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Effect of abiotic factors on seasonal fluctuation of major phototectic insect pests of rice

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Abstract
Major activity period of *M. separata* (Walker) was observed from 33rd to 52nd SW (13 Aug. to 31 December 2014). *L. acuta* (Thunberg) was active from 31st to 46th SW (30 July to 18 Nov. 2014). *N. virescens* (Distant) was observed from 27th to 47th SW (02 July to 25 Nov. 2014). *T. subulata* (Linnaeus) activity was observed from 26th to 48 SW (25 June to 02 Dec. 2014) respectively. Among all the abiotic factors, rainfall and morning relative humidity were showed significantly negative correlation with *M. separata* sp. (r= -0.452*and-0.040 byx), (r= -0.450*and 0.108 byx), evening vapor pressure had significantly negative correlation (r= -0.394*and 0.470 byx) with *N. virescens* while minimum temperature, rainfall and morning relative humidity and evaporation has significantly positive correlation with the activity of *T. subulata* (r= +0.541** and byx= +0.104) (r= +0.529** and byx= +0.004) (r= +0.544** and byx= +0.016) (r= +0.561** and byx= +0.209).

Keywords: abiotic factors, rice, phototactic, insect pests

Introduction
Rice (*Oryza sativa* L.) is an important cereal crop in the world serving as a staple diet for millions of peoples. Almost 90 % of rice is grown and consumed in Asia [1]. Insect pests damage is one of the most important limiting factor for increase of rice yield. Light traps can be used as an effective IPM tool for monitoring and management of phototectic rice pests. Many of the insects mostly nocturnal and few diurnal species are positively phototropic (phototactic) and are attracted towards light. Light trap is an adequate indicator of the ecological effects of climate change on insects [2, 3] Monitored the seasonal activity of 14 major and minor insect pest species of rice through light trap at Jabalpur, similarly [6] evaluated light trap as direct control tool against four major pest species of rice in Jabalpur, M.P., with exception of *Mythimna separate* (Walker) result have consistently proved the utility of light trap as direct control tool against remaining three major species namely *Sogatella furcifera* (Horvath) *Cnaphalocrocis medinalis* (Guenee) and Grass hopper (Complex). Therefore the present experiment was conducted with an objective to collect significant information on impact of weather factors on seasonal fluctuation, distribution and occurrence of major phototactic insect pests of rice collected through light trap.

Materials and Methods
The experiment was conducted in rice field at research farm, JNKVV Jabalpur during *kharif* 2014. The experiment was conducted by using the new Jawahar model of light trap with Mercury vapor lamp (80 W.) was used as light source. Seasonal activities of major insect pests were recorded on daily basis by operating the light trap throughout the season and were converted into standard weekly averages. This observation method is similar to the method adopted by [10]. Observations of weather data (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 etc.) were recorded on daily basis from JNKVV meteorological observatory. The correlation coefficient between in all four major species was and various weather factors were calculated by using the statistical correlation regression analysis.

Result and Discussions
Four major insect pests species namely Army worm *M. separata*, Gundhi bug *L. acuta* Green leaf hopper *N. virescens* and Short horn grass hopper *T. subulata* were identified as important phototactic insect pests in this region because they occurred in significantly high numbers in

trap catches and in field. Species wise as description is as follows.

***Mythimna separata* (Walker)**

It is a major pest of Rice in Jabalpur. Activity period of *M. separata* was observed from 33rd to 52nd SW (13 Aug. 2014 to 31 Dec. 2014) with two distinct peaks during 44th and 45th SW (38.57 and 23.28 moths/ SW respectively) (Fig. 01). The highest peak was observed in 44th SW during this period maximum temperature and minimum temperature were 27.9 ^{0}C and 14.4 ^{0}C respectively, whereas morning and evening relative humidity and vapor pressure were 87 and 29 percent and 12.4 and 9.7 mm respectively. Further sunshine, wind velocity and evaporation were 8.6 hrs, 1.6 km/hrs and 2.9 mm respectively. There was no rainfall during this week. Present finding are accordance with those of [5, 7, 9] also reported that rice *M. separata* as major pest of Rice through light trap. Correlation coefficient between various weather parameters and *M. separata* was no significance except rainfall (mm) and morning relative humidity which exhibited significance negative effect on *M. separata* moths catches. Regression coefficient between various weather parameters and *M. separata* was non significancant except sunshine (hrs), evening relative humidity (%) and evening vapor pressure (mm) which showed positive correlation with moth catches.

