Int.J.Curr.Microbiol.App.Sci (2021) *10*(05): 802-808

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 10 Number 05 (2021)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2021.1005.090

Studies on Population Dynamics of Sucking Pests Complex of Chilli and their Relation with Environmental Factors

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Keywords

Chilli, population dynamics, sucking pest complex, correlation, environmental factors

Article Info

Accepted:
22 April 2021
Available Online:
10 May 2021

A B S T R A C T

The present experiment entitled Studies on population dynamics of sucking pests complex of chilli and their relation with environmental factors was carried out in Insectary, Department of Entomology, CSAUA&T, Kanpur in *kharif* season 2018-2019. An experiment is conducted to find out the seasonal abundance of sucking pest complex of chilli. The presence of aphid, whitefly, and mites were recorded from the vegetative to maturity stage of the crop. Aphid, whitefly and mites were found to damage the crop moderately. First appearance of aphids were observed on 33rd standard week and reached at its peak during 37th standard week. The aphid population showed positive significant relation with maximum temperature and positive non significant relation with the minimum temperature, minimum relative humidity. Maximum relative humidity and rainfall are negatively non significant with aphid population. The occurrence of thrips on 35th standard week and reached to peak on 44th standard week. Maximum temperature showed non- significant positive correlation with thrips population. Minimum temperature have non-significant negative correlation. Remaining maximum and minimum relative humidity, rainfall showed negative correlation but statistically significant. Chilli mite was first appeared on 36th standard week and it's at peak on 47th standard week. Maximum and minimum temperature, maximum and minimum relative humidity, rainfall are negatively correlated to the mite population. Maximum temperature is non-significant while all other parameters are statistically significant.

Introduction

Chilli (*Capsicum annum L.*and *Capsicum frutescenes*) is an important spice cum vegetable crop belongs to family solanaceae. The native home of chilli is considered to be in Mexico. Nutritionally, it is rich source of vitamin-A, B, C and E with minerals like molybdenum, potassium, and folate. Capsaicin ($C_{18}H_{27}O_3N$) is an alkaloid produced by chilli is responsible for its pungency and has medicinal properties to prevent heart attack by dilating the blood vessels. India is the largest consumer and exporter of chilli in the world

with a production of 1492 thousand MT from an area of 775 thousand hectare (Ministry of Agriculture & Farmers Welfare 2019-20). About 5-10 percent is exported in the form of chilli powder and oleoresins (Singhal, 2003). India contributes about 36% to the total world production. The major chilli growing states are Andhra Pradesh, Maharastara, Karnataka, Tamil nadu, Rajasthan, and in hill areas of Uttar Pradesh. In UP production of chilli is 12.72 thousand tons.

About 51 insects and 2 mite species belonging to 27 families and 9 orders infesting chilli (Reddy and Puttuswami, 1988). Among this aphid, *Aphis gossypi* Genn, whitefly, *Bemesia tabaci*, jassid, *Amrasca biguttula biguttula*, fruit borer, *Helicoverpa armigera* Hubner, mites, *Polyphagotarsonemus latus* are the important pests that contributing 50-90 per cent of yield loss out of which thirps, whitefly, and aphid cause major damage resulting in low productivity reducing up to 50% of yield (kumar, 1995). Thrips can alone cause economic loss upto 30-50 per cent (Bhede *et al.*, 2008).

Thrips, mites and aphids causing leaf curl complex which is one of the most destructive syndrome affecting in chilli. Thrips and mite causing leaf curl syndrome called "mudra" complex in chilli (Venkatesh *et al.*, 1998).

Mites attack the upper portions like young leaves and buds forming crumpled, rosette and the plant become stunted (karmakar, 1997). Leafs truns to dark green colour curled downwards and petiole is elongated. While in thrips damage leaves will be crinkled and curled upwards. While aphids suck sap and secrete honey dew which forms a black coating hinders photosynthetic activity of plant (Butani, 1976). A thorough Survey of seasonal incidence or population dynamics of thrips, mites, and aphids in chilli crop in relation to environmental factors helps in developing efficient pest management strategies in a particular set of agro climatic conditions. Basic information about the populations dynamics of insects is needed for the selection of proper method of control (Manjunath *et al*,. 2001).

