Journal of Agrometeorology 16 (2) : 222-226 (December 2014)

Short Comminucation

Effect of weather parameters on pest complex of banana under heavy rainfall zone of South Gujarat

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Banana (*Musa paradiciaca* L.) called 'Apple of the Paradise' is one of the important fruit crop of the world and recently has achieved the status of food, while plantain group (AAB) are the major staple food of millions of people across the globe (FAO, 1985). In India, the banana plant by virtue of its continuous reproduction is considered as a symbol of fertility and prosperity. Therefore, the plant finds its place as a token of goodwill in the various religious practices and ceremonial functions, especially marriages. It is delicious, seedless and grown throughout the year, providing a more balanced diet than any other fruit or vegetable. The crop is an important component of many of the farming systems prevailing in the states of Maharashtra, Tamil Nadu, Kerala, Gujarat, Assam, Andhra Pradesh, and Karnataka. Among the various factors affecting the yield and economic value of banana, damage done by insect pests is very important. In India, banana pseudostem weevil, *Odoiporus longicollis* Oliver, rhizome weevil, *Cosmopolites sordidus* Germar, lacewing bug (*Stephanitis typicus* Dist.), leaf eating caterpillar (*Spodoptera litura* Fabricius), Semilooper [*Chrysodeixis acuta* (Walker)], scale insect (*Aspidiotus destructor* Signoret), mite (*Raolia indica* Hirst) and mealy bug (*Pseudococcus* sp.). Undoubtedly, among these pests, banana weevil borers' *viz.*, pseudostem weevil *O. longicollis* and rhizome weevil, *C. sordidus* are considered as potential pests which limit the production and productivity of banana and plantains. Both these borers also found damaging to banana in Gandevi area of Navsari, Zagadiya-Rajpipala area of Narmada and Kamrej area of Surat districts (Patel and Jagdale, 2003).

Moreover, the banana semilooper, *Chrysodeixis acuta* (Walker) is recently reported as a pest of banana in Gujarat (Patel, 1991). This pest is found damaging to the younger banana of about 1 to 4 months old. The survey data generated at Fruit Research Station, N. A. U., Gandevi (Anonymous, 2006) revealed 15.22 per cent damage, and was also found increasing over years. Therefore, present investigation was performed to study the impact of variations in weather parameters on population dynamics of banana pest complex.

In order to study the effect of weather parameters on population dynamics of banana pest complex, observations were recorded on cv. Grand Naine, planted on 11 July, 2007 at Fruit Research Station, Navsari Agricultural University, Gandevi. Fifty plants were selected randomly and observations on incidence of pest were recorded fortnightly commencing from August, 2007 to November, 2008. The meteorological data recorded at meteorological observatory at Fruit Research Station, Navsari Agricultural University, Gandevi were used for this purpose. To study the population dynamics of different pests, total numbers of leaves and number of leaves infested by pests of randomly selected plant were counted for lacewing bug (*Stephanitis typicus* Dist.), leaf eating caterpillar (*Spodoptera litura* Fabricius), Semilooper [*Chrysodeixis acuta* (Walker)], scale insect (*Aspidiotus destructor* Signoret), mite (*Raolia indica* Hirst) and mealy bug (*Pseudococcus* sp.). While, healthy and infested pseudosuckers were recorded fortnightly and per cent infestation was worked out for aphid (*Pentalonia nigronervosa* Coquerel). Numbers of adults present on pseudostem were counted at fortnightly interval in case of pseudostem weevil, (*Odoiporus longicollis* Oliver). The obtained data was correlated with different weather parameters.

Aphid, Pentalonia nigronervosa Coquerel

It can be seen from data (Table 1), that the aphid infestation was seen thrice *i.e.*, during September to November (2007), April to June and October to November (2008). The activity of the pest was more pronounced during April to June with maximum 5.86 per cent infested

