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Seasonal incidence and effect of abiotic factors on population dynamics of major insect pests on Brinjal crop

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ABSTRACT

Experiment was carried out on Seasonal incidence and effect of abiotic factors on population dynamics of major insect pests on Brinjal (*Solanum melongena* L.) at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari during summer-2020. The results revealed that incidence of shoot borer infestation on shoot was commenced from second week of March (11th SMW) to third week of May (21st SMW) while, infestation of fruit damage was noticed at first picking of the brinjal fruit in the first week of April (14th SMW) with maximum in fourth week of May (21st SMW). Shoot and fruit borer infestation exhibited significant and positive correlation with maximum temperature (r= 0.8129) and minimum temperature (r= 0.8444) and wind velocity (r= 0.5871), respectively. Whitefly population was started from second week of February (9th SMW) with 0.93 whitefly per leaf, increased gradually to reach its peak in the last week of April, *i.e.*17th SMW (15.95 whiteflies/leaf) and positively and significantly correlated with and maximum temperature (r= 0.8062). The jassid infestation started from first week of March, *i.e.* 10th SMW (0.34 jassids/leaf), initially increased slowly and reached to its peak level (11.89 jassids/leaf) at last week of April (17th SMW) and positively and significantly correlated with maximum (r= 0.7202) and minimum (r= 0.5712) temperatures. Aphid population started from the first week of March (10th SMW) with a minimum level of 0.60 aphids/leaf, increased slowly and reached to its peak level (5.04 aphids/leaf) at third week of April (16th SMW) and exhibited positive and significant correlation with maximum temperature (r= 0.7849).

Key words: *Brinjal, Insect pests on Brinjal, Population dynamics*

Introduction

Brinjal or Eggplant or Aubergine (*Solanum melongena* L.) is an important vegetable crop in tropical and sub-tropical countries particularly in India, Japan, Indonesia, Bulgaria, Italy, France, USA and several African countries. It is the third most important vegetable crop grown throughout the year in all parts of India. Major brinjal growing states are Andhra Pradesh, Karnataka, West Bengal, Tamil Nadu, Maharashtra, Orissa, Uttar Pradesh, Bihar, Rajasthan and Gujarat. Insect pests have become major constraints for higher productivity and quality in brinjal as it is subjected to attack by a number of insect pests right from nursery stage till harvesting (Srinivasan, 2009). Kumar *et al.* (2017) reported 26 insect pests in brinjal and among them, shoot and fruit borer (*Leucinodes orbonalis* Guenee), whitefly

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(Bemisia tabaci Gennadius*)*, jassid (*Amrasca biguttula biguttula* Ishida*)* and aphid *(Aphis gossypii* Glover) are the major pests. Kumar *et al*. (2015) reported about 20 to 89 per cent yield loses in brinjal due to infestation of insect pests. Moreover, weather parameters also play a pivotal role in the biology of any insect pests. Temperature, humidity, sun shine hours and wind velocity are the most crucial weather parameters influencing the rate of growth and development of insect pests (Shukla and Khatri, 2010).

Materials and Methods

Brinjal (*var*. Surti Ravaiya) crop was transplanted during third week of February (17-02-2020) and raised by adopting recommended agronomical practices at College Farm, N. M. College of Agriculture, NAU, Navsari. The incidence of shoot and fruit borer, whitefly, jassid and aphid was recorded at seven days intervals from the first week after transplanting the brinjal crop and continued till the harvesting of the crop. For this purpose, 50 plants were randomly selected and tagged from the entire experimental area. Per cent shoot damage was worked out on the basis of number of healthy and damage shoots at weekly interval from 50 randomly selected plants. The data thus obtained were converted to per cent shoot damage. The infestations of fruits were observed at every picking with respect to standard week. Number of healthy and damage fruits were recorded separately at each picking. The data thus obtained were converted to per cent fruit damage. Observation on sucking pests *viz*., whitefly, aphid and jassid were also recorded at weekly interval from three leaves each from top, middle and bottom canopies of each of randomly selected 50 plants. Number of adult of whitefly (*Bemisia tabaci* G.), nymph and adult aphid (*Aphis gosypii* G.) and nymph and adult jassid (*Amrasca biguttula biguttula* Ishida) population were recorded. The data thus obtained were converted to average population per leaf. The simple correlation coefficients were worked out between insect pest population and various weather parameters (maximum and minimum temperatures, morning and evening relative humidity, wind velocity and rainfall) recorded at the Meteorological observatory, College Farm, Navsari Agricultural University, Navsari.

