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Study on the pest complex of bottle gourd in the gangetic plains of West Bengal

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Abstract

Bottle gourd, *Lagenaria siceraria* (Malina) Standl. is a popular vegetable in India and some other Asian countries. But its productivity constraints limit the potential yield and several insect pests have been reported to cause considerable damage in different parts of the world. The present study was carried out to find out the situation in New Alluvial Zone of West Bengal. Red pumpkin beetle (*Aulacophora foveicollis*) and epilachna beetle (*Henosepilachna vigintioctopunctata*) were found to be the major pests and it appeared from early to mid crop growth stage (6.2 – 35.6% damage) and from mid to late crop growth stage (16.3 – 45.6% damage). The green semilooper (*Trichoplusia ni*) attacked the crop during prime vegetative growth stage and caused about 7.5 – 19.2% foliage damage). Study also revealed that some of the meteorological parameters exerted significant influences on the growth and development of the pest populations and hence their resultant damages.

Keywords: Bottle gourd, pest complex, damage, incidence, correlation

1. Introduction

Bottle gourd, *Lagenaria siceraria* (Malina) Standl. being a good source of minerals, is grown widely in India. The edible portion of bottle gourd fruit contains 96.3% moisture, Energy 63 kJ (15 kcal), Carbohydrates 5.87 g, Fat 0.02 g, Protein 0.6 g, Vitamin C – 10.100 mg, Zinc - 3.77 mg, Potassium – 3320.0 mg, Magnesium – 162.33 mg (Parle Milind and Kuar Satvir 2011) [1]. Fruits at tender stage are used as a cooked vegetable and for preparation of sweets and pickles. Bottle gourd is also known for its immense medicinal uses such as cooling effect, diuretic and cardio- tonic properties. Fruit pulp is used as an antidote against certain poisons and is good for controlling constipation, night blindness and cough. According to Dhillon *et al.*, 2005 [2], cucurbitaceous vegetables faced a yield loss due to pest attack ranged from 30 – 100% depending upon cucurbit species and the season in different parts of the world. But literature about the bottle gourd pest complex was very scanty, so, an effort was made to document the pest spectrum of bottle gourd in the gangetic plains of West Bengal giving the emphasize on important insect pests infesting bottle gourd along with their incidence and damage and their correlation with weather parameters.

2. Materials and Methods

2.1 Materials: Plant materials like Bottle gourd seeds (variety Pusa Naveen) and neem cake were used in the present study.

2.2 Methods: The experiments were carried out at Horticultural Teaching Farm, Bidhan Chandra Krishi Viswavidyalaya, Mondouri, Nadia, West Bengal, during winter season from September to December 2014. The topographic situation of the experimental site is under gangetic new alluvial plains of West Bengal. The data was collected from an unsprayed plot of bottle gourd field which was subdivided into four plots of 4m × 16m each. The crop was sown on 1st week of September (9/9/2014) at a spacing of 1.5×2m. 3-4 seeds are sown per point on the plot. Standard agronomic practices were followed to ensure optimal crop stand. The crop was harvested during the second week of December (15/12/2014).

Observations on the Population build up and infestation by the important insect pests' viz., red pumpkin beetle, epilachna beetle, green semilooper were recorded at weekly intervals in the early morning hours starting from 10 days after transplanting continued till final harvest was over. During the early stage of crop i.e. two leaf stage data was collected from the two plants out of five plants present in a plot. In the later stage i.e. when vining started, count was made

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from two quadrates of 0.5m each. In case of red pumpkin beetle, the number of the adult and the number of egg mass, grubs and adults of epilachna were recorded through direct count on upper and lower surfaces of semi mature leaves per plant. Damage inflicted by red pumpkin beetle and epilachna beetle was formulated by:

$$\text{Infestation of leaves (\%)} = \frac{\text{Number of infested leaves}}{\text{Total number of leaves}} \times 100$$

Leaf damaged in three portion of plant i.e. top, middle and lower counted from the whole plant and meaned. The number

of semilooper larva was recorded through visual observations on upper and lowers surfaces of semi mature leaves. Semilooper damage was determined by:

$$\text{Infestation of tendrils (\%)} = \frac{\text{Number of infested tendrils}}{\text{Total number of tendrils}} \times 100$$

Correlation between weather parameters and incidence of the important insect pests were worked out to find out how different meteorological parameters affected the abundance of those species in bottle gourd fields and their statistical analysis was done.

Table 1: Major Insect Pests of Bottle Gourd with Their Potential Yield Losses

Serial No.	Name of the pest	Distribution	Potential yield Loss (%)
1.	Melon Fruit fly <i>Bactrocera cucurbitae</i> (Coquillett) (Tephritidae, Diptera)	Throughout India	30 to 100%
2.	Red Pumpkin Beetle <i>Aulacophora foveicollis</i> (Lucas) (Chrysomelidae, Coleoptera)	Rajasthan, Tripura, Assam, Karnataka, Uttar Pradesh, West Bengal	35-75%
3.	Hadda beetle <i>Henosepilachna vigintioctopunctata</i> Fab. and <i>Epilachna dodecastigma</i> (Wied.) (Curculionidae: Coleoptera)	Eastern Uttar Pradesh and Bihar, Jammu, Allahabad	More than 80%
4.	Melon aphid <i>Aphis gossypii</i> Glover, Aphididae, Hemiptera	Andhra Pradesh, Assam, Delhi, Gujarat, Haryana, Kerala, Karnataka, Tamil Nadu etc.	Not available
5.	Pumpkin caterpillar <i>Diaphania indica</i> (Saunders) (Pyralidae, Lepidoptera)	Several states of India	25 – 30%
6.	Bottle gourd plume moth <i>Sphenarches caffer</i> (Zeller) (Pterophoridae, Lepidoptera)	Varanasi, Tirupathi	Not available
7.	Melon thrips <i>Thrips palmi</i> (Karny) (Thripidae, Thysanoptera)	West Bengal, Tamil Nadu, Andhra Pradesh, Delhi, Jammu & Kashmir, Uttar Pradesh etc.	About 80 – 90% (mainly in Cucumber)
8.	White fly <i>Bemisia tabaci</i> (Gennadius) (Aleyrodidae, Hemiptera)	Almost throughout the India, excepting very high altitude	Not available

