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EVALUATION OF SEASONAL INCIDENCE OF MAJOR BRINJAL PESTS

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ABSTRACT

Brinjal (*Solanum melongena* L.; Solanacae) known also as "egg plant" or "Aubergine", is one of the important vegetable crops of India. The insect pests like Shoot and Fruit borer, *Epilachna* beetle, Whitefly and Mealybug are considered major. Evaluation of the seasonal incidence of these pests helps in understanding the population fluctuation of these pests and therefore their effective management. A field survey was carried out at weekly interval in two different locations during January 2016 and 2017. The percent shoot damage caused by Brinjal shoot and fruit borer increased slowly till 10th standard week and then started to decline. Similarly, the fruit damage also increased till 12th standard week and then started to decline. The average number of *Epilachna* grubs per plant indicated their abundance starting from sixth standard week till 14th standard week. The damage decreased with decreasing number of grubs. The population of white flies started to increase during the mid season of the crop (8th standard week) and continued in an increasing trend till 16th standard week. The mealy bug incidence was totally absent till sixth standard week and started to increase thereafter. However, the peak incidence was reported only in the late season crop starting from 13th standard week. Correlation with weather parameters revealed their influence of population fluctuation.

KEYWORDS: Brinjal, Correlation, Major Pests, Seasonal Incidence, Weather Parameters

INTRODUCTION

Brinjal (*Solanum melongena* L.; Solanacae) known also as "egg plant" or "Aubergine", is one of the important vegetable crops of India. India is the second largest producer of brinjal next to china and it contributes to nine percent of the country's total vegetable production. The insect pests like Shoot and Fruit borer, *Leucinodes orbonalis* Guenee (Pyraustidae: Lepidoptera), *Epilachna* beetle *Epilachna vigintioctopunctata* Fab. (Coleoptera: Coccinellidae), Whitefly *Bemisia tabaci* Gennadius (Aleyrodidae: Hemiptera) and Mealybug *Coccidohystrix insolita* Green (Pseudococcidae: Hemiptera) are considered as major and destructive (Singh, 1970; Rosaiah, 2001; Saad *et al*., 2013 and Kalaiyarasi and Livingstone, 2015). Managing these pests for sustained yield is very important and evaluation of the seasonal incidence of these pests helps in understanding the population fluctuation of these pests and therefore their effective management.

MATERIALS AND METHODS

Evaluation of Seasonal Incidence of Major Insect Pest Population of Brinjal through Field Survey

A field survey was carried out at weekly interval in selected brinjal fields of 200m^2 area at two different locations *viz.,* Location I (11^{0}35' N latitude and 79^{0}72' E longitude; Thittukattur) and Location II (11^{0}35' N latitude and 79^{0}71' E longitude; Perampattu), during January 2016 and 2017. Five plants per 40m^2 areas were randomly selected from each field and data on total number of shoots and fruits, affected shoots and fruits, the number of *Epilachna* grubs and adults per

plant, number of white flies on top, middle and bottom leaves, and mealy bugs per centimeter length of shoot were collected. Further, damaged leaf with ladder scrapping was also collected @ one leaf per plant. From these data, percent damaged shoot and fruit and mean number of *Epilachna*, White fly and Mealy bug were worked out. Percent leaf area damage caused by *Epilachna* was also worked out.

Simultaneously, the meteorological data, such as maximum and minimum temperature, relative humidity and rainfall were collected from the meteorological centre located at Faculty of Agriculture, Annamalai University, Annamalai Nagar ($11^0 23'$ N latitude, $79^0 41'$ E longitude). Simple correlation analysis between these parameters and seasonal incidence data of major pests were done.

RESULTS AND DISCUSSIONS

Seasonal Incidence of Major Insect Pest Population of Brinjal during January – April 2016 (Season I)

Location I

A field survey conducted during January - April 2016 comprising of 16 standard weeks revealed the incidence pattern of major brinjal pests *viz.,* brinjal shoot and fruit borer, *Epilachna* beetle, whitefly and mealy bug. The percent shoot damage caused by brinjal shoot and fruit borer increased slowly till 10th standard week and then started to decline. Similarly, the fruit damage also increased till 12th standard week and then started to decline. However, fruit damage was not recorded till fourth standard week.