Results and Discussion

Shoot and fruit borer

The results (Table 1) indicated that infestation on shoot was commenced from second week of March

Table 1. Population dynamics of insect pests of brinjal during summer 2020

Months	SMW	WAT	Mean per cent damage		Mean population per leaf		
			Shoot damage	Fruit damage	Whitefly	Jassid	Aphid
February-2020	8	1	0.00	0.00	0.00	0.00	0.00
	9	2	0.00	0.00	0.93	0.00	0.00
March-2020	10	3	0.00	0.00	1.02	0.34	0.60
	11	4	2.00	0.00	2.73	0.86	1.12
	12	5	4.75	0.00	4.93	1.50	2.04
	13	6	6.88	0.00	6.90	2.13	2.85
April-2020	14	7	8.60	10.22	8.53	4.74	3.75
	15	8	11.60	13.65	10.11	7.12	4.71
	16	9	13.33	17.10	13.44	10.64	5.04
	17	10	11.83	19.80	15.95	11.89	4.38
May-2020	18	11	9.33	24.70	14.11	10.29	3.50
	19	12	8.15	29.18	12.07	9.72	2.55
	20	13	6.00	31.15	11.50	8.49	2.41
	21	14	4.76	33.24	9.90	7.18	2.06
	22	15	0.00	30.12	7.75	5.96	1.95
June-2020	23	16	0.00	26.24	5.95	4.94	1.59
	24	17	0.00	18.80	3.40	3.41	1.01
	25	18	0.00	16.46	1.50	2.94	0.73
	26	19	0.00	11.21	0.83	0.00	0.00
July-2017	27	20	0.00	7.24	0.00	0.00	0.00

(11th SMW) to third week of May (21st SMW). The average shoot infestation ranged from 2.00 to 13.33 per cent with maximum in third week of April (16th SMW). The infestation in shoot was decreased after fruit setting and completely disappeared after third week of May (21st SMW). The incidence on fruit damage was noticed at first picking of the brinjal fruit in the first week of April (14th SMW), corresponding 7th week after transplanting. The fruit infestation ranged from 7.24 to 33.24 per cent with maximum in fourth week of May (21st SMW). The incidence of shoot damage was significantly and positively correlated with maximum temperature (r= 0.8129), whereas in case of fruit infestation, positive and significant correlation (Table 2) with minimum temperature (r= 0.8444) and wind velocity (r= 0.5871). The results are in close conformity with the findings of Tripura *et al.* (2017), Rattan *et al*. (2016) and Kumar *et al*. (2017).

Sucking pests

Whitefly

Whitefly population was started from second week of February (9th SMW) with 0.93 whitefly per leaf (Table 2). Further, the population of whitefly increased gradually to reach its peak in the last week of April *i.e.* 17th SMW (15.95 whiteflies/leaf), thereafter the population of whitefly gradually decreased and found zero in first week of July. Thus, in present study, results revealed that whitefly was most active during the months of March to May (Table 1). The results indicated positive and significant correlation existed (Table 2) between whitefly population and maximum temperature (r= 0.8062). The present findings are supported by the Patel (2013), Choudhary *et al.* (2015).

Jassid

The jassid infestation started from first week of March *i.e.* 10th SMW (0.34 jassids/leaf). Initially, the incidence of this pest was increased slowly and reached to its peak level (11.89 jassids/leaf) at last week of April (17th SMW). Thereafter, the population of jassid declined and there was sharp decline in the last week of June. Thus, from foregoing results, it can be confirmed that the jassid was most active during the months of April to May (Table 1). Correlation between population of jassid and maximum temperature (r= 0.7202) and minimum (r= 0.5712) temperatures found positive and significant (Table 2). Experimental results are in close conformity with the findings of Rashid *et al.* (2013) and Patel *et al.* (2015).

