Int.J.Curr.Microbiol.App.Sci (2020) Special Issue-11: 4055-4059

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Special Issue-11 pp. 4055-4059**
Journal homepage: http://www.ijcmas.com

Original Research Article

Pest Population Fluctuation in Tomato (*Solanum lycopersicum* L.) Crop and their Correlation with Weather Parameters

R. K. Panse[1]*, Sharad Bisen[1], Rahul Dongre[2], D. M. Kadam[1], Dinesh Kumar Kuldeep[2] and S. K. Rajak[1]

[1]College of Agriculture, Balaghat, M.P., India
[2]College of Agriculture, Jabalpur, M.P., India
**Corresponding author*

A B S T R A C T

The field experiment was carried out to study the seasonal incidence of major insect pests of tomato and their effective management with newer insecticidal molecules at Research farm, College of Agriculture, Balaghat, Madhya Pradesh during the Rabi season of 2019. During the course of study from December 2019 to March 2020, Jassid (*Amrasca devastans* Ishida), White fly (*Bemisia tabaci* Genn.), Leaf miner (*Liriomyza trifolii* Burgess), and Fruit borer (*Helicoverpa armigera* Hub.) were infesting the tomato crop. *A. gossypii* and *L. trifolii* were appeared on the tomato crop on 22nd December 2019, while, *B. tabaci* were appeared in 5 to 11 January 2020 and peak during 26 Feb. to 4 March 2020. *A. devastans*, and *H. armigera* were another major insect pests of tomato crops and it appeared on 5th, and 26th January 2020, respectively. The peak activity of *A. devastans*, *L. trifolii*, and *H. armigera* was recorded during 26th Feb. to 4th March 2020, 12th to 18th March 2020, and 19th to 25th March 2020, respectively. The seasonal incidence highest mean 9.26/6 leaves, 11.85/10 cm twig, 45.95 per cent, 2.08/6 leaves and 6.11 larval population/plant, were recorded by *A. devastans*, *B. tabaci*, *L. trifolii*, and *H. armigera*, respectively and considered as pests of tomato.

Keywords

Seasonal incidence, leaf miner, white fly, fruit borer, tomato

Introduction

India is next only to the China in area and production of vegetables. In India it occupies an area of 933.25 thousand hectare with production of 19377.44 thousand metric tonnes and productivity of 20.76 metric tonnes per hectare (NHB data based 2017-18). Major tomato growing states in India are Bihar, Karnataka, Orissa, Maharashtra and Andhra Pradesh. In Madhya Pradesh, it is grown in 60.84 thousand hectare with the annual production of 1484.55 thousand metric tonnes and productivity of 24.40 metric tonnes per hectare (NHB data based 2017-18). Insects attack in tomato from the time of planting until the fruit is harvested. Insects can cause death of the tomato plant

and damage to fruits in the form of tissue destruction and aberration in shape or colour. Insects can also introduce decay organisms in to fruit or can act as vector for many viruses and several mycoplasms that cause growth disorders or death of the plant.

The major insect pests which plays most important role in the economic losses of tomato crop are leaf miner, aphid, jassid, whitefly and fruit borer.

Materials and Methods

The present investigation entitled "Pest population fluctuation in tomato (*Solanum lycopersicum* L.) crop and their correlation with weather parameters" was carried out at Research Farm, College of Agriculture, Balaghat Madhya Pradesh during the *rabi* 2019. The experiment was laid out to record the seasonal incidence. Observations for seasonal fluctuation on major insect pests were recorded on 25 randomly selected plants of the crop in a standard week (7 day interval) from transplanting to till the availability of insects or maturity of the crop.

Observation on leaf miner and jassids

Five plants per plot were selected at random and six leaves (two upper, two middle and two lower) in every plant were observe for the phyto extract and to calculate the per cent infestation by leaf miner, 30 leaves of five selected plants, were observed.

$$\% \text{ Leaf infestation by leaf minor} = \frac{\text{No. of damage leaf observed}}{\text{Total No. of leaf observed}} \times 100$$

Observation on white fly

The observations were taken on one selected twig of 10cm in each plant of randomly selected plants in the plot. Each twig was covered carefully with transparent polythene bags. The numbers of nymph and adult flies were counted in each twig. Five plants were selected randomly for this purpose.

