Int.J.Curr.Microbiol.App.Sci (2017) *6*(8): 1777-1784

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 8 (2017) pp. 1777-1784**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.608.210

Seasonal Incidence of Major Insect Pests of Cowpea in Relation to Biotic and Abiotic Factors

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Keywords

Cowpea, Flower thrips, Biotic and abiotic factors.

Article Info

Accepted:
19 June 2017
Available Online:
10 August 2017

A B S T R A C T

The present study was conducted at Horticultural Research Farm, College of Agriculture, Indira Gandhi KrishiVishwavidyalaya; Raipur (C.G.) during *kharif* season 2015-16. The results of field experiments revealed that the major insect pest *viz.*, spotted pod borer, flower thrips, pod sucking bug and green stink bug were attacking in cowpea germplasm Lola. The incidence of pod sucking bug, green stink bug and flower thrips started from third week after transplanting, further increased and recorded the peak activity of 9.0 bugs per plant and 12.3 bugs per plant during second week of November, whereas the peak activity of 4.3 thrips per plant was observed during first week of October. The cowpea spotted pod borer infestation was first appeared during fifth week of September, increased gradually with peak pod infestation of 19.7 per cent during third week of October. The population of flower thrips and pod sucking bug was positively and non significant correlated with maximum and minimum temperature while negatively correlated with maximum and minimum relative humidity, rainfall and sunshine hours. The cowpea spotted pod borer infestation showed positive and non significant correlation with maximum and minimum temperature, rainfall, sunshine hours, maximum and minimum relative humidity.

Introduction

Cowpea is a tropical, annual herbaceous legume, which belongs to the family Papilionaceae (Fabaceae), order Leguminosae and genus *Vigna*. The cowpea is considered a grain legume or pulse (Uwaegbute, 1991). The cowpea grain contains an average of 23-25% protein and 50-67% carbohydrates (Singh *et al.*, 1997). It has fat content of 1.3%, fibre content of 1.8% and 8-9% of water. The most damaging pests of cowpea include those that occur during the flowering and podding stages. These pests include flower thrips, such as *Megalurothrips sjostedti* (Trybom) (Thysanoptera: Thripidae), pod borer, *Marucavitrata* (Fabricius) (Lepidoptera: Crambidae) and pod suckers such as, *Riptortus dentipes* (Hemiptera: Coreidae) (Adati *et al.*, 2007). Many morphological and biochemical factors are known to be associated with insect resistance in crop plants. It is obvious in many cases that the morphological factors are more important in conferring non-preference and antibiosis. Some biochemical constituents may act as

feeding stimuli for insects. Occurrence at lower concentration or total absence of such biochemical leads to insect resistance.

Materials and Methods

The seasonal incidence of cowpea insect pest, were recorded weekly on cowpea genotypes. Weekly observations on major insect pest population available in the experimental field were recorded on randomly selected five plants from experimental plots during the whole cropping season *i.e.* from September 2015 to December 2015.The method modified as according to (Jackai, 1982; Kumar and Kumar, 2015). Correlation analysis was worked out as per method given by Gomez and Gomez (1984).

Results and Discussion

Seasonal activity of cowpea flower thrips (*M. sjoestdi* Trybom)

Periodical observations on the flower thrips incidence showed that the first appearance of nymph and adult thrips population was started from 5th week of September (39thSMW (standard meteorological week)). Initially, there were 3.1 thrips per plant which increased up to the maximum 4.3 nymphs and adult per plant during the first week of October (40th SMW). Thereafter, the nymph and adult population gradually declined to 1.5 thrips per plant during the third week of December (50th SMW). The thrips population was observed during the entire crop growth period, during this period maximum (32.5 ^{0}C) and minimum temperature (24.6 ^{0}C), morning 92% and evening relative humidity 57% and sunshine 7.7 hours/day prevailed (Tables 1 and 2; Fig. 1).