The results indicated low levels of soot damage which gradually increased and then decreased. However, the fruit damage steeply increased from the seventh week to 12th week and thereafter steeply decreased. The average number of *Epilachna* grubs per plant indicated their abundance starting from sixth standard week till 14th standard week. However, the corresponding mean adult number per plant was not significantly abundant. The data collected on mean percent damage caused by *Epilachna* occurred on the eighth standard week and coincide with the peak number of grubs and adult. The damage decreased with decreasing number of grubs.

The population of whiteflies started to increase during the mid season of the crop (8th standard week) and continued in an increasing trend till 16th standard week. The mealy bug incidence was totally absent till sixth standard week and started to increase thereafter. However, the peak incidence was reported only in the late season crop starting from 13th standard week.

The data revealed that shoot damage, number of grubs, adult and damage of *Epilachna* peaked during the 8th standard week, whereas the fruit damage peaked during the 12th standard week. The population of sap feeding insects behaved differently and their incidence peaked during 15th standard week (whitefly) and 16th standard week (mealy bug) (Table 1).

Location II

A similar field survey conducted at location II revealed a similar trend as noticed in location I (Table 2).

Seasonal Incidence of Major Insect Pest Population of Brinjal during January – March 2017 (Season II)

Location I

From the seasonal incidence data recorded in second season at Location I, it was noticed that a similar pattern of incidence of major pest as noticed in the first season, was recorded. Per cent shoot damage peaked during the sixth

standard week, per cent fruit damage peaked during the 12th standard week. *Epilachna* incidence during eighth or ninth standard week as recorded in the first season. The incidence of sap feeders also recorded a similar trend (Table 3).

Location II

The seasonal incidence data on major brinjal pest occurred in the second season indicated a similar trend as noticed in first season in Location II (Table 4).

The shoot damage was on a low level and occurred within 12 per cent level in all the instances. Moreover the incidence was gradually increasing from early season till the mid season of the crop. It showed a declining trend thereafter. Such low level of shoot damage was supported by Tripathy and Senapati (1998) who reported that a maximum of 15.71 per cent damage was noticed. Further, peak incidence occurring in the month of February was corroborated by Anjali *et al.* (2012). The research findings of Singh *et al.* (2000) and Naqvi *et al.* (2009) coincided with the present results that the per cent shoot damage decreased with fruit set. This was obvious from the recorded data that the incidence of shoot damage started to decline after two months of planting. These findings clearly demonstrated the shoot damage of brinjal shoot and fruit borer as an early season problem occurring on a low intensity.

The incidence of fruit showed a steep increase in damage till the late mid season (12^{th} standard week) and started to decline steeply. The fruit damage was on a higher scale when compared with the shoot damage. Peak damage occurred ranged from 64 per cent to 80 per cent. Such heavy incidence of fruit damage was reported by Tripathy and Senapati (1998); Singh *et al.* (2000); Naqvi *et al.* (2009) and Ghosh and Senapati (2009). The seasonal incidence, evaluation unmistakably presented the serious nature of fruit damage caused by Brinjal shoot and fruit borer and the need to take care of to sustain the yield.

Occurrence of increased number of grubs had also been reported by Raghuraman and Veeravel (1999). The peak incidence of grubs occurred in the early mid season crop and started to decline. This was in accordance with the findings of Haseeb *et al.* (2009). The adult beetle occurred on a very low intensity throughout the cropping season. This was supported by Varmasavita and Anadhi (2008).

Among sap feeders, the white fly steadily increased from early season, whereas the mealy bug incidence was steeper. These pests colonized the crop during the late season as the occurrences of other pests were on a declining trend then. The data clearly demonstrated the severity of sap feeders in the late season crop. The reason may be increased temperature and lack of competition from other major pests. Such direct role of temperature on population build up of white fly was reported by Leite *et al.* (2003) and Mane and Kulkarni (2011). The peak incidence coinciding with summer months of April and May had been reported by Shivanna *et al.* (2011) and Farman *et al.* (2004) in case of white fly and by Suresh and Kavitha (2007) and Mandal *et al.* (2014) in case of mealy bug.

