

## RELATIONSHIP OF BACTERIAL LEAF BLIGHT DISEASE OF COTTON WITH DIFFERENT WEATHER PARAMETERS UNDER SOUTH GUJARAT CONDITION OF INDIA

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Received Oct. 04, 2017. Revised: Jan. 30, 2018. Accepted: Feb. 15, 2018. Published online: Mar. 27, 2018

**ABSTRACT.** Cotton is a soft, fluffy staple fiber that grows in a boll, around the seeds of the cotton plants of the genus *Gossypium* in the family Malvaceae. Bacterial blight of cotton, also known as angular leaf spot, boll rot, and black leg, is a potentially destructive bacterial disease of cotton production. The disease caused by *Xanthomonas campestris* pv. *malvacearum* (Smith) Dye (synonyms *Xanthomonas malvacearum* (E.F. Sm) Dowson) is one of the most important and serious diseases in cotton crop. Main objective of present research is to study the progress of the bacterial blight disease of cotton (BLB), caused by *Xanthomonas campestris* pv. *malvacearum* (Smith) Dye, with relation to the environmental parameters. This is a common disease affecting the growth, development and yield of cotton. A field trial was conducted to determine the influence of environmental factors, viz. rainfall periods, temperature, sun shine hours and humidity on the development of disease. Bacterial blight disease was recorded with its appearance and

subsequently at weekly interval till it prevailed on G. Cot. Hy.12 (Non Bt). The incidence of bacterial blight disease (BLB) was noticed during 28 to 49<sup>th</sup> standard week with the maximum disease intensity in third week of September (23.5% PDI). None of the abiotic factors had significant influence on bacterial blight disease progress and development.

**Keywords:** bacterial leaf blight; *Xanthomonas campestris* pv. *malvacearum*; environmental parameters; correlation.

### INTRODUCTION

Cotton, a remarkable crop belongs to the genus *Gossypium* spp. L., is cultivated in all around the countries, mainly for cellulose fibres. The disease caused by *Xanthomonas campestris* pv. *malvacearum* (Smith) Dye (synonyms *Xanthomonas*

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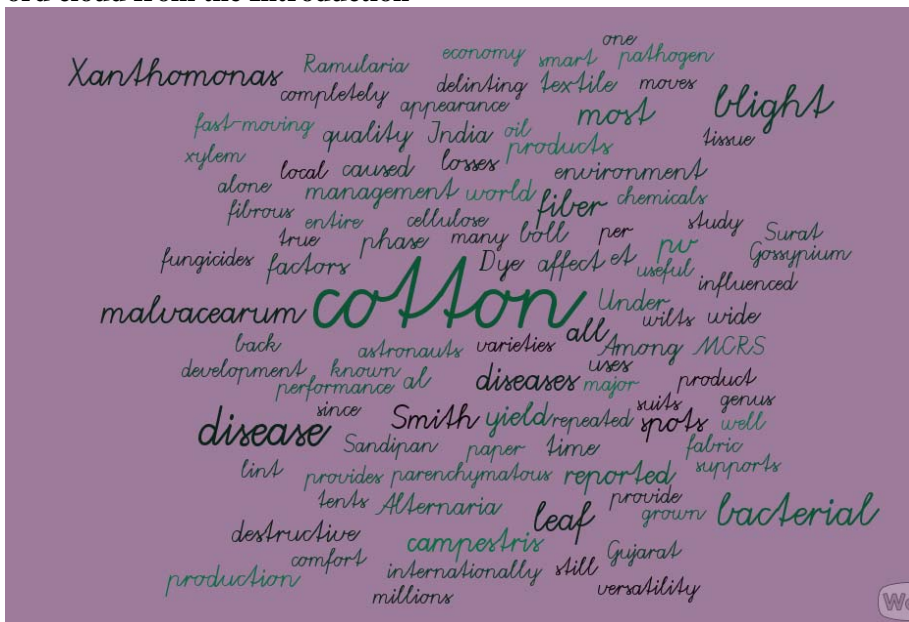
*malvacearum* (E. F. Sm) Dowson) is one of the most important and serious disease in cotton crop. Cotton stands as a back bone of national economy. Cotton is miraculous in terms of fiber production under the sun, since 8,000 years; as no other crop comes closer for the fibre quality. The cotton crop is noted for its versatility, appearance, performance and above all, its natural comfort. It is widely used in 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, notified in the category of smart textile. It provides thousands of useful products and ultimately supports the millions of jobs, as it moves from field to fabric (www.cotton.org). However, 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% (Bhatti & Bhutta, 1983 and Kalpana *et al.*, 2004) and also affect the quality of lint (Sharma & Chauhan, 1985). Bacterial leaf blight, boll rots, wilts and leaf spots