These finding are in conformity with Kumar *et al.*, (2015) reported that Thrips (*Megalurothripssjostedti* Tryb.) population was observed in last week of September and its highest population was recorded in third week of October (5.87/flower bud). On the contrary, According to Patel *et al.*, (2010) population of thrips was recorded in the month of March only and reached to its maximum level during fourth week of March. The thrips was noticed at flowering stage with varying population density. Singh and Singh (2014) also maximum and minimum thrips populations (2.53 and 0.15 insect/flower) were observed during 25th and 21st standard weeks respectively during *zaid*, 2009-10.

Correlation to weather parameters

The population of thrips was correlated with weather parameters *viz*. temperature, rainfall, relative humidity and sunshine hours. The correlation coefficient between flower thrips population and weather parameter revealed positive and highly significant with maximum temperature (r= 0.705), minimum temperature (r= 0.839) highly significant, positive and non significant with maximum (r= 0.182), minimum (r= 0.565) relative humidity is positive and significant correlation and negatively non significant with rainfall (r= -0.390) while positive and non significant with sunshine (r= 0.369) (Table 3). The present studies are corroborated with Patel *et al.*, (2010) who reported that none of weather variables had significant impact on occurrence of thrips. Similarly Faleiro *et al.*, (1990) also reported that relative humidity, bright sunshine hours and vapour pressure affect negatively; while, temperature and wind speed influenced positively on the population of thrips.

Seasonal activity of pod sucking bug (*R. dentipes*)

Perusal of data presented (Tables 1 and 2; Fig. 2) on the incidence of pod sucking bug showed that the first appearance of pod

sucking bug was started from 5th week of September (39th SMW). Initial population of pod sucking bug was 0.5 bugs per plant and reached to the maximum (9.0 bugs/plant) in the 2nd week of November (45th SMW). The pod sucking bug population was observed during the entire crop growth period with the prevalence of maximum (32.5 ^{0}C) and minimum (24.6 ^{0}C) temperature, morning (92%) and evening (57%) relative humidity and sunshine hours (7.2 hours/day) respectively. Thereafter, the population gradually decreased to 2.5bugs/plant during the second week of December**.** The present findings are in agreement with Niba (2011) from South Africa; pod sucking bugs entered in cowpea fields at 8 weeks after sowing and remained on the crop till harvesting. They attained peak infestation level at 12 weeks after sowing.

Correlation to weather parameters

The mean jassid population was correlated with weather parameters *viz*. temperature, rainfall, and relative humidity and sunshine hours. The correlation coefficient between pod sucking bug population and weather parameter revealed negative and non significant with maximum temperature (r= -0.147), minimum temperature (r= -0.598) negatively significant (at 5%), positively and non significant with maximum (r= 0.359), minimum (r= -0.771) relative humidity is negative and highly significant (at 1%) and negatively non significant with rainfall (r= -0.241) while positive and non significant with sunshine (r= 0.330).

Seasonal activity of green stink bug (*Nezara viridula)*

Periodical observations on the green stink bug incidence showed that the first appearance of green stink bug population was recorded from 5th week of September (39th SMW). Initially, the bugs population was 0.5 bugs per plant and it reached to maximum (12.3 bugs/plant) in the first week of November (45th SMW). During this period, there was prevalence of maximum (32.5^{0}C) and minimum (24.6 ^{0}C) temperature, morning (92%) and evening (57%) relative humidity and sunshine hours (7.2 hours/day), respectively. Thereafter, the population gradually declined to 4.5 bugs /plant during second week of December (Tables 1 and 2; Fig. 3).

Correlation to weather parameters

The mean population of green stink bug was correlated with weather parameters *viz.* temperature, rainfall, relative, humidity and sunshine hours. The correlation coefficient between green stink bug population and weather parameter revealed negative and non significant with maximum temperature (r= -0.194), minimum temperature (r= -0.520) negative and significant, positively and non significant with maximum (r= 0.003), minimum (r= -0.620) relative humidity is negatively significant and negatively non significant with rainfall (r= -0.316) while positive and non significant with sunshine (r= 0.314) (Table 3).

