CORRELATION OF THE ENVIRONMENTAL FACTORS WITH THE BACTERIAL BLIGHT DISEASE OF COTTON CAUSED BY *XANTHOMONAS CAMPESTRIS* PV. *MALVACEARUM* UNDER SOUTH GUJARAT CONDITION

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Abstract: Bacterial blight (BL), caused by *Xanthomonas campestris* pv. *malvacearum* (Smith) Dye, is a common disease affecting the growth, development and yield of cotton crop. Field trial was conducted for a season to determine the influence of environmental conditions representing rainfall periods, temperature and humidity on development of disease incidence. Bacterial blight disease infestation was recorded with its first appearance and subsequently at weekly interval till it prevailed on cotton G.Cot.Hy. 12 variety. The result indicated that the disease was first appeared in 32nd standard week (First week of August) with 2.66 % intensity and prevailed up to 47th Met. Week *i.e* third week of November (1.37 %) with its peak during 38th week *i.e.* September 3rd week (24.75 %) and then it gradually decreased.

Keywords: Bacterial blight, Epidemiology, *Xanthomonas campestris* pv. *malvacearum*

INTRODUCTION

Cotton (*Gossypium hirsutum*) is one of the most important commercial crop and it is the back bone of national economy of our country. Cotton remains the most miraculous fiber under the sun, even after 8,000 years. No other fiber comes close to duplicating all of the desirable characteristics combined in cotton. The fiber of a thousand faces and almost as many uses, cotton is noted for its versatility, appearance, performance and above all, its natural comfort. From all types of apparel, including astronauts' in-flight space suits, to sheets and towels, and tarpaulins and tents, cotton in today's fast-moving world is still nature's wonder fiber. It provides thousands of useful products and supports millions of jobs as it moves from field to fabric (www.cotton.org). Cotton is a white fibrous agricultural product that has a wide variety of uses, from textile production, to creating paper, to producing oil and food products. Cotton is grown all around the globe, and is traded internationally as well. The production is influenced by the repeated out breaks of pest and diseases and these are the major factors responsible for lower yield of cotton in India. Out of 25 diseases known to occur in cotton crop from time to time, the bacterial blight is the most wide spread and destructive disease reported to cause yield losses of about 10 to 30 per cent (Kalpana *et al*., 2004) and also affect the quality of lint (Sharma and Chauhan, 1985). Bacterial leaf blight, boll rots, wilts and leaf spots are the most destructive cotton diseases (Chopra, 1977). Leaf spots rank third among the diseases on cotton in India. Among the leaf spots, bacterial blight (*Xanthomonas campestris* pv. *malvacearum* (Smith), Alternaria leaf spot (*Alternaria macrospora* Zimn) and grey mildew (*Ramularia aereola*) have been reported to be damaging. Bacterial blight (BL) of cotton caused by *Xanthomonas campestris* pv. *malvacearum* (Smith) Dye affects the entire aerial parts of cotton plant *i.e*. necrosis of parenchymatous tissue in the local phase and blockage of xylem vessels in its systemic phase (Casson *et al*., 1977). Resistant varieties are the valid option in any disease management strategies. Control of the disease through chemicals, seed treatment or acid delinting is recommended but bactericide alone or in combination with fungicides dose not eradicate the pathogen completely (Khan and Ilyas, 1999; Hussain and Tahir, 1993). Characterization of environment factors conductive for bacterial blight disease may provide a basis to forecast the disease and issue advance warning to cotton growers for its timely management. Keeping in view the seriousness of this disease, a study was conducted at Main Cotton Research Station (MCRS), Surat (Gujarat) during *kharif*, 2013 to know the affect of environment factors on the disease development.

MATERIAL AND METHOD

The susceptible cultivar LRA – 5166 were sown around the G.Cot.Hy. 12 in this experiment by dibbling method with the following experimental details. All the recommended agronomic practices were followed for raising the good crop. The observations on disease development were recorded at weekly interval from 20 randomly selected tagged plants and 5 leaves from lower part and 5 leaves from middle/ plant were selected by using 0-4 scale as given by (Sheoraj, 1989).

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$$\text{Disease incidence (\%)} = \frac{\text{No. of infected plants}}{\text{No. of leaves observed x Max. Grade}} \times 100$$

Score	Description
0	Immune, completely free from bacterial blight
1	Highly resistant, infection 0-10 %
2	Moderately resistant, infection 11-20 %
3	Moderately susceptible, infection 21-40 %
4	Highly susceptible, infection more than 40 %

The weather data of the corresponding disease interval was obtained from the meteorological observatory of MCRS, Surat. The data were compiled to standard weeks and subjected to correlation equations (Gomez and Gomez, 1984).

