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Studies on seasonal incidence and correlation of chilli aphids

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Abstract

The investigation was carried out to determine the impact of weather parameters on seasonal incidence of chilli aphids during *Kharif* season of 2016-17 at the experimental Farm of Department of Agricultural Entomology, Vasantnao Naik Marathwada Krishi Vidyapeeth, Parbhani with chilli variety PBNC-1 in non-replicated design. Seasonal Incidence studies were initiated from 32nd SMW and observation on incidence were continued up to harvest of the crop in 4th SMW. Aphids infestation was initiated during 44th SMW (2.00 aphids/leaf) and it was continued to increase and reached its peak 11.56 aphids/leaf in 50th SMW. During 2016-17 Correlation studies revealed that, the correlation of aphid population showed positively significant correlation with the bright sunshine hours and negatively significant effect with minimum temperature, morning RH, evening RH, wind velocity and rainfall.

Keywords: Seasonal incidence, whitefly and chilli

Introduction

Chilli, *Capsicum annum* L. has its origin in the Latin American region, but Portuguese traders introduced it in to India, Indonesia and other parts of Asia around 450 to 500 years ago (Berke and Shieh, 2000) [3] and since then, it has gained importance as an important spice and vegetable crop. Chilli is used as a paste, powder or in whole form. It is one of the chief sources of vitamin A, C and E. Its paste is externally used as a rubefacient and as a local stimulant for the tonsils in tonsillitis. Chilli is also known to have medicinal value, as it prevents heart attack by dilating the blood vessels. Of late, the export value of capsaicin, further led to increase in production of chilli in India. Chilli has two important commercial qualities. Some varieties are famous for red colour because of the capsanthin, others are known for biting pungency attributed by capsaicin. Out of total production of chillies nearly 90 to 95 per cent consumed within the country and about 5 to 10 per cent exported in the form of dry chilli, chilli powder and oleoresins (Singhal, 2003) [11].

The major chilli exporting countries in the world are India (25%), China (24%), Spain (17%), Mexico (8%), Pakistan (7.2%), Morocco (7%) and Turkey (4.5%). Indian chilli is exported to Sri Lanka, Mexico, U.S., Nepal, Bangladesh and gulf countries. According to the report from the Spices Board, India exported 1,66,000 tonnes of red chilli during the period from April to August 2009 valued at 947.35 crore as against 1,76,255 tonnes valued of 940.12 crore during the same period in the previous year (Anon. 2011) [12].

In India, chilli is mainly grown for its fruits which are used prior to its maturity in various culinary preparations and also in stuffings, pizza and burger. Both green and dry chillies are produced world over from the chilli crop. Over 35 species of insect and mite have been reported as pests of chilli which includes thrips, aphid, whitefly, fruit borer, cutworm, plant bug, mite and other minor pests (Sorensen, 2005) [12]. Among all the sucking pests attacking chilli, thrips (*Scirtothrips dorsalis* Hood), mite (*Polyphagotarsonemus latus* Banks) and aphids (*Myzus persicae* Sulzer, *Aphis gossypii* Glover) are dominant pests (Ananthakrishnan, 1971; Krishna Kumar *et al.*, 1996 and Berke and Sheih, 2000) [1, 5, 3]. The cotton aphid (*Aphis gossypii* Glover) is commonly found infesting chillies. Small, ovate, soft, greenish, brown, sluggish nymphs and adults are found in large colonies on the under surface of leaves and growing shoots of plants, sucking the cell sap. The aphids also secrete honeydew on which black sooty mould develops covering the leaves and twigs. This black coating hinders the photosynthetic activity of the plant causing further retardation in growth and fruiting capacity of the plant (Butani, 1976) [4].

Hence, it is imperative to resort the knowledge on aspects of the seasonal incidence, the present investigations were undertaken with objective seasonal incidence of aphids and it's relation with weather parameter in marathwada region.

Materials and Methods

Investigation on was carried out during *Kharif* season of the year 2016-17 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, Vasantnao Naik Marathwada Krishi Vidyapeeth, Parbhani. The seedlings of chilli cv., PBNC-1 were transplanted in 10 X 10 m² 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) [8]. Data so recorded was subjected to correlation and multiple regression between white flies and weather parameter by Panse and Sukhatme (1967) [7] methodology and by using WASP software.

