

SCREENING OF GENETIC STOCKS FOR RESISTANCE TO BACTERIAL BLIGHT OF COTTON

TALIB HUSSAIN

Cotton Research Institute, Multan, Pakistan.

Abstract

One hundred and seven lines of *Gossypium hirsutum* L. originating from ten different countries were screened for resistance to bacterial blight incited by *Xanthomonas malvacearum* (E.F. Smith), Dowson. Seven lines were homozygous immune, six segregating and ninety-four lines were found homozygous susceptible in the presence of race 18 of the pathogen. The immune lines appear to be a valuable source of germplasm for the control of bacterial blight of cotton in Pakistan.

Introduction

Bacterial blight of cotton caused by *Xanthomonas malvacearum* (Smith) Dowson is the major disease, causing substantial reduction in yield and deterioration of the quality (Brinkerhoff & Hussain, 1978, Hussain & Ali, 1975). Losses tend to be especially severe in the Punjab where summer rains favour the disease. Race 18 of *X. malvacearum* is the common race of the blight bacterium in Pakistan (Hussain & Brinkerhoff, 1978). This race is pathogenic to the largest number of resistance genes of cotton of any of the known races (Hussain & Brinkerhoff, 1978).

Kharata & Chand (1977) tested reaction of some cotton lines to bacterial blight and found Reba B50, B59, 1679, NG 8 and IAN 1327 immune to bacterial blight in India. Singh & Verma (1971) tested genetic stock and found 101-102B, Reba B50, BJA-592, HG-9 and P. 14T. 128 resistant to all the races of *X. malvacearum* present in India. Brinkerhoff & Hussain (1978) evaluated 54 introduced cotton breeding lines and found 37 homozygous immune, one homozygous resistant and 14 segregating with most of the plants immune or resistant.

In this paper the results of screening of genetic stock of Cotton Research Institute, Multan for resistance to bacterial blight of cotton, have been given.

Materials and Methods

One hundred and seven *G. hirsutum* lines were planted on June 16 in single row

trial in duplicate in 6.8 meters long rows. The plants were spaced 30 cm from plant to plant and 75 cm from row to row. The plants were inoculated individually at the 4 to 6 leaf stage with a knapsack power sprayer that produced mild water soaking of the leaves.

The inoculum consisted of bacterial suspension of approximately 10^5 bacteria per ml prepared by homogenizing naturally infected fresh cotton leaves in a blender. The leaves were obtained from experimental plots of Cotton Research Institute, Multan. Disease symptoms appeared 7 days after inoculation.

A scale with 11 grades ranging from "0" to "10" was used in recording the disease reaction. Plants classified as immune showed no visible reaction with field levels of inoculum and were graded as "0". The resistant reaction varied from round, dry, pinhead size lesions to progressively larger and wetter angular lesions. Grade 10 was large angular, water soaked lesions that was considered fully susceptible.

Results and Discussion

The reaction of immune and segregating lines and a list of homozygous susceptible lines is given in Table 1.

One hundred and seven local and introduced lines of *G. hirsutum* L. were screened for resistance to bacterial blight of cotton incited by *X. malvacearum*. Three lines from Africa and four from United States (Table 1) were found to be homozygous immune; four from Africa and two from United States were segregating. Other lines from ten countries were homozygous susceptible. None of the line from Pakistan was found to be resistant or immune to bacterial blight.

Immunity in the presence of race 18 is only possible when more than one blight resistant genes are present in the line (Hussain & Brinkerhoff, 1978). Immunity in LB 544 and LB 612 has been derived from IM 216 line of U.S.A. with addition of BN gene. IM 216 line is inherited completely dominant trait that tentatively has been identified as due to two dominant genes, one recessive and possibly one or two modifiers (Brinkerhoff & Hussain, 1978). Inheritance of Reba lines has been stated due to blight resistant B_{9L} and B_{10L} genes (Carvalho, 1969) but that of other lines is not known. It seems very probable from the diverse origin of other immune and segregating lines that different blight resistance genes are involved. These diversified immune lines, alongwith those already found (Brinkerhoff & Hussain, 1978) appear to be a valuable source of germ-plasm for the control of bacterial blight of cotton in Pakistan.

Breeding for resistance to bacterial blight programmes are already in progress by using varieties LB603, HA. 8 and Reba-B 50 as resistant source in a cooperative project of cotton Breeding and Pathology Divisions of this Institute. In addition to bacterial blight immunity, some of other characters like early maturity, short stature and boll rot resistance is also being transferred from Texas and Oklahoma lines.

Table 1. Number of plants in bacterial blight disease reaction grades.