Seasonal activity of spotted pod borer (*Maruca vitrata* Fabricius*)*

Periodical observations on the *M. vitrata* incidence showed that the first appearance of *M. vitrata* population was noticed from last week of September (39th SMW). Initial incidence of *M. vitrata* was 10.6 per cent which reached to maximum (19.7 percent) in the third week of October (42th SMW). During this period, there was prevalence of maximum (32.5^{0}C) and minimum (24.6^{0}C) temperature, morning (92%) and evening relative humidity (57%) and sunshine hours (7.2 hours/day), respectively. Thereafter, the population of *M. vitrata* was gradually declined (0.1/plant) during the last week of

November (48th SMW) (Tables 1 and 2; Fig. 4).

These finding are in conformity with Niba (2011) from South Africa, found that the larvae of this insect were invading the crop at four week after sowing (47th standard week). The peak level of infestation was observed at ten week after sowing (1st standard week) and disappeared at thirteen week after sowing (3rd standard week). Lalasangi, 1988also reported that the peak activity of *M. vitrata has* been observed during the month of July, August and October. Similarly Srivastava *et al.,* 1992 reported two population peaks has been observed in moth catches from light traps at ICRISAT, Hyderabad i.e. first peak during September and second peak in early November to mid December, while it is between mid September to mid October at Hisar.

Table.1 Seasonal incidence of major insect pests on cowpea during Kharif, 2015-16

SMW	Flower Thrips	Pod Sucking Bug	Green Stink Bug	Spotted Pod Borer Infestation Percent	Lady Bird Beetle	Spider
39	3.1	0.5	0.5	10.6	0.2	0.9
40	4.3	3.5	9.3	16.7	0.3	0.4
41	2.8	4.3	5.0	13.6	0.5	1.0
42	3.0	3.3	8.3	19.7	0.6	1.4
43	2.4	3.5	5.8	14.4	0.5	1.2
44	2.3	1.5	8.0	12.1	0.2	1.6
45	2.1	9.0	12.3	12.1	0.8	0.8
46	1.7	7.8	10.5	12.1	0.8	1.0
47	2.1	8.8	9.0	9.1	1.3	1.4
48	2.4	6.8	7.3	15.2	1.5	1.4
49	1.8	4.5	12.3	12.1	1.0	1.2
50	1.5	2.5	4.3	15.2	0.8	1.0
Seasonal mean	**2.4**	**4.6**	**7.7**	**13.6**	**0.7**	**1.1**

Table.2 Period of activity and population of major insect pests of cowpea crop during Kharif 2015-16

S.N.	Common name	Range of incidence	Status of peak activity
1.	Flower thrips	1.5-4.3	First week of October
2.	Pod sucking bug	0.5-9.0	Second week of November
3.	Green stink bug	0.5-12.3	Second week of November
4.	Spotted pod borer	9.1-19.7	Third week of October

Table.3 Correlation between major insect pests of cowpea and weather parameters

Mean population/ per cent infestation per plant	Temperature (°C)		Relative humidity (%)		Rainfall (mm)	Sunshine (hrs)
	Max.	Min.	Max.	Min.		
Flower thrips	0.705**	0.839**	0.182	0.565*	-0.390	0.369
Pod sucking bug	-0.147	-0.598*	0.359	-0.771**	-0.241	0.330
Green stink bug	-0.194	-0.520*	0.003	-0.620*	-0.316	0.314
Pod borer	0.490	0.405	0.152	0.127	0.178	0.023

Table.4 Correlation coefficient between population of natural enemies and insect pests of cowpea during Kharif season 2015-16

Natural enemies	Flower thrips	Pod sucking bug	Green stink bug	Spotted pod borer
Lady bird beetle	-0.501	-	-	-0.136
Spider	-	0.001	0.013	-0.095

Fig.1 Average number of flower thrips (*Megalothrips sjoestdi*) on cowpea crop as influenced by different weather parameters during kharif, 2015

