Int.J.Curr.Microbiol.App.Sci (2018) *7*(8): 1705-1715

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 7 Number 08 (2018)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2018.708.195

Seasonal Incidence and Population Dynamics of Major Insect Pest Species of Paddy Collected in Light Trap in Relation to Weather Parameters

S.K. Meena, A.K. Sharma and Rajesh Aarwe*

Department of Entomology, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur-482004, Madhya Pradesh, India

**Corresponding author*

Keywords

Light trap, Rice, Lepidoptera, Hemiptera, Orthoptera, Species

Article Info

Accepted:
10 July 2018
Available Online:
10 August 2018

A B S T R A C T

The present research was studied on seasonal incidence and population dynamics of major insect pest species of paddy collected in light trap by operating, Jawahar light trap (with 80 Watt mercury vapour lamp) in paddy field at Krishi Nagar experimental farm, Adhartal during *kharif* 2014. Result showed that all 8 species were identified as pests of paddy having regular occurrence in light trap catches like Army worm, *Mythimna separata* (Walker), Rice leaf folder, *Cnaphalocrocis medinalis* (Guenee), Rice butterfly, *Melanitis leda ismene* Cramer, Rice gundhi bug, *Leptocorisa acuta* (Thunberg), Green leaf hopper, *Nephotettix virescens* (Distant), Short horn grass hopper, *Tetrix subulata* Linnaeus, Field cricket, *Euscyrtus concinnus* (de Haan), and Mole cricket, *Gryllotalpa orientalis* Burmeister.

Introduction

Rice (*Oryza sativa* L.) is an important cereal crop in the world serving as staple diet for millions of peoples. Rice stand second in the world after wheat in area and production. Almost 90% of rice is grown and consumed in Asia (Anonymous, 2006).

At global level, rice is grown on an area of about 155.2 million ha with production and productivity of 461 million tonnes and 4.09 tonne ha^{-1} respectively. India ranks first in respect of area 43.95 million ha second in production 106.54 million tonne, only after China, but the productivity of rice is very low only 2.42 tonne ha^{-1}. In Madhya Pradesh rice is cultivated in area of 1.93 million ha with production of 2.78 million tonne and productivity of 1.44 tonne ha^{-1} (Anonymous, 2014).

Worldwide food plants are damaged by more than 10,000 species of insects (Dhaliwal *et al.*, 2007). In India, average losses of paddy production due to insect pests are 25-30% (Dhaliwal and Arora, 2010) and in Madhya Pradesh about 40-100 % losses were observed (Dhamdhere, 1990).

Nocturnal insects are often attracted to light sources that emit large amount of UV radiation, and devices that exploit this behavior, such as light traps for forecasting pest outbreaks, and electric insect killers, have been developed (Shimoda and Honda, 2013).

Garris and Snyder (2010) reported that phototactic behavior toward ultraviolet light varies among nocturnal flying insects.

Sinu *et al.,* (2013) suggested that that light trap is an effective, bias-free monitoring tool of moth pests, it has often been used in the ecological studies of lepidopteron insect pests in agro-ecosystems. Sharma *et al.,* (2004) suggested that light trap is an important tool for minimizing the insect pests damage without any toxic hazards.

Vaishampayan (2002) proposed a new concept of adult-oriented pest management strategy, which is based on the suppression of pest population through mass trapping and killing of adults using their behavioral responses (visual, olfactory, gustatory, sexual reproductive, biological, etc.) and describe the salient points of using light traps as a component of such strategy.

Now the use of light trap has become a common tool for various studies in entomological research.

