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Incidence Studies on Some Important Insect Pests of Ridge Gourd (*Luffa acutangula*)

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Abstract The experiment was conducted from December second week to March second week in 2011 and March first week to June first week in 2012 Results showed pests were active throughout the cropping season in both years. The peak fruit fly larval incidence (11.1 maggots / fruit) was recorded during first week of March during 2011 whereas, (14.4 maggots / fruit) on fourth week of May during 2012. Highest fruit damage by fruit fly, 62.5% was recorded during fourth week of February, 2011 and 71.6% recorded during third week of May, for 2012. Peak incidence of initiated from last week of February upto third week of March during 2011 whereas ; during 2012, incidence was high in end of April. The peak incidence of red pumpkin beetle recorded during second week of March, 2011 and during second week of May, 2012. The maximum number of leaf damage by epilachna beetle was observed in middle portion of plant canopy compared to top and lower portion canopy of leaves in both the year. Relating to the weather factors, temperature (both maximum and minimum) and relative humidity had significant association with incidence of the pests.

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Introduction

Ridge gourd (*Luffa acutangula*) is highly grown cucurbitaceous vegetable crop in new alluvial Gangetic zone of Eastern region of India. Extent of yield loss caused by the insect pests to cucurbitaceous vegetables ranged from 30 to 100% depending upon cucurbit species and the season in different parts of the world [1]. Like other cucurbits, ridge gourd is also being subjected to damage by wide array of insect pests, major being melon fruit fly (*Bacrocera curcurbitae* Coq.), epilachna beetle (*Henosepilachna septima* Dieke), red pumpkin beetle (*Aulacophora foveicolis* Lucas) right from the initial stages of the crop to harvest of the products in India. Due to melon fruit fly infestation, 75.65% damage was reported from ridge gourd [2]. Ryckewaert et al. [3] reported 100% yield losses by fruit fly to cucurbits. Along with melon fruit fly, Epilachna beetle and red pumpkin beetle also earlier reported as destructive pests of other cucurbits along with ridge gourd [4, 5]. From these reports, it is evident that the attack of these insect pests is a key factor in reducing the quality and quantity of the ridge gourd. Unfortunately report on infestation of insect pests on the ridge gourd in West Bengal in scanty. Keeping these facts in mind, it was thought worthwhile to conduct study on periodicity of occurrence and finding out factors responsible for their periodicity to evolve an effective and economical strategy of management of these insect pests.

Table 1. Studies on incidence and infestation of insect pests on ridge gourd in 2011.

Month	Week	Melon fruit fly			Epilachna beetle				Red pumpkin beetle		Temperature (C°)		Total rainfall (mm)	Relative humidity	
		% of fruit damage	Number of maggots/ fruit	Grubs/ plant	Adults/ plant	Number of leaf damage			Adult/ plant	% of flower damage					
						Top	Middle	Lower			Max.	Min.		I	II
Dec	III	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27	7	0.0	95	36
	IV	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	28	7	0.0	95	36
Jan	I	0.0	0.0	0.0	0.2	6.0	13.9	12.9	0.9	0.0	24	8	0.0	100	39
	II	0.0	0.0	1.6	0.6	2.8	14.7	4.9	0.9	0.0	27	6	0.0	100	46
	III	0.0	0.0	0.4	0.2	7.2	17.3	4.3	1.2	36.8	26	6	0.0	94	39
	IV	9.2	3.0	0.6	0.3	6.7	13.2	4.6	0.4	46.2	29	9	0.0	95	38
Feb	I	28.6	1.8	0.5	0.6	4.3	18.0	3.6	0.5	29.2	28	10	0.0	96	31
	II	35.0	5.1	1.6	1.1	11.4	20.1	10.3	1.6	35.3	31	12	0.0	95	31
	III	40.0	8.6	3.3	1.0	11.9	21.7	14.2	1.8	52.2	34	14	0.0	98	28
	IV	62.5	9.9	4.7	1.6	17.7	22.2	19.7	1.3	36.2	31	11	0.0	95	27
Mar	I	51.4	11.1	3.8	1.5	20.0	24.4	16.9	1.7	28.6	36	11	1.0	93	29
	II	47.6	10.5	2.4	4.5	23.5	27.3	22.3	2.2	36.4	34	13	7.6	90	23

