Screening of germplasm against bacterial blight of cotton under field conditions

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Abstract: The basic purpose of this study to evaluate the germplasm of cotton against bacterial blight of cotton under field conditions to search out resistant cultivar for the development of resistant variety. For this purpose, disease screening nursery of eleven cultivars was established in the experimental research of Department of Plant Pathology, University of Agriculture Faisalabad for two years 2016 and 2017. The seeds of eleven varieties were neither treated with chemical nor given acid delinting to increase chances of primary infection of the disease. Seeds of all varieties were sown under RCBD with three replications. No spreader was sown either around the field or between the lines. The varieties i.e. Bt-VH 329, Bt-MNH 886, and Bt-FH 177 expressed moderately resistant response with rating 4. Three varieties (Bt-FH 143, Bt-NS 131 and Non Bt-CM 82 exhibited moderately susceptible response with rating 5. Two varieties (Bt-FH 142, Bt-4243 and Bt-FH 169) showed susceptible response (rating 6) while Non Bt-Shahbaz and Non Bt- CRIS 134 expressed highly susceptible response with rating 7.

Key words: Bacterial blight of cotton, germplasm, disease rating

1. Introduction

Cotton (*Gossypium hirsutum* L.) is belongs to family *Malvaceae* and genus gossypium. It is most important fiber and oilseed crop in Pakistan. Cotton (*Gossypium hirsutum* L.) is backbone of Pakistan economy. It is grown in temperate and subtropical regions of the world including Pakistan (Smith, 1999). Worldwide area under cultivation of cotton is 33.1 million hectares with production of 116.7 million bales while in Pakistan it is cultivated on an area of 3.0 million hectares during 2013-14 with production of 9.5 million bales (Johnson *et al.,* 2014). Pakistan is the fourth largest producer of cotton after China, USA and India (Hanif and Jafri, 2008). Several biotic and abiotic factors are responsible for poor quality and yield. Many diseases attack on cotton crop, but bacterial blight of cotton is a potential threat for cotton production which is caused by *Xanthomonas axonopodis* pv. *malvacearum (Xam)* (Saha *et al.,* 2001). This pathogen infects plant at any stage of the growth period by invading through stomata or wounds. Initially small, irregular and dark water-soaked spots appear on lower epidermis of leaves that later becomes dark brown (Liberato *et al.,* 2007). Water soaked abrasions on bolls; early stem and leaves senescence, stunted growth of infected plants are the characteristic symptoms of bacterial blight disease (Rungis *et al.,* 2002). Bacterial blight of cotton causes 40% losses and when environmental conditions are favorable losses exceed up to 50% (Verma, 1986). Several management strategies like cultural control, biological control and resistance varieties are used against this disease. Although use of synthetic chemical is easy, direct and rapid mean of controlling the disease but the continuous dependence on pesticides raise the problem of environmental pollution and degradation. So, there is a dire need to find the alterantive of this method which is environment friendly and cost effective approach. Integrated management of bacterial blight of cotton is an environmentally sound and suitable strategy which minimize the use of chemicals by placing more reliance on resistant varieties, use of plant extracts and other non-chemical methods. The ultimate objective of the integrated management of bacterial blight is to produce the optimum crop yield of high quality at minimum cost and preservation of the environment.

Use of the resistant cultivars is the most efficient and eco-friendly method for the management of bacterial blight of cotton (Iglesias *et al.*, 2010; Jacobs *et al.*, 2010). Moreover, resistant varieties also avoid the damage caused by other management strategies like acid delinting of seed and use of synthetic chemicals (Thaxton and El-Zik, 2001). Search for source of resistance against bacterial blight disease of cotton was preliminary objective for management of this disease. As the development of resistant variety takes many years, so the screening of available

germplasm of cotton to search out resistant cultivar of cotton was the short-term solution. The basic purpose of this study is to evaluate the germplasm under field conditions to identify the source of resistance against bacterial blight of cotton.

2. Material and method

Eleven Bt and non Bt varieties, (Bt-VH 329, Bt-MNH 886, Bt-FH 177, Bt-FH 143, Bt-NS 131, Non Bt-CM 82, Bt-FH 142, Bt-4243, Bt-FH 169, Non Bt-Shahbaz, Non Bt-CRIS 134) of cotton were collected (based on their good agronomic traits) from (CCRI), Department of Plant Breeding and Genetics, University of Agriculture Faisalabad and (AARI). Disease screening nursery was established in the experimental research Area, Department of Plant Pathology, University of Agriculture Faisalabad for two years 2016 and 2017 to find out source of resistance against bacterial blight disease of cotton. Seeds of above mentioned verities were neither treated with chemical nor given acid delinting to increase chances of primary infection of the disease. Seeds of all varieties were sown under RCBD with three replications. No spreader was sown either around the field or between the lines. All the agronomic practices including recommended dose of fertilizers and irrigation schedule were followed to keep the crop in good condition. Data regarding disease incidence was collected on weekly basis by using (Brinkerhoff scale, 1977).