Results and Discussion

The population of aphids found to range from 0.00 to 11.56 aphids /leaf during 2016-17 (Table 1 and Fig. 1).

During 2016-17, the nymphal and adult population was first spotted during 44th SMW (2.00 aphids/leaf) and it was continued to increase and reached its peak 11.56 aphids /leaf in 50th SMW. The corresponding weather parameters were recorded as maximum and minimum temperature (29.7 and 12.7 °C), morning and evening relative humidity (74 and 30 per cent), evaporation (4.7 mm), bright sunshine hours (8.5 hrs) and wind velocity (3.9 kmph). Thereafter the population gradually decreased and sustained up to 2nd SMW.

Table 1: Seasonal incidence of Whiteflies on chilli and Weather Parameter during 2016-17

Std. Met. Week	Duration	Aphids (No./Leaf)	Temperature (°C)		Humidity (%)		Rainfall (mm)	EVP (mm)	BSS (Hrs.)	WV (Kmph)
			Max	Min	Morning (I)	Evening (II)				
32	08-14 Aug	0.00	31.7	22.1	84	56	0.0	5.2	5.9	6.2
33	15-21 Aug	0.00	31.8	21.4	85	58	11.2	5.0	6.6	5.4
34	22-28 Aug	0.00	32.4	21.4	87	52	13.0	5.2	8.0	4.4
35	29-04 Sep	0.00	31.0	22.5	92	68	71.5	4.2	4.2	3.6
36	05-11 Sept	0.00	30.9	20.7	80	58	1.5	5.3	8.8	5.0
37	12-18 Sep	0.00	29.3	22.4	88	78	101.6	3.6	1.7	4.6
38	19-25 Sep	0.00	29.6	22.3	96	85	109.1	2.9	2.5	3.4
39	26-02 Oct	0.00	30.2	21.7	91	73	96.9	3.3	3.7	4.7
40	03-09 Oct	0.00	29.4	21.3	93	72	109.5	3.4	5.3	3.9
41	10-16 Oct	0.00	32.0	21.2	88	52	56.9	4.7	7.5	2.9
42	17-23 Oct	0.00	32.2	16.9	77	33	0.0	5.5	9.6	2.2
43	24-30 Oct	0.00	32.3	16.1	74	31	0.0	5.9	9.0	2.7
44	31-06 Nov	2.00	31.2	14.4	75	32	0.0	5.1	9.5	3.8
45	07-13 Nov	9.18	30.6	11.0	74	26	0.0	4.3	9.5	1.9
46	14-20 Nov	9.48	30.3	12.1	76	32	0.0	4.1	8.2	2.5
47	21-27 Nov	10.48	30.3	9.6	77	25	0.0	4.7	9.6	2.8
48	28-04 Dec	10.56	31.5	10.1	77	25	0.0	4.7	9.1	2.2
49	05-11 Dec	10.78	30.0	11.9	74	36	0.0	4.6	9.1	3.3
50	12-18 Dec	11.56	29.7	12.7	74	30	0.0	4.7	8.5	3.9
51	19-25 Dec	10.00	29.6	8.8	75	24	0.0	4.6	9.8	2.3
52	26-31 Dec	4.48	25.9	6.9	66	25	0.0	3.7	8.6	2.4
1	1-7 Jan	2.48	29.2	8.5	78	27	0.0	4.2	9.3	2.0
2	8-14 Jan	1.04	27.6	7.7	77	36	0.0	4.0	9.0	3.0
3	15-21 Jan	0.00	28.9	11.5	75	37	0.0	4.2	7.0	2.8
4	22-29 Jan	0.00	31.1	13.1	72	31	0.0	4.3	8.9	3.6

