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# INSECT AND NON-INSECT PESTS INFESTING POINTED GOURD (*TRICHOSANTHES DIOICA* ROXB.) IN WEST BENGAL

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**ABSTRACT**
Pointed gourd (*Trichosanthes dioica* Roxb.) was found to be infested by seven insect and non-insect pests *viz*. *Epilachna dodecastigma* (Wied.), *Aulacophora foveicollis* (Lucas),*Diaphania indica*(Saunders), *Bactrocera cucurbitae* (Coquillett), *Bemisia tabaci* (Gennandius), *Tetranychus urticae* (Koch) and *Meloidogyne incognita* (Kofoid and White). Peak incidences of mite in last week of April to first fortnight of May, of leaf roller in third week of January, first to second week of March, first to second week of April, first fortnight of May, first week of June, second week of July, of fruit fly usually, in third week of May to first week of June and that of epilachna beetle in March, first fortnight of April, May, third week of July were obtained. Maximum temperature, morning and evening RH% and bright sun shine hour (BSS) had significant association on the mite population. Max temp., min temp., morning RH%, evening RH%, rainfall, soil temperature and BSS had significant association with leaf roller population. Max temp., min temp., morning RH% and soil temperature had significant association with fruit fly population. Max temp., morning RH%, evening RH%, rainfall and BSS had significant association with epilachna population.

## INTRODUCTION

Pointed gourd (*Trichosanthes dioica* Roxb.) commonly known as 'Parwal', holds a coveted position in the vegetable market in India, is a dioecious semi-perennial creeper (Niir, 2004) and is one of the most nutritive, wholesome and highly accepted vegetable (Wadhwani *et al*., 2007). The crop is grown extensively in the eastern part of India particularly West Bengal, U.P., Bihar, Odisha and to some extent in north eastern states like Assam, Tripura *etc*. It is extensively cultivated in almost six agro-climatic zones of West Bengal except Hill zone. Like other cucurbits, pointed gourd is also being subjected to damage by wide array of insect and non-insect pests, major being, fruit fly, red pumpkin beetle, leaf miner, aphids, whitefly and mites (Rajak, 2001; Jhala *et al*., 2005; Gopalkrishnan, 2007; Kumar, 2008; Sapkota *et al*., 2010; Tiwari *et al*., 2012) right from the initial stages of the crop to harvest of the products in India. Such pests attacking pointed gourd in other countries have been reported so far by Rashid *et al*., 2010; Haque *et al*., 2011; Hasan *et al*., 2012. Unfortunately, the report on infestation of insect-pests on the crop in West Bengal is scanty. Patel and Karmakar, (2004, 2005) reported for the first time that false spider mite (*Brevipalpus phoenicis* Geijskes) was a potential pest of pointed gourd from West Bengal. Jha *et al*. (2007) observed infestation of fruit fly to the tune of 17% on the crop in the districts of Malda, Murshidabad and Nadia of the state. Other than these, attack of acharines (Chintha *et al*., 2002) and root knot nematodes (Chakraborty, 2000; Khan and Banerjee, 2003) also caused menacing damage to this crop. Hence, through the present study attempt has been made to record some of the pests infesting the crop as well as to study their periodicity of occurrence and finding out factors responsible for their periodicity. This will help in preparation of management design of the pests which act as a limiting factor for improvement of the productivity of the crop.

## MATERIALS AND METHODS

The experiment was conducted at Central Research Farm, Bidhan Chandra Krishi Viswavidyalaya, Gayeshpur, Nadia, West Bengal which was located at 23ºN L, 89ºE L and 9.75m above sea level in three successive crop growing seasons from 2007-08 to 2009-10. The soil was a typical alluvial soil (Entisol) with a sandy clay loam texture with good drainage, slightly acidic pH and moderate fertility.