Majority of these rice insect pests are phototactic in nature. Therefore light traps can be used as an effective IPM tool for monitoring and management of phototactic paddy pests. Sharma (2004) monitored the seasonal activity of 14 major and minor insect pest species of paddy through light trap at Jabalpur, similarly Sharma and Vaishampayan (2009)[20] evaluated light trap as direct control tool against four major pest species of paddy in Jabalpur, M.P., with exception of army worm *Mythimna separata* (Walker) results have consistently proved the utility of light trap as direct control tool againest remaining three major species namely *Sogatella furcifera* (Horvath) *Cnaphalocrocis medinalis* (Guenee) and grass hopper (Complex). Effective coverage area was between 100-200 m distances from trap covering around 5 to 6 ha of crop area per trap. The present investigation is proposed to observe the "Seasonal Incidence and Population Dynamics of Major Insect Pest Species of Paddy Collected in Light Trap In Relation To Weather Parameters".

Materials and Methods

The present experiment entitled, "Seasonal incidence and population dynamics of major insect pest species of paddy collected in light trap in relation to weather parameters" was carried out at the Krishi Nagar experimental farm, Adhartal, JNKVV, Jabalpur, Madhya Pradesh during the period between last week of June to last week of December, 2014.

Details of light trap unit

New Jawahar light trap model developed at JNKVV, Jabalpur with mercury vapor lamp (80 W) as light source was used for the present study. The light trap units comprised of two components are as follows:-

Trapping device

It is made up of 24 gauge GI sheet consisting of a funnel (40 cm top diameter), baffle plates each 30 x 12 cm in size. In this design long funnel stem (pipe) is provided in place of collection chamber which is directly attached to collection trey.

Insect collection device

It is made up of 24 gauge GI sheet 40 cm x 40 cm x 15 cm in size with cupboard and built-in locking system. The insects collected in the chamber of light trap were killed by the exposure of Dichlorvos 76 EC vapours (as fumigating agent) which is directly placed in collection tray for instant killing of trapped insects.

Observation procedure

Seasonal activity study of major insect pest species of paddy was recorded by operating the light trap in *Kharif* season of 2014. Major and minor pests of paddy were observed on daily basis. In order to study the seasonal activity, daily trap catch was converted into weekly total and mean per day per week (weekly mean/day).

Weekly divisions are based on standard meteorological week. Observations of weather data (Maximum temperature, Minimum temperature, relative humidity morning & evening, rainfall, number of rainy days, sunshine hours, wind velocity, morning & evening vapour pressure and evaporation etc.) were recorded on daily basis from JNKVV meteorological observatory.

The correlation coefficient between major insect pests of paddy and various weather parameters was calculated by using the correlation regression analysis.

Statistical method

Correlation and regression of the abiotic factors on major insects were worked out by using the formula as suggested by Snedecor and Cochran (1967).

$$\text{Correlation 'r'} = \frac{\sum x\,y - \frac{\sum x.\sum y}{n}}{\sqrt{\left\{\sum_x 2 - \frac{((\sum x)^2)}{n}\right\}\left\{\sum_y 2 - \frac{((\sum y)^2)}{N}\right\}}}$$

Regression $\hat{Y} = a + bx$ (R^2)

a = Intercept.

b = Regression coefficient.

R^2 = Coefficient of multiple determination.

Test of significance 'r'

$$t = \frac{r}{\sqrt{1 - r^2}}\sqrt{n - 2}$$

Results and Discussion

Seasonal activity of major insect pest species of paddy collected in light trap were studied by operating, Jawahar light trap (with 80 Watt mercury vapour lamp) in paddy field at Krishi Nagar experimental farm, Adhartal during *kharif* 2014.

In all 8 species were identified as pests of paddy having regular occurrence in light trap catches (Table 1).

Correlation studies

The correlation coefficients among various insect population and weather parameters viz., maximum temperature, minimum temperature, sunshine, wind velocity, morning relative humidity, evening relative humidity, rainfall, morning vapor pressure, evening vapor pressure, evaporation and number of rainy days have been computed.

Army worm, *Mythimna separata* (Walker)

Army worm was first recorded during 34^{rth} SW (standard week) in light trap. The activity period of *Mythimna separata* (Walker) was observed from mid of August to December with two distinct peaks during 40th and 44^{rth} SW. The highest peak was observed in 44^{rth} SW (Table 1).

