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Studies on population of chilli aphids in response to environmental factors

NE Jayewar, BB Bhosle and MM Sonkamble

Abstract
The studies on population built of Chilli aphids during *Kharif* season of 2017-18 at the experimental Farm of Department of Agricultural Entomology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani with chilli variety PBNC-1 in non-replicated design was carried out to Status of chilli aphids in Parbhani region and to determine the impact of weather parameters on population built of chilli aphids. A close watch on the incidence of chilli aphids was kept from 32nd SMW and was continued up to harvest of the crop in 4th SMW. The population of aphids found to ranged from 1.20 and 9.98 aphids /leaf during 2017-18. During 2017-18 the aphid population was correlated positively significant with the bright sunshine hours (r = 0.711*) and showed negatively significant effect with minimum temperature (r = -0.672*), evening RH (r = -0.773*) and rainfall (r = -0.644*) whereas other wheather parameters were having non-Significant correlation with aphids population. Regression studies concluded the predictions of the aphid population by using weather parameters were more reliable.

Keywords: Seasonal incidence, whitefly and chilli

Introduction
Chilli, (*Capsicum annuum* L.) is one of the most popular and highly remunerative vegetable crops grown in most parts of the world, *viz.*, China, Spain, Mexico, Romania, Yugoslavia, Bulgaria, USA, India, Europe and Central & South America are the major countries of capsicum production. In India, it is intensively cultivated in Karnataka, Maharashtra, Tamil Nadu, Himachal Pradesh and hilly areas of Uttar Pradesh.
The major importers of Indian chillies are Malaysia, Sri Lanka, Indonesia, The Us, Bangladesh, Singapore, UK, Nepal and Mexico. Chilli export from India mainly depended on Vietnam, Thailand, Malaysia and Sri Lanka. The average quantity of chilli exported was 300375 Metric tonnes with value of Rs, 269101.50 lakhs. The US and UK are other significant importers of Indian Chilli. Malaysia is the largest importer of Chilli from India. Most of chillies imported by Malaysia are processed and re-exported to other countries. (Geetha R. and K. Selvarani, 2017) [5].
In Maharashtra , major green chilli growing districts in the order of decreasing area and production are Nagpur, Jalgaon, Nashik, Nanded, Nandurbar, Palghar, Pune, Jalana, Aurangabad And Amaravati (Anon., 2017) [2].
The major reason which attributes to low productivity of chilli is infestation of insect pests and diseases. Over 53 species of insects and mites have been reported as pests of chilli in India which includes thrips, aphids, whiteflies, fruit borers, cutworms, plant bugs, mites and other minor pests (Sorensen, 2005) [15]. Among the different insect pests of chilli, thrips is the dominant one which can cause 50 to 90 per cent yield loss (Borah, 1987, Varadharajan, 1994 and Patel and Gupta 1998) [4, 16, 9]. Reddy and Reddy (1999) [11] reported that the fruit borers also cause losses to the extent of 90 per cent. The yield of green chilli is also affected by aphid, Jassid, whitefly and mite under field conditions (Anon., 1979) [1].
Therefore the present investigations were undertaken with objective to study seasonal incidence of aphids and it's relation with weather parameter in Marathwada region.

Materials and Methods
Investigation on seasonal incidance was carried out during *Kharif* season of the year 2017-18 to study seasonal incidence of aphids and it's correlation with weather parameters in Non-replicated design at the Research Farm of Department of Agricultural Entomology, Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani. The seedlings of chilli cv., PBNC-1 were transplanted in 10 X 10 m^2 plot with 60 cm x 45 cm spacing which was divided in four quadrants. No insecticidal treatment was applied at any stage of the crop growth. Observations were recorded from five plant from each quadrant to assess Aphids population from five

leaves, one from top and two each from middle and bottom of randomly selected five plants from each net plot for mites, whitefly and aphids whereas from five terminal leaves for thrips. (Pathipati *et al.* 2012) [10]. Data so recorded was subjected to correlation and multiple regression between white flies and weather parameter by Panse and Sukhatme (1967) [8] methodology and by using WASP software.