Origin & name of the cultivar	Grades							Remarks
	0	1	2 to 4	5	6	7 to 9	10	
Africa								
1. Reba-P179	27	0	0	0	0	0	0	Homozygous immune
2. Reba-P279	23	0	0	0	0	0	0	Homozygous immune
3. BJA-592	18	0	0	0	0	0	0	Homozygous immune
4. UKA1 (67)229	0	0	15	5	7	25	0	Segregating
5. UKAS ₃ (70)2642	0	0	14	5	10	11	15	Segregating
6. UKAS1 (70)2141/2	0	0	18	3	15	24	5	Segregating
7. UKA1 (69)1124	0	0	15	5	7	25	0	Segregating
U.S.A.								
8. D ₂ L-9-68	21	0	2	0	1	1	9	Segregating
9. Frego Bract	15	0	0	0	0	0	0	Homozygous immune
10. LB 391	20	2	3	2	0	1	1	Segregating
11. LB 544	38	0	0	0	0	0	0	Homozygous immune
11. LB 612	34	0	0	0	0	0	0	Homozygous immune
12. V. 75-040	36	0	0	0	0	0	0	Homozygous immune
Pakistan								
14. 149F	0	0	0	0	0	0	62	Homozygous susceptible
15. B. 557	0	0	0	0	0	0	65	Homozygous susceptible

*Varieties found susceptible in the screening test..

Africa.

Al-Reba/202, Al-SR-1054-2/302, Bar 10/1, Bar 14/25, Bar 12/93, UKA1 (59) 240, UKAS3, UKAC2, UKAB2 & UKAJ59/140.

China.

Peking cotton.

Central & South America.

RA31-9, RA31-11A, S-47, Sue 72-33 & Sue33.

India.

PRS-75.

Iran.

Varamine

Mexico.

Mex 2,3,4,12 & 13.

Pakistan.

AC161, AU14, AU172, B.557, B. 558/70, B. 452. 149F, 108F, GH68/9, H.51, H.55, H.60, H.66, MNH49, MNH53 & N.T. Mirpur.

Syria.

Allepo

Turkey.

Turkey-1, Turkey-2.

U.S.A.

Acala-44, 442, 4-4292, SJI, 4-42, 13, 123902, 1517C, 1958F, Arizona 621, Blanco 3363, Baryou SM-1, Carolina Queen 168, Coker 100 staple, 100 W, 310, 100/2 (68-62), 100/AWR, 116, 8316, 413/69B, DPL-16, 25, 21-15, 45-A, 6127, 6137, 5886, SR2, SL-NL, 15-21, 55, Lambright G.D-4, 15-3A, Lankar, Lanqart 65, Locket 4783A Mebane-B1, MCM-2-65, Mysore American, Northern Star R4, Northern Star 4-R11, No. 5, NL-11-61-1, Paymaster-111, 101A, Perso American, Satu, SJ-2 (S-91881), 413 Arkansas-3 and 407-26.

Acknowledgements

The author is indebted to Dr. Mahbub Ali, Director, Cotton Research Institute, Multan and Dr. Jose A. Giles, UNDP/FAO Project Manager, Central Cotton Research Institute, Multan for goin through the manuscript and giving valuable suggestions.

References

- Brinkerhoff L.A. and T. Hussain. 1978. Bacterial blight of cotton in Pakistan. Proceedings of Beltwide cotton production Research Conferences held January 9, 1978, Dallas, Texas (Abstract).
- . 1978. Evaluation of American and African bacterial blight immune cotton lines in Pakistan in 1977. Pl. Dis. Rept., 62: 1082-1085
- Carvalho, P.P. 1969. Susceptibilidade de cultivares de algodao a bacteriose. Technicas Para Pesquisa da doenca. Agron. Mocamb. Lourenco Morques, 3: 27-48.
- Hussain, T. and L.A. Brinkerhoff. 1978. Race 18 of the cotton bacterial blight pathogen identified in Pakistan in 1977. Pl. Dis. Rept., 62: 1085-1087.
- Hussain T. and M. Ali. 1975. A review of cotton diseases of Pakistan. The Pak. Cottons, 19: 71-86.
- Kharata, R.B.S. and J.W. Chand, 1977. Reaction of cotton lines to bacterial blight incited by *Xanthomonas malvacearum*. Indian Phytopath., 29: 64.
- Singh, R.P. and J.P. Verma. 1971. Reaction of genetic stocks to black arm of cotton (*Xanthomonas malvacearum*) (E.F. Smith) Dowson. Indian Phytopath., 24: 193.