***Leptocorisa acuta* (Thunberg)**

Activity period of *L. acuta* was observed from 31st to 46th SW (30 July 2014 to 18 Nov. 2014) with two distinct peaks during 42th and 43th SW (16.85 and 12.00 bugs/ SW respectively) (Fig. 02). The highest peak was observed in 42th SW, during this period maximum temperature 32.5 ^{0}C and minimum temperature 18.8 ^{0}C whereas morning and evening relative humidity and vapor pressure were 91 and 44 percent and 16.9 and 15.3 mm respectively. Further sunshine, wind velocity and evaporation were 7.9 hrs, 2.3 km/hrs and 2.9 mm respectively. There was no rainfall during this week. Present finding are accordance with those of [8] also reported through light trap collection over 15 years that maximum population of *L. acuta* was observed during third week of October. Correlation coefficient between various weather parameter and *L. acuta* catches were found non- significant.

***Nephotettix virescens* (Distant)**

Activity period of *N. virescens* was observed from 27th to 47th SW (02 July 2014 to 25 Nov. 2014) with three distinct peaks during 34th, 42nd and 43rd SW (107.71, 166.85 and 146.00 hoppers/ SW respectively) (Fig. 03). The highest peak was observed in 42th SW during this period maximum temperature and minimum temperature 32.5 ^{0}C and 18.8 ^{0}C respectively whereas morning and evening relative humidity and vapor pressure were 91 and 44 percent and 16.9 mm and 15.3 mm respectively. Further sunshine, wind velocity and evaporation were 7.9 hrs, 2.3 km/hrs and 2.9 mm respectively. There was no rainfall during this week. Present finding are accordance with those of [4] who also reported that maximum population of *N. virescence* was recorded during the third week of October. Correlation coefficient between various weather parameters and *N. virescens* catches were found non-significant, except evening vapor pressure which showed significant negative effect on hopper catches.

***Tetrix subulata* (Linnaeus)**

Activity period of short horn grasshopper *T. subulata* was observed from 26th to 48th SW (25 June 2014 to 02 Dec. 2014) with two distinct peaks during 32th and 33th SW (6.14 and 3.71 grasshopper/ SW respectively) (Fig. 4). The highest peak was observed in 32th SW, during this period maximum temperature and minimum temperature where 27.7 ^{0}C and 23.7 ^{0}C whereas morning and evening relative humidity and vapor pressure were 86 and 73 percent and 21.0 and 21.5 mm respectively. Further sunshine, wind velocity and evaporation were 4.9 hrs, 7.9 km/hrs and 3.7 mm respectively. There was 145.8 mm rainfall during this week. Present finding are contrast with those of [5] observed two species of grass hopper viz. *Trilophidia cristella* S. and *Gastrimargus transverses* T. in light trap catches in rice field during 2002 (*kharif* season) at Jabalpur. Correlation coefficient between various weather parameter and short horn grasshopper catches were found non- significant. Except minimum temperature (C°), rainfall (mm), morning relative humidity (%) and evaporation (mm) which showed positive correlation with grasshopper catches.

Table 1: Correlation coefficient of weather factors on light trap catches of major phototectic insect pests of rice

Weather Parameter	*M. separata* (Walker)		*L. acuta* (Thunberg)		*N. virescens* (Distant)		*T. subulata* Linnaeus	
	r	Byx	r	Byx	r	byx	r	byx
Maximum temperature (ºC)	-0.249	-	0.024	-	0.169	-	0.186	-
Minimum temperature (ºC)	-0.293	-	0.045	-	0.109	-	0.541**	0.104
Sunshine (hrs)	0.076	-	0.292	-	0.21	-	0.077	-
Rainfall (mm)	-0.452*	-0.040	-0.028	-	-0.004	-	0.529**	0.004
Morning relative humidity (%)	-0.450*	-0.108	-0.301	-	-0.285	-	0.544**	0.0169
Evening relative humidity (%)	-0.334	-	0.213	-	0.272	-	-0.227	-
Wind Velocity (km/hr)	-0.32	-	-0.187	-	-0.225	--	0.238	-
Morning vapor pressure (mm)	-0.375	-	-0.175	-	-0.256	-	0.314	-
Evening vapor pressure (mm)	-0.179	-	-0.325	-	-0.394*	-0.470	-0.319	-
Evaporation (mm)	-0.312	-	-0.006	-	-0.058	-	0.561**	0.209
Number of rainy days	-0.14	-	-0.219	-	-0.091	-	0.2	-
NS = Non- significant *.= Significant at 0.05 level ** = Significant at 0.01 level								