Materials and Methods

An experiment is conducted in Insectary, Department of Entomology, CSAUA&T, Kanpur in *kharif* season 2018-19. The chilli seedlings of variety Azad-1 was obtained from Vegetable Research farm, kalyanpur, Chandra Shekhar Azad University and Technology. About 550 seedlings are obtained and transplanted in the experimental plot (2m x 1.5m). The infestation of aphid and thrips is measured by taking the readings from randomly selected 5 plants in a plot. Mite infestation is taken in percentage damage. In each plot five plants are randomly selected, in each plant three infested leaves, upper, middle and lower are selected (Bhatt and Karnatak, 2018). Each leaf is observed under the stereo zoom binocular microscope and the observations are recorded. Data collected in the morning hour at weekly interval right from vegetative to maturity stage of crop.

Results and Discussion

Weekly observations were recorded from transplanting to maturity of the crop. Studies on pest incidence were initiation from august 2018 and continued up to January 2019. Studies on insect pest succession and field incidence revealed that three species of insect sucking pests were observed to be associated with various stages of the chilli crop at Kanpur, Uttar Pradesh during 2018-19. The insect pest species associated with chilli crop along with their nature of damage, damaging stage, seasonal incidence and their relation with environmental factors have been studied and shown in table 1 and 2.

Sucking Pest complex on chilli crop succession at CSAU&T, Kanpur

Aphid

First appearance of the pest in the field was observed 33rd standard week of august 2018 and was available up to 52nd standard week. The number of aphids were recorded weekly and reached its peak during 37th week (22.93 aphids/3 leaves). The acquired results are at par with the findings of Meena R.S, O.P Ameta (2013). The aphid attained their peak population in first and second week of September during 2006-07 (9.0 aphids/ 3leaves/plant) and during 2007-08 (9.3 aphid/ 3 leaves/plant), respectively. Deepak kumar *et al.*, 2019, observed that the aphid population attained it's on 44th SW.

Thrips

First appearance of the pest in the field was observed 35rd standard week of august 2018 and was available upto 52nd standard week. The number of thrips were recorded weekly. Thrips population reached its peak on 42nd week (8.33 thrips/3 leaves). These results, may be arranged with earlier findings of Patnaik *et al.*, the incidence of chilli thrips was low from August to December and from May onwards a steady rise in the pest population to reaching its peak in December. Bhede *et al.*,2008, studied on population dynamics of chilli thrips, *Scirtothrips dorsalis* (Hood). They reported that incidence of thrips was highest during 40th meteorological week.

Mites

Chilli mite was first appeared on 36th standard week of august 2018 and was available upto 52nd standard week of august. The highest number of mite population was recorded on 47nd week (12.41 mites/leaf). The obtained results are at par with Lingeri *et al.*, studied the seasonal incidence of chilli mite, The peak activity of chilli mite was noticed in the months of November and February.

Co-efficient of Correlation and regression equation of aphid abundance with environmental factors

Aphid

Correlation studies revealed that maximum and minimum temperature, minimum relative humidity exhibited positive correlation (r = 0.46, 0.40, and 0.184 respectively) with aphid population, statistically maximum temperature is significant but minimum temperature and minimum relative humidity and are found to be statistically non significant. Further, maximum relative humidity, and rainfall showed a negative correlation (r = -0.23, -0.187 respectively) with aphid population, but statistically found to be non significant. The acquired results are at par with the findings of Ghose *et al.*, 2018 recorded a positive correlation with minimum temperature, Rafee, 2018 showed that maximum temperature have positive correlation with aphid population.