Simple Correlation Analysis between Weather Parameters and Seasonal Incidence

The data on per cent shoot and fruit damage caused by Brinjal shoot and fruit borer, the population of Epilachna grub, Whiteflies and Mealybugs collected at two locations and two seasons were subjected to simple correlation analysis with maximum, minimum temperature, relative humidity, hours of bright sunshine and rainfall data respectively.

CONCLUSIONS

The results indicated that per cent shoot damage had negative correlation with maximum and minimum temperature and positive correlation with relative humidity. This was *vice versa* in the case of per cent fruit damage in season I. This was corroborated by the findings of Shukla and Khatri (2010); Kumar and Singh (2013) and Kaur *et al.* (2014). In both the cases the rainfall was found to be nonsignificant. This was supported by Singh *et al.* (2009) and Naqvi *et al.* (2009). However, hours of bright sunshine which were non significant in imparting per cent shoot damage, had negative correlation with per cent fruit damage. The correlation data of Epilachna grub revealed that only maximum, minimum temperature and relative humidity were significantly positively correlated and the other two parameters were nonsignificant. The sap feeder's population clearly indicated a uniform trend. Maximum and minimum temperature were positively correlated and relative humidity, hours of bright sunshine and rainfall were negatively correlated. The positive correlation between *Epilachna* and temperature was supported by the findings of Raghuraman and Veeravel (1999); Chandrakumar *et al.* (2008) and Koushik *et al.* (2014). Such similar positive correlation between temperature and incidence of sap feeders have also been reported by Prasad and Logiswaran (1997); Leite *et al.* (2003) and Hanchinal *et al.* (2010). The findings of Shivanna *et al.* (2011) and Mandal *et al.* (2014) that rainfall played a negative role in population build up of sap feeders strengthened the present finding.

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APPENDICES

Table 1: Seasonal Incidence of Major Brinjal Pests during Season I (January to April 2016) at Location I

Week	Shoot and Fruit borer*		*Epilachna* beetle*			Mean Population of Whitefly/ Plant*	Mean Population of Mealy Bugs/ Plant*
	% Shoot Damage	% Fruit Damage	No. of Grubs / Plant	No. of Adults / Plant	% Leaf Area Damage		
1	2.25	0.00	0.00	0.00	0.00	4.2	0.00
2	4.78	0.00	4.66	0.10	71.72	5.8	0.00
3	7.92	0.00	10.33	0.30	158.98	6.8	0.00
4	9.61	0.00	15.44	0.84	237.62	7.1	0.00
5	9.72	4.29	18.62	0.96	286.56	8.6	0.00
6	9.83	7.54	24.73	1.20	380.59	9.0	0.00
7	10.73	16.75	32.13	1.88	492.48	14.2	3.16
8	12.88	35.66	37.76	2.04	581.13	19.7	7.32
9	12.63	58.91	34.29	1.88	527.72	21.3	10.16
10	12.23	66.66	32.78	1.36	504.48	25.0	13.69
11	8.24	74.29	31.82	0.96	489.71	27.9	17.01
12	7.87	79.83	29.72	0.83	457.39	33.2	19.57
13	7.32	61.12	23.52	1.36	361.97	35.9	21.92
14	5.87	45.31	20.11	1.93	309.49	37.5	23.82
15	4.28	32.06	13.76	1.02	211.77	38.4	25.73
16	4.18	20.73	9.22	0.84	141.89	38.2	26.32

* Mean of twenty plants

Table 2: Seasonal Incidence of Major Brinjal Pests during (January to April 2016) at Location II

