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Study on seasonal incidence of insect pests of vegetable crops collected through light trap

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Abstract
The present research was carried out by operating, Jawahar light trap (with 125 Watt mercury vapour lamp) in vegetable field at Horticulture experimental farm, Maharajpur, during *Rabi* 2016-17 (November to April). The result showed that all 4 species of vegetable pest having regular occurrence in light trap catches like Gram pod borer *Helicoverpa armigera* (Hubner), Cabbage semilooper *Plusia orichalcea* (Fabricius), Tobaco caterpillar *Spodoptera litura* (Fabricius), Cutworm, *Agrotis ipsilon* (Hufnagel). Among these 4 pest cut worm dominate the light trap catches, followed by gram pod borer, cabbage semilooper and tobacco caterpillar.

Keywords: Jawahar light trap, gram pod borer, cabbage semilooper, tobacco caterpillar

Introduction
India's diverse climate ensures availability of all varieties of vegetables. It ranks second in vegetable production in the world, after China. India produced 169.478 million metric tons of vegetables, in 2014-15. (Anonymous, 2014) [1]. Light trap is an important tool for minimizing the insect pests damage without any toxic hazard (Sharma et al., 2004) [2], apart from this light trap has been used to supplement the knowledge of pest fauna of given locality, geographical distribution and their seasonal activity, etc (Verma and Vaishampayan, 1983) [6].

Nocturnal insects are often attracted to light sources that emit a 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) [3].

Sinu *et al.*, (2013) [4] 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) [2] suggested that light trap is an important tool for minimizing the insect pests damage without any toxic hazards.

Vaishampayan (2002) [5] 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.

Material and methods
Experimental site
The experiment was conducted at the Horticultural Experimental Farm, Maharajpur, Jabalpur (MP) during the period between second week of November to last week of April 2016-17

Design of light trap
The experiment was conducted by using new Jawahar light trap model developed at JNKVV, Jabalpur with mercury vapor lamp (125 W) made up of 24 gauge GI sheet consisting of a funnel (40 cm top diameter), baffle plates each 30 x 12 cm in size trapping device and 24 gauge GI sheet 40 cm x 40 cm x 40 cm in size with cupboard and built-in locking system insect collecting device. 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.

Seasonal activity study of major insect pests of vegetable crops was recorded by operating the light trap in Rabi season of 2016-17.

Major and minor pests of vegetable crops were observed on a 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 the standard meteorological week.

Result

Study on seasonal incidence of insect pests of vegetable crops collected through the light trap.

Seasonal incidence of major insect pest of vegetable crops (Table1) collected in light trap was studied by operating Jawahar light trap (with 125 Watt mercury vapour lamp) in vegetable field at Horticulture experimental farm, Maharajpur, during *Rabi* 2016-17 (November to April). The data of every day catch of major insect pest of vegetable crops collected in trap were converted to standard weekly averages.

Record of daily collection of insect species known as pests of vegetable crops based on our experience occurring consistently throughout the season was maintained (Table2). In all 4 species were identified as pests of vegetable crops having regular occurrence in light trap catches are listed below-

List of insect pest species of vegetable crops collected in light trap during *Rabi* 2016-17 (November to April)

S. No.	Common Name	Scientific Name	Family
1.	Gram pod borer	*Helicoverpa armigera* (Hubner)	Noctuidae
2	Cabbage semilooper	*Plucia orichalsia* (Fabricius)	Noctuidae
3	Tobaco caterpillar	*Spodoptera litura* (Fabricius)	Noctuidae
4	Cutworm	*Agrotis ipsilon* (Hufnagel)	Noctuidae

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.

Table 1: Seasonal incidence of insect pest species of vegetable crops during *Rabi* (November to April) 2016-17 (Weekly average).

SW	*Helicoverpa armigera*	*Plusia orichalcea*	*Spodoptera litura*	*Agrotis ipsilon*
45	0.57	0.85	0	0
46	1.14	2	0.71	0.42
47	1.71	2.28	0.71	0.42
48	1.81	1.85	0.71	0.28
49	1.85	1.71	1.85	0.71
50	1.42	2.42	0.71	0.28
51	2.85	1.57	1	0.42
52	1.28	1.71	2	0.57
1	2.14	1.71	0.85	1
2	3.57	1.42	2.42	1
3	2.14	2.42	1.28	0.85
4	1.71	0.71	1.57	2.28
5	1.57	1.42	1.14	0.42
6	1.71	1.71	1.57	0.57
7	0.8	6	2.14	0.57
8	1.14	8.71	1.85	0.71
9	5	7.14	2	1
10	3.85	9.14	2.28	1.57
11	4.85	8.42	7.14	2.57
12	6.42	42.14	13.42	6.85
13	10.14	39	19.71	4
14	15.14	29.58	11.14	5.57
15	6.42	10.85	5.28	5.42
16	5.42	10.71	5.71	6.8
17	6.28	7.57	3.71	3.8