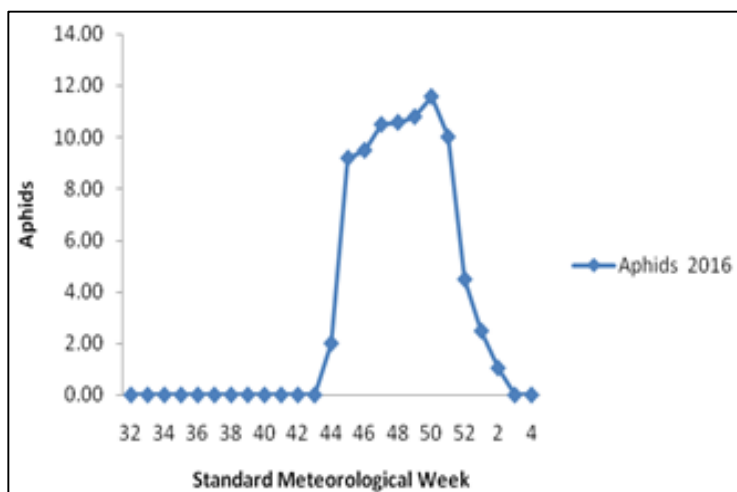


Fig 1: Seasonal incidence of aphids on chilli

Correlation studies

The data on correlation between aphid population and weather parameters during 2016-17 is presented in Table 2.

During 2016, the aphid population showed positively significant correlation with the bright sunshine hours ($r = 0.478^*$) and negatively significant effect with minimum temperature ($r = -0.644^*$), morning RH ($r = -0.512^*$), evening RH ($r = -0.609^*$), wind velocity ($r = -0.454^*$) and rainfall ($r = -0.420^*$). While, negatively non-significant reaction with maximum temperature and positively non-significant reaction with wind velocity was recorded.

Multiple regression studies

The partial regression coefficients for different weather parameters and aphid population during 2016-17 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 2016-17

$Y = -19.961 + (-0.006) X_1 + (1.171) X_2 + (-0.633) X_3 + (0.152) X_4 + (-0.147) X_5 + (-1.996) X_6 + (-0.330) X_7 + (0.972) X_8 + 3.997$ ($R^2 = 0.4960$).

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 49.60 per cent of total variation in the population of aphid in chilli during 2016 indicating that the predictions of the aphid population by using weather parameters were more reliable.

The results of present investigation are in consonance with those of earlier research workers like Singh (2001) [10] who reported that *A. gossypii* appeared on chilli in last week of October and reaching its peak at December. Prasad *et al.*, (2008) [6] who reported that the incidence of aphids had significant negative association with maximum temperature, minimum temperature, evening relative humidity and rainfall. Rathod and Bapodra (2004) [9] reported that the maximum temperature, relative humidity and sunshine hours showed the positive correlation, whereas minimum relative humidity showed negative correlation with the aphid population in cotton.

Table 2: Correlation of coefficient (r) between whiteflies population on chilli and weather parameters during 2016-17

Weather parameters	Correlation coefficient (r)
Rainfall (mm)	-0.420*
Maximum temperature ($^{\circ}$ C)	-0.172
Minimum temperature ($^{\circ}$ C)	-0.644*
Morning relative humidity (%)	-0.512*
Evening relative humidity (%)	-0.609*
Evaporation (mm)	0.037
Bright sunshine hours(hrs)	0.478*
Wind velocity (km/hr)	-0.454*

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

Table 3: Multiple regression of weather parameters and whiteflies on chilli (2016-17)

Weather parameters	Reg. coefficients	SE (b)	'T' Test
Rainfall (mm)	-0.006	0.034	-0.188
Maximum temperature ($^{\circ}$ C)	1.171	1.479	0.791
Minimum temperature ($^{\circ}$ C)	-0.633	0.853	-0.742
Morning relative humidity (%)	0.152	0.371	0.410
Evening relative humidity (%)	-0.147	0.324	-0.453
Evaporation (mm)	-1.996	2.882	-0.693
Bright sunshine hours(hrs)	-0.330	0.996	-0.331
Wind velocity (km/hr)	0.972	1.316	0.739
Intercept	2016=-19.961		
Coefficient of determination (R^2)	2016=0.496		
T table (0.05)	2.120		

Conclusion

The results concluded that aphids was found to be important insect pest of chilli and their presence was moderate to high during the experimental period, particularly during month of December. 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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