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Anatomical Basis of Resistance against Bacteria Blight of Cotton Caused by Xam Race No. 18

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ABSTRACT

Cotton, "King of Fibers" enjoys a pre-eminent status among all cash crops in the country, being the principal raw material for a flourishing textile industry. Among the various diseases occurring on cotton, the foliar disease Bacterial blight caused by Xanthomonas axonopodis pv. malvacearum is gaining more importance in recent years because of their increasing incidence. These have been known to occur on all the various cultivated and wild species of cotton in Maharashtra, since many years, in an epiphytotic form on commercially grown varieties, which leads to severe defoliation and substantial yield losses. Seven resistant, seven Moderately resistance and Seven susceptible genotypes to Bacterial blight of cotton were critically examined for their structural and anatomical differences if existing. In resistant genotypes the frequency of stomata was found higher on adaxial and abaxial leaf surface than the susceptible genotypes. The length and width of stomata in resistant genotypes was found less as compared to susceptible genotypes.

Key words: *Anatomy, Genotypes, Cotton, Bacterial blight, Race no.18 etc.*

INTRODUCTION

The cotton crop is known to suffer from number of diseases caused by fungal, bacterial and viral origins. During the last two decades, a change in the relative importance of the different diseases was a cultivation of Asiatic or desi (*G. herbeceum* and *G. arboreum*) to American cotton (*G. hirsutum*) and hybrids most of them, even though high yielding ones were susceptible to diseases. Among all these diseases, bacterial blight occurs in all cotton growing areas of country and is most important and destructive affecting yield of cotton. In nature, some genotypes exhibits the resistance against foliar diseases and the degree of resistance also varies at different stages of crop growth. This phenomenon has been attributed to the genetic, biochemical and anatomical make up of particular cultivar, which needs to be investigated.

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There are number of cultivated varieties or hybrids of cotton showing variability in reaction (susceptibility/ resistance) to bacterial blight and therefore, it is almost important to study and find out the factors of resistance. Here, the attempts will be made to find out the anatomical diversity of resistance and susceptible genotypes of cotton against bacterial blight.

MATERIALS AND METHODS

Depending upon the evaluation of Bacterial blight severity seven resistant, seven moderately and seven susceptible genotypes were selected for further defence studies. Twenty one genotypes were sown in glasshouse. After 50 days of planting anatomy of healthy leaves was studied. The herbofix impression of the second leaflet were taken from both adaxial and abaxial surfaces by using xylene + thermocol sticker for the leaf surface studies. The frequency of stomata (number of stomata per sq.mm) at 200 X magnification was worked out in five different microscopic fields. The length and breadth of stomata was determined with ocular micrometer.

RESULTS AND DISCUSSION

Seven resistant, seven moderately resistance and Seven susceptible genotypes to bacterial blight of cotton were critically examined for their structural and anatomical differences if existing. It was revealed that all the resistant types were characterized by small sized stomata on both surfaces. Sokshi*et al. (*1985*)* studied the anatomy of groundnut leaf in relation to resistance and reported that the thickness and toughness of epidermal cells including cuticle might be giving required defence against formation of uredia. Similarly they found greater stomatal number and longer stomata in rust susceptible genotypes than resistant one. (Table 1 and Table 2)