Table 2: Correlation coefficient of weather factors on light trap catches of *Helicoverpa armegera* (fabricius), *Cabage semilooper* (Fabricius), *Spodoptera litura* (Walker) *and Agrotis ipsilon* (Hufnagel)

Weather Parameter	*Helicoverpa armigera* (*Hubner*)		*Plusia orichalcea* (*Fabricius*)		*Spodoptera litura* (*Fabricius*)		*Agrotis ipsilon* (*Hufnagel*)	
	R	***Byx***	***R***	***Byx***	***R***	***Byx***	***R***	***Byx***
Maximum temperature (ºC)	0.742**	0.44	0.644**	1.13	0.638**	0.53	0.820**	0.31
Minimum temperature (ºC)	0.726**	0.52	0.583**	1.44	0.565**	0.57	0.814**	0.38
Morning relative humidity (%)	-0.785**	-0.15	-0.519**	-0.34	-0.531**	-0.14	-0.826**	-0.1
Evening relative humidity (%)	-0.576**	-0.16	-0.527**	-0.51	-0.522**	-0.2	-0.622**	-0.11
Rainfall (mm)	0.163NS	-	0.056NS	-	0.003NS	-	-0.022NS	-
Sunshine (hrs)	0.533**	1.18	0.529**	4.02	0.495*	1.53	0.543**	0.77
Wind Velocity (km/hr)	0.651**	1.51	0.415*	3.31	0.397*	1.29	0.726**	1.09
Morning vapor pressure (mm)	0.444*	1.19	0.637**	5.87	0.598**	2.25	0.561**	0.97
Evening vapor pressure (mm)	-0.249NS	-	-0.146NS	-	-0.205NS	-	-0.29NS	-
Number of rainy days	-0.068NS	-	0.172NS	-	0.119NS	-	0.154NS	-
Evaporation (mm)	0.763**	1.07	0.582**	2.81	0.598**	-1.18	0.838**	0.76
*.= Significant at 0.05 level ** = Significant at 0.01 level NS = Non Significant								

Gram pod borer *Helicoverpa armigera* (Hubner)
It is a major polyphagous pest of pulses, potato, tomato, chilli, and okra crops in Jabalpur. The first appearance was recorded during 45th SW. (Table 1) the number of adults trapped every day was converted into standard weekly average and data are presented in (Table 1) Correlation studies revealed that maximum temperature, minimum temperature, sunshine, evaporation, wind velocity, and morning vapor pressure respectively showed a significant positive correlation (r=0.742, 0.726, 0.533, 0.763, 0.651 and 0.444 respectively) with moths catches. (Table 2)

Cabbage semilooper *Plusia orichalcea* (Fabricius)
It is a major polyphagous pest of vegetable crops, like cabbage, cauliflower in Jabalpur. The activity of pest started from 45thSW. (Table 1) The number of adults trapped every day was converted into standard weekly average and data are presented in (Table 1)
Correlation studies revealed that maximum temperature, minimum temperature, sunshine, evaporation wind velocity, and morning vapor pressure showed significant positive correlation (r=0.644, 0.583, 0.529, 0.582, 0.415, and 0.637 respectively) with moths catches. (Table 2)

Tobacco caterpillar *Spodoptera litura* (Fabricius)
It is a major pest of vegetable crops like cabbage, cucurbits, potato, chilli and pea etc. in Jabalpur. Activity during 45th SW (07-11-2016 to 13-11-2016) was absolutely nil. (Table 1) Pest first appeared during 46th SW (14-11-2016 to 20-11-2016) (0.71 moths) in light trap. The number of moths trapped every day was converted into standard weekly average and data are presented in (Table 1)
Correlation studies revealed that maximum temperature, minimum temperature, sunshine, evaporation, wind velocity, and morning vapor pressure respectively showed a significant positive correlation (r= 0.638, 0.565, 0.495, 0.598, 0.397 and 0.598 respectively) with moths catches. (Table 2)

Cutworm, *Agrotis ipsilon* (Hufnagel)
It is a major polyphagous pest of pulses and vegetable crops like cabbage, cucurbits, potato in Jabalpur as per the earlier records but this year activity of this pest was very low (Table 1). Cutworm first appeared during 46th SW (14-11-2016 to 20-11-2016) (0.42 moths) in a light trap. The number of moths trapped every day was converted into standard weekly average and data are presented in Table 1
Correlation studies revealed that maximum temperature, minimum temperature, sunshine, evaporation, wind velocity, and morning vapor pressure showed a significant positive correlation (r=0.820, 0.814, 0.543, 0.838, 0.726 and 0.561 respectively) with moths catches. (Table 2)

Conclusion
The present investigation has provided valuable information on presence occurrence, distribution and population dynamics of four insect species in the vegetable ecosystem at Jabalpur. This will serve as baseline data, useful at present and in future for surveillance and monitoring of insects for forecasting.

Reference

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