Materials and Methods

The experiment was conducted at the Incheck farm, C Block, BCKV, Kalyani, Nadia, West Bengal from December second week to March second week in 2011 and March first week to June first week in 2012. Local variety Seven star was replicated two times of plot size 8m^2 (2m × 4m) with a plant spacing 100 cm × 40 cm following all agronomical practices excluding plant protection. Observations on pest incidence were taken at seven days interval during early hours during the whole period of crop growing season. Direct count of seven randomly selected plants from each plot was undertaken for study of all the developmental stages of the pests like epilachna beetle (grub and adult) and red pumpkin beetle (adult). The percent flower damage by red pumpkin beetle was calculated by counting total number flowers from those randomly

Table 2. Studies on incidence and infestation of insect pests on ridge gourd in 2012.

Month	Week	Melon fruit fly			Epilachna beetle				Red pumpkin beetle		Temperature (C°)		Total rainfall (mm)	Relative humidity	
		% of fruit damage	Number of maggots/ fruit	Grubs/ plant	Adults/ plant	Number of leaf damage			Adult/ plant	% of flower damage					
						Top	Middle	Lower			Max.	Min.		I	II
Mar	I	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31	17	3	92	30
	II	0.0	0.0	0.0	0.3	0.0	0.1	0.2	0.0	0.0	34	19	0	95	39
	III	0.0	0.0	0.0	0.3	0.0	0.1	0.4	0.0	0.0	33	18	0	86	38
	IV	0.0	0.0	0.0	1.0	0.0	0.7	1.2	0.2	0.0	34	18	0	91	40
Apr	I	0.0	0.0	0.0	1.7	1.2	2.8	0.8	0.4	12.4	36	22	0	93	36
	II	8.7	2.7	1.0	1.3	1.5	6.4	2.5	0.3	31.6	33	21	29	95	57
	III	33.5	3.2	6.2	4.0	6.1	11.4	3.4	0.1	26.5	33	21	17	92	68
	IV	16.8	7.5	11.7	4.9	6.8	15.4	7.1	1.4	39.0	37	25	0	96	54
May	I	50.4	9.1	2.5	3.7	7.3	17.0	8.0	1.7	51.7	37	25	17	95	49
	II	69.7	13.8	3.8	2.0	11.4	15.1	6.9	2.3	47.4	35	23	108	90	59
	III	71.6	11.6	4.9	3.6	16.3	21.2	9.3	0.8	21.8	35	24	0	90	58
	IV	23.7	14.4	7.9	3.6	14.9	23.2	9.9	0.4	28.5	38	27	1	87	59
Jun	I	29.8	10.9	6.1	4.3	11.8	21.2	9.2	0.3	0.6	37	27	18	91	63

Table 3. Correlation between incidences of insect pests with weather parameters in 2011. * : Significant at 5 per cent level ; **: Significant at 1 per cent level.

Insect pest	Max. temperature	Min. temperature	Total rainfall	Relative humidity I	Relative humidity II
Number of maggots / fruit	0.957**	0.857**	0.663*	−0.482	−0.853**
Grubs / plant Epilachna beetle	0.808**	0.657*	0.445	−0.240	−0.668*
Adults / plant Epilachna beetle	0.798**	0.750**	0.594*	−0.314	−0.740**
Adult / plant Red pumpkin beetle	0.656*	0.728**	0.593*	−0.317	−0.619*

selected seven plants/plot along with number of damaged leaves from top, middle and lower portions of the plant canopy whereas for melon fruit fly, incidence was recorded on the basis of number of fruits damaged by the pest. These data were later converted to maggot population per fruit with conversion formula used by Barma and Jha [4].

$$\text{Maggot population per fruit} = \frac{\text{No. of infested fruits} \times \text{No. of maggots per infested fruit}}{\text{Total no. of fruit sampled}}$$

Meteorological parameter viz., maximum and minimum temperature (°C), total rainfall (mm) and relative humidity maximum and minimum I and II (%) were further used for analysis of data and correlation was done with the incidence of pest using SPSS.

