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Short Communication

Effect of meteorological parameters on abundance of mirid bug, *Nesidiocoris cruentatus* (Ballard) (Hemiptera:Miridae): An emerging insect pest of bottle gourd

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Bottle gourd or *Lagenaria siceraria* (Mol.) Standl., of the family Cucurbitaceae, is a climbing perennial plant widely cultivated round the year as a vegetable crop across the country.This crop is often attacked by a number of insect pests throughout its growth period. Apart from its regular pests, recently serious incidence of a mirid bug,*Nesidiocoris cruentatus* (Ballard) was observed on tender leaves and young fruits in many parts of eastern Uttar Pradesh. On tender leaves, a minute puncture spot with yellow hallow were observed. The damage was more prominent in young fruits. Brown puncture spots with on the rind with sap oozing out from the tender fruits was the characteristic symptoms of this sucking pests. The affected fruits often failed to fetch a good market price. During this period, the damage by this pest was so serious that chemical control was almost inevitable. Farmers of this region often used to apply around 4-5 rounds of synthetic insecticides to control this oligophagous pest. This practices have led to many fold problems like resistance to insecticides, resurgence of target insects and secondary pest outbreak, in addition to insecticide residues in food and beverages, contamination of groundwater, adverse effect on human health, and widespread killing of non-target organisms (Halder *et al*., 2012; 2014).

The insect pest incidence is an outcome of interaction between host, insect and weather over a period of time (Halder *et al*., 2017). Different meteorological parameters *viz*., temperature, rainfall and relative humidity greatly influence the insect population. With this in view, the present investigation was aimed to elucidate the effect of different weather parameters on the population buildup of *N. cruentatus* in the bottle gourd ecosystem. This will be useful to take suitable control measures well in advance, thus reducing the excessive and unnecessary usage of insecticides, cost of cultivation as well as environmental hazards.

The field experiments were carried out on the experimental farm of ICAR-Indian Institute Vegetable Research, Varanasi (82°52' E longitude and 25°12' N latitude), Uttar Pradesh, India during three seasons(pre-*kharif, kharif* and r*abi)* of 2016-17. The regular monitoring of the insect incidence and subsequent damage on fruits as well as on tender buds was recorded during the morning (in between 10 to 11 am) in all the seasons. Fifty randomly selected fruits were tagged and data on the number of nymphs and adults of *N. cruentatus*per fruit were counted at weekly intervals and expressed as number of bugs fruit^{-1}. The data were recorded from just beginning when the first occurrence of *N. cruentatus* was observed on bottle gourd.

The data on weather parameters during the cropping periods were taken from the meteorological observatory located in the institute. The weather parameters included in the study were daily maximum temperature (T_{max}) (^{o}C), daily minimum temperature(T_{min}) (^{o}C), average daily temperature ($T_{average}$) (^{o}C), average day relative humidity at 7.00 am and 2.00 pm (RH_{day}), bright sunshine hour, evaporation (mm), rainfall (mm) and wind velocity (km h^{-1}). The growing degree day (GDD) was calculated by subtracting base temperature (10^{o}C) from the average daily temperature whereas heliothermal unit (HTU) was derived by multiplying GDD with bright sunshine hours (Ghosh *et al*., 2015). The cumulative value of weather parameters were calculated by adding everyday value since the date of sowing.

It is evident from the Fig.1 that the incidence of mirid bug, *N. cruentatus*on bottle gourd was started during 17th standard meteorological week (SMW). During the *pre-kharif* season, 4.2 bugs/fruit was recorded during 17th SMW and a maximum of 4.7 bugs/fruits were observed during the 24th SMW. During the *kharif* season, highest bug population (5.8) per fruit was recorded during 28th SMW whereas lowest bugs (1.4 bugs fruit^{-1}) were recorded during 32nd SMW coinciding with the extreme summer in the region. During the *rabi* season, maximum mirid bug population of 5.6 fruit^{-}