Experiments were replicated three times having a plot size of $6m^2$ (3m x 2m) with a plant spacing 100cm x 135cm. A 50cm wide channel was provided between two beds as irrigation and drainage channel. Mature root of pointed gourd cultivar, Dhapa, cuttings were collected from the farmer's field early in the morning of the planting day (a day after land preparation). Six female root cuttings with one male per plot were planted in pits. FYM @ 150 quintals per hectare was applied at the time of last ploughing. Inorganic fertilizer N: P: K @ 90: 80: 70 was applied. Half of the $N_2$ and full dose of $P_2O_5$ and $K_2O$ were applied at the time of planting and rest half of $N_2$ was applied in two split doses at one month's interval.

Observations on pest incidence were taken at an interval of seven days during the whole period of crop growing. Six vines of pointed gourds from each plot taking two for each replication were selected for observations. Direct count of all the

**Table 1: Enumeration of insect and non-insect pests infesting pointed gourd**

| Sl. no. | Scientific Name | Common Name | Family | Order | Remarks |
|---|---|---|---|---|---|
| 1. | *Epilachna dodecastigma* (Wied) | Hadda beetle | Coccinellidae | Coleoptera | Foliage feeder |
| 2. | *Aulacophora foveicollis* (Lucas) | Red pumpkin beetle | Chrysomelidae | Coleoptera | Foliage and flower feeder |
| 3. | *Diaphania indica* (Saunders) | Leaf roller | Pyralidae | Lepidoptera | Foliage tender fruit feeder |
| 4. | *Bactrocera cucurbitae* (Coquillet) | Fruit fly | Tephritidae | Diptera | Damaging fruits |
| 5. | *Bemisia tabaci* (Genn.) | White fly | Aleyrodidae | Hemiptera | Foliage feeder |
| 6. | *Tetranychus urticae* (Koch.) | Two spotted red spider mite | Tetranychidae | Acarina | Remove chlorophyll from leaves |
| 7. | *Meloidogyne incognita* (Kofoid and White) | Root knot nematode | Meloidogynidae | Tylenchida | Produce root gall |

**Table 2: Pooled correlation between *T. urticae* and weather parameters**

| Sl. No. | Parameters | r |
|---|---|---|
| 1 | Maximum temperature | +0.797(**) |
| 2 | Minimum temperature | +0.078 |
| 3 | Morning RH | -0.650(**) |
| 4 | Evening RH | -0.539(**) |
| 5 | Rainfall | -0.289 |
| 6 | Soil temperature | +0.271 |
| 7 | Bright sun shine hour | +0.622(**) |

* Correlation is significant at the 0.05 level; ** Correlation is significant at the 0.01 level.

**Table 3: Pooled correlation between leaf roller and weather parameters**

| Sl. No. | Parameters | r |
|---|---|---|
| 1 | Maximum temperature | -0.523(**) |
| 2 | Minimum temperature | -0.774(**) |
| 3 | Morning RH | -0.029 |
| 4 | Evening RH | -0.535(**) |
| 5 | Rainfall | -0.524(**) |
| 6 | Soil temperature | -0.763(**) |
| 7 | Bright sun shine hour | +0.396(*) |

* Correlation is significant at the 0.05 level; ** Correlation is significant at the 0.01 level.

**Table 4: Pooled correlation between fruit fly and weather parameters**

| Sl. No. | Parameters | r |
|---|---|---|
| 1 | Maximum temperature | +0.386* |
| 2 | Minimum temperature | +0.501** |
| 3 | Morning RH | -0.451* |
| 4 | Evening RH | +0.284 |
| 5 | Rainfall | +0.195 |
| 6 | Soil temperature | +0.555** |
| 7 | Bright sun shine hour | +0.103 |

* Correlation is significant at the 0.05 level;** Correlation is significant at the 0.01 level.