Results and Discussion

Fruit fly, one of the most important pests of ridge gourd along with all members of cucurbitaceous family initiated from fourth week of January during 2011 to the second week of March. Peak larval population (11.1 maggots / fruit) could be recorded in first week of March with corresponding fruit damage of 51.4% in 2011 (Table 1). Highest fruit damage (62.5%) during 2011 was recorded in fourth week of February. In 2012, population of maggots was peak during (14.4 maggots / fruit) fourth week of May. Highest fruit damage (71.6%) could be recorded in third week of May in 2012 (Table 2). The present findings are in conformity with the results Krishna Kumar et al. [2], who found maximum fruit fly infestation of 75.65% on ridge gourd and are also similar to that reported by Chaudhary and Patel [6]. Epilachna beetle occurred from first week of January to harvest of the crop in 2011. Peak incidence (4.7 grubs / plant) was recorded in fourth week of February, 2011 whereas maximum incidence of adults (4.5 adults / plant) was noticed in second week of March (Table 1). During 2012, population initiated from second week of March and peak grub and adult population (11.7 grubs / plant and 4.9 adults / plant, respectively) were recorded in fourth week of April

Table 4. Correlation between incidences of insect pests with weather parameters in 2012. * : Significant at 5 per cent level ; ** : Significant at 1 per cent level.

Insect pest	Max. temperature	Min. temperature	Total rainfall	Relative humidity I	Relative humidity II
Number of maggots / fruit	0.644*	0.814**	0.461	−0.325	0.786**
Grubs / plant Epilachna beetle	0.514	0.774**	0.268	−0.031	0.820**
Adults / plant Epilachna beetle	0.622*	0.828**	0.233	0.110	0.721**
Adult / plant Red pumpkin beetle	0.708**	0.744**	0.288	0.037	0.387

(Table 2). The maximum number of leaf damage was observed in middle portion of plant canopy than top and lower portion canopy leaves in both years. So it may be concluded that moderately old leaves most preferred by epilachna beetle. These findings are supported by the reports of Barma and Jha [4]. The incidence of red pumpkin beetle found persistently throughout the entire crop seasons in both years of experiment. In 2011, the incidence had two peaks, during third week of January and third week of February, whereas the highest population could be recorded during second week of March, 2011 (Table 2). During 2012, incidence of red pumpkin beetle was highest at second week of May (Table 2). The maximum flower damage was recorded of 52.2%) during third week of February, 2011 and of 51.7% during first week of May, 2012 (Tables 1 and 2). These results are in conformity with Rathod and Borad [7], who reported population abundance of *A. foveicollis* beetles second week of February to last week of May.

Correlation of pest incidence build up with each of five weather factors prevailing during occurrence of the pest were worked out. Incidence of maggots in 2011 both maximum and minimum temperature and total rainfall showed positively significant correlation (Table 3). The RH-II was negatively and significantly correlated with maggot incidence. During 2012, both maximum and minimum temperature and RH-II were positively and significantly correlated with incidence of maggots (Table 4). Reports of Laskar and Chatterjee [8] and Ganie et al. [9] support these results of the present findings. Both epilachna grub and adult populations showed positively significant correlation with both temperatures (maximum and minimum) and rainfall whereas, the relative humidity (both I and II) found negatively significant in 2011 (Table 3). Barma and Jha [4] reported the same results during their study. In 2012, population of both epilachna grub and adult showed similar correlation to temperature as like observed in previous year but relation to relative humidity was significantly positive (Table 4). Incidence of red pumpkin beetle showed the positively significant correlation to temperature (both maximum and minimum) in both years of experiment (Tables 3 and 4). Rainfall was positively significant during 2011. Relative humidity (I and II) had negatively significant correlation with population of red pumpkin beetle in 2011, whereas in 2012 it was positively non-significant. Results are in conformity with the findings of Khan et al. [5] and Rathod and Borad [7].

Conclusion

Infestation of these insect pests found as key factor in reducing the quality and quantity of the ridge gourd. It is essential to know the peak period of occurrence of this pest in view of getting higher yield. Keeping these facts in mind, current investigation was conducted as help to evolve an effective and economical strategy of management of these pests. In this study, population of these insect pests found to be active in cropping season from primordial stages to harvesting stage of crop particularly during February to May months. Moderately old leaves found to be most preferred by epilachna beetle. Variability in abiotic factors found to be responsible for certain changes in insect pests populations. It was noticed from present studies that influence of abiotic factors such as temperature (both maximum and minimum) and relative humidity had significant association in population build up of pests.

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