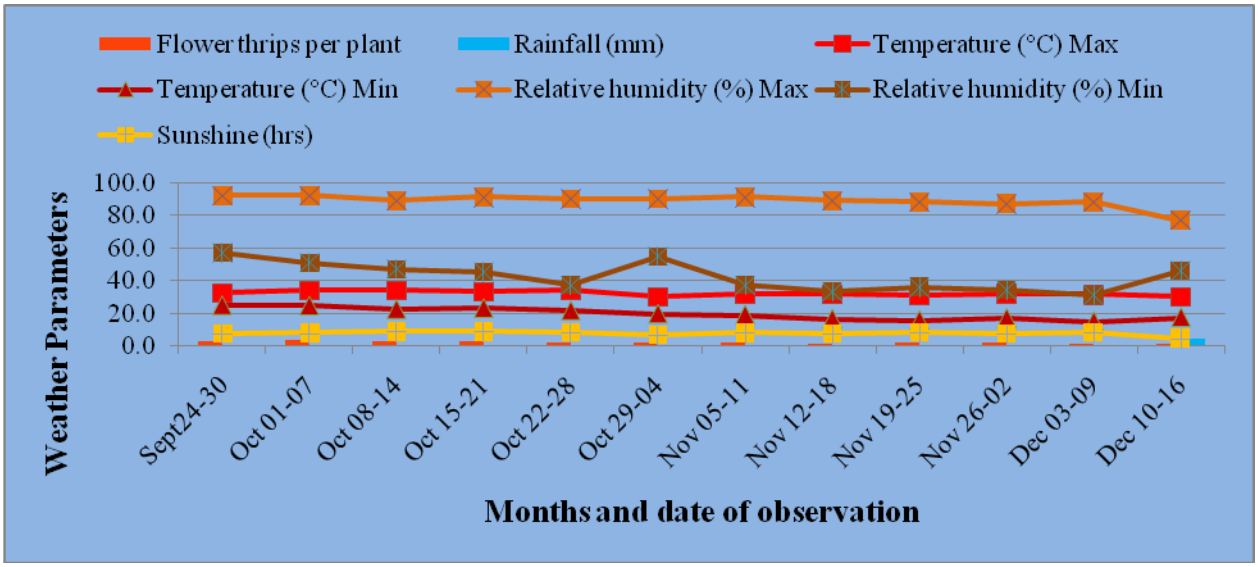


Fig.2 Average number of pod sucking bug (*Riptorsus dentipes*) on cowpea crop as influenced by different weather parameters during kharif, 2015