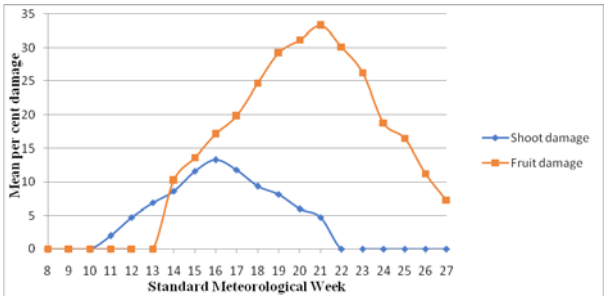

Fig. 1. Periodical mean percent shoot and fruit borer in brinjal during summer

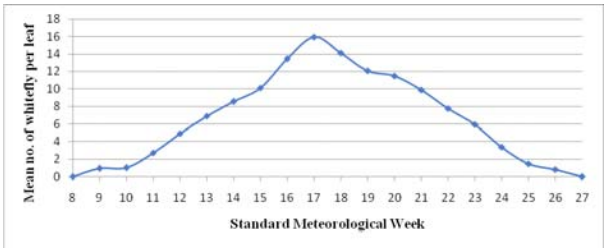

Fig. 2. Periodical mean incidence of whitefly in brinjal during summer

Table 2. Correlation between weather parameters of preceding week and mean population of major insect pests of brinjal during summer

Insect pests	Temperature (°C)		RH (%)		Wind velocity (km/hr)	Rain fall (mm)
	Maximum	Minimum	Morning	Evening		
Shoot borer	0.8129*	0.1758	-0.1055	-0.3266	-0.2340	-0.3246
Fruit borer	0.4086	0.8444*	-0.1256	0.4175	0.5871*	-0.0983
Whitefly	0.8062*	0.4643	-0.2506	-0.1561	0.0665	-0.3849
Jassid	0.7207*	0.5712*	-0.1990	-0.0024	0.1822	-0.3005
Aphid	0.7849*	0.2574	-0.0056	-0.2654	-0.0678	-0.3689

Significant at 5% level (r= ±0.5321)

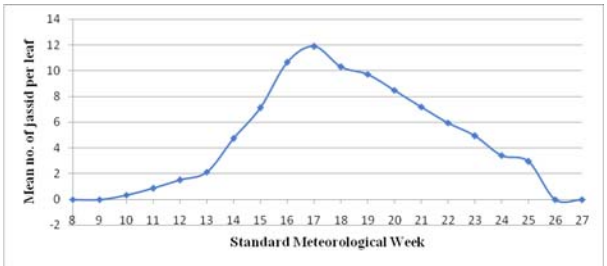

Fig. 3. Periodical mean incidence of jassid in brinjal during summer

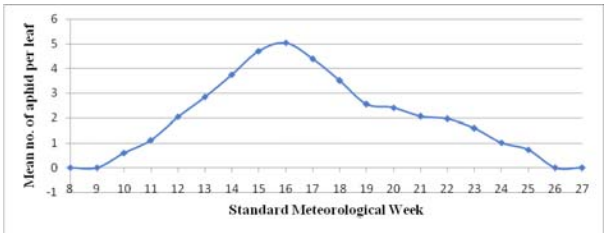

Fig. 4. Periodical mean incidence of aphid in brinjal during summer

Aphid

The population of aphid started from the first week of March (10th SMW) with a minimum level of (0.60 aphids/leaf), increased slowly and reached to its peak level (5.04 aphids/leaf) at third week of April (16th SMW). Thereafter, the aphid population gradually declined and reached to zero level in the fourth week of June (Table 1). The aphid population exhibited positive and significant correlation (Table 2) with maximum temperature (r= 0.7849). The results are well supported with the findings of Nonita *et al.* (2007) and Kadgonkar *et al.* (2018) in brinjal.