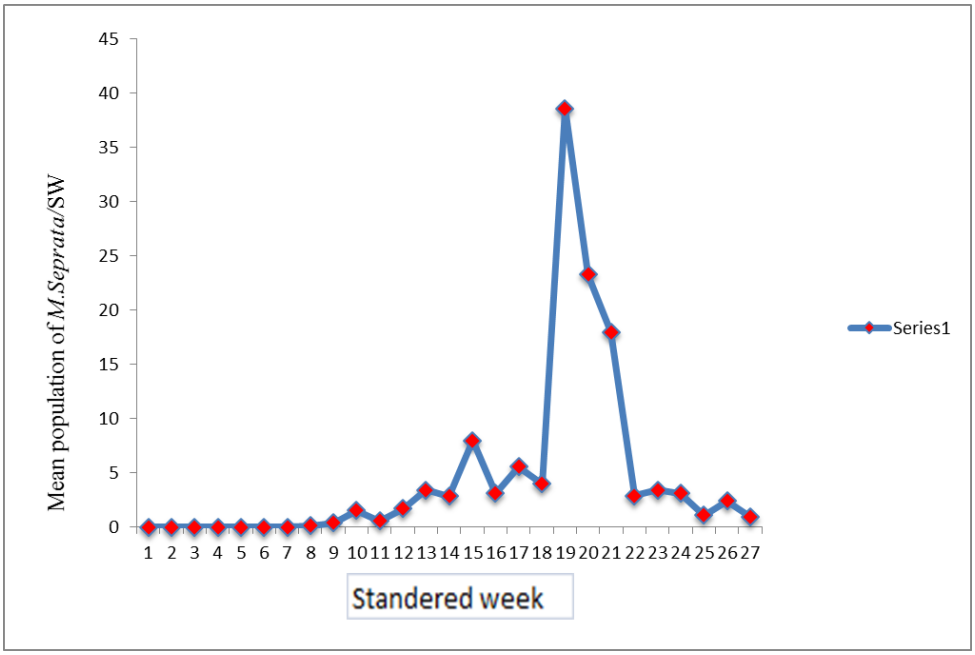

Fig 1: Mean population of *M. separata* (Guenee) in light trap during *kharif* 2014 (August to December).