Thrips

Correlation studies revealed that maximum temperature showed non- significant positive correlation (r =0.30) with thrips population Minimum temperature have non-significant negative correlation (r=-29), Remaining maximum and minimum relative humidity, rainfall showed negative correlation but statistically significant. The results are at par with, Reddy *et al.*, 2017, recorded a negative correlation with minimum relative humidity. Patel *et al.*, 2009, recorded a positive correlation with maximum temperature.

Table.1 Abundance of insect-pests as affected by environmental factors on chilli crop

Standard week	Mean number of insects on chilli		
	Aphid/3 leaves	Thrips/3 leaves	Mite/leaf
31	0.00	0.00	0.00
32	0.00	0.00	0.00
33	5.42	0.00	0.00
34	9.60	0.00	0.00
35	16.50	1.26	0.00
36	20.66	1.53	2.29
37	22.93	3.26	2.73
38	17.00	2.13	3.60
39	14.20	3.90	5.81
40	11.93	9.26	6.40
41	8.63	6.66	5.94
42	7.52	8.33	3.59
43	12.16	7.07	4.70
44	10.71	9.30	10.94
45	10.41	6.36	7.61
46	11.43	5.28	7.80
47	7.71	4.66	12.49
48	6.30	4.93	9.16
49	5.23	3.63	6.09
50	2.70	3.03	4.15
51	4.26	2.10	3.38
52	2.90	1.08	1.80

Table.2a Co-efficient of Correlation and regression equation of aphid abundance with environmental factors

Parameters	Co-efficient of correlation	Regression equation
Temperature		
Maximum	0.46(S)	y = 0.671x - 10.74
Minimum	0.40(NS)	y = 0.341x + 3.62
Relative humidity		
Maximum	-0.23(NS)	y = -0.196x + 25.9
Minimum	0.18(NS)	y = 0.060x + 6.42
Rainfall	-0.18(NS)	y = -0.015x + 9.90

Fig.1

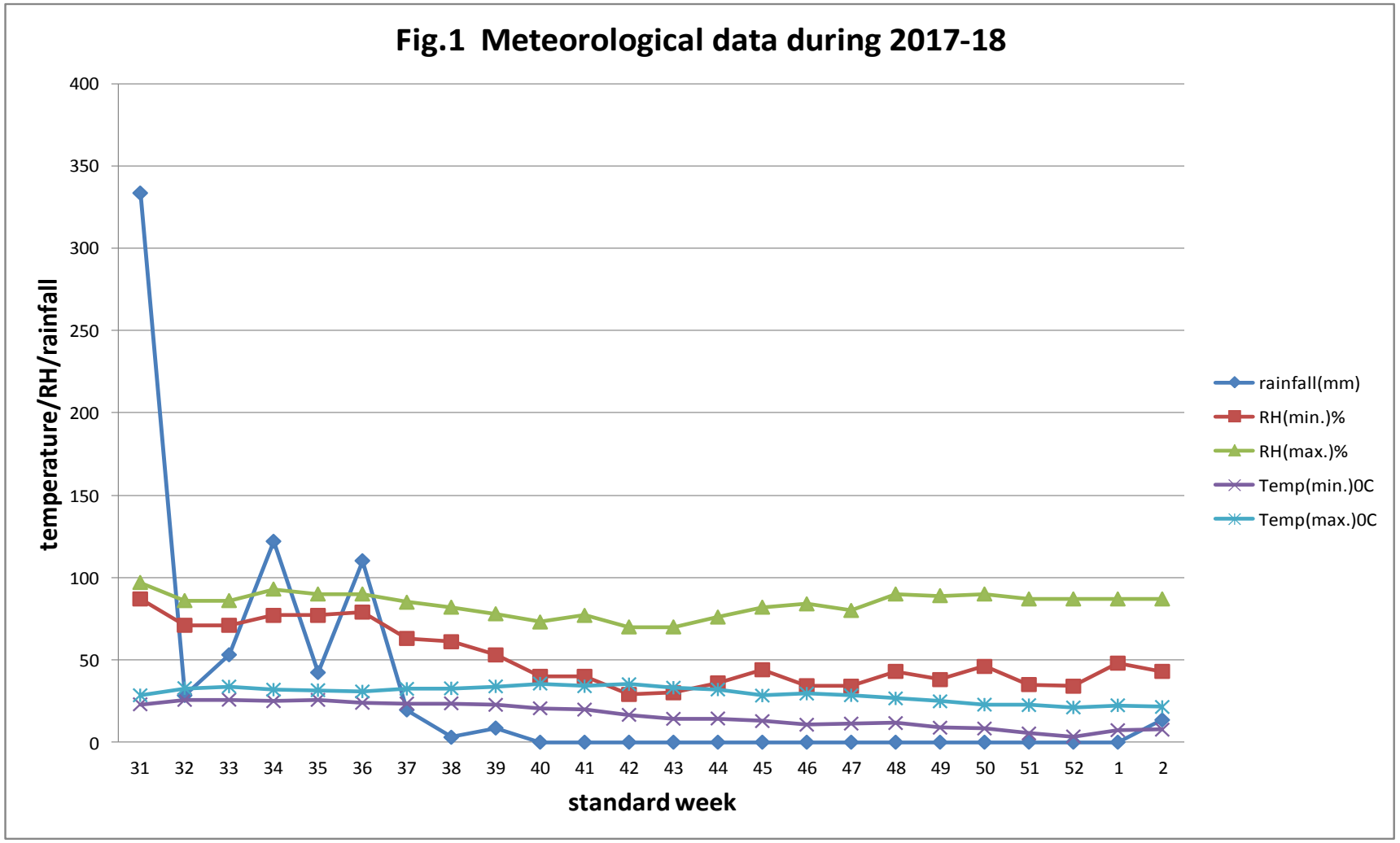
Fig.1 Meteorological data during 2017-18
temperature/RH/rainfall
400
350
300
250
200
150
100
50
0
31
32
33
34
35
36
37
38
39
40
41
42
43
44
45
46
47
48
49
50
51
52
1
2
standard week
rainfall(mm)
RH(min.)%
RH(max.)%
Temp(min.)0C
Temp(max.)0C