In accordance with the present findings Muchhala (2014) also reported two distinct peaks of *M. separata* during 39th and 44^{rth} SW, while Sharma *et al.*, (2013) reported that highest peaks of *M. separata* were observed during third week of September and November. Sharma *et al.*, (2002) also reported

that *Mythimna separata* (Walker) was observed highest in trap catches during September.

Correlation between various weather parameters and adults of army worm moth catches were found non-significant (Table 2).

On contrast to the present findings, Muchhala (2014) reported that maximum temperature and evaporation exhibited a significant positive effect on moths catches, while Sharma *et al.,* (2013) found that higher rainfall, lower mean maximum temperature and higher relative humidity were favourable for *M. separata*. Sharma *et al.,* (2002) reported that rainfall, morning and evening relative humidity were positively associated with trap catches, while maximum temperature, evaporation, sunshine and wind velocity showed a negative correlation with trap catches of *M. separata*.

Rice leaf folder, *Cnaphalocrocis medinalis* (Guenee)

Rice leaf folder was first recorded during 38^{rth} SW in light trap. The activity period of *C. medinalis* was observed from September to December. Two distinct peaks were recorded in 40th SW and 44^{rth} SW. The highest peak was observed in 44^{rth} SW (Table 1). In accordance with the present findings, Patel *et al.,* (2011) reported that rice leaf folder, *C. medinalis* reached its peak level during 43rd SW, Khan and Ramamurthy (2004) revealed that the moth numbers were higher in the month of October, followed by September.

In contrary of present findings, Hafeez *et al.,* (2010) reported that adults of leaf folder start in light trap catches during 26th SW and reached its highest peak in 33rd SW, while Sharma *et al.,* (2013) from Jabalpur recorded three to four peaks of rice leaf folder during the main cropping season (*kharif*) of paddy. Harinkhere *et al.,* (1998) reported that first appearance of *C. medinalis* in trap catches started from first week of August and major peaks were observed during September and October at Balaghat (M.P.). However Manisegaran and Letchoumanane (2001) reported that weekly catches of rice leaf folder was highest during August and September in Tamil Nadu.

Correlation between rice leaf folder catch and maximum temperature minimum temperature, morning vapor pressure and evaporation found significant positive, while rest of weather parameters found non-significant (Table 2).

In accordance with present findings, Patel *et al.,* (2011) reported that Maximum temperature (r=0.726) had significant positive correlation with trap catches. Hafeez *et al.,* (2010) reported that minimum temperature (r=0.513) had a significant positive effect on trap catches. In contrary to current findings, Muchhala (2014) observed that all the weather parameters did not show any significant effect on moth catches, while Patel *et al.,* (2011)[15] reported that wind velocity (r=-0.539) and rainy days (r=-0.518) had significant negative correlation. Sabir *et al.,* (2006)[18] observed that the maximum and minimum temperature have negative effect, while rainfall having positive effect on trap catches of *C. medinalis*. Kathirvelu and Manickavasgam (2007) also reported that leaf folder had significant negative correlation with maximum temperature and significant positive correlation with sunshine.

Rice butterfly, *Melanitis leda ismene* Cramer

Rice butterfly was first recorded during 33rd SW in light trap. The activity period of *M. leda ismene* was observed from mid of August to November with three distinct peaks during 39th, 42nd and 45th SW, respectively.

Table.1 Seasonal activity of insect pest species of paddy during *kharif* 2014 (June to December) (Weekly average)