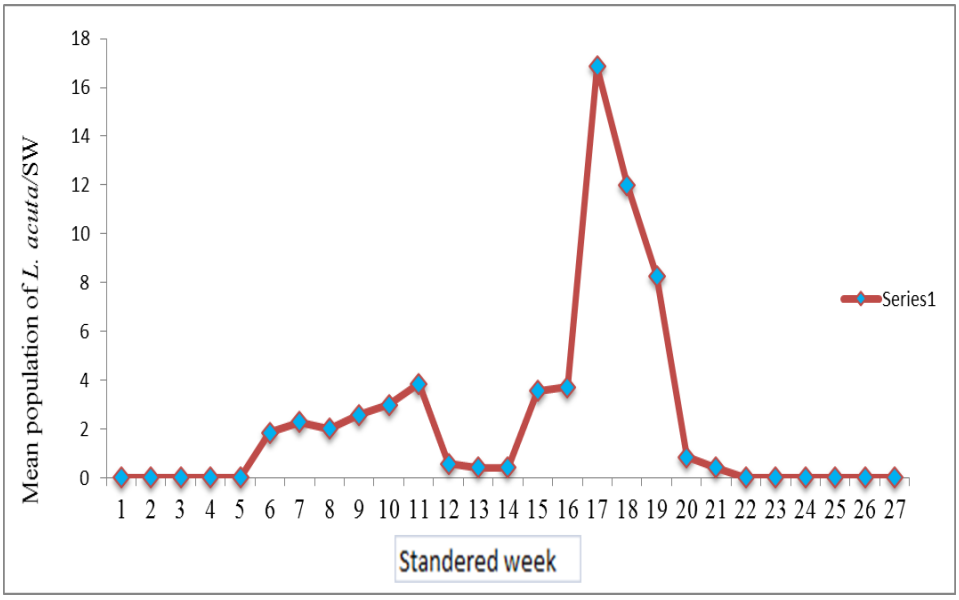

Fig 2: Mean population of *L. acuta* (Thunberg) in light trap during *kharif* 2014 (August to November).

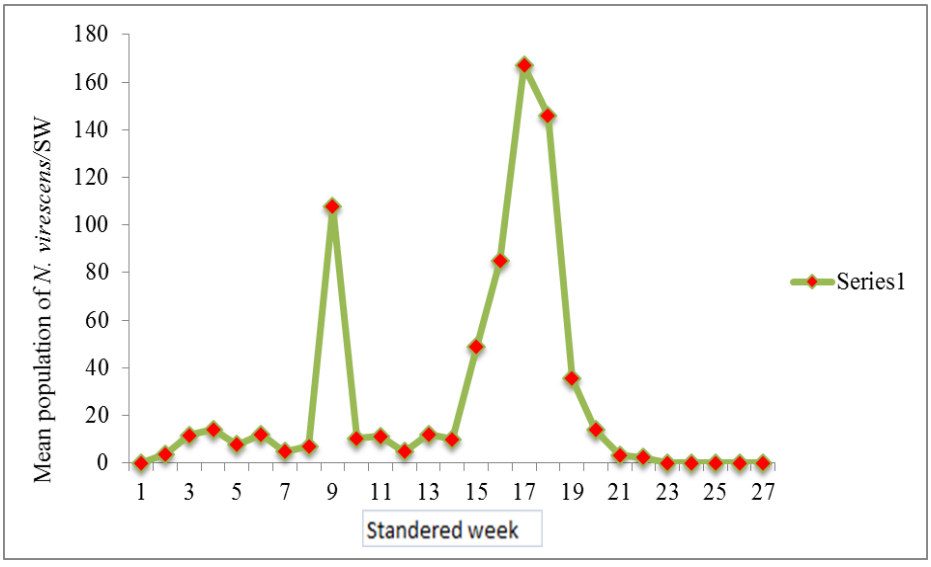

Fig 3: Mean population of *N. virescens* (Distant) in light trap during *kharif* 2014 (August to November)

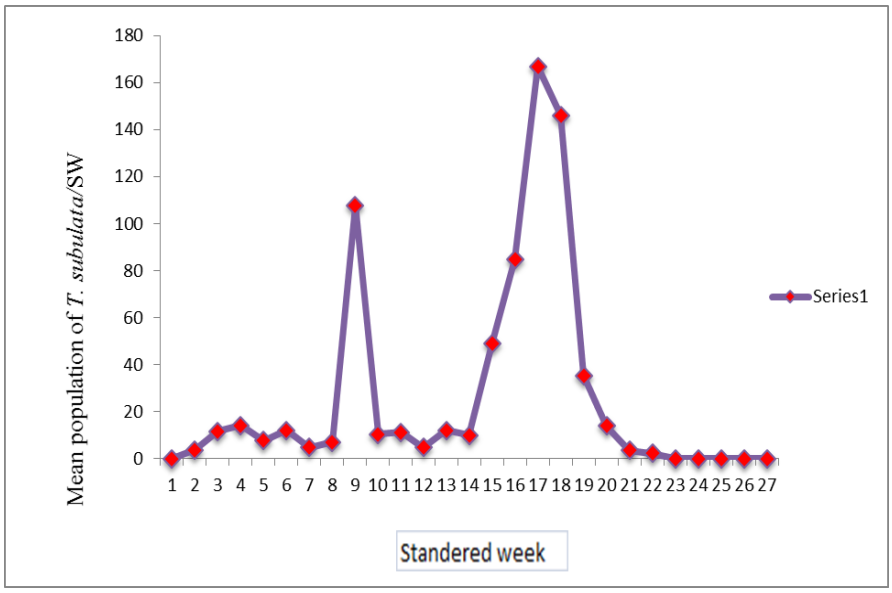

Fig 4: Mean population of *T. subulata* (Linnaeus) in light trap during *kharif* 2014 (June to December)