Results and Discussion

Data presented in Table 1 and depreciated in Fig. 1 shows that During 2017-18, the incidence of aphids (1.20 and 9.98 aphids/plant) was noticed from end of September (39th SMW) to last fortnight of January (50th SMW). The peak incidence (9.98 aphids/plant) was observed in 50th SMW when the prevailing weather parameters were maximum and minimum temperature (31.0 and 12.5 ^{0}C), morning and evening relative humidity (78.0 and 31.0 per cent), evaporation (4.7 mm), bright sunshine hourshours (8.6 hrs) and wind velocity (2.8 kmph). Thereafter, the Aphids population fluctuated and sustained up to 4th SMW (3.28 aphids/leaf).

Table 1: Seasonal incidence of Whiteflies on Chilli and Weather Parameter during 2017-18

Std. Met. Week	Duration	Aphids (No./Leaf)	Temperature (^{0}C)		Humidity (%)		Rainfall (mm)	EVP (mm)	BSS (Hrs.)	WV (Kmph)
			Max	Min	Morning (I)	Evening (II)				
32	08-14 Aug	0.00	32.2	23.0	85	59	16.1	4.8	3.6	3.7
33	15-21 Aug	0.00	28.7	22.7	92	77	141.0	2.9	3.0	4.4
34	22-28 Aug	0.00	29.2	9.4	90	77	98.2	3.5	4.1	5.0
35	29-04 Sep	0.00	17.4	9.6	88	67	29.8	3.8	6.8	3.0
36	05-11 Sept	0.00	13.7	22.7	82	60	78.9	3.9	6.6	3.0
37	12-18 Sep	0.00	30.5	22.7	87	72	79.2	2.8	4.9	2.5
38	19-25 Sep	0.00	31.5	22.3	87	61	6.6	4.6	6.0	3.1
39	26-02 Oct	1.20	34.2	22.5	77	48	0.0	6.2	8.5	3.4
40	03-09 Oct	3.24	33.2	21.6	82	65	57.6	5.4	7.0	3.4
41	10-16 Oct	3.48	31.2	22.2	89	69	111.2	3.3	5.3	2.5
42	17-23 Oct	4.42	32.6	20.2	79	46	1.4	4.7	6.5	2.2
43	24-30 Oct	4.40	32.6	16.4	77	32	0.0	4.3	8.9	2.0
44	31-06 Nov	3.28	30.9	14.5	78	31	0.0	4.5	9.2	2.6
45	07-13 Nov	4.68	30.8	12.2	79	31	0.0	4.8	9.6	3.4
46	14-20 Nov	5.24	31.4	14.4	76	32	0.0	4.7	8.7	2.9
47	21-27 Nov	5.02	32.0	17.0	77	42	0.0	4.5	7.4	2.4
48	28-04 Dec	6.02	29.9	10.2	77	31	0.0	3.9	9.2	2.9
49	05-11 Dec	6.38	30.4	14.4	75	42	0.0	4.5	7.4	4.7
50	12-18 Dec	9.98	31.0	12.5	78	31	0.0	4.7	8.6	2.8
51	19-25 Dec	8.64	29.3	7.9	75	27	0.0	4.0	8.4	3.8
52	26-31Dec	9.32	25.6	6.1	67	19	0.0	3.4	8.3	2.7
1	1-7 Jan	9.86	29.6	9.2	44	18	0.0	3.9	8.6	2.6
2	8-14 Jan	6.32	30.3	11.5	76	32	0.0	4.5	8.7	2.9
3	15-21 Jan	4.20	31.0	11.8	74	27	0.0	5.1	9.2	3.0
4	22-29 Jan	3.28	29.9	8.7	120	39	0.0	4.5	9.4	3.1

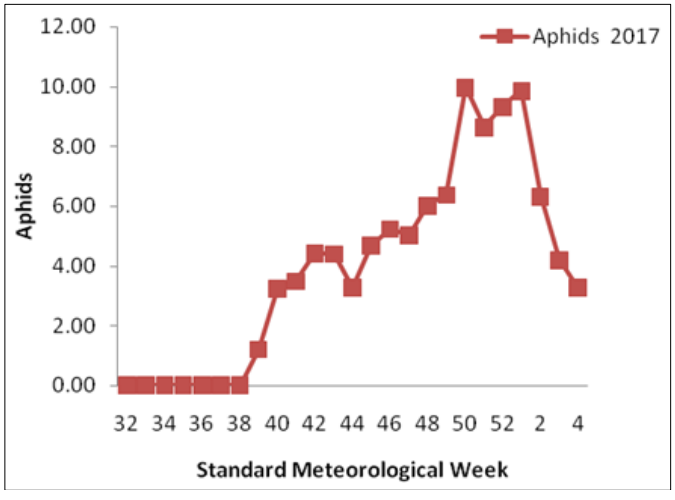

Fig 1: Seasonal incidence of aphids on chilli

Correlation studies

The data on correlation between aphid population and weather parameters during 2017-18 is presented in Table 2.