In the present studies, it was evident that the stomatal frequency on the adaxial leaf surface was significantly higher in the susceptible genotypes LRA-5166 and Malika than the resistant genotypes which had the low stomatal frequency (141 to 167 per mm^2) and (142 to 168 per mm^2)on both adaxial as well as abaxial leaf surfaces, respectively. The stomatal size differed substantially among the genotypes. The resistant lines had smaller stomatal size ranging from 17.24 µ x 6.1 µ to 23.40 µ x 9.6 µ as against larger stomatal size in the susceptible genotypes (28.5 µ x 11.9µ) on the adaxial surface. Similarly on the abaxial surface stomatal size of the resistant genotypes was in the range of 18.34 µ x 6.9 µ to 24.5 µ x 9.6 µ as against 29.6 µ x 12.7 µ in the two susceptible genotypes. Thus it was very clear that stomatal frequency and size of the stomata on both adaxial and abaxial leaf surfaces were significantly higher in the susceptible genotypes than the resistant ones. These results indicated that the stomatal size and frequency play important role in resistance/susceptibility of the cotton genotypess. Mayee and Apet[3] studied the structural defense mechanism in groundnut rust pathogen. They studied five genotypes namely EC 76446, NcAc 927, NcAc 17090, PI 215696 and PI 350680, by using the sequential section cutting and whole mount technique they found that the resistant genotypes had smaller and fewer stomata. Prabhpreet *et.al*.[4] studied Pre-penetration anatomical barriers of 22 muskmelon genotypes against downy mildew (*Pseudoperonospora cubensis*). They found that thickness of epidermis and cuticle on both adaxial and abaxial leaf surfaces was significantly greater in the resistant genotypes than in the susceptible genotypes. The significant correlation of disease resistance with stomatal and trichome size and frequency indicated their importance in determining resistance. Gururaj and Kulkarni[1] studied the Mechanism of resistance on the basis of structural and biochemical changes in resistant (GPBD- 4 and DH-22), moderately resistant (K-134 and R-8808) and susceptible (KRG-1 and TMV-2) genotypes of groundnut. Resistant and moderately resistant genotypes were characterized by higher cuticular and epidermal cell thickness with lesser epidermal cells, size (length, breadth) and number of stomata and more wax content at later stages of crop growth.

Table 1: Differential characters stomata of adaxial surfaces of bacterial blight resistant and susceptible Cotton genotypes

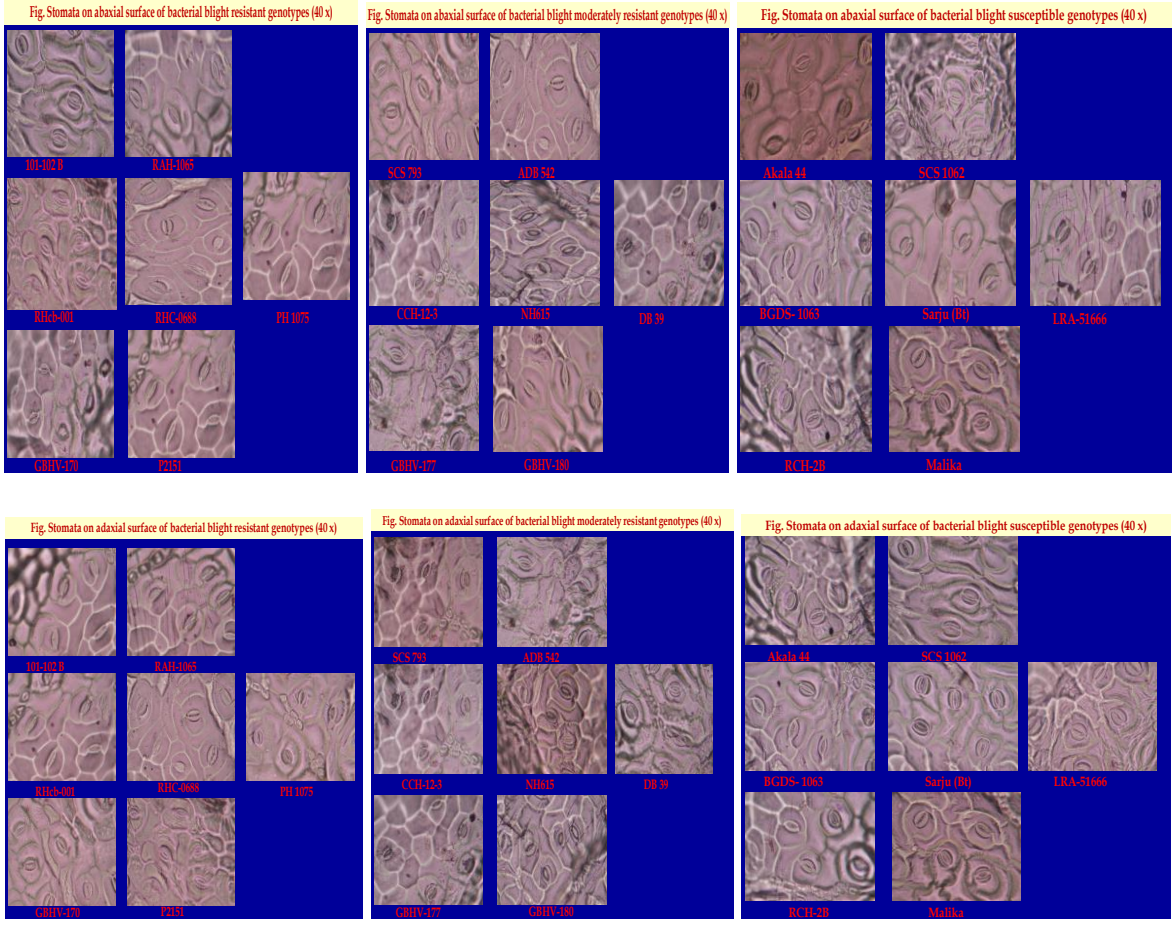
Sr. No.	Genotype	Length of stomata (µm)*	Breadth of stomata (µm)*	Stomatal frequency (per mm)*
1.	101-102 B	17.9	6.1	141.57
2.	RAH-1065	18.2	8.7	147.34
3.	RHcb-001	17.92	9.6	146.59
4.	RHC- 0688	18.7	8.2	147.56
5.	GBHV-170	17.24	7.3	148.72
6.	P2151	17.93	7.3	141.8
7.	PH 1075	19.7	8.1	149.79
8.	SCS 793	20.2	6.2	153.11
9.	ADB 542	21.52	6.1	158.87
10.	CCH-12-3	20.66	6.8	150.86
11.	NH615	23.4	8.9	167.1
12.	GBHV- 177	21.6	8.8	149.94
13	GBHV- 180	22.4	8.7	166.1
14	DB 39	22.67	6.9	164.32
15	Akala 44	26.24	11.9	187.7
16	SCS 1062	25.46	10.8	172.6
17	BGDS 1063	24.66	10.2	181.8
18	Sarju (Bt)	26.42	11.5	190.86
19	RCH- 2B	27.25	11.6	188.7
20	Malika	27.5	11.4	192.28
21	LRA-5166	28.5	11.8	195.53
SE±		**0.49**	**0.17**	**0.54**
C.D. at 5%		**1.44**	**0.52**	**1.58**

