies*, *8*(1), 715-719.

Singh, S. P., Singh, S. K. and Chandra, U. (2022). Incidence of insect pests on summer mungbean in relation to weather parameters. *Biological Forum – An International Journal*, *14*(3), 1492-1496.

Sonune, V. R., Bharodia, R. K., Jethva, D. M. and Dabhade, P. L. (2010). Seasonal incidence of spotted pod borer, *Maruca testulalis* (Geyer) on blackgram. *Legume Research-An International Journal*, *33*(1), 61-63.

Sreekanth, M., Ratnam, M. and Ramana, M. V. (2019). Population dynamics of pod borers on pigeonpea (*Cajanus cajan* (L) Millsp.) in relation to abiotic

factors. *International Journal of Bio-resource and Stress Management*, *10*(6), 616-620.
Srivastava, C. P., Pimbert, M. P. and Jadhav, D. R. (1992). Monitoring of adult population *Maruca testulalis* (Geyer) with light traps at Patancheru and Hisar in India. *International Pigeonpea Newsletter*, *15*, 27-28.
Sujatha, B. and Bharpoda, T. (2017). Succession of major insect pests and impact of abiotic factors in green gram. *Agriculture Update*, *12*(10), 2788-2794.
Sujithra, M. and Chander, S. (2014). Seasonal incidence and damage of major insect pests of pigeon pea, *Cajanus cajan* (L.). *Indian Journal of Entomology*, *76*(3), 202-206.
Umbarkar, P. S., Parsanna, G. J. and Jethva, D. M. (2010). Seasonal incidence of spotted pod borer, *Maruca testulalis* (Geyer) on green gram. *Agricultural Science Digest*, *30*(2), 150-151.
Virani, V. R. (2000). Population dynamics, varietal screening and chemical control of insect pest complex of black gram, *Vigna mungo* (L.) Hepper. Ph. D. thesis submitted to the Gujarat Agricultural University, Sardar Krushinagar, pp. 183.

How to cite this article: Mirala Sruthi, Pravasini Behera, S.K. Mukherjee, J. Padhi, P. Tripathy and K.C. Samal (2023). Population Dynamics of *Maruca vitrata* Fabricius on Vegetable cowpea Genotypes during Summer, 2021 and *kharif*, 2021. *Biological Forum – An International Journal, 15*(10): 1675-1685.