During 2017 the aphid population was positively significant with the bright sunshine hours (r = 0.711*) and showed negatively significant effect with minimum temperature (r = -0.672*), evening RH (r = -0.773*) and rainfall (r = -0.644*). While, negatively non-significant reaction was observed with morning RH (r=-0.062*), evaporation (r = -0.225) and wind velocity (r =-0.351) and positively non-significant reaction with maximum temperature (r = 0.298).

Multiple regression studies

The partial regression coefficients for different weather parameters and aphid population during 2017-18 was worked out and presented in Table 3. The multiple regression equation fitted with weather parameters in order to predict aphid population on chilli was as below.

Regression equation 2017-18

$Y = 13.570 + (-0.017)\ X_1 + (0.123)\ X_2 + (-0.089) X_3 + (-0.068)\ X_4 + (-0.084)\ X_5 + (-0.923)\ X_6 + (0.160)\ X_7 + (0.241)\ X_8 + 1.872$ ($R^2 = 0.7840$)

Where

X_1= rainfall, X_2 = maximum temperature, X_3= minimum temperature, X_4= morning RH, X_5= evening RH, X_6= evaporation X_7= bright sunshine hours X_8= wind velocity and R^2= coefficient of determination.

The coefficient of determination (R^2) represents the proportion of common variation in the two variables. The present investigations revealed that the weather parameters contributed for 78.40 per cent of total variation in the

population of aphid in chilli during 2017 indicating that the predictions of the aphid population by using weather parameters were more reliable.

The present findings of experiment are in agreement with Singh (2001) [13] who reported that *A. gossypii* appeared on chilli in last week of October and reaching its peak at December. Baloch *et al.* (1994) [3] noted population of aphids on chilli crop during summer months and reported it was dominant on chilli crop from February to March when maximum temperature varied from 24 to 38 ^{0}C. Idris *et al.* (2001) [6] reported that light intensity and air temperature had significant correlation with number of apterous aphids in chilli varieties with erect plant architecture only. Marmat (2000) [7] reported that correlation of aphid population with morning relative humidity was found non-significant and with evening relative humidity it was negatively significant. More or less similar results were also recorded by Soujanya *et al*. (2010) [14] and Shivanna *et al*. (2011) [12] that also confirming the results obtained during present investigations.

Table 2: Correlation of coefficient (r) between whiteflies population on chilli and weather parameters during 2017-18.

Weather parameters	Correlation coefficient (r)
Rainfall (mm)	-0.644*
Maximum temperature (^{0}C)	0.298
Minimum temperature (^{0}C)	-0.672*
Morning relative humidity (%)	-0.062
Evening relative humidity (%)	-0.773*
Evaporation (mm)	-0.225
Bright sunshine hours (hrs)	0.711*
Wind velocity (km/hr)	-0.351

* Significant at 5% level, ** Significant at 1% level.

Table 3: Multiple regression of weather parameters and whiteflies on chilli (2017-18)

Weather parameters	Reg. coefficients	SE (b)	'T' Test
Rainfall (mm)	-0.017	0.014	-1.261
Maximum temperature (^{0}C)	0.123	0.100	1.227
Minimum temperature (^{0}C)	-0.089	0.125	-0.714
Morning relative humidity (%)	-0.068	0.048	-1.414
Evening relative humidity (%)	-0.084	0.058	-1.450
Evaporation (mm)	-0.923	0.800	-1.154
Bright sunshine hours (hrs)	0.160	0.512	0.313
Wind velocity (km/hr)	0.241	0.732	0.329
Intercept	2017= 13.570		
Coefficient of determination (R^2)	2017=0.784		
T table (0.05)	2.120		

Conclusion

The results concluded that aphids was found to be one of the regular pest of chilli and their presence was moderate to high during the experimental period, particularly during month of December and January. Simple correlation and regression studies revealed that there was significant effect of different weather parameters on incidence of aphids on chilli.

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