**Table 5: Pooled correlation between epilachna and weather parameters**

| Sl. No. | Parameters | r |
|---|---|---|
| 1 | Maximum temperature | +0.387(*) |
| 2 | Minimum temperature | -0.205 |
| 3 | Morning RH | -0.438(*) |
| 4 | Evening RH | -0.512(**) |
| 5 | Rainfall | -0.386(*) |
| 6 | Soil temperature | -0.195 |
| 7 | Bright sun shine hour | +0.452(*) |

* Correlation is significant at the 0.05 level; ** Correlation is significant at the 0.01 level.

developmental stages of the pests like leaf roller (*Diaphaniai ndica* Saunders) and epilachna beetle (*Epilachna dodecastigma* Wied.) were taken on the creepers. Mite (*Tetranychus urticae* Koch.) population was counted from three selected leaves (*i.e.*, one tender, one moderately old and one old) per creeper with the help of hand lens (10X). Melon fruit fly (*Bactrocera cucurbitae* Coquillett) 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 the conversion formula developed by Gupta and Verma (1992).

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

## RESULTS AND DISCUSSION

### Pests infesting pointed gourd

The crop was infested by five insect and two non-insect pests which are presented in Table 1.

### Seasonal incidence

Studies on seasonal incidence of the following four pests had been taken up.

### Two spotted red spider mite (*Tetranychus urticae* Koch.)

Mite occurred throughout the period of observations from first week of March to second week of September during each of the three years of study. Incidence pattern was of typical single peakedness in May 2008 (2.89 mite/leaf), last week of April 2009 (3.77 mite/leaf) and first week of May 2010 (6.44 mite/leaf).The ascending period of population build up was comparatively less *i.e.* 9 weeks in 2008 (Fig. 1), 7 weeks in 2009 (Fig. 2) and 8 weeks in 2010 (Fig. 3) before reaching peak.The declining phase, in contrast was of longer duration *i.e.* 17 weeks in 2008 and 2009 and 16 weeks in 2010. Dey (2000), however, reported from this region two peaks of mite population during 2nd week of May and 3rd week of August in 1999 while, Das (2001) noted three peaks, in end of March, 2nd week of June and 3rd week of July on the crop. A study on population development of the pest was conducted in Bangladesh from August to January 2010 and peak of the population could be recorded during December (Haque *et al.*, 2011). But data of hot summer months as was not available it cannot be taken as the highest population level of the season.

Multiple correlation of the three years pooled data of mite population with weather factors (recorded as weekly average) indicated highly significant positive correlation with maximum temperature (r = +0.797) and bright sun shine hour (r = +0.622). Minimum weather and soil temp. showednon - significant positive correlation, morning and evening RH% highly significant negative correlation (r = -0.650 and - 0.539

