



## SCREENING OF *GOSSYPIUM ARBOREUM* VARIETIES/BREEDING MATERIALS FOR RESISTANCE TO BACTERIAL LEAF BLIGHT DISEASE UNDER NATURAL AND RAINFED CONDITION

Patel R. K<sup>1</sup>, Prashant B. Sandipan\*<sup>2</sup> and Patel A. D<sup>3</sup>

<sup>1</sup>Krishi Vigyan Kendra (KVK), NAU, Surat (Gujarat), India

<sup>2</sup>Main Cotton Research Station (MCRS), NAU, Surat (Gujarat), India

<sup>3</sup>Regional Cotton Research Station (RCRS), NAU, Bharuch (Gujarat), India

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### ABSTRACT

Drought tolerance, resistance to diseases like root rot and insect pests like bollworms and aphids makes species *G. arboreum* well adapt to dry land (rain fed) conditions and low input cultivation practices. Under natural condition, bacterial blight infection, boll yield losses up to 35 % have been reported (Sheo Raj and Verma, 1988). Bacterial blight disease 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). *Gossypium arboreum* cotton genotypes *viz.*, GBav-106, GBav-107, GBav-111, GBav-124, GBav-125, GBav-128, GBav-133, GBav-135, GBav-136, GBav-137, GBav-138, and G.Cot-19 observed as Disease free whereas GBav-123 observed as resistant against the bacterial leaf blight disease.

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### INTRODUCTION

*Gossypium arboreum*, commonly called as tree cotton, is a species of cotton native to India, Pakistan and other tropical and subtropical regions of the Old World. In India, 30 diseases have been reported for cotton crop. The diseases of economic significance that affect cotton are *viz.*, Bacterial blight, Alternaria leaf spot, Grey mildew, Root rot, Boll rot, Wilt and other physiological problems as para wilt and leaf reddening as a major one *etc.* 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. Different 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 (Bhatti and Bhutta, 1983 and 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). Under, bacterial blight infection, boll yield losses up to 35 % have been reported (Sheo Raj and Verma, 1988). *G. arboreum* is blessed with some inherent agronomical, entomological and physiological attributes. Species of *G. arboreum* possesses many favourable traits for cotton production, which the upland cotton cultivars lack. Drought tolerance, resistance to diseases like root rot and insect pests like bollworms and aphids makes species *G. arboreum* well adapt to dry land (rain fed) conditions and low input cultivation practices.

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 (Casson *et al.*, 1977 and Sandipan *et al.*, 2016). Keeping in view different entries were screened under natural condition against the bacterial leaf blight disease.

#### Crop Condition

During all the three year seasons, the average rainfall was less than sufficient in the cotton crop during the season. The plant population and crop growth was healthy. The germination was good and satisfactory plant populations were maintained by proper gap filling.

### MATERIAL AND METHOD

The susceptible cultivar LRA – 5166 were sown after each four entry in this experiment by dibbling method with the following experimental details (Table: 1). The different *G. arboreum* entries were screened with the given respective years as shown in the Table No. 2. In the given table, common entries have been selected for all the three years. All the recommended agronomic practices were followed for raising the good crop. In each net plot of each treatment randomly tag 5 plants and score 5 lower and 5 middle leaves of each plant in terms of 0-4 grade and work out PDI as mentioned below by using 0-4 scale as given by Sheoraj, 1988 and then these grades were converted into per cent disease incidence (PDI) by using the formula given by Wheeler, 1969.

\*Corresponding author: Prashant B. Sandipan  
Main Cotton Research Station (MCRS), NAU, Surat  
(Gujarat), India

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

**For, Bacterial leaf blight (BLB) disease**

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

**Table No 1** Experimental details

1	Year of commencement	: 2013-14, 2014-15 and 2015-16
2	Details of experiment	
3	Crop and variety	: Different entries of <i>G. arboreum</i>
4	Treatments	
5	Design	: R. B. D.
6	Plot size	
7	Spacing	: 120 x 45
8	Replications	: 2 (Two)
9	Fertilizer	
	Basal Dose	: 120:80:00 NPK/ha
	Top Dressing	: 2013-14: 01.07.2013
10	Sowing dates	: 2014-15 : 21.07.2014
		: 2015-16 : 31.07.2015
11	No of rows in Gross plot	: 2.4 x 4.50 (2 rows of each entry and 10 dibbles per line)
12	No of rows in Net plot	: 2.4 x 3.60 (2 rows of each entry and 8 dibbles per line)