SW	*Mythimna separata* (Walker)	*Cnaphalocrosis medinalis* (Guenee)	*Melanitis leda ismene* Cramer	*Leptocorisa acuta* (Thunberg)	*Nephotettix virescens* (Distant)	*Tetrix subulata* Linnaeus	*Euscyrtus concinnus* (de Haan)	*Gryllotalpa orientalis* Burmeister
26	0	0	0	0	0	0.57	39.85	0.71
27	0	0	0	0	3.42	0.57	102.42	2.85
28	0	0	0	0	11.14	0.71	147.42	3.14
29	0	0	0	0	13	1	218.14	4
30	0	0	0	0	7.28	1.14	300.42	4.85
31	0	0	0	1.71	11.71	1.14	304.85	6.57
32	0	0	0	1.85	4	5.71	321.42	15
33	0	0	0.42	1.71	6.71	3.42	343.85	13
34	0.28	0	0.42	2.14	21.42	1.85	340.71	14.28
35	1.14	0	0.57	2.71	10	0.85	298.57	12
36	0.42	0	0.71	3.57	11.14	0.71	263	15.42
37	1.14	0	0.85	0.42	4.28	0.14	228	11
38	3.14	0.71	0.85	0	11.57	2.28	220	5.85
39	2.57	3.14	1	0.28	9.57	1.85	152.85	17.71
40	7.71	3.42	0.57	3.14	48	1.57	119.28	17.57
41	2.57	1.57	1.14	3.42	84.42	1.14	28.28	17.42
42	5.14	2.42	2.14	15.85	159.14	1	166	8.28
43	3.85	2	0.42	11.57	143.42	0.14	156.71	4.85
44	36.71	3.71	0.42	8.14	34.85	0.71	25.71	0.85
45	22.85	2.28	2.28	0.85	13.57	0.42	19	1.42
46	17.71	1.85	0.57	0	0	0.28	15.71	2.71
47	2.57	0.42	0	0	0	0.14	7.71	0.71
48	3	1.14	0	0	0	0	6.14	0.57
49	2.57	0.14	0	0	0	0	4.71	0.71
50	0.85	0.57	0	0	0	0	2.57	0.57
51	2.14	0.71	0	0	0	0	1.85	0.42
52	0.71	0	0	0	0	0	0.28	0

Table.2 Correlation coefficient of weather factors on light trap catches of *Mythimna separata* (Walker), *Cnaphalocrocis medinalis* (Guenee) and *Melanitis leda ismene* Cramer

Weather Parameter	*Mythimna separata* (Walker)		*Cnaphalocrocis medinalis* (Guenee)		*Melanitis leda ismene* Cramer	
	R	Byx	R	Byx	R	Byx
Maximum temperature (°C)	-0.170 NS	-	**0.549***	**0.222**	0.207NS	-
Minimum temperature (°C)	-0.119 NS	-	**0.617***	**0.113**	0.075NS	-
Sunshine (hrs)	0.163 NS	-	0.322NS	-	0.278NS	-
Rainfall (mm)	0.268 NS	-	-0.183NS	-	-0.299NS	-
Morning relative humidity (%)	-0.151 NS	-	0.013NS	-	0.284NS	-
Evening relative humidity (%)	-0.404 NS	-	0.205NS	-	-0.085NS	-
Wind Velocity (km/hr)	-0.359 NS	-	-0.170NS	-	-0.276NS	-
Morning vapor pressure (mm)	-0.179 NS	-	**0.584***	**0.126**	0.095NS	-
Evening vapor pressure (mm)	-0.27 NS	-	0.493NS	-	0.037NS	-
Evaporation (mm)	0.78 NS	-	**0.561***	**0.81**	-0.085NS	-
Number of rainy days	-0.271 NS	-	-0.018NS	-	-0.184NS	-
NS = Non-Significant		*.= Significant at 0.05 level			** = Significant at 0.01 level	

Table.4 Correlation coefficient of weather factors on light trap catches of *Tetrix subulata* Linnaeus *Euscyrtus concinnus* (de Haan) and *Gryllotalpa orientalis* Burmeister