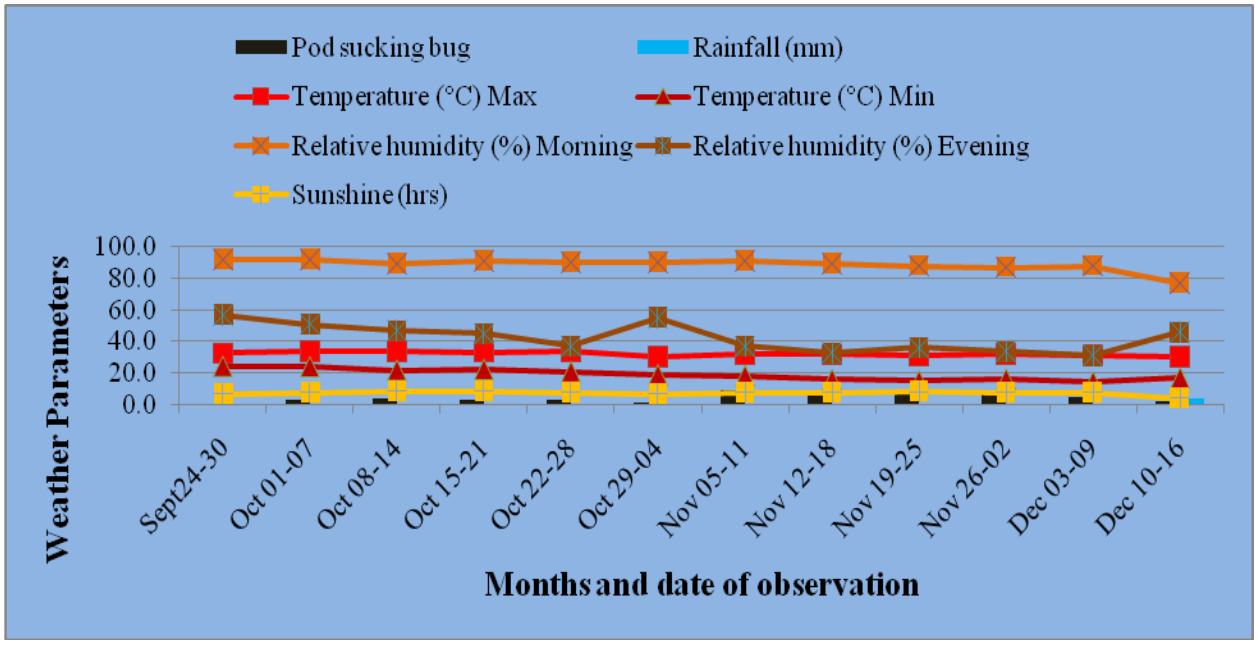


Fig.3 Average number of green stink bug (*Nezara viridula*) on cowpea crop as influenced by different weather parameters during kharif, 2015

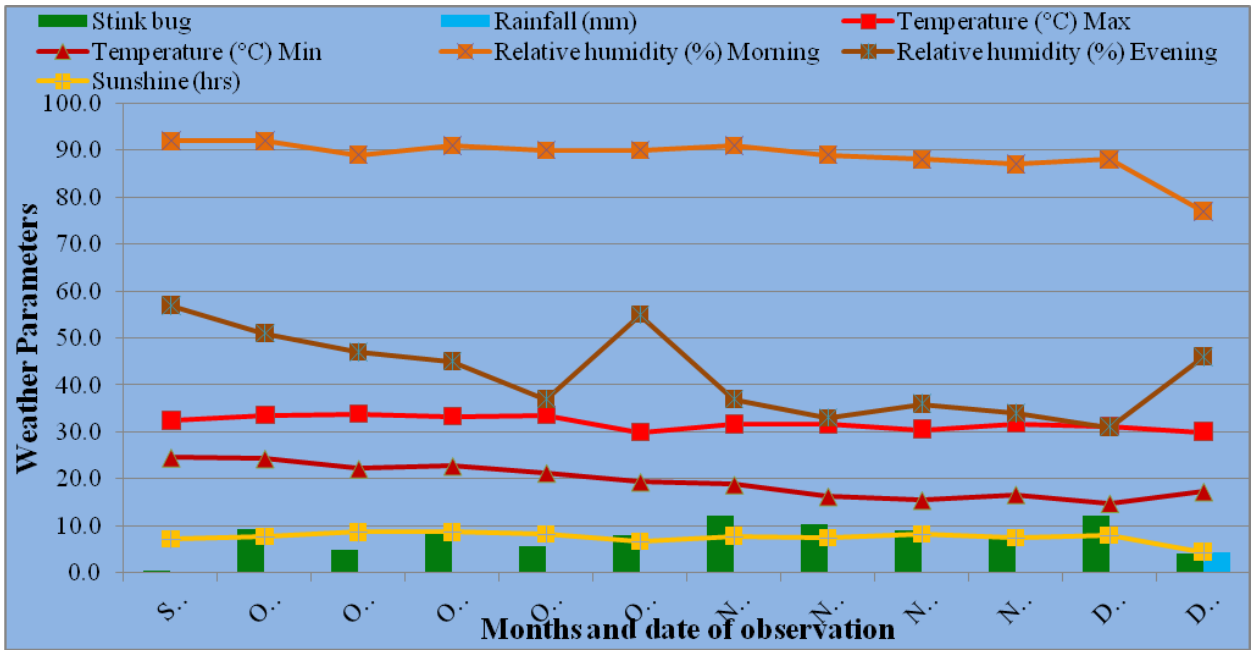
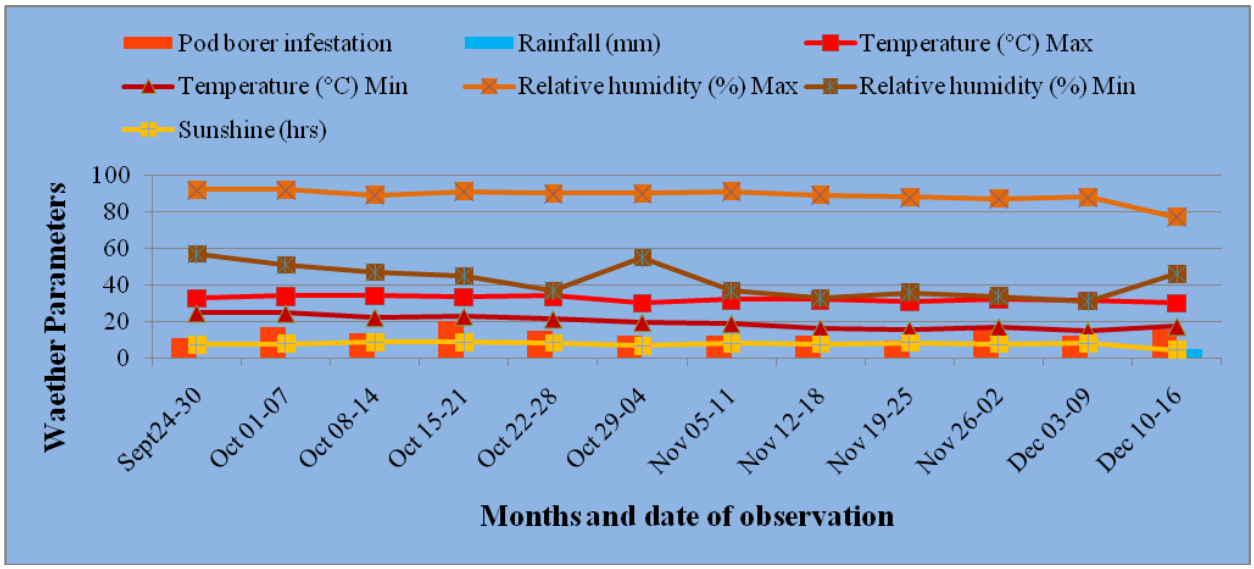