RESULT AND DISCUSSION

Bacterial blight disease infestation was recorded with its first appearance and subsequently at weekly interval till it prevailed on cotton G.Cot.Hy. 12 variety. The result presented in Table: 1 and Fig: 1 indicated that the disease was first appeared in 32nd standard week (First week of August) with 2.66 % intensity and prevailed up to 47th Met. Week *i.e* third week of November (1.37 %) with its peak during 38th week *i.e*. September 3rd week (24.75 %) and then it gradually decreased.

The correlation of bacterial blight disease (BLB) incidence with the weather parameters revealed positive and significant correlation with the mimimum temperature. All other parameters (morning & evening humidity, maximum temperature, rainy days and rainfall) had positive but non-significant correlations.

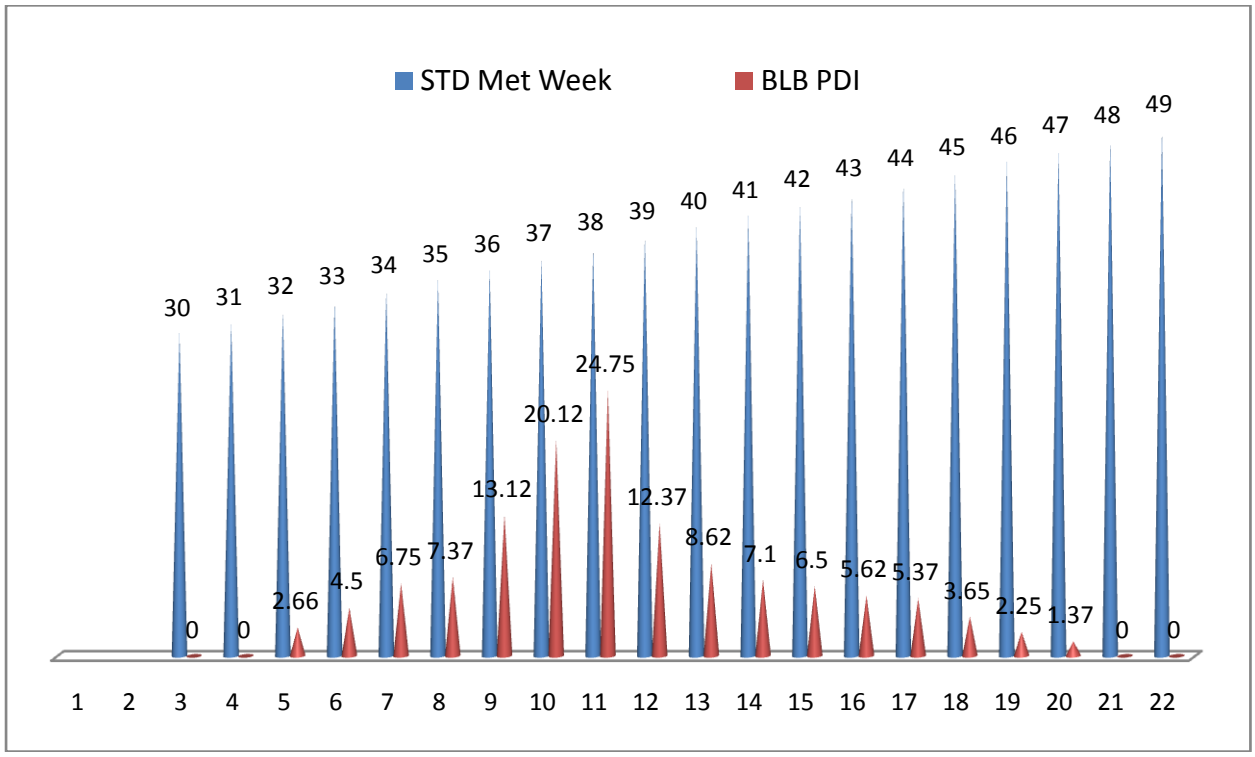

Fig: 1. Seasonal incidence of bacterial blight disease in cotton during 2013-14.