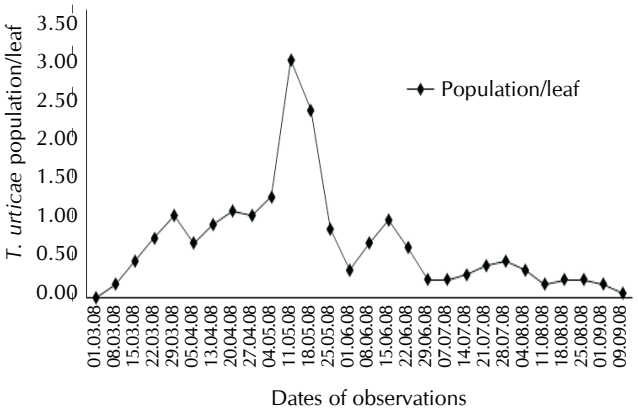


**Figure 1: Seasonal incidence of *T. urticae* in pointed gourd during 2008**

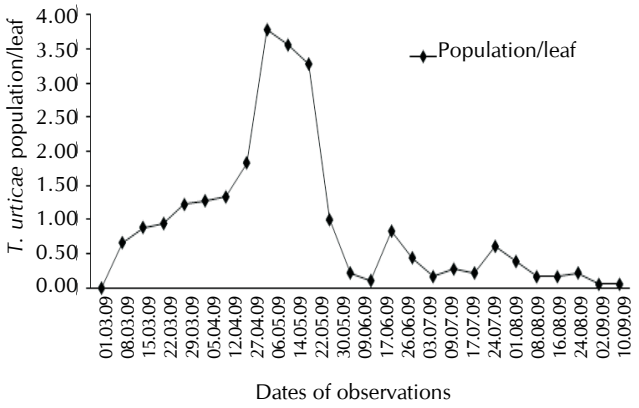


**Figure 2: Seasonal incidence of *T. urticae* in pointed gourd during 2009**

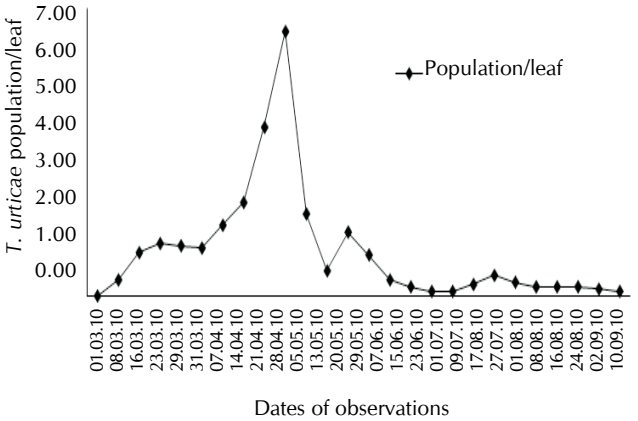


**Figure 3: Seasonal incidence of *T. urticae* in pointed gourd during 2010**

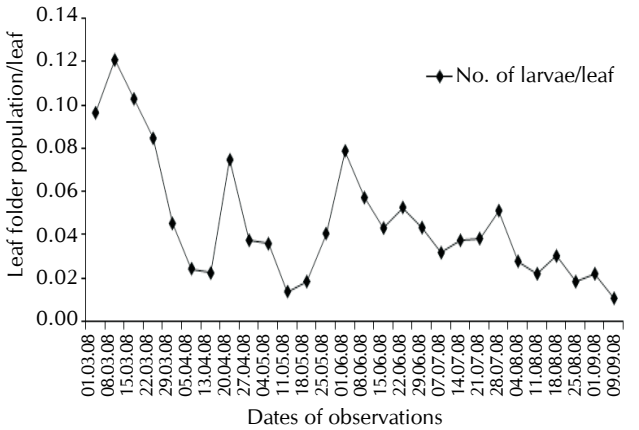


**Figure 4: Incidence pattern of leaf roller larvae/leaf in pointed gourd during 2008**

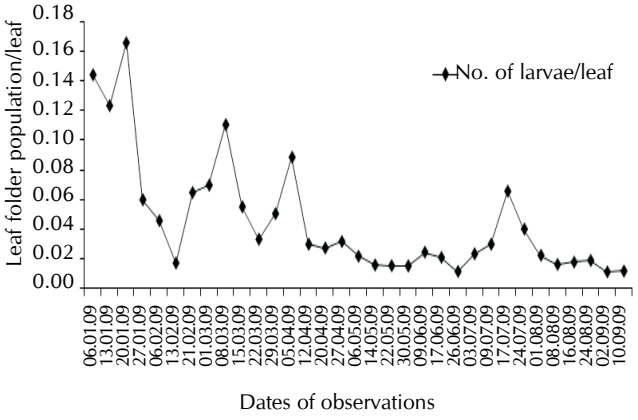


**Figure 5: Incidence pattern of leaf roller larvae/leaf in pointed gourd during 2009**

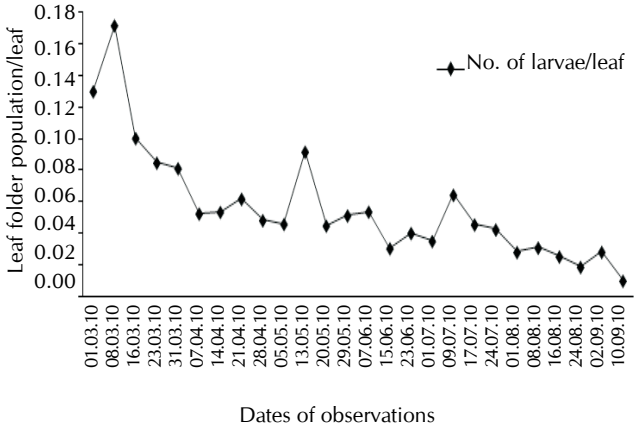


**Figure 6: Incidence pattern of leaf roller larvae/leaf in pointed gourd during 2010**

respectively) and total rainfall non-significant negative correlation (Table 2). Dey in 2000 made such correlations with abiotic factors and found the effect of temp. as positive and significant, while relative humidity and rainfall as non-significant on population development of the pest. He found warmer temp. (30.5ºC), high RH (83.5%) and low to trace rainfall (4.6mm) to be optimum for population build up of *T. urticae*. Das in 2001 established correlations between different weather parameters and population build up of the pest. It was significantly positive with max. temp., non-significantly negative with morning and evening RH and non - significantly positive with rainfall. Haque *et al.*, 2011 reported that temperature and rainfall had non-significant positive effect and relative humidity had non-significant negative effect on population buildup. The effect of temperature though had positive impact on population development of the pest; it was

