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Short communication

Seasonal incidence of white fly (*Bemisia tabaci* Gennadius) on Tomato (*Lycopersicon esculentum* Mill.) in eastern region of U.P.

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Vegetables crops occupy a prominent position in the human diet owing to their richness in vitamins and minerals. The role played by the vegetables, as a protective food in human diet need no advocacy. In our country, more than 70 types of vegetable are grown but maximum emphasis has been given an important vegetable like Tomato, Brinjal, Chilli, Cauliflower, Cabbage, Pea and few important Cucurbits. Among them tomato (*Lycopersicon esculentum* Mill.), belonging to solanaceae family, is one of the most popular and widely grown vegetable. The area under this crop is 478 million hectares with the production 60616 million tones annually.

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The production and quality of tomato fruits are considerably affected by array of insect pests infesting at different stages of crop growth. The key insect-pests of tomato include jassids (*Amrasca bigutulla bigutulla*, Ishida), aphid (*Aphis gossypi* Glover and *Myzus persicae* Sulzer), white fly (*Bemisia tabaci* Gennadius), cutworm (*Agrotis sp.*), tobacco caterpillar (*Spodoptera litura* Fabr.) and Tomato fruit borer (*Helicoverpa armigera* Hubner), which infest and hamper the growth of plants. Out of these insect-pests, white fly (*Bemisia tabaci* Gennadius.) is the major constraints in the higher production of tomato fruits.

The experiment was laid out at vegetable research farm of Udai Pratap Autonomous College, Varanasi, U.P. during *Rabi* seasons of 2005-06 and 2006-07. The soil type of experimental fields was sandy loam with an average fertility. The fields were well prepared and leveled having good drainage and adequate irrigation facility. All agronomical practices (e.g. raising of nursery, transplanting, fertilizer application, irrigation and cultural practices etc.) were done as per recommendations. The cultivar, Kashi Hemant was selected for the experiment. The field was kept free from noxious weeds after every irrigation. The soil was fairly pulverized by khurpi and hand hoe so as to increase and conserve the soil aeration and moisture in the field. No pesticide was applied on the plants. The meteorological observations during entire period of investigation were recorded from the observatory of Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (U.P.).

Seasonal incidence of leaf curl caused by white fly, *Bemisia tabaci* (Gennadius) was recorded by counting leaf curled plant and then converted it into per cent. The weekly observations were taken on cultivar Kashi Hemant to know the seasonal incidence of white fly in terms of leaf curl (TLCV/ Tomato Leaf Curl Virus). The results thus obtained were correlated with prevailing

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meteorological conditions viz., rainfall, temperature and relative humidity to signify the impact of environmental factors on the pest activity.

Seasonal incidence/occurrence of leaf curl caused by tomato leaf curl virus (TLCV) and transmitted by white fly (*Bemisia tabaci* Gennadius) was noticed in 49th standard week when 5.33 and 3.67 per cent plants were found suffering from leaf curl in both the years of investigation i.e. 2005-06 and 2006-07, respectively. The spread of disease was gradually increased till 3rd week of January but it increased rapidly later and reached to the extent of 76.00 and 77.33 per cent leaf curl in 7th standard week during 2005-06 and 2006-07, respectively. Thereafter, the increase in the incidence of disease was negligible during both the years of experimentation (Table- 1 and Table- 2).

Table 1: Seasonal incidence of white fly (*Bemisia tabaci* Gennadius) during 2005-06

Week No.	Rainfall (mm)	Temperature (^{0}C)		R.H. (%)		Leaf curl %
		Max.	Min.	Max.	Min.	
45.	0.00	29.0	13.0	88	39	-
46.	0.00	29.1	13.0	75	30	-
47.	10.0	28.2	11.4	91	31	-
48.	0.00	28.8	12.9	91	37	-
49.	0.00	25.2	10.8	76	31	5.33
50.	0.00	24.4	07.4	91	34	6.33
51.	0.00	23.7	09.6	89	46	10.67
52.	0.00	26.6	08.9	90	49	13.67
01.	0.00	24.5	08.7	89	35	14.33
02.	0.00	22.4	07.5	82	34	19.67
03.	0.00	25.3	10.7	88	44	24.67
04.	0.00	18.8	07.7	86	45	35.33
05.	0.00	25.7	10.3	89	52	54.67
06.	0.00	26.7	11.5	89	58	67.67
07.	0.00	29.6	13.7	81	41	76.33
08.	0.00	27.7	15.6	76	38	76.67
09.	0.00	30.0	13.9	76	36	76.00
10.	15.7	29.7	16.7	81	54	76.33
11.	01.8	29.7	15.5	85	70	77.67
12.	0.00	35.0	14.5	58	28	77.67
13.	0.00	36.0	16.5	52	18	78.00
14.	0.00	39.5	20.0	67	16	78.33
15.	0.00	40.1	22.3	46	14	78.00
16.	01.6	36.0	21.1	58	25	78.00
17.	0.00	38.4	24.2	60	30	78.00

As regards the impact of environmental factors on the disease incidence, it is amply documented in the Table-3 that the total rainfall (X_1) during the course if investigation played a negative significant (r = -0.45256) role during 2005-06 and negative non significant during the next year. However, the maximum temperature (X_2) exhibited positive and significant impact (r = 0.69667 and 0.63236) on the build up of leaf curl incidence in both the respective years of study. Likewise minimum

Table 2: Seasonal incidence of white fly (*Bemisia tabaci* Gennadius) during 2006-07.