Table 1. Occurrence of Bacterial blight on G. Cot. Hy. 12 in relation to weather parameters at MCRS, NAU, Surat (2013-14)

Sr. No	STD Met Week	Period	BLB PDI	Weather parameter					
				Temp		Humidity		Rainy days	Rain fall
				Max	Min	Morning	Evening		
1	30	23/07/13-29/07/13	0.00	**29.2**	**27.3**	**88.5**	**81.7**	**7**	**86.9**
2	31	30/07/13-05/08/13	0.00	28.0	26.6	90.3	82.9	7	196.4

3	32	06/08/13-12/08/13	2.66	30.2	27.7	89.6	79.9	4	31
4	33	13/08/13-19/08/13	4.50	30.7	27.1	88.9	80	7	57
5	34	20/08/13-26/08/13	6.75	30.2	27.2	86.7	77.3	3	25.6
6	35	27/08/13-02/09/13	7.37	31.6	27.2	83.3	69.1	2	2.2
7	36	03/09/13-09/09/13	13.12	32.3	27.1	85.7	77.7	3	12.6
8	37	10/09/13-16/09/13	20.12	34.2	26.7	88.6	63.3	3	27
9	38	17/09/13-23/09/13	24.75	33.1	26.9	85.7	73.9	3	62.1
10	39	24/09/13-30/09/13	12.37	29.2	26.7	91.8	90.6	5	385.4
11	40	01/10/13-07/10/13	8.62	32.1	27.4	89.6	82.4	3	2.8
12	41	08/10/13-14/10/13	7.10	32.1	26.3	91.0	83.1	2	21.4
13	42	15/10/13-21/10/13	6.50	36.2	25.6	86.3	51.3	0	0
14	43	22/10/13-28/10/13	5.62	35.3	24.9	69.8	35.0	0	0
15	44	29/10/13-04/11/13	5.37	34.9	22.1	76.4	37.4	0	0
16	45	05/11/13-11/11/13	3.65	32.2	22.7	83.7	36.7	0	0
17	46	12/11/13-18/11/13	2.25	32.2	22.1	74.8	38.0	0	0
18	47	19/11/13-25/11/13	1.37	33.6	19.8	67.7	37.1	0	0
19	48	26/11/13-02/12/13	0.00	34.5	24.2	66.7	52.0	0	0
20	49	03/12/13-09/12/13	0.00	33.2	20.2	76.8	52.0	0	0
21	50	10/12/13-16/12/13	0.00	31.8	17	71.0	28.8	0	0
22	51	17/12/13-23/12/13	0.00	30.8	17.3	80.0	35.2	0	0
Correlation efficient				0.203	0.491*	0.409	0.368	0.168	0.181

*significant at 5 % and ** 1% level of significance

S.N.	Experiments	Location /Zone	Treat.	Variety	Design	Rep.	Plot size		Spacing (cm)	Sowing Date	Fertilizer NPK kg/ha	Irrigation
							Gross	Net				
1	Proj.Patho.1(b)	SG II Surat (Gujarat)	1	G.Cot.Hy. 12	Single block	1	36.0 x 13.5	33.6 x 11.7	120 x 45	18/06/13	240.40.0	2

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REFERENCES

Casson, E. T., P. E. Richardson, L. A. Brinkerhoff and R. K. Gholson. (1977). Histopathology of immune and susceptible cotton cultivars inoculated with *Xanthomonas campestris* pv. *malvacearum*. *Phytopathology*, 67: 195-196.

Chopra, B. L. (1977). Important diseases of cotton and their control measures in India. *Paper presented at staff course on cotton production, its processing and marketing technology* held at P.A.U., Ludhiana.

Gomez, K. A. and Gomez, A. A. (1984). *Statistical procedure for agricultural research*. 2nd Ed. John Willey and Sons, New York. P. 680.

Hussain, T. and Tahir, M. (1993). Chemical control of bacterial blight of cotton. *Pak. J. Phytopathol*. 5 (1-2): 119-121.

https://www.cotton.org/pubs/cottoncounts/fieldtofabric/index.cfm

Kalpana, P., Chellamuthu, V. and Jeyalakshmi, C. (2004). Screening of cotton hybrids against bacterial blight incited by *Xanthomonas campestris* pv. *malvacearum* (Smith) Dye, *Paper presented in Inter. Symp. Strat. Sust. Cotton Prod*. – A Global Vision 3, Crop Production, 23-25 Novermber 2004, Univ. Agric. Sci., Dharwad (India), pp. 373-374.

Khan, M. A. and Ilyas, M. B. (1999). Cotton germplasm response of slow blighting against *Xanthomonas campestris* pv. *malvacearum* and slow curling against CLCuV infection. Proc. 2nd. National Conf. of Pl. Path. Sep. 27-29, U.A.F. pp. 138-139.

Sharma, B. K. and Chauhan, M. S. (1985). Studies on the chemical control of foliar diseases of cotton in Haryana state. *Agric. Sci. Digest*. **5**: 153-56.