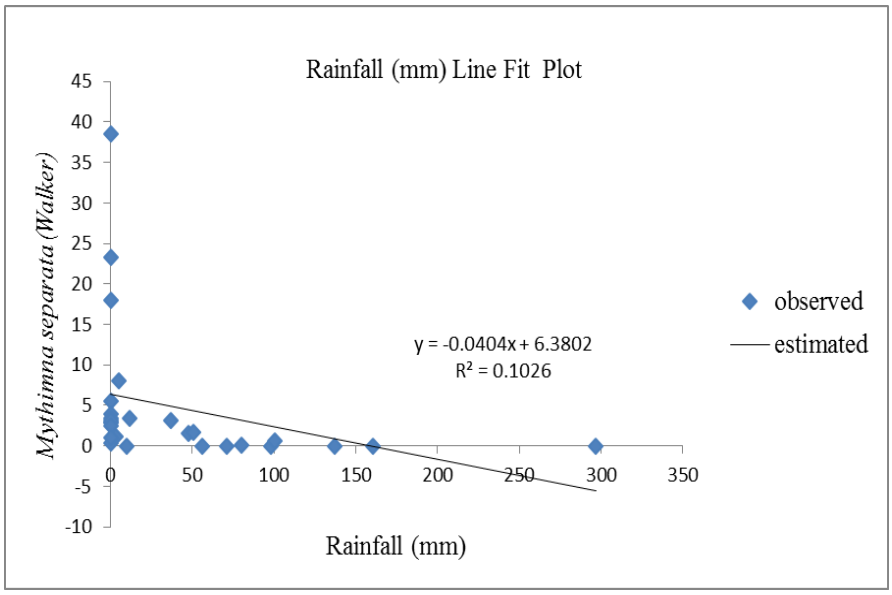

Fig 5: Regression of rainfall (mm) on *M. separate* trapped in light trap.

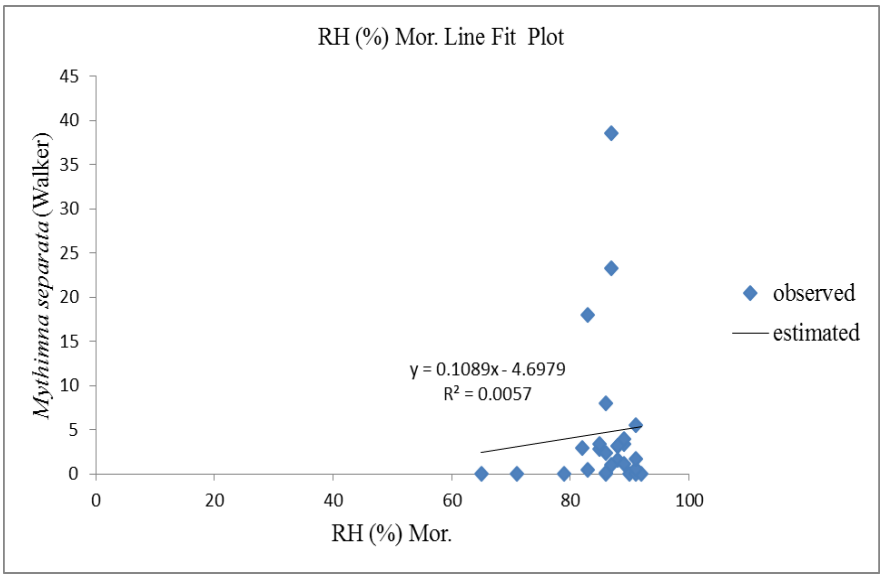

Fig 6: Regression of morning relative humidity on *M. separata* trapped in light trap.