Weather Parameter	*Tetrix subulata* Linnaeus		*Euscyrtus concinnus* (de Haan)		*Gryllotalpa orientalis* Burmeister	
	R	Byx	R	byx	R	Byx
Maximum temperature (°C)	0.009NS		0.106	-	0.315NS	-
Minimum temperature (°C)	**0.492****	**0.089**	**0.747****	**13.64**	**0.559****	**0.513**
Sunshine (hrs)	-0.169NS	-	**-0.537****	**-29.61**	-0.060NS	-
Rainfall (mm)	0.338NS	-	**0.434***	**0.773**	0.96NS	-
Morning relative humidity (%)	0.056NS	-	0.289NS	-	0.248NS	-
Evening relative humidity (%)	**0.473***	**0.031**	**0.836****	**5.522**	**0.536****	**0.178**
Wind Velocity (km/hrs)	**0.507****	**0.314**	**0.515****	**33.02**	0.202NS	-
Morning vapor pressure (mm)	**0.526****	**0.117**	**0.831****	**18.33**	**0.632****	**0.701**
Evening vapor pressure (mm)	**0.513****	**0.100**	**0.861****	**17.08**	**0.618****	**0.616**
Evaporation (mm)	0.199NS	-	0.177NS	-	0.095NS	-
Number of rainy days	0.270NS	-	**0.574****	**31.87**	0.325NS	-
NS = Non-Significant		*.= Significant at 0.05 level			** = Significant at 0.01 level	

Table.3 Correlation coefficient of weather factors on light trap catches of *Leptocorisa acuta* (Thunberg) and *Nephotettix virescens* (Distant)

Weather Parameter	*Leptocorisa acuta* (Thunberg)		*Nephotettix virescens* (Distant)	
	R	byx	R	Byx
Maximum temperature (^{o}C)	0.197NS	-	0.320NS	-
Minimum temperature (^{o}C)	0.031NS	-	**-0.519***	**-6.603**
Sunshine (hrs)	0.215NS	-	0.425NS	-
Rainfall (mm)	-0.227NS	-	-0.435NS	-
Morning relative humidity (%)	0.288NS	-	0.244NS	-
Evening relative humidity (%)	-0.039NS	-	-0.387NS	-
Wind Velocity (km/hrs)	-0.307NS	-	**-0.525***	**-12.47**
Morning vapor pressure (mm)	0.049NS	-	**-0.491***	**-6.933**
Evening vapor pressure (mm)	0.008NS	-	**-0.483***	**-5.161**
Evaporation (mm)	-0.163NS	-	-0.295NS	-
Number of rainy days	-0.177NS	-	-0.455NS	-

The highest weekly peak was observed in 45th SW (Table 1).

Similar to the present findings, Muchhala (2014) reported three distinct peaks during 38^{rth}, 42nd and 44^{rth} SW, respectively. Major activity period was observed from August to December at Jabalpur.

In contrary to present findings, Sharma *et al.*, (2004) from Jabalpur reported that major activity period of *Melanitis leda ismene* Cramer was observed in light trap from July to August and peak period was observed during September.

Correlation between various weather parameters and rice butterfly catches were found non-significant (Table 2).

In contrast to the present findings, Muchhala (2014) observed that maximum temperature exhibited a significant positive effect on butterfly catches.

Rice Gundhi bug, *Leptocorisa acuta* (Thunberg)

Rice gundhi bug was first recorded during 31st SW in light trap. The activity period of *Leptocorisa acuta* (Thunberg) was observed from August to mid of November with two distinct peaks during 36th and 42nd SW. The highest peak was observed in 42nd SW (Table 1).

In accordance with the present findings, Sharma *et al.*, (2011) also reported through light trap collection over 15 years that maximum population of *L. acuta* was observed during third week of October, while Venkatesh *et al.*, (2009) reported that higher activity of ear head bug, *Leptocorisa* sp. was observed during September to October in *kharif* of 2006, which is in contrast to present findings. Correlation between various weather parameters and rice gundhi bug catches were found non-significant (Table 3).

In contrast with the present findings, Sharma *et al.,* (2004) found that rainfall had positive correlation of order 0.857 with population buildup of *L. acuta* whereas Bhatnagar and Saxena (1999) found a positive correlation between maximum temperature & sunshine and trap catches of *L. acuta*, they also found significant negative correlation of minimum temperature, evening relative humidity and rainfall with light tap catches of *L. acuta* at Jagdalpur, India.