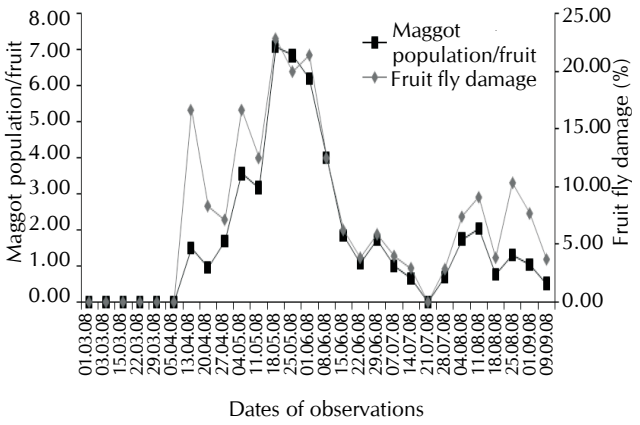


**Figure 7: Incidence pattern of fruit fly as maggot population in pointed gourd during 2008**

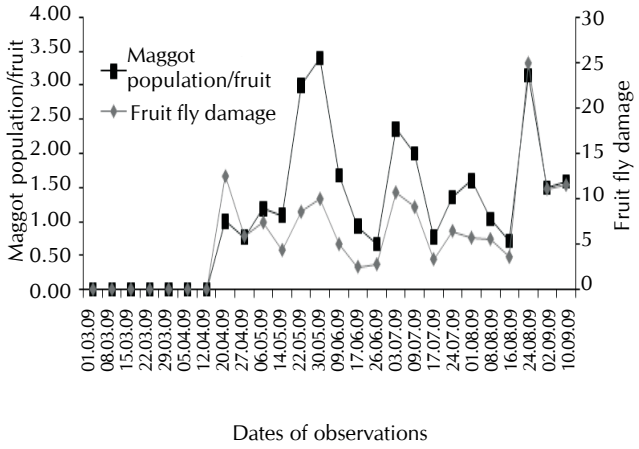


**Figure 8: Incidence pattern of fruit fly as maggot population in pointed gourd during 2009**

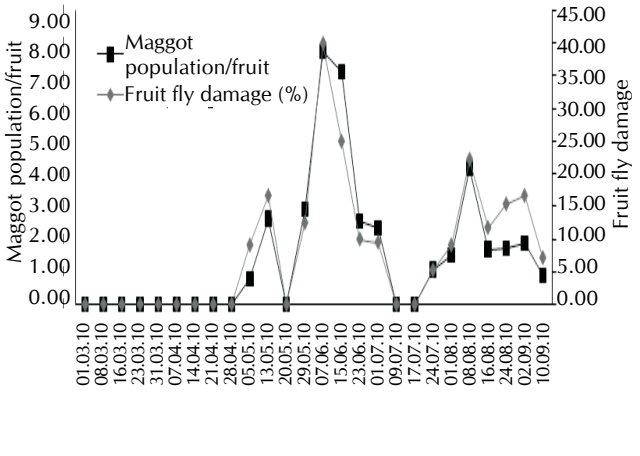


**Figure 9: Incidence pattern of fruit fly as maggot population in pointed gourd during 2010**

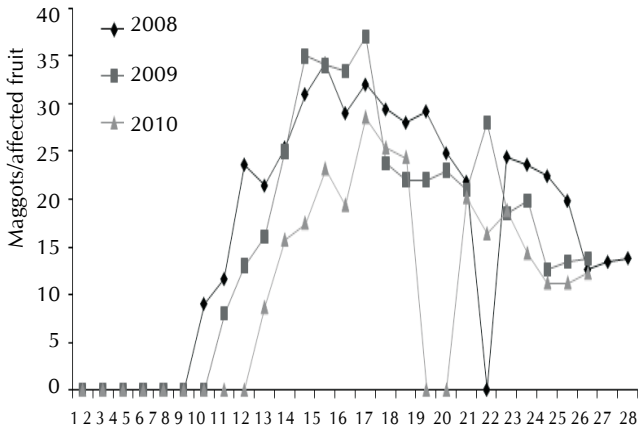


**Figure 10: Maggot population per affected fruit on pointed gourd in 2008-2010**

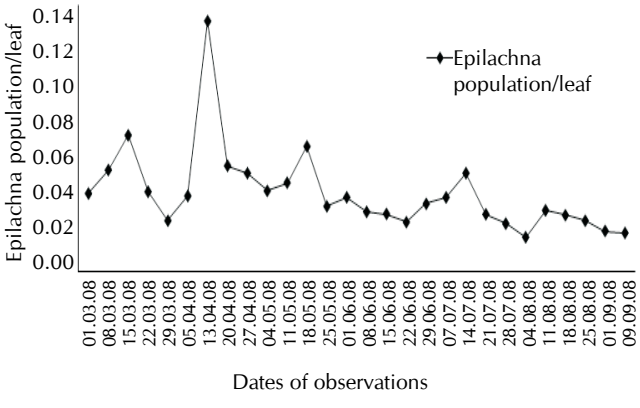


**Figure 11: Incidence pattern of Epilachna/leaf in pointed gourd during 2008**

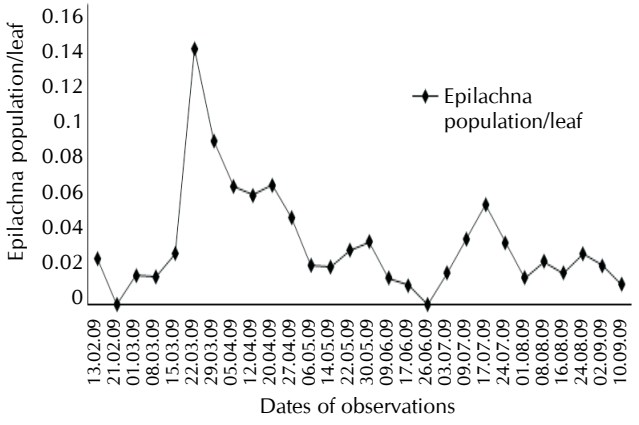


**Figure 12: Incidence pattern of Epilachna/leaf in pointed gourd during 2009**

not significantly expressed due to comparatively colder temperature months of the crop growing which was not normal.