Table.2b Co-efficient of Correlation and regression equation of thrips abundance with environmental factors

Parameters	Co-efficient of correlation	Regression equation
Temperature		
Maximum	0.30(NS)	y = 0.216x - 2.709
Minimum	-0.29(NS)	y = -0.121x + 5.887
Relative humidity		
Maximum	-0.81(NS)	y = -0.335x + 31.89
Minimum	-0.71(NS)	y = -0.115x + 9.619
Rainfall	-0.42(NS)	y = -0.017x + 4.301

Table.2c Co-efficient of Correlation and regression equation of mites abundance with environmental factors

Parameters	Co-efficient of correlation	Regression equation
Temperature		
Maximum	-0.07(NS)	y = -0.065x + 6.456
Minimum	-0.49(S)	y = -0.249x + 8.739
Relative humidity		
Maximum	-0.45(S)	y = -0.224x + 23.26
Minimum	-0.68(S)	y = -0.131x + 11.12
Rainfall	-0.42(S)	y = -0.021x + 5.061

Gopal *et al.,* 2018, recorded significant negative correlation with maximum relative humidity and rainfall. Pathiapal *et al.,* 2014, observed that a negative correlation with minimum temperature, rainfall, morning and evening relative humidity, positive correlation with the maximum temperature.

Mite

It revealed that all the parameters, maximum and minimum temperature, maximum and minimum relative humidity, rainfall are negatively correlated to the mite population. Maximum temperature is non-significant while all other parameters are statistically significant. Lingeri *et al.,* 1998, studied the mite population was favoured by higher temperature, lower humidity and lesser intensity of rainfall and negative correlation was observed between relative humidity and total rainfall.

References

Bhede, B. V., Bhosle, B. B. and More, D. G. (2008a). Influence of meteorological factors over the incidence of chilli mite, *Polyphagotarsonemus latus* and its chemical control strategies. *Indian Journal of Plant Protection*. 36(2): 200-203.