Green leaf hopper, *Nephotettix virescens* (Distant)

Green leaf hopper was first recorded during 27th SW in light trap. The activity period of *N. virescens* was observed from July to mid of November with two distinct peaks during 34^{rth} and 42nd SW respectively.

The highest weekly peak was observed in 42nd SW (Table 1). The present finding confirms the finding of Sharma *et al.,* (2004)[23] who also reported that maximum population of *N. virescens* was recorded during the third week of October.

On the contrary of present findings, Sabale *et al.,* (2010) also reported that first peak of green leaf hopper, *N. virescens* was observed during 38^{rth} to 41st SW, the second peak was observed during 45th SW and the third peak was observed during 52nd to 2nd SW, respectively at Kelara. Srinavasa *et al.,* (1991) recorded that *N. virescens* (Distant) was present throughout this period but showed peaks of abundance in November and May.

Correlation between minimum temperature, wind velocity, morning and evening vapor pressure showed significant negative effect on green leaf hopper catches, while rest of weather parameters were found non-significant (Table 3).

In contrast with the present findings, Kathirvelu and Manickavasgam (2007) observed that green leaf hopper were positively correlated with maximum & minimum temperature, sunshine and rainy days, similarly Samim *et al.,* (2009) revealed that the bright sunshine hours had a significant positive correlation (r=0.166) with green leaf hopper.

Short horn grass hopper, *Tetrix subulata* Linnaeus

Short horn grass hopper was first recorded during 26th SW in light trap. The activity period was observed from June to mid of November with two distinct peaks during 32nd SW and 38^{rth} SW. The highest peak was observed in 32nd SW (Table 1).

In contrast to the present findings, Sharma *et al.,* (2006)[22] observed two species of grass hopper viz. *Trilophidia cristella* S. and *Gastrimargus transversus* T. in light trap catches in paddy field during 2002 (*kharif* season) at Jabalpur while Singh and Ramaneek (2007) reported that population fluctuations of twenty four species of orthopterans, were correlated with temperature and relative humidity,

In all six families viz. Gryllidae, Gryllotalpidae, Tettigoniidae (belonging to Suborder Ensifera) and Acrididae, Tridactylidae, and Tetrigidae (belonging to Suborder Caelifera) were collected. Gryllidae was found dominant followed by Tetrigidae as compared to other families.

Correlation between minimum temperature, evening relative humidity, wind velocity, morning vapor pressure and evening vapor pressure were showed significant positive correlation, while rest of weather parameters were found to non-significant with grass hopper catches (Table 4).

Field cricket, *Euscyrtus concinnus* (de Haan)

Field cricket was first recorded during 26th SW in light trap. The activity period of *E. concinnus* was observed from June to December with two distinct peaks during 33rd and 42nd SW. The highest peak was observed in 33rd SW (Table 1).

Similar to the present findings, Sharma *et al.*, (2004)[23] also reported the major activity period of field cricket between July to October with maximum monthly catches during July, While Rathore (2001) reported that major activity period of field cricket was observed during September and October. Highest monthly catches were recorded during September (320 crickets) at Jabalpur.

Correlation between minimum temperature, rainfall, evening relative humidity, wind velocity, morning vapor pressure, evening vapor pressure and number of rainy days showed significant positive correlation and field cricket catches was found significantly positive, while sunshine exhibited a significant negative effect on crickets catches. Effect of maximum temperature, morning relative humidity and evaporation was found non-significant (Table 4).

Mole cricket, *Gryllotalpa orientalis* Burmeister

Mole cricket was first recorded during 26th SW in light trap. The activity period of *Gryllotalpa orientalis* Burmeister was observed throughout the season (June to December) with three distinct peaks during 32nd, 36th and 39th SW. The highest peak was observed in 39th SW (Table 1).