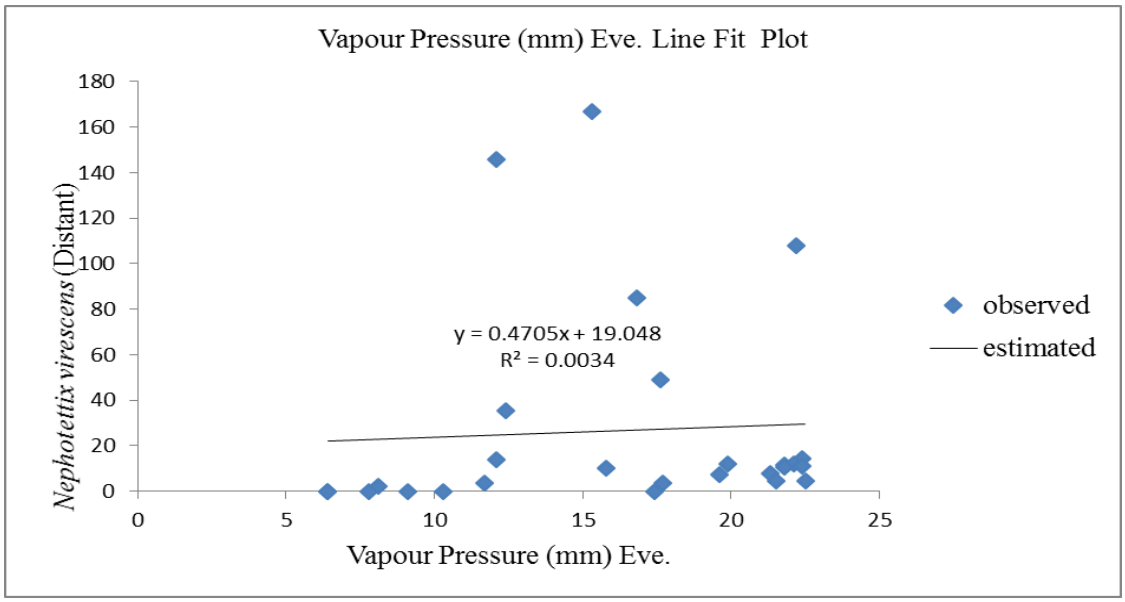

Fig 7: Regression of evening vapoor pressure (mm) on *N. virescens* trapped in light trap.

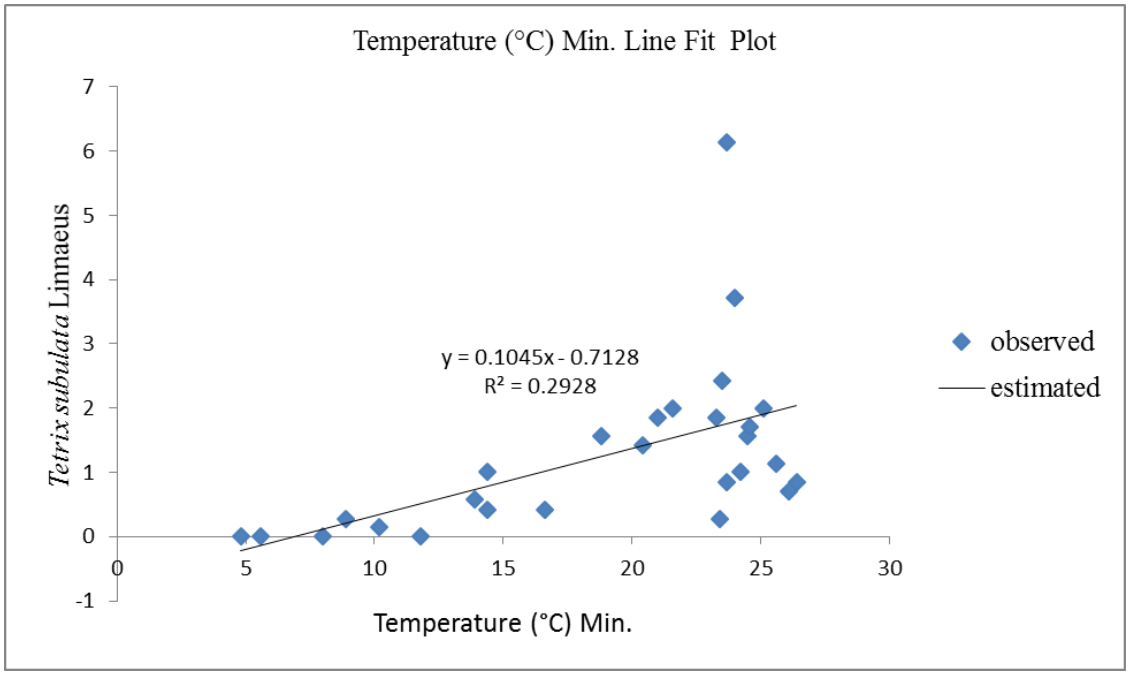

Fig 8: Regression of minimum temerature (°C) on *T. subulata* trapped in light trap.