3. Results and Discussion

Numbers of insect pests were encountered in the present investigation in substantial numbers and some of them were quite serious (Table - 2). Red pumpkin beetle adults appeared in the middle of September, and reached the peak during end of October to mid – November and gradually disappeared at the middle of December. The number of adult beetles during this time varied from 6.7 – 9.9/0.5m quadrates causing the significant amount of leaf damage between 6.2 – 35.6%. Epilachna beetle was also found to be a very serious pest of bottle gourd and appeared as early as middle of September but field density started to climb from the mid – crop growth stage. Peak adult activity was recorded during early November to mid – December and numbers varied between 4.1 – 5.4/0.5m quadrates while peak grub density was recorded during mid – November to mid – December, number varied between 7.9 – 16.2/0.5m quadrates. High field density of the adults and grubs caused high degree of damage ranging between 16.3 – 45.6% and the damage intensity was more during early November – mid December (29.2 – 45.6%). Green semilooper, *Trichoplusia ni*, was recorded mostly during mid – November to mid – December, but it appeared to a minor significance because their field population density (0.6 – 3.9/ plot) never reached alarming status and damage was also not of high magnitude (7.5 – 19.2%). Rahman and Prodhan (2007)^[6] observed that the pest red pumpkin beetle occurred throughout the year and caused severe damage to the crops especially at seedling stage. Khan *et al.* (2012)^[7] reported that the adult red pumpkin beetles fed insatiably on

leaves, flower buds and flowers. So, it can be called as one of the most serious pest of cucurbits, except bitter gourd. In some cases the losses of this pest have been reported to 30-100% in the field. Thus present findings are in general agreement with these observations that the red pumpkin beetle and epilachna beetle appeared as major pest of bottle gourd. Results (Table - 3) also showed all the meteorological parameters have a great influence (either negative or positive) on the growth & incidences of pest population in the present experiment. Maximum temperature showed a significant positive correlation while minimum temperature on the other hand, significantly and negatively impacted the red pumpkin beetle. Minimum RH had a negative effect on the beetle while maximum RH showed a positive correlation with the incidence of the beetle. Bright sunshine hours also showed non-significant positive correlation with incidence of Red pumpkin beetle. These are in general agreement with the findings of Saljoqi and Khan (2007)^[8] who concluded that RH was among the most favourable conditions for pest prevalence. It was also in line with the findings of Rajak (2000)^[9] that relationship of pest population with temperature was positive and that with relative humidity was negative. In case of epilachna beetle, both the temperatures showed positive correlation but only minimum temperature exerted significant influence on the growth of epilachna population. It is in line with the findings of Ghosh and Senapati, 2001^[10], Haseeb *et al.* (2009)^[11] and Tushar M. Ghule *et al.* (2014)^[12]. Maximum relative humidity showed negative correlation with the epilachna beetle while minimum relative humidity held

positive correlation with the incidence of epilachna beetle but was not significant. Mean bright sunshine hours exerted a strong influence on the growth and development of the beetle and it was a strong positive correlation. Maximum temperature adversely affected the green semilooper and the

effect was significant. Minimum temperature, maximum and minimum relative humidity and bright sunshine hours also exhibited positive correlation with the semilooper population but none was significant.

Table 2: Population count and damage % of bottle gourd pests

Month	Red pumpkin beetle *		Epilachna beetle *			Semi looper larva (per plot)	
	Adult	% Damage leaf	Adult	Grub	% Damage leaf **	Number	% Damage trails
15/9/14	1.4	-	0.1	-	-	-	-
25/9/14	4.3	6.2	0.6	-	1.5	-	-
4/10/14	4.2	14.2	1.2	1.6	1.8	-	-
14/10/14	5.4	18.3	1.2	1.3	5.2	0.6	7.5
24/10/14	6.7	28.2	2.2	2.8	16.3	1.2	9.6
3/11/14	7.8	30.5	4.1	6.1	29.2	1.6	9.7
13/11/14	9.9	35.6	4.8	7.9	36.5	3.8	18.2
23/11/14	3.2	22.6	5.4	9.4	39.7	3.6	17.4
2/12/14	1.1	16.2	4.1	12.3	42.5	3.9	19.2
12/12/14	0.5	14.2	4.2	16.2	45.6	3.5	18.4
Mean ± SE	4.45 ± 0.461	18.6 ± 1.793	2.8 ± 0.276	5.76 ± 0.569	21.8 ± 2.191	1.82 ± 0.178	10.2 ± 1.102

* Upto 14/10/14 per plant, then per 50cm quadrat

** Cumulative of grub and adult.

Table 3: Correlation between weather parameters and incidence of insect pests on bottle gourd

Pests	T _{max}	T _{min}	RH _{max}	RH _{min}	MBSH
Red pumpkin beetle	0.542 *	- 0.725 *	0.612	- 0.482 *	0.532
Epilachna beetle	0.472	0.447 *	- 0.372	0.396	0.476 **
Semi looper	- 0.516 *	0.564	0.581	0.602	0.613

* Significant at 5% level

** Significant at 1% level

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