Week	Shoot and Fruit borer*		*Epilachna* beetle*			Mean Population of Whitefly / Plant*	Mean Population of Mealy Bugs / Plant*
	% Shoot Damage	% Fruit Damage	No. of Grubs / Plant	No. of Adults / Plant	% Leaf Area Damage		
1	3.08	0.00	0.00	0.00	0.00	3.5	0.00
2	4.47	0.00	0.00	0.09	0.00	5.2	0.00
3	6.81	0.00	2.72	0.18	41.86	6.9	0.00
4	8.14	4.69	5.86	0.74	90.19	8.3	0.00
5	8.96	8.54	9.11	1.39	140.20	10.7	2.13
6	10.23	12.25	14.78	1.87	227.46	14.6	3.52
7	11.87	18.16	20.33	2.51	312.88	19.0	4.62
8	9.31	25.87	28.90	2.09	444.77	21.1	11.01
9	8.11	39.10	36.13	1.80	556.04	24.8	14.32
10	6.98	49.37	34.08	1.67	524.49	31.4	18.11
11	6.48	61.54	29.57	0.84	455.08	32.0	21.57
12	5.57	72.81	25.03	0.91	385.21	34.9	23.73
13	4.93	58.88	21.78	1.02	335.19	35.6	25.26
14	3.31	51.01	17.31	1.63	266.40	36.2	26.82
15	2.47	38.71	8.28	0.63	127.43	35.9	28.16
16	2.18	23.26	6.26	0.79	96.34	35.7	29.39

* Mean of twenty plants

Table 3: Seasonal Incidence of Major Brinjal Pests during Season II (January to March 2017) at Location I

Week	Shoot and Fruit borer*		*Epilachna* beetle*			Mean Population of Whitefly / Plant*	Mean Population of Mealy Bugs / Plant*
	% Shoot Damage	% Fruit Damage	No. of Grubs / Plant	No. of Adults / Plant	% Leaf Area Damage		
1	3.08	0.00	0.00	0.00	0.00	3.5	0.00
2	4.47	0.00	0.00	0.09	0.00	5.2	0.00
3	6.81	0.00	2.72	0.18	41.86	6.9	0.00
4	8.14	4.69	5.86	0.74	90.19	8.3	0.00
5	8.96	8.54	9.11	1.39	140.20	10.7	2.13
6	10.23	12.25	14.78	1.87	227.46	14.6	3.52
7	11.87	18.16	20.33	2.51	312.88	19.0	4.62
8	9.31	25.87	28.90	2.09	444.77	21.1	11.01
9	8.11	39.10	36.13	1.80	556.04	24.8	14.32
10	6.98	49.37	34.08	1.67	524.49	31.4	18.11
11	6.48	61.54	29.57	0.84	455.08	32.0	21.57
12	5.57	72.81	25.03	0.91	385.21	34.9	23.73
13	4.93	58.88	21.78	1.02	335.19	35.6	25.26
14	3.31	51.01	17.31	1.63	266.40	36.2	26.82
15	2.47	38.71	8.28	0.63	127.43	35.9	28.16
16	2.18	23.26	6.26	0.79	96.34	35.7	29.39

* Mean of twenty plants

Table 4: Seasonal Incidence of Major Brinjal Pests during Season II (January to March 2017) at Location II

Week	Shoot and Fruit borer*		*Epilachna* beetle*			Mean Population of Whitefly / Plant*	Mean Population of Mealy Bugs/ Plant*
	% Shoot Damage	% Fruit Damage	No. of Grubs / Plant	No. of Adults / Plant	% Leaf Area Damage		
1	4.12	0.00	2.02	0.05	31.09	2.9	0.00
2	5.78	1.98	4.19	0.47	64.48	3.6	0.00
3	7.26	2.67	6.18	0.93	95.11	5.8	0.00
4	8.12	4.66	7.09	1.07	109.12	7.2	0.00
5	8.99	7.33	9.45	1.98	145.44	13.0	3.78
6	10.78	9.25	15.78	2.19	242.85	16.7	4.89
7	11.42	18.90	17.31	2.56	266.40	20.4	6.17
8	10.39	29.53	25.66	1.24	394.91	23.6	8.32
9	8.30	36.24	33.22	1.02	511.26	29.7	12.37
10	7.88	52.22	29.17	0.98	488.93	32.2	16.90
11	6.39	63.12	24.82	0.84	381.98	33.5	17.02
12	5.88	67.70	19.01	0.69	292.56	30.2	18.67

* Mean of twenty plants