are the most destructive cotton diseases (Chopra, 1977). Under, bacterial blight infection, boll yield losses up to 35% have been reported (Raj & Verma, 1988). Leaf spots rank third among the diseases on cotton in India. Among the leaf spots, bacterial leaf blight (*Xanthomonas campestris* pv. *malvacearum* (Smith), *Alternaria* leaf spot (*Alternaria macrospora* Zimm) and grey mildew (*Ramularia aereola*) have been reported for the damage of the cotton crop. Bacterial leaf blight disease (BLB) affects the entire aerial parts of cotton plant. Bacterial blight can cause significant premature defoliation and in the worst cases significant boll rot., *i.e.* necrosis of parenchymatous tissue in the local phase and blockage of xylem vessels in its systemic phase (Casson *et al.*, 1977 and Sandipan *et al.*, 2015).

Control of the disease through chemicals, seed treatment or acid delinting is recommended for the control of the disease. Characterization of environment factors, which are responsible for bacterial leaf blight disease, may provide a basis to forecast the disease and also helps the cotton growers for its timely management. Keeping in view, the experiment was laid to study the relationship with the weather parameters at Main Cotton Research Station (MCRS), Surat (Gujarat), during *kharij*, 2015, to know the effect on the disease development.

## BACTERIAL LEAF BLIGHT DISEASE OF COTTON WITH DIFFERENT WEATHER PARAMETERS

### Word cloud from the Introduction



### MATERIAL AND METHODS

The susceptible cultivar LRA-5166 was sown around the G. Cot. Hy. 12 (Non Bt) in this experiment with the following experimental details. All the recommended agronomic practices were followed for raising crop.

The observations on disease development were recorded at weekly interval from 10 randomly selected tagged plants and five leaves from lower part and five leaves from middle/ plant were selected by using 0-4 scale as given by Raj & Verma (1988) and Sheoraj (1989).

Location/ zone	Treatment	Variety	Rep.	Plot size (mtr)		Spacing (cm)	Sowing date	Fertilizer NPK (kg/ha)	Irrigation
				Gross	Net				
SG II Surat (Gujarat)	1	G.Cot.Hy. 12	NR	36.9 x 12	34.5 x 11.1	120 x 45	23.06.15	240.40.0	2

$$\text{Disease incidence (\%)} = \frac{\text{Sum of numerical ratings}}{\text{No. of leaves observed} \times \text{Max. grade}} \times 100$$

Score	Description
0	DF = Immune, completely free from bacterial leaf blight infection
1	R = Resistant, nearly 1 mm in diameter, not coalescing, reddish, not angular, veins free (Spots few scattered)
2	MR = Moderately resistant, leaf area covered up to 10%
3	MS = Moderately susceptible, leaf area covered up to 11-20%
4	S = Susceptible, leaf area covered more than 20%

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

## RESULTS AND DISCUSSION

Characterization of environment factors for bacterial blight disease may provide a basis to forecast the disease and which helps the cotton growers for its timely management. Keeping in view, a study was conducted at Main Cotton Research Station, Surat (Gujarat), to know the affect of environment parameters on the disease development.

Bacterial blight disease (BLB) 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. However, in this experiment, bacterial blight disease progress was recorded with its first appearance and subsequently at weekly interval till it prevailed on G. Cot. Hy. 12 on Research farm. The result presented in *Table 1* and *Fig. 1* indicated that the disease was first appeared in 2<sup>nd</sup> week of July (2.0%), i.e. in 28<sup>th</sup> Met. week. The incidence of bacterial blight disease was noticed from 28 to 49<sup>th</sup> standard week with the maximum disease intensity in third week of September (23.5%), i.e. in 39<sup>th</sup> Met. week. Non significant correlation with weather parameters (morning and evening humidity, maximum temperature, rainy days and rainfall) was found for the disease development.