In contrast to the present findings, Wang *et al.,* (2012) reported that the mole cricket (*Gryllotalpa* sp.) had two damage peaks (late May to early July, early September to mid and late October) at Hangzhou (China), similarly Rathore (2001) also reported that major activity period of mole cricket was observed during September to October with highest monthly catches during September (285 crickets) at Jabalpur. Whereas Bhowmick (1985) reported that highest monthly catches of mole crickets were recorded during November (1395 adults) at Waraseoni, Balaghat, Madhya Pradesh.

Correlation between various weather parameters and mole cricket catches were found non-significant, except minimum temperature, evening relative humidity, morning vapor pressure and evening vapor pressure, which exhibited a significant positive effect on crickets catches (Table 4).

References

Anonymous, 2006. Rice in India hand book of statistics, Director of Rice Development, Government of India, Hyderabad (AP).

Anonymous, 2014. Agriculture Statistics at a glance, Department of Agriculture and co-operation, Ministry of Agriculture, Government of India, New Delhi.

Bhatnagar, A., and Saxena, RR. 1999. Environmental correlates of population build up of rice insect pests through light trap catches. Oryza 36(3): 241-245.

Bhowmick, AK. 1985. Role of light trap in surveillance and management of insect pests of forest trees of major economic importance. Ph.D. Thesis, RDVV, Jabalpur.85p.

Dhaliwal, G.S., and Arora, R. 2010. Integrated Pest Management. Kalyani Publishers, New Delhi, India, 369 p.

Dhaliwal, G.S., Dhawan, A.K., and Singh, R. 2007. Biodiversity and Ecological

Agriculture Issues and Prospectives. Indian Journal of Ecology 34(2): 100-109.

Dhamdhere, SV. 1990. Phansalon Ke Pramukh Hanikark Keet. Haryana Sahitya Academy, Chandigarh. 374p.

Garris, H.W., and Snyder, JA. 2010. Sex-specific attraction of moth species to ultraviolet light traps. Southeastern Naturalist 9(3): 427-434.

Hafeez, A.K., Devinder Sharma, R.B., Jamwal, V.V.S., and Saurav, Gupta. 2010. Seasonal incidence, infestation and trap catches of *Cnaphalocrocis mendinalis* (Guenee) in rice. Annals of Plant Protection Sciences 18(2): 380-383.

Harinkhere, J.P., Kandalkar, VS., and Bhowmick, AK. 1998. Seasonal abundance and association of light trap catches with field incidence of rice leaf folder (*Cnaphalocrocis medinalis* Guenee). Oryza 35(1): 91-92.

Kathirvelu, C., and Manickavasgam, S. 2007. Correlation of light trap catches of important parasitoids, predators and pest complex of rice with meteorological parameters. Hexapoda 14(1): 9-14.

Khan, Z.H., and Ramamurthy, VV. 2004. Influence of weather factors on the activity of rice leaf folder, *Cnaphalocrocis medinalis* (Guene). Annual of Plant Protection Sciences 12(2): 267-270.

Manisegaran, S., and Letchoumanane, S. 2001. Influence of weather factors on the population of rice leaf folder in the coastal region of Karaikal. Madras Agricultural Journal 88(7/9): 502-503.

Muchhala, Y. 2014. Study on insect pest fauna of paddy ecosystem collected in light trap in Jabalpur region. M.Sc Thesis, JNKVV, Jabalpur. 1-109p.

Patel, H.N., Kadu, RV., and Landge, SA. 2011. Study on seasonal incidence of rice leaf folders (*Cnaphalocrocis medinalis* Guen. and *Pelopidas mathias* Fb.) of paddy and its correlation with weather parameters. International Journal of Plant Protection 4(1): 175-180.

Rathore, MS. 2001. Studies on the major insect pests of vegetables collected in light trap in vegetable area at Jabalpur. M. Sc. Thesis, JNKVV, Jabalpur. 29-35p.

Sabale, J.P., Chandana, Das and Samui, RP. 2010. Influence of weather factors on light trap catches of green leaf hopper at Pattambi, Kerala. Journal of Agrometeorology 12(1): 108-110.