Observation on fruit borer

Five randomly select plants per plot. The number of larvae was physically recorded. Percentage of damaged fruits, after each picking, the numbers of damaged and healthy fruits were recorded to calculate the damage percentage.

Percentage losses of fruit yield, fruits of all the six pickings were separated in to healthy and infested fruits to calculate the Percentage weight losses.

Results and Discussion

Jassids, *Amrasca devastans*

A. devastans population was highest (9.15/ 6 leaves) in the 26 Feb. to 4 March 2020. During this period temperature maximum and minimum ranged from 28 to 31.6^{0}C and 9.2 to 14.7^{0}C respectively. Relative humidity (morning) are also high in 84 per cent to 87 per cent and occasional rains was also observed. The pest was present throughout the growing stage of the crop, and caused leaf curl leading to stunted growth of plants. It was one of the major sucking pests of tomato. Present observations were more or less similar with the results of earlier workers Kumar (2008) reported that the *A. devastans* appeared in the 1st week of January. Correlation coefficient of *A. devastans* population exhibited non significant and positive with rainy days (0.389), relative humidity evening (0.280) and temperature maximum (0.115), while, negative association of this character was observed with temperature minimum (-0.189) and relative humidity morning (-0.060).

Table.1 Incidence of major insect pests on tomato during *rabi* 2019

Meteorological Weeks	Jassid/ 6 leaves	Whitefly population/ 10 cm twig	Leaf miner infestation (%)	Fruit borer larval population/plant
43	0.00	0.00	0.14	0.00
44	0.00	0.00	1.22	0.00
45	0.20	0.76	4.70	0.00
46	0.56	0.65	8.33	0.00
47	1.77	0.54	12.59	0.00
48	2.73	1.32	13.55	0.51
49	2.42	1.76	13.46	0.70
50	1.11	0.91	14.70	0.89
51	3.39	3.66	16.29	1.04
52	4.01	4.00	18.62	1.54
1	3.87	4.44	21.82	1.77
2	4.74	5.11	26.28	1.91
3	5.24	5.85	28.40	2.09
4	6.21	4.66	32.43	2.67
5	6.54	6.33	34.29	3.12
6	8.00	7.41	33.18	3.84
7	7.99	9.84	32.74	4.66
8	8.00	4.51	39.04	4.90
9	9.26	11.85	41.80	5.29
10	8.59	9.10	44.56	5.50
11	9.15	8.44	45.95	6.02
12	7.00	6.09	44.02	6.11

Table.2 Correlation coefficient of insect population with meteorological parameter

	Jassid	Whitefly	Leaf miner	Fruit borer
Temp.(max.)	0.115	0.106	0.231	0.224
Temp. (min.)	-0.189	-0.193	-0.155	0.289
RH (morn.)	-0.060	-0.060	-0.148	-0.086
RH (even.)	0.280	0.275	0.161	0.414
Rainy days	0.389	0.416	0.386	0.428*

White fly, *Bemisia tabaci*

B. tabaci appeared in 5 to 11 November and peak during 26 Feb. to 4 March 2020 and remained active until the harvest of the crop. *B. tabaci* population ranged from 0.0 to 11.85/10 cm twig with an overall mean performance of 4.42/10 cm twig. Similar findings have been reported by Reddy and Kumar (2004), Mandal (2019). They also reported that, *B. tabaci* to be an important sucking pest of tomato and was present throughout the growing period of the crop. Kharpuse (2005) found that the *B. tabaci* population peaked (13 files/10 cm twig) during first week of March. Association of *B.*

tabaci was recorded positive with rainy days (0.389), relative humidity evening (0.275) and temperature maximum (0.106), while it was found negative with temperature minimum (-0.193) and relative humidity morning (-0.060). Present findings are in accordance with those of Abdel *et al.,* (1998).