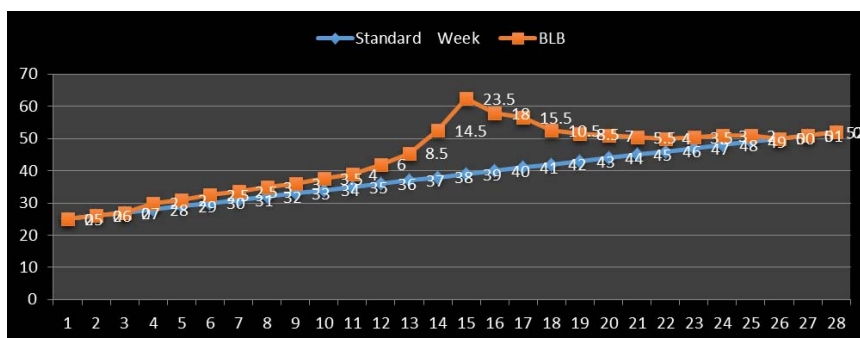


Figure 1 - Seasonal incidence of bacterial blight disease in cotton during 2015-2016

BACTERIAL LEAF BLIGHT DISEASE OF COTTON WITH DIFFERENT WEATHER PARAMETERS

Table 1 - Diseases progress in relation to weather factors at MCRS, NAU, Surat (Gujarat), during 2015-2016

Sr. No.	Standard week	Period	BLB PDI	Temp °C			Humidity, %		Rainfall, mm	Rainy days	Sunshine, h
				Max.	Min.	Morning	Evening				
1	25	18/06/15	0.0	32.1	28.1	93.0	84.0	209.8	3	2.6	
2	26	25/06/15	0.0	31.5	29.2	82.0	76.0	0	0	5.3	
3	27	02/07/15	0.0	34.8	30.3	80.0	74.0	0	0	5.5	
4	28	09/07/15	2.0	32.9	29.8	78.0	73.0	2.0	1	5.3	
5	29	16/07/15	2.0	33.1	29.2	86.0	81.0	40.2	2	3.2	
6	30	23/07/15	2.5	30.1	27.7	90.0	86.0	93.0	6	1.4	
7	31	30/07/15	2.5	30.6	29.1	88.0	84.0	0	0	2.0	
8	32	06/08/15	3.0	31.8	28.3	89.0	75.0	2.4	1	2.8	
9	33	13/08/15	3.0	31.9	28.1	86.0	75.0	6.4	2	2.6	
10	34	20/08/15	3.5	32.0	28.5	87.0	73.0	0	0	4.2	
11	35	27/08/15	4.0	33.1	28.5	89.0	71.0	18.2	1	5.3	
12	36	03/09/15	6.0	32.5	26.9	86.0	69.0	0	0	7.4	
13	37	10/09/15	8.5	32.1	28.4	89.0	82.0	24.4	2	6.4	
14	38	17/09/15	14.5	31.1	27.3	95.0	88.0	150.0	3	3.4	
15	39	24/09/15	<b>23.5</b>	32.6	26.7	91.0	68.0	0	0	7.0	
16	40	01/10/15	18.0	36.1	27.5	80.0	68.0	0	0	7.1	
17	41	08/10/15	15.5	36.6	27.1	85.0	64.0	0	0	7.0	
18	42	15/10/15	10.5	37.3	27.1	76.0	63.0	0	0	6.8	
19	43	22/10/15	8.5	36.4	25.7	78.0	57.0	0	0	6.0	
20	44	29/10/15	7.0	34.9	24.0	80.0	53.0	0	0	6.0	
21	45	05/11/15	5.5	32.4	23.3	74.0	70.0	0	0	4.9	
22	46	12/11/15	4.0	34.9	24.0	75.0	70.0	0	0	5.4	
23	47	19/11/15	3.5	34.7	23.9	79.0	66.0	0	0	6.6	
24	48	26/11/15	3.0	34.9	23.4	75.0	72.0	0	0	6.5	
25	49	03/12/15	2.0	33.6	18.7	70.0	60.0	0	0	6.7	
26	50	10/12/15	0.0	33.3	19.3	71.0	62.0	0	0	7.3	
27	51	17/12/15	0.0	31.1	16.7	68.0	61.0	0	0	7.8	
28	52	24/12/15	0.0	33.2	16.2	70.0	62.0	0	0	7.9	
Correlation matrix				<b>0.3366</b>	<b>0.2094</b>	<b>0.3264</b>	<b>-0.1019</b>	<b>-0.0219</b>	<b>-0.0873</b>	<b>0.2493</b>	

\*significant at 5%, \*\* 1% level of significance

**Acknowledgement.** Author is extremely appreciative to Main Cotton Research Station (MCRS), Surat (Gujarat) for providing the requisite facility and other required arrangements for conducting the experiment.

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