**Leaf roller (*Diaphania indica*, Saunders)**

Leaf roller, *Diaphania indica* (Saunders), could be recorded throughout the crop season during all three years of study. Population was very low during all the years of study being 0.01 to 0.12 per leaf in 2008, 0.01 to 0.17 per leaf in 2009 and 2010 (Fig. 4, 5, 6). The peaks of leaf roller population was recorded in the third week of January (0.17 larvae/leaf), first to

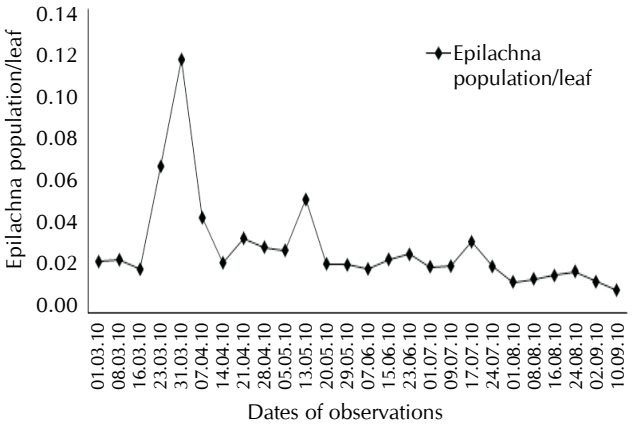


**Figure 13: Incidence pattern of Epilachna/leaf in pointed gourd during 2010**

second week of March (0.11 - 0.17 larvae/leaf), first to second week of April (0.07 – 0.09 larvae/leaf), second week of May (0.09 larvae/leaf), first week of June (0.08 larvae/leaf) and second week of July (0.06 – 0.07 larvae/leaf). Population was relatively high in early phase of crop growth, *i.e.*, during March 2008, during January 2009 and again during March 2010. Various workers had worked on the seasonal incidence of the pest on pointed gourd and other cucurbits. Das (2001) made a report from the same region of present study that the peak population of the pest on pointed gourd was during second week of May after which it maintained a low level up to the end of July.

The incidence of this pest had been reported to be highest during April-September on ivy gourd (Peter and David, 1991). Very serious infestation was observed by Ravi *et al*. (1998) between June and October on gherkins. Singh and Naik (2006) reported that the highest number of larvae was observed in March on bitter gourd.

Study on impact of different weather parameters had been made on the population build up of the pest. The temperature both maximum and minimum exerted significantly negative effects (r = - 0.523 and - 0.774 respectively), RH% of both morning and evening negatively (r = -0.029 and -0.535 respectively), rainfall (r = -0.524) and soil temperature (r = - 0.736) significantly negative on the population of leaf roller larvae. However, the only exception was bright sun shine hours which showed weak but positive and significant correlation (r = +0.396) with the population build up of the pest (Table 3). This findings contradicted the observation of Das (2001) who reported that maximum and minimum temperature had significant positive relation, whereas relative humidity and rainfall had no significant effect on leaf roller population on the crop.

**Fruit fly (*Bactroceracu curbitae,*Coquillett)**

Fruit fly (*Bactrocera cucurbitae*, Coq.), one of the most important pests of pointed gourd along with all members of family Cucurbitaceae occurred from second week of April to second week of September of 2008. This, during 2009, initiated its infestation, during third week of April and continued to occur till the crop was finally harvested during second week of September and during 2010 it was further late being during first week of May and persisted till the end of crop season during second week of September. High larval population (7.09 maggot/fruit) could be recorded from third week of May with corresponding fruit damage of 22.86% in 2008 (Fig. 7). Population of maggot was relatively low during 2009 being 3-3.4 maggot/fruit during last part of May and caused 10% fruit damage (Fig. 8). But highest fruit damage was found at the fag end of cropping season, *i.e.*, last week of August (25%). During 2010, however, population prevalence was of almost of the same order as on 2008 and the highest population of 7.15 to 7.76 maggots/fruit and fruit damage (25-40%) occurred during first and second week of June (Fig. 9). Development of population to reach high level took five weeks during 2008 and 2009 but in 2010 it took lesser time of four weeks. The decline of population to reach minimum during the last day of occurrence took thirteen weeks during 2008 and 2009 but it was eleven weeks in 2010. If three years' incidence pattern be considered together, it could have been found that the average maggot population/fruit was maximum in 2010 followed by 2008. The population was minimum in 2009. The corresponding damage percentage also followed more or less the same trend. However, on critical analysis of the maggot load per affected fruit (Fig. 10) it had been found that the population distribution per fruit was much skewed in 2009.