Bhatt B, Karnatak A K. Population dynamics of sucking pests and their predators on okra agroecosystem. *Journal of Entomology and Zoology Studies*. 2018; 6(2):1289- 1291.

Butani, D. K. (1976). *Pest and diseases of chillies and their control*. Pesticides. 9: 38-41.

Deepak Kumar, S V S Raju and Kamal Ravi Sharma, *Journal of Pharmacognosy and Phytochemistry* 2019; 8(2): 403-407.

Gopal G V, Lakshmi K V, Babu B S, Varma P K. Seasonal incidence of chilli thrips, Scirtothrips dorsalis hood in relation to weather parameters. *J Ent., Zool. Stud*. 2018; 6(2):466-471

Ghose M, Bhattacharya S, Mandal S K. Seasonal incidence of pests of bell pepper (*Capsicum annum* var grossum Sendt) and their correlation with weather parameters. *Journal of Entomology and Zoology Studies*. 2018; 6(3):825-830

Karmakar K. (1995). Comparative symptomology of chilli leaf curl disease and biology of tarsonemid mite, *Polyphagotarsonemus latus* Banks, (Acari :Tarsonemidae). *Annals of Entomology*. 13(2): 65-70.

Kumar N K K. Yield loss in chilli and sweet pepper due to *Scirtothrips dorsalis* Hood. *Pest Management in Horticultural Ecosystem*. 1995; 1(2):61-69.

Lingeri, M. S., Awaknavar, J. S., Lingappa, S. and Kulkarni, K. A. (1998). *Seasonal occurrence of chilli mites* (*Polyphagotarsonemus latus* Banks) and thrips (*Scirtothrips dorsalis* Hood). *Karnataka Journal of Agricultural Science*. 11(2): 380-385.

Manjunatha M, Hanchinal S G, Reddy G V P (2001) *Survey of yellow mite and thrips on chilli in North Karnataka*. Insect Environment 6: 178.

Meena, R. S., Ameta, O. P. and Meena, B. L. (2013). Population dynamics of sucking pests and their correlation with weather parameters in chilli, *Capsicum annum* L crop. *The Bioscan*. 8(1):177-180.

Patel B H, Koshiya D J, Korat D M (2009) Population dynamics of chillithrips, *Scirtothrips dorsalis* Hood in relation to weather parameters. *Karnataka Journal of Agricultural Sciences* 22: 108-110.

Pathipati V L, Vijayalakshmi T, Naidu L N (2014) Seasonal incidence of major insect pests of chilli in relation to weather parameters in Andhra Pradesh. Pest Management in Horticultural Ecosystems 20: 36-40.

Patnaik, N. C., Behera, P. K. and Dash, A. N., 1986, some bio-ecological observations on the chilli thrips, *Scirtothrips dorsalis* Hood in Orissa. *Orissa J. Hort.*, 14; 25-28.

Rafee C, Havanoor R,. Seasonal incidence of sucking pests of chilli (*Capsicum annum* L.) and their natural enemies. *Entomology and Zoology Studies*. 2018; 6(4):1786-1789.

Reddy A A, Narendra R C, Antha K D, Manohar R A, Narebdra R S. Seasonal incidence of thrips and relation to abiotic factors in chilli (*Capsicum annun* L.), *Journal of Entomology and Zoological Studies*. 2017; 5(6):304-306.

Venkatesh, H M., Muniyappa, V., Ravi, K S and Krishna Prasad, 1998, Management of chilli leaf curl complex, proceedings of First National Symposium on Integrated Pest management (IPM) in Horticultural crops, Bangalore, pp 111-117.

How to cite this article:

Prathyusha, P., R. K. Dwivedi, Deepak Pal and Gulab. 2021. Studies on Population Dynamics of Sucking Pests Complex of Chilli and their Relation with Environmental Factors. *Int.J.Curr.Microbiol.App.Sci.* 10(05): 802-808. doi: https://doi.org/10.20546/ijcmas.2021.1005.090