*/ = Mean of 10 observations

Table 2: Differential characters of stomata of abaxial surfaces of bacterial blight resistant and susceptible Cotton genotypes

Sr. No.	Genotype	Length of stomata (µm)*	Breadth of stomata (µm)*	Stomatal frequency (per mm)*
1.	101-102 B	19.1	6.9	142.69
2.	RAH-1065	19.3	9.5	148.46
3.	RHcb-001	19.02	9.4	147.71
4.	RHC- 0688	19.8	9.1	148.68
5.	GBHV-170	18.34	8.1	149.84
6.	P2151	19.03	8.1	142.92
7.	PH 1075	20.8	8.9	150.91
8.	SCS 793	21.3	7.2	154.23
9.	ADB 542	22.62	6.9	159.99
10.	CCH-12-3	21.76	7.6	151.98
11.	NH615	24.5	9.7	168.22
12.	GBHV- 177	22.7	9.6	151.06
13	GBHV- 180	23.5	9.5	167.22
14	DB 39	23.77	7.7	165.44
15	Akala 44	27.34	12.7	188.82
16	SCS 1062	26.56	11.6	173.72
17	BGDS 1063	25.76	11.1	182.92
18	Sarju (Bt)	27.52	12.3	191.98
19	RCH- 2B	28.35	12.4	189.82
20	Malika	28.6	12.2	193.4
21	LRA-5166	29.6	12.6	196.65
SE±		**0.49**	**0.17**	**0.54**
C.D. at 5%		**1.44**	**0.52**	**1.58**

*/ = Mean of 10 observations



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