Leaf miner, *Liriomyza trifolii*

L. trifolii appeared in the 22nd October 2019 and continued till the harvesting. Increasing trend was observed in this case with crop growth stages. The maximum (45.95 %) leaf infestation was recorded at 12 to 18 March 2020, when the average maximum and minimum temperature was 31.6 and 14.7^{0}C respectively with 84 per cent relative humidity and no rainfall. The pest was present throughout the growing stage of the crop and mined the leaves. Present findings are in accordance with those of Reddy and Kumar (2004). They recorded *Liriomyza spp*. as major pest in tomato. Kharpuse (2005) revealed that the maximum (76.67 %) leaf infestation by *L. trifolii* was recorded at middle of the March. *L. trifolii* tunnels were recorded positive association with rainy days (0.386), temperature maximum (0.231) and relative humidity evening (0.161). However, it exhibited negative association with temperature minimum (-0.155) and relative humidity morning (-0.148). These findings are in agreement with that of Bagmare *et al.*, (1995) Asalatha (2002).

Fruit borer, *Helicoverpa armigera*

The larvae of *H. armigera* were first observed on tomato crop in 26th November 2019 and gradually increased till the crop was harvested. Population peaked (6.11 larvae/plant) in the 19 to 25 March, 2020 at that time the average maximum and minimum temperature were 33.4^{0}C and 16.2^{0}C respectively with (77 %) relative humidity and occasional rains was also observed. The pest was present during the entire reproductive stage of the crop and caused circular or irregular holes on the surface of the fruit and bore inside it. Present findings are in accordance with those of Mandal (2012). They all reported that *H. armigera* had been major insect pests of tomato. Kharpuse (2005) revealed that the fruit borer population peaked (26 larvae/10 plant) in the third week of March. *H. armigera* population expressed significant and positive correlation with rainy days (0.428) and other positive association i.e. relative humidity evening (0.414), temperature minimum (0.289) and temperature maximum (0.224). Also, negative association was exhibited with relative humidity morning (-0.086). These findings are in agreement with that of Kakati *et al.,* (2005).

A. gossypii and *L. trifolii* were appeared on the tomato crop on 22nd October 2019, while, *B. tabaci* were appeared in 5th November and peak during 26th to 4th of March 2020. *A. devastans*, *S. dorsolis* and *H. armigera*. Were another major insect pest of tomato crops and it appeared on 5th, 12th and 26th November 2019, respectively.

References

Abdel, M. L; Hegab, M. F.; Hegazy, G. M. and Kamel, M. H. (1998). Association of certain weather factors with population dynamics of white fly *Bemisia tabaci* Genn. on tomato plants. *Ann. Agric. Sci.cait.*(Special issue). 10 (1): 161-176.

Asalatha, R. (2002). Seasonal activity and bioefficacy of some eco-friendly insecticides against the serpentine leaf miner *Liriomyza trifolii*. *M.Sc. (Ag.) Thesis*, JNKVV, Jabalpur.

Bagmare, A.; Sharma, D. and Gupta, A.

(1995). Effect of weather parameters on the population build-up of various leaf miner species infesting different host plants. *Crop Res*. 10 (3): 344-395.

Kakati, M., Saikia, D. K. and Nath, R. K. (2005). Seasonal history and population build up of tomato fruit borer, *Heliothis armigera* (Hb.) *Res on Crop*. 6 (2): 371-373.

Kharpuse, Y. K (2005). Studies on seasonal incidence and role of botanical against major insect pests of tomato (*Lycopersicon esculentum* M.). M.Sc. (Ag.) (Ent.) Thesis submitted to J.N.K.V.V., Jabalpur (M.P.). pp: 1-53.

Kumar, K. Indra (2008). Studies on insect pest complex of tomato (*Lycopersicon esculentum* Mill.) and management of fruit borer, *Helicoverpa armigera* Hub. with chemicals. MSc. (Ag.) (Ent) Thesis submitted to J.N.K.V.V., Jabalpur (M.P.). pp 1-91.

Mandal, S. K. (2019). Bio-efficacy of cyazypyr 10% OD, a new anthranilic diamide insecticide, against the insect pests of tomato and its impact on natural enemies and crop health. *Acta Phytopathologica et Entomologica Hungarica*. 47 (2): 233-249.

Reddy, N. A and Kumar, C. T. A (2004). Insect pests of tomato, *Lycopersicon esculentum* Mill. in eastern dry zone of Karnataka. *Insect Environ.* 10 (1): 40-42.