Table 1: Per cent infested pseudosuckers and leaves by various pests of banana

Sr. No.	Year	Month	Fortnight	Per cent Infested Pseudosuckers	Per cent infested leaves					Mean Number of adults per plant	Mean number of holes /5cm2
				Aphid	Lace wing bug	*Spodoptera*	Semilooper	Scale insect	Mite	Mealy bug		
1	2007	August	I	0.00		0.00	0.00					
2	"	August	II	0.00		5.26	10.27					
3	"	September	I	1.56		3.46	9.06					
4	"	September	II	0.95		3.31	6.43					
5	"	October	I	0.68		1.53	3.15		1.56	0.67		
6	"	October	II	0.57		0.93	1.23		2.10	0.87		
7	"	November	I	0.62		0.96	1.20		2.69	0.75		
8	"	November	II	0.35			0.67		3.56	1.07		
9	"	December	I	0.00					2.84	1.13		
10	"	December	II	0.00					4.65	1.47		
11	2008	January	I	0.00					6.91	1.68		
12	"	January	II	0.00					7.20	0.89		
13	"	February	I	0.00					7.01	0.40		
14	"	February	II	0.00					8.48	0.87		
15	"	March	I	0.00					8.37	1.79		
16	"	March	II	0.00					9.15	1.23		
17	"	April	I	3.90					7.06	1.76		
18	"	April	II	4.24						0.47		
19	"	May	I	5.86						0.78		
20	"	May	II	2.06						0.98		
21	"	June	I	1.32	1.76			1.17		0.97		
22	"	June	II	0.65	2.07			1.06		1.34	0.00	3.10
23	"	July	I	0.00	2.62			0.87		0.65	2.86	4.57
24	"	July	II	0.00	3.60			0.95		0.57	3.10	6.24
25	"	August	I	0.00	4.60			0.64		0.00	4.67	7.26
26	"	August	II	0.00	3.27			1.02		0.00	5.90	5.68
27	"	September	I	0.00	1.70			1.02		0.00	4.85	8.64
28	"	September	II	0.00	0.00			0.91		0.00	3.75	8.10
29	"	October	I	0.70	0.00			0.00		0.75	2.70	7.38
30	"	October	II	0.84	0.00			0.00		0.67	1.46	8.67
31	"	November	I	1.29	0.00			0.00		0.80	1.75	10.68
32	"	November	II	0.68	0.00			0.00		0.94	1.02	10.35

Table 2: Correlation coefficient values of infestation of various pests of banana plant with respect to weather parameters. Significant at 5% level of significance (r=+/-0.34876)

Weather parameters / Characters	Maximum temperature (ºC)	Minimum temperature (ºC)	Average temperature (ºC)	Morning relative humidity (%)	Evening relative humidity (%)	Average relative humidity (%)	Rainfall (mm)	Rainy days
Aphid	0.535*	0.251	0.444*	-0.489*	-0.168	-0.274	-0.219	-0.234
Lace wing bug	-0.411*	0.464*	0.255	0.349*	0.602*	0.576*	0.718*	0.717*
Spodoptera	-0.116	0.303	0.228	0.467*	0.353*	0.414*	0.127	0.256
Semilooper	-0.134	0.289	0.209	0.456*	0.351*	0.409*	0.115	0.261
Scale insect	-0.362*	0.502*	0.310	0.316	0.599*	0.564*	0.382*	0.502*
Mite	0.124	-0.762*	-0.641*	-0.276	-0.628*	-0.575*	-0.352*	-0.471*
Mealy bug	0.414*	-0.453*	-0.245	-0.515*	-0.595*	-0.619*	-0.404*	-0.468*
Adults, O. longicollis	-0.301	0.349*	0.195	0.364*	0.447*	0.458*	0.360*	0.350*
Damaged holes	-0.077	0.209	0.158	0.133	0.212	0.206	0.176	0.143

pseudosuckers noted in II[nd] fortnight of June. The aphid infestation exhibited significant positive correlation with maximum temperature and average temperature, while it was significantly negative with morning relative humidity. This correlation indicated that as the maximum temperature increases and relative humidity decreases, the infestation of aphid was found increasing and vice versa.

Lace wing bug,* Stephanitis typicus *Dist.

The infestation was mostly confined during monsoon *i.e.*, from June to September (2008) (Table 1). It was recorded as high as 4.60 per cent infested leaves in first fortnight of August. The lace wing bug infestation showed significant positive correlation with minimum temperature, morning relative humidity, evening relative humidity, average relative humidity, rainfall and rainy days. This indicated that, as these weather parameters increases, the infestation of lace wing bug also found increases and vice-versa (Table 2). Moreover, there was significant negative correlation with maximum temperature, while the average temperature did not influenced to the pest infestation.

Leaf eating caterpillar,* Spodoptera litura *Fabricius

This pest was found damaging to banana crop at early stage of growth when the crop is of 2 to 4 months old. The infestation of the pest started appearing in the month of August and appeared up to first fortnight of November (Table 1). The pest could damage as high as 5.26 per cent infested leaves in second fortnight of August and thereafter, it was gradually declined. The infestation also found sporadic and no serious damage was noticed during the present investigation in south Gujarat condition. It is revealed that there was significant positive correlation between *Spodoptera* infestation and morning, evening and average relative humidity. This indicated that as the relative humidity increases, the infestation of *S. litura* found increases and vice versa (Table 2).

Banana semilooper,* Chrysodeixis acuta *(Walker)

The newly introduced pest was found damaging to banana at early stage of growth *i.e.*, upto the age of 5 months. The infestation of semilooper started from August and observed up to November. It was recorded as high as 10.27 per cent infested leaves in second fortnight of August (Table 1). The data clearly indicated that, the pest remained active during monsoon months only. Moreover, the infestation of this pest found associated with early stage crop during second fortnight of August to second fortnight of September. Infestation of *C. acuta* is not observed from

November onwards during the present research work.