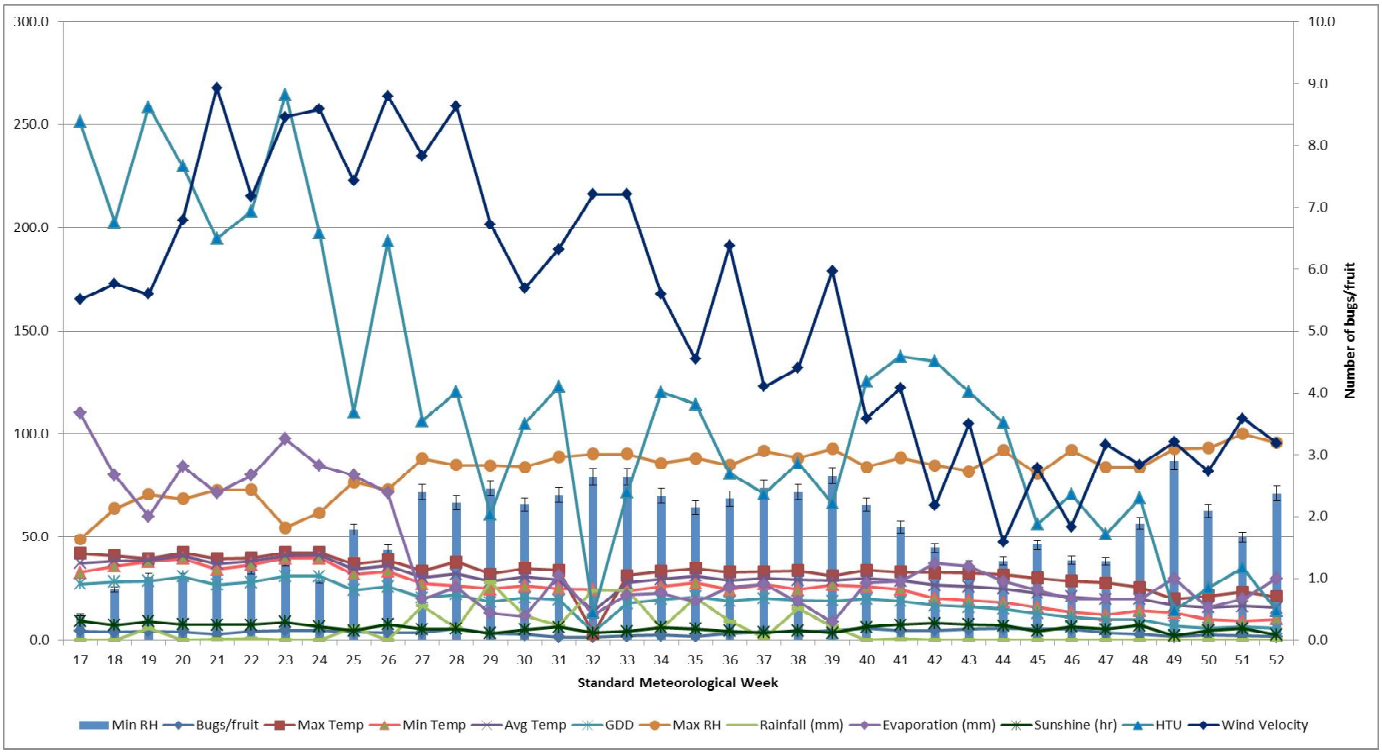

Fig.1: Mean mirid bug, *Nesidiocoris cruentatus* infesting bottle gourd and influenced by mean weather factors of the year 2016.

Table 1: Correlation coefficient (r) of incidence of bottle gourd mirid bug, *N. cruentatus* with abiotic factors during 2016

Abiotic parameters	Pooled
Maximum temperature (T_{max})	0.623*
Minimum temperature (T_{min})	0.552*
Average temperature (T_{mean})	0.656*
Growing degree day (GDD)	0.656*
Relative humidity at 7 am (RH I)	-0.421
Relative humidity at 2 pm (RH II)	-0.492
Rainfall (RF)	-0.263
Sunshine hour (BSS)	0.346
Heliothermal unit (HTU)	0.506
Evaporation (EP)	0.291
Wind velocity (WS)	-0.340

* Significant at the 0.05 level (2-tailed)

[1] was recorded during 44th SMW and after that its population was gradually declining and lowest population (1.6 bugs fruit^{-1}) was recorded during 49 and 51st SMW due to severe winter in Varanasi region.

From Table 1 it is evident that maximum, minimum and average temperatures had positive and significant correlation with the mirid bug population and the corresponding pooled correlation co-efficient (r) values were 0.623*, 0.552*, 0.656*, respectively. A similar observation was also noted on growing degree day (r=0.656*).In another study Halder *et al*. (2017) concluded that sporadic incidence of cucumber moth, *Diaphania indica* relied upon the maximum, minimum and average temperature under Varanasi conditions.

In contrast,relative humidity at 7 am, 2 pm, wind velocity as well as rainfall had negative correlation with pest incidence but the correlation were non-significant. It can be inferred that high rainfall are detrimental effect on abundance of this hemipteran insect. According to Patel *et al*. (2010), morning as well as the average relative humidity was significantly and negatively associated with the larval population of *Maruca vitrata*.

Along with the meteorological parameter sunshine hour, agroclimatic indices heliothermal unit had positive correlations(0.346 and 0.506, respectively) with the *N. cruentatus*population. However, during the *rabi* season, both the meteorological parameters had significant and positive correlation (0.671 and 0.805, respectively). Patel *et al*.(2010) reported that temperature, bright sunshine hours, wind speed and vapour pressure exhibited positive influences on spotted pod borer (*M. vitrata*) infesting cowpea.

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