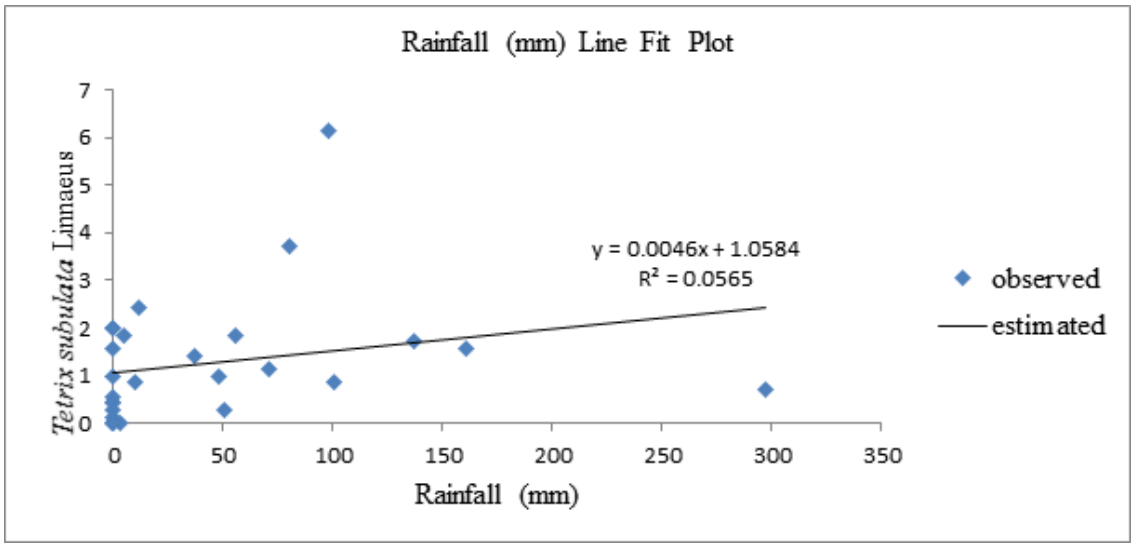

Fig 9: Regression of rainfall (mm) on *T. subulata* trapped in light trap

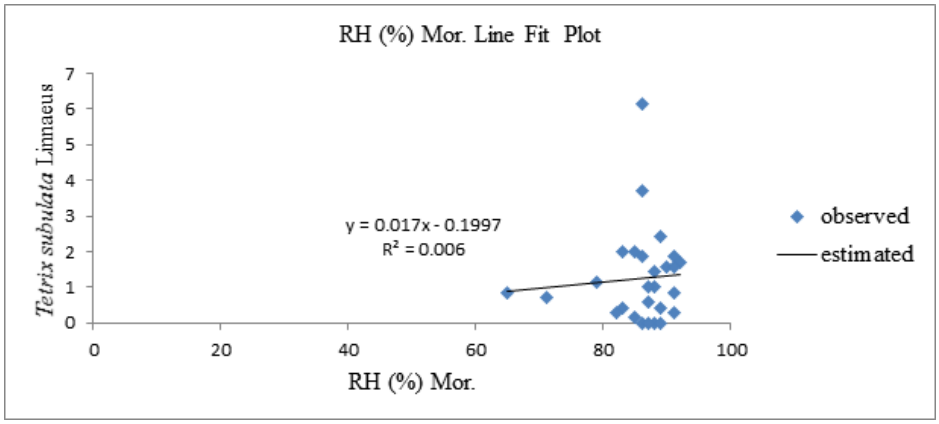

Fig 10: Regression of morning relative humidity (%) *T. subulata* trapped in light trap