There was significant positive correlation between semilooper infestation and morning, evening as well as average relative humidity. This indicated that as the relative humidity increases the semilooper infestation also found increases and vice-versa (Table 2).

Scale insect,* Aspidiotus destructor *Signoret

The scale insect infestation on leaves found started from June, 2008 and observed up to September, 2008 with maximum 1.17 per cent infestation in first fortnight of June, 2008 (Table 1). This infestation was coinciding at reproductive stage of banana. The data also indicated that the scale insect prefers the monsoon season in south Gujarat condition. There was significant negative correlation between maximum temperature and pest infestation. While, it was significant positive correlation with minimum temperature, evening relative humidity, average relative humidity, rainfall and rainy days. This correlation coefficient indicated that, the pest infestation was increased with decreased in maximum temperature and increased in minimum temperature, evening relative humidity, rainfall as well as rainy days and vice versa (Table 2).

Mite,* Raoiella indica *Hirst

The infestation of *R. indica* on leaves found started from first fortnight of October, 2007 and observed up to first fortnight of April, 2008. It was recorded as high as 9.15 per cent in second fortnight of March. All the weather parameters except maximum temperature were influenced significantly the incidence of mite. The correlation found during the studies was negative with all weather parameters (Table 2).

Mealy bug,* Pseudococcus *sp.

The infestation of mealy bug, *Pseudococcus* sp. found twice during the crop duration *i.e.*, in winter and summer, while in monsoon there was no infestation. It was recorded maximum 1.79 per cent in first fortnight of March, 2008. The higher activity of this pest was recorded in November to January and March to April (Table 1).

All the weather parameters except average temperature influenced the pest infestation. There was a significant positive correlation with maximum temperature. While, significant negative correlation was observed with minimum temperature, morning relative humidity, evening relative humidity, average relative humidity, rainfall as well as rainy days. Thus, it can be concluded that as the maximum temperature increases the pest infestation also increases and vice versa (Table 2).

Pseudostem weevil,* Odoiporus longicollis *Oliver

It is indicative from the data that the number of adult weevils on pseudostem were as high as 5.90 (2nd fortnight of August). The population started building up after onset of monsoon. The adult weevils are found active from July to November in south Gujarat condition (Table 2).

There was significant positive correlation between mean number of adults and minimum temperature, morning relative humidity, evening relative humidity, average relative humidity, rainfall as well as rainy days. This indicated that as the above weather parameters increases, the population of adults also found increased and vice-versa (Table 2).

REFERENCES

Anonymous (2005). The survey of banana pests in south Gujarat Annual Research Report of F.R.S., Gandevi, presented in 2nd PPSC meeting of AGRESCO of G.A.U., held at Navsari. pp. 1-4.

Anonymous (2007) Survey of banana pest in south Gujrat. Annual Research Report of F.R.S., Gandevi, presented in 2nd PPSC meeting of Agresco of G.A.U., held at Navsari. pp. 3-5.

Anonymous (2008). All India co-ordinated research project and ICARAD-HOC schemes on tropical fruits. Biennial research report held on 9-12 May 2008 at Coimbatore. pp. 233-237.

Anonymous (2011). Indian Horticulture Database, National Horticulture Board, Government of India. pp. 40.

Anoymous (2006). Survey of banana pest in south Gujarat. Annual Research Report of F.R.S., Gandevi, presented in 2nd PPSC meeting of Agresco of G.A.U., held at Navsari. pp. 1-2.

Jagadale, V.S. (2005). Biology of banana pseudostem weevil, *Odoiporus longicollis* Oliver (Curculionidae : Coleoptera) and its management. M.Sc (Agri.). Thesis (unpublished) submitted to Navsari Agricultural University, Navsari.

Karmakar, K. and Dey Soma (2006). Studies on seasonal incidence of phytophagous mite species on selected germplasms of banana in West Bengal. *Indian J. Crop Sc.*, **1** (1-2): 138-139.

Patel, Z.P. (1991). Identification Service Report, International Institute of Entomology, United Kingdom, Collection

No-21601 Dated on 1, October, 1991.

Patel, Z.P. and Jagadale, V.S. (2003). Two curculionids on banana in Gujarat. *Insect Environment*, 9 (3) : 120-121.

Sundararaju, B.; Padmanaban, B. and Tangavelu, R. (1999). Integrated insect pest, nematodes and disease management of banana in India. *In: Seminar on technical advancement in banana production, handling and processing management-Jalgaon-Maharashtra-India.*; 1999/03/27-28 : 114-120.

Received : Febuary, 2014; Accepted: August, 2014