No such study was taken up from this region earlier. However, peak population of the pest had been reported to occur on bitter gourd from this region during summer followed by winter season (Banerji *et al.,* 2005). The study of Patnaik *et al.,* 2004 showed that the peak population of the fly was noted during April-May, *i.e.*, around eighteenth to twentieth standard weeks on bitter gourd. Such infestation on little gourd recorded throughout the year starting from the month of February reaching peak during third week of March and with negligible infestation during December-January (Patel and Patel, 1996). In a study conducted in Pakistan, peak of the *Bactrocera cucurbitae* population could be recorded in May and August and decline of it was observed from October reaching the minimum in January. It was due to the host fruit maturity, temperature and rainfall (Mahmood and Mishkatullah, 2007).

Relating the weather factors with incidence of maggot revealed significant positive correlation with both maximum (r = +0.386) and minimum (r = +0.501) temperature, the latter being highly so. Similarly soil temperature also showed highly significant positive correlation (r = +0.555). Morning RH% was negatively and significantly correlated with maggot incidence (r = -0.451). The other weather factors did not have any significant effects on incidence of the pest (Table 4). The result was more or less in conformity with Laskar and Chatterjee (2010) barring the effect of bright sun shine hour which in the present study was positively (insignificantly) correlated and that of the authors referred above were negatively correlated on pumpkin. The number of the fly captured with cuelure baited traps could be correlated positively with all three abiotic factors, *i.e.* temperature, humidity and rainfall (Hasyim *et al.,* 2008). Similar observation with regard to influence of meteorological parameters on the incidence of melon fly was also recorded earlier by several workers (Mahmood *et al.,* 2002; Gupta and Bhatia, 2000; Shukla and Prasad, 1985; Su, 1984).

**Epilachna beetle (*Epilachna dodecastigma* Wied.)**

Epilachna (*Epilachna dodecastigma* Wied.) is an important pest as both larval and adult stages feed on the foliages. The insect occurred persistently throughout entire crop seasons of all the three years of study. It started from first week of March to second week of September. Highest population of 0.13, 0.14 and 0.12 per leaf could be recorded during second week of April, third week of March and end of March of 2008, 2009 and 2010 respectively (Fig. 11,12,13). Population increased to reach peak at 6, 5 and 4 weeks after initiation of infestation in 2008, 2009 and 2010 and the declining phase to reach minimum from peak took 21, 22 and 21 weeks with usual fluctuations during 2008, 2009 and 2010 respectively reaching nil population during third week of June 2009 only. Seasonal incidence of epilachna was worked out by various workers in different provinces of India (Bassi, 1963; Thakur, 1966; Rajagopal and Trivedi, 1989; Jha, 2008). Das (2001) took up study on seasonality of the pest on pointed gourd in West Bengal. He also found the pest to remain active during entire growth stages of the crop but with peak of it in January, early May and third week of June.

Correlation of pest population build up with each of seven weather factors prevailing during occurrence of the pest were worked out. Significant positive correlations with max. temp. (r = +0.387) and bright sun shine hours (r = +0.452) were found. The remaining five factors showed negative correlation and these were only significantly so for morning RH% (r = -0.438), evening RH% (r = -0.512) and rainfall (r = -0.386) (Table 5). However, the result contradicted the observation of Das (2001) who reported that maximum and minimum temperature had significantly negative, relative humidity and rainfall negatively correlated with the pest population.

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