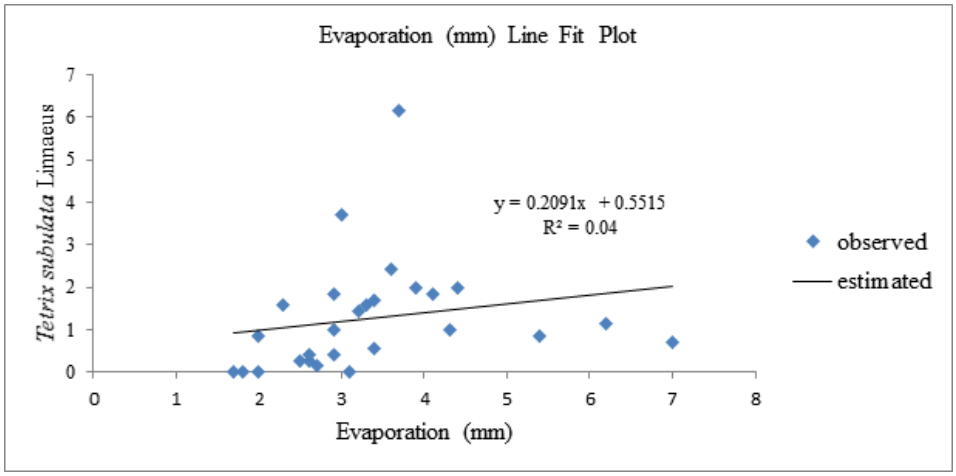

Fig 11: Regression of evaporation (mm) *T. subulata* trapped in light trap

Conclusion

Four different species of insect pests were recorded namely *M. separate, L. acuta, N. virescens* and *T. subulata* on the rice crop at experimental field of Department of Entomology, JNKVV, Jabalpur (M.P.) during *kharif* 2014 which represented 3 orders (Lepidoptera Hemiptera and Orthoptera) and 4 families (Noctuidae Coreidae, Delphacidae, and Tetrigidae).

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References

1. Anonymous. Rice in India Hand Book of Statistics, Director of Rice Development, Government of India, Hyderabad (A.P.), 2006.
2. Hufnagel L, Sipkay Cs, Drégelyi-Kiss Á, Farkas E, Türei D, Gergócs V *et al*. Klímaváltozás, biodiverzitás és közösségökológiai folyamatok kölcsönhatásai. In: Zs. Harnos, L. Csete, (eds.). Klímaváltozás: környezet – kockázat – társadalom. *Budapest: Szaktudás Kiadó Ház.* 2008, 229-266.
3. Sharma AK, Barche S, Mishra PK. Scope of light trap as ipm tool for sustainable cultivation of rice. Modern biotechnology and its application. New india publishing agency. 2004, 303-312.
4. Sharma MK, Pandey V, Singh RS, Singh RA. A study on light trap catches of some rice pests in relation to meterological factors. Sinet Ethiopian journal of science. 2004; 27(2):165-170
5. Sharma AK, Vaishampayan S, Vaishampayan SM. Distribution of insect pests fauna of rice ecosystem collected through light trap at Jabalpur. JNKVV Research Journal. 2006; 40(1, 2):50-60.
6. Sharma AK, Vaishampayan SM. Evaluation of light trap as eco-friendly control tool in the management of insect pest species of Rice ecosystem. JNKVV research journal. 2009; 44(2):183-187
7. Sharma AK, Vaishampayan SM. Evaluation of light trap as eco-friendly control tool in the management of insect pest species of Rice ecosystem JNKVV Research Journal 2009; 44(2):183-187
8. Sharma MK, Asrat Atsedewoin and Fanta S. Forewarning models of the insects of Rice crop. International Journal of Biodiversity Conservation 2011; 3(8):367-375.
9. Shama AK, Bisen UK. Taxonomic documentation of insect pest fauna of vegetable ecosystem collected in light trap. International Journal of Environmental Science: Development and Monitoring (IJESDM) 2013; 4(3):4-10.
10. Vaishampayan SM, Shrivastava SK. Effect of moon phase and lunar cycle on the activity of light trap catch of tobacco caterpillar *Spodoptera litura* (F.). J. of Bombay Natural History Society. 1977; 75(1):83-87.