Fig.4 Pod borer infestation (*Maruca vitrata*) on cowpea as influenced by different weather parameters during kharif, 2015



Correlation to weather parameters

The mean population of *M. vitrata* was correlated with weather parameters *viz.* temperature, rainfall and relative humidity and sunshine hours. The correlation coefficient between spotted pod borer infestation and weather parameter revealed positive and non significant with maximum temperature (r= -0.490), minimum temperature (r= 0.405), maximum (r= 0.152), minimum (r= -0.127) relative humidity, rainfall (r= 0.178) and sunshine (r= 0.023) (Table 3).

Correlation co-efficient between major insect pest of cowpea and biotic parameters

Perusal of data presented (Table 4) revealed that the flower thrips population showed negatively non significant correlation to lady bird beetle (r=-0.501), spotted pod borer infestation also showed that negatively non significant correlation to lady bird beetle (r=-0.140) and spider (r=-0.095).The pod sucking bug and green stink bug population showed non-significant positive correlation with natural enemies.

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How to cite this article:

Maya Shree Mahipal, Shri Gajendra Chandrakar, Yashpal Singh Nirala, Devendra Nishad and Birendra Tigga. 2017. Seasonal Incidence of Major Insect Pests of Cowpea in Relation to Biotic and Abiotic Factors. *Int.J.Curr.Microbiol.App.Sci.* 6(8): 1777-1784.
doi: https://doi.org/10.20546/ijcmas.2017.608.210