**Table No 2** Total entries of *G. arboreum* taken in the years 2013-14, 2014-15 and 2015-16

Sr. No.	Entries of <i>G. arboreum</i>		
	2013-14	2014-15	2015-16
1	FMDH 36	Gbav-106	Gbav-106
2	RAJDH 623	Gbav-107	Gbav-107
3	RHAH 1040	Gbav-111	Gbav-111
4	CISAA 2/NACH 6 (ZC)	Gbav-123	Gbav-123
5	FMDH 29	Gbav-124	Gbav-124
6	Mohini	Gbav-125	Gbav-125
7	NACH 433	Gbav-128	Gbav-128
8	G. Cot. MDH 11	Gbav-131	Gbav-131
9	AAH 35	Gbav-133	Gbav-133
10	CISAA 27	Gbav-135	Gbav-135
11	GSGDH 223	Gbav-136	Gbav-136
12	AKDH 98	Gbav-137	Gbav-137
13	Gbav-106	Gbav-138	Gbav-138
14	Gbav-107	G.Cot-19(C)	G.Cot-19(C)
15	Gbav-111	LRA-5166 (SC)	LRA-5166 (SC)
16	Gbav-123	1027 ALF (Desi check)	1027 ALF (Desi check)
17	Gbav-124	Digvijay (Desi check)	Digvijay (Desi check)
18	Gbav-125		
19	Gbav-128		
20	Gbav-131		
21	Gbav-133		
22	Gbav-135		
23	Gbav-136		
24	Gbav-137		
25	Gbav-138		
26	G.Cot-19(C)		
27	LRA-5166 (Alternated row) (SC)		
28	1027 ALF (Desi check)		
29	Digvijay (Desi check)		
Total entries 26 + 03 check	Total entries 14 + 03 check	Total entries 14 + 03 check	

**RESULT & DISCUSSION**

Continuous efforts were undertaken and made to situate the resistant sources and their utilization in resistance breeding programme is crucial to supervise the diseases in the long time run. Screening was therefore made obligatory to assess a number of cotton (*G. arboreum*) entries against the bacterial leaf blight disease during the different years as mentioned.

Year wise data presented in the Table No. 3 and Table No. 4 indicates that entries of *Gossypium arboreum* as GBav-106, GBav-107, GBav-111, GBav-123, GBav-124, GBav-125, GBav-128, GBav-131, GBav-133, GBav-135, GBav-136, GBav-137, GBav-138, and G.Cot-19 observed as Disease free against the bacterial leaf blight disease.

**Table No. 3** Reaction of *G. arboreum* varieties/breeding materials against Bacterial leaf blight disease at RCRS, NAU, Bharuch under rainfed condition during 2013-14, 2014-15 and 2015-16

Sr. No.	Entries <i>G. arboreum</i>	Bacterial leaf blight						Final Reaction
		2013-14		2014-15		2015-16		
		PDI	G	R	PDI	G	R	
1	GBav-106	0.0	0	DF	0.0	0	DF	DF
2	GBav-107	0.0	0	DF	0.0	0	DF	DF
3	GBav-111	0.0	0	DF	0.0	0	DF	DF
4	GBav-123	0.0	0	DF	0.0	0	DF	DF
5	GBav-124	0.0	0	DF	0.0	0	DF	DF
6	GBav-125	0.0	0	DF	0.0	0	DF	DF
7	GBav-128	0.0	0	DF	0.0	0	DF	DF
8	GBav-131	0.0	0	DF	0.0	0	DF	DF
9	GBav-133	0.0	0	DF	0.0	0	DF	DF
10	GBav-135	0.0	0	DF	0.0	0	DF	DF
11	GBav-136	0.0	0	DF	0.0	0	DF	DF
12	GBav-137	0.0	0	DF	0.0	0	DF	DF
13	GBav-138	0.0	0	DF	0.0	0	DF	DF
14	G.Cot-19	0.0	0	DF	0.0	0	DF	DF
		<b>Checks</b>						
15	LRA 5166 (Infester row)	0.0	0	DF	0.0	0	DF	DF
16	1027 ALF	0.0	0	DF	0.0	0	DF	DF
17	Digvijay	0.0	0	DF	0.0	0	DF	DF

1027 ALF\* and Digvijay\* Desi check

**CONCLUSION**

Year wise data presented in the Table: 3 indicates that entries as GBav-106, GBav-107, GBav-111, GBav-123, GBav-124, GBav-125, GBav-128, GBav-131, GBav-133, GBav-135, GBav-136, GBav-137, GBav-138, and G.Cot-19 observed as Disease free against the bacterial leaf blight disease.

The purpose of this information which, is generated may be used or can be incorporated in the any research activity. However, the results may vary due low disease pressure present in the respective area.

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