Sabir, A.M., Sohail, Ahmed, Mansoor-Ul-Hassan, Sahi, and Abdul, Qadir. 2006. Pest weather interaction of major insect pest in rice ecosystem. SAARC Journal of Agriculture 4: 203-212.

Shamim, M., Shekh, AM., Patel, V.J., Dodia, J.F., Korat, D.M., and Mehta, AM. 2009. Effect of weather parameters on population dynamics of green leaf hopper and white backed plant hopper in paddy grown in middle Gujarat region. Journal of Agrometeorology 11(2): 172-174.

Sharma, A.K. 2004. Scope of use of light trap as IPM tool in paddy ecosystem. Ph.D. Thesis, RDVV, Jabalpur. 1-136p.

Sharma, A.K., and Vaishampayan, SM. 2009. Evaluation of light trap as eco-friendly control tool in the management of insect pest species of paddy ecosystem. JNKVV Research Journal 44(2): 183-187.

Sharma, A.K., Barche, S., and Mishra, PK. 2013. Seasonal activity of *Sogatella furcifera* H., *Cnaphalocropcis medinalis* G. and *Mythimna separata* W. in relation to weather parameters in Central India. Technofame Vol. (1): 19-29p.

Sharma, A.K., Vaishampayan, S., and Vaishampayan, SM. 2006. Distribution of insect pests fauna of rice ecosystem collected through light trap at Jabalpur. JNKVV Research Journal 40(1&2): 50-60.

Sharma, H.C., Sullivan, D.J., and Bhatnagar, VS. 2002. Population dynamics and natural mortality factors of the Oriental armyworm, *Mythimna separate* (Lepidoptera: Noctuidae), in South Central India. Crop Protection 21(9): 721-732.

Sharma, M.K., Asrat Atsedewoin, and Fanta, S. 2011. Forewarning models of the insects of paddy crop. International Journal of Biodiversity and Conservation 3(8): 367-375.

Shimoda, M., and Honda, K. 2013. Insect reactions to light and its applications to pest management. Applied Entomology and Zoology 48(4): 413-421.

Singh Devinder, and Ramaneek, HB. 2007. Population dynamics of Orthoptera (Insecta) collected from light trap. Journal of Entomological Research 31(1): 63-71.

Sinu, P.A., Picklu Mandal, Dipak Banerjee, Sadhan Mallick, Tapan Talukdar and Pathak, SK. 2013. Moth pests collected in light traps of tea plantations in North East India: species composition, seasonality and effect of habitat type. Current Science 104(5): 646-651.

Snedecor, G.W., and Cochran, WG. 1967. Statistical Methods. Oxford and IBH Publishing Company. New Delhi. 1-292 p.

Srinavasa, N., Viraktamath, C.A., and Sathyanarayana, J. 1991. Relative abundance of major insect pests of rice in light trap and their incidence in the field. Indian Journal of Entomology 53(4): 603-607.

Vaishampayan, SM. 2002. Use of light trap as a component of adult oriented strategy of pest management. Resources management in plant protection, Indian Hydrabad publication, 139-144p.

Venkatesh Hosamani, Pradeep, S., Sridhara, S., and Naik, MI. 2009. Incidence of rice earhead bug, *Leptocorisa oratorius* (F.) (Hemiptera: Alydidae) in Bhadra command area and effect of its feeding on grain damage. Environment and Ecology 27(2): 708-712.

Wang DaoZe, Hong WenYing, Wu YanJun, Wang AiJuan and Wei JiQian. 2012. Study on the occurrence regularity and prediction model of underground pest adults in Hangzhou district. [Chinese] Acta Agriculturae Zhejiangensis; 24(6): 1050-1057.

How to cite this article:

Meena, S.K., A.K. Sharma and Rajesh Aarwe. 2018. Seasonal Incidence and Population Dynamics of Major Insect Pest Species of Paddy Collected in Light Trap in Relation to Weather Parameters. *Int.J.Curr.Microbiol.App.Sci.* 7(08): 1705-1715.
doi: https://doi.org/10.20546/ijcmas.2018.708.195