Week No.	Rainfall (mm)	Temperature (^{0}C)		R.H. (%)		Leaf curl %
		Max.	Min.	Max.	Min.	
45.	0.00	30.8	16.4	86	43	-
46.	0.00	29.9	14.7	86	41	-
47.	0.00	28.5	14.4	79	39	-
48.	0.00	25.6	09.4	73	27	-
49.	0.00	28.3	11.4	79	34	3.67
50.	0.00	25.8	10.7	80	41	9.00
51.	0.00	25.1	10.1	92	46	13.67
52.	0.00	23.8	07.3	87	44	15.00
01.	0.00	22.3	05.8	79	34	18.67
02.	0.00	22.5	07.1	87	35	20.33
03.	0.00	23.6	07.0	73	30	24.33
04.	0.00	24.7	07.2	76	40	35.67
05.	0.00	27.9	12.1	80	37	42.33
06.	35.6	22.2	13.1	89	70	69.67
07.	30.6	23.1	12.1	81	55	77.00
08.	01.4	26.1	09.9	80	43	77.33
09.	32.2	26.2	13.0	80	50	77.33
10.	0.00	28.0	11.4	6 5	32	78.67
11.	38.2	26.3	15.2	77	58	78.67
12.	0.00	32.0	16.8	67	36	78.67
13.	0.00	35.7	16.7	60	28	80.33
14.	0.00	37.6	18.3	45	16	80.00
15.	0.00	37.1	22.1	56	28	80.00
16.	0.40	39.2	24.2	54	27	80.00
17.	02.8	40.3	24.4	53	28	80.00

temperature (X_3) also demonstrated positive and significant role (r = 0.48563 and 0.62532). While considering the effect of relative humidity on leaf curl incidence, it undoubtedly manifested negative and significant role (r = -0.69631 and -0.69491) during both the respective years, i.e. rate of disease incidence did not increase significantly.

While accounting the combined impact of rainfall, maximum temperature, minimum temperature and relative humidity, it may further be seen after table that rainfall exhibited negative non significant association with maximum temperature on occurrence of disease. Likewise, it was not significant with maximum temperature. However, rainfall demonstrated positive significant (r = 0.43885) association with relative humidity in 2005-06 and positive non significant relationship in 2006-07. As regards the impact of

Table 3: Correlation matrix of leaf curl and abiotic factors in tomato crop during 2005-06 and 2006-07.

Characters	Leaf curl Y_1	Total rain fall X_1	Maximum temperature X_2	Minimum temperature X_3	Relative humidity X_4
2005-06					
Y_1	1.0000	-0.45256**	0.69667**	0.48563**	-0.69631**
X_1	-	1.0000	-0.026561	0.02182	0.43885**
X_2	-	-	1.0000	0.90236**	-0.85756**
X_3	-	-	-	1.0000	-0.65471**
X_4	-	-	-	-	1.0000
2006-07					
Y_1	1.0000	-0.15932	0.63236**	0.62532	-0.69491**
X_1	-	1.0000	-0.14455	-0.26853	0.19615
X_2	-	-	1.0000	0.94921**	-0.83043
X_3	-	-	-	1.0000	-0.78082
X_4	-	-	-	-	1.0000

* Significant at 5 per cent level, ** Significant at 1 per cent level.

maximum temperature on minimum temperature and relative humidity it is obvious from the table that former exhibited a significant positive association with minimum temperature. However, it elicited negative significant association with relative humidity (Table- 3). Similarly minimum temperature demonstrated negative and significant relationship with relative humidity (r = -0.65471 and -0.78082) in both the years of investigation against the occurrence of leaf curl incidence of tomato.

Seasonal incidence of leaf curl were recorded during vegetative and fruiting phase of the crop and correlated with prevailing meteorological conditions to signify the impact of environmental factors with special references to temperature, relative humidity and rainfall.

Seasonal occurrence of leaf curl was noticed in first week of December and its spread gradually increased and reached up to 76.33 and 77.00 per cent in the seventh standard week during 2005-06 and 2006-07, respectively. Thereafter, the increase in incidence was negligible in both the years of experimentation. These findings were found in full support with Sastry *et al.*, (1978) who studied epidemiology of TLCV at IIHR and found that disease progresses when dry and hot months prevail and the incidence may reach up to 100 per cent. Saikia and Muniyappa (1989) and Singh and Tripathi (1991) found the incidence of TLCV at low ebb when humidity was higher. It reached to the extent of 100 per cent during hot and dry season.

As regards the role of abiotic factors on seasonal incidence of leaf curl, the rainfall played a negative role in incidence of leaf curl. While maximum and minimum temperature manifested positive and significant impact on spread of TLCV. Contrary relative humidity demonstrated negative and significant role in build up of TLCV. Considering the combined impact, rainfall decidedly non-significant with maximum and minimum temperature. But it was positive and significantly associated with relative humidity. The maximum temperature was positive and significant in association with minimum temperature while, it was negatively correlated with relative humidity. Likewise, the minimum temperature was also negatively associated with relative humidity. Similarly, the study made by Gupta *et al.*, (1997) on impact of abiotic factors on population build up of white fly on cotton crop in IARI, New Delhi reported negative correlation of relative humidity and rainfall on population build up of white fly. However, non-significant correlations were found with regard to the functional relationship between pest population and biotic factors. Rathore (1998) also found positive correlation with minimum and maximum temperature and negative correlation with rainfall and relative humidity. These findings of earlier workers uphold the views held by present investigator.

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