Infestation on shoot was commenced from second week of March (11th SMW) with maximum in third week of April (16th SMW) and significantly and positively correlated with maximum temperature (r= 0.8129). While, fruit damage was noticed at first picking of the brinjal fruit in the first week of April (14th SMW) with maximum in fourth week of May (21st SMW) and significantly and positively correlated with minimum temperature (r= 0.8444) and wind velocity (r= 0.5871). Whitefly population was started from second week of February (9th SMW) reach its peak in the last week of April, *i.e.* 17th SMW (15.95 whiteflies/leaf) and exhibited positive and significant correlation maximum temperature (r= 0.8062). The jassid infestation started from first week of March, *i.e.* 10th SMW and reached to its peak level (11.89 jassids/leaf) at last week of April (17th SMW) and showed positive and significant correlation with maximum temperature (r= 0.7849). The population of aphid started from the first week of March (10th SMW) and reached to its peak level (5.04 aphids/leaf) at third week of April (16th SMW) and indicated positive and significant correlation with maximum temperature (r= 0.7849).

References

Choudhary, M.A.R., Rahman, M.M., Alam, M.Z., Hossain, M.M. and Khaliq, Q.A. 2015. Fluctuation pattern of insect pests and natural enemies in summer brinjal ecosystem. *Journal Sylhet Agricultural University.* 2(2): 149-155.

Kadgonkar, T.S., Bagde, A.S., Deshmukh, V.J. and Mali, A.S. 2018. Seasonal incidence of major pests of brinjal. *International Journal Current Microbiol Applied Science.* **7**(9): 2727-2731.

Kumar, B., Uikey, B.L., Gharde, S.K. and Pal, P.K. 2015. Field efficacy of some novel insecticides on sucking pest of brinjal. *Journal of Pure Applied Microbiology.* 9(2): 1719-1723.

Kumar, R., Singh, N.N., Raju, S.V.S. and Mishra, V.K. 2017. Influence of Abiotic Factors on Seasonal Incidence of Brinjal Shoot and Fruit Borer, *Leucinodes orbonalis* Guen. in Varanasi Region. *International Journal Current Microbiology Applied Science.* 6**(**4): 1513-1518.

Nonita, M., Hemchandra, O., Bijiya, P. and Singh, T.K. 2007. Effect of abiotic and biotic factors on the abundance of *Aphis gossypii,* Glover infesting brinjal. *Indian Journal of Entomology.* 69(2): 149-153.

Patel, H.V. 2013. *Bio-efficacy and residual status of different insecticides in/on brinjal fruits.* Ph. D. Thesis submitted to N. M. College of Agriculture, Navsari Agricultural University, Navsari.

Patel, H.V., Radadia, G.G. and Chavda, S.K. 2015. Seasonal incidence of major pests of brinjal crop during summer season. *Insect Environment.* 20(4): 149-151.

Rashid, M.H., Khatun, M.J., Mahfuz, M.S., Dash, C.K. and Hussain, M.A. 2013. Seasonal fluctuation of insect pests of brinjal at agricultural research station, Burirhat, Rangpur. *International Journal of Experimental Agriculture.* 3(1): 4-8.

Rattan, P., Kumar, S. and salgotra, R.K. 2016. Role of *abiotic* factors in the incidence of fruit and shoot borer (*Leucinodes orbonalis* Guenee) in eggplant (*Solanum melongena* L.). *The Bioscan.* 11(4): 2721-2726.

Shukla, A. and Khatri, S.N. 2010. Incidence and abundance of brinjal shoot and fruit borer *Leucinodes orbonalis* Guenee. *The Bioscan.* 5(2): 305-308.

Srinivasan, R. 2009. Insect and mite pests on brinjal. *AVRDC-World Vegetable Center.* 9: 729.

Tripura, A., Lalruatsangi, K., Hatterjee1, M.L. and Patra, S. 2017. Seasonal incidence of shoot and fruit Borer (*Leucinodes orbonalis* Guenee) of brinjal in Mid-Hills of Meghalaya. *Indian Journal of Hill Farming.* 30(2): 335-340.