While disease incidence was calculated by using following formula.

$$\text{Disease incidence } (\%) = \frac{\text{No. of infected plants}}{\text{Total No. of plants}} \times 100$$

3. Result and Discussion
Evaluation of cotton germplasm against bacterial blight under field conditions for two years

Table 1. Response of cotton varieties against bacterial blight under field condition during 2016.

Sr.#	Varieties	Disease rating	Disease incidence (%)	Response
1	Bt-VH 329	4	28.40A	MR
2	Bt-MNH 886	4	43.40B	MR
3	Bt-FH 177	4	49.00C	MR
4	Bt-FH 143	5	52.50D	MS
5	Bt-NS 131	5	60.60E	MS
6	Non Bt-CM 82	5	62.40F	MS
7	Bt-FH 142	6	72.70G	S
8	Bt-4243	6	76.70H	S
9	Bt-FH 169	6	78.70I	S
10	Non Bt-Shahbaz	7	81.60J	HS
11	Non Bt-CRIS 134	7	83.60K	HS

*Mean values in a column sharing similar letters do not differ significantly as determined by the LSD test (P ≤ 0.05). MR = Moderately resistant　　　MS = Moderately susceptible　　　S = Susceptible　　　HS = Highly susceptible
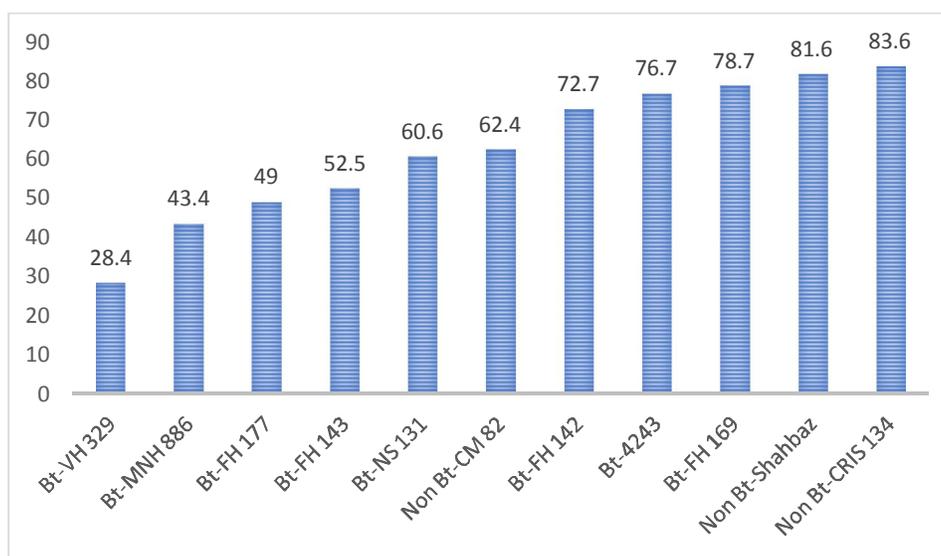
Fig.1.1 Response of cotton germplasm against bacterial blight of cotton under field conditions during 2016

Eleven varieties were evaluated against bacterial blight of cotton for two years under field conditions. During, 2016 three varieties expressed moderately resistant response i.e. Bt-VH 329(28.40), Bt-MNH 886 (43.40), and Bt-FH 177 with 49% disease incidence (rating.4). Three varieties (Bt-FH 143, Bt-NS 131 and Non Bt-CM 82 exhibited moderately susceptible response with 52.50, 60.60, and 62.40 %

disease incidence with rating 5. Two varieties (Bt-FH 142, Bt-4243 and Bt-FH 169) showed susceptible response with 72.70, 76.70 and 78.70% disease incidence respectively (rating 6) while Non Bt-Shahbaz and Non Bt- CRIS 134 expressed highly susceptible response with 81.60 and 83.60% disease incidence with rating 7 (Table.1 & fig.1.1).

Table. 2 Response of cotton varieties against bacterial blight under field conditions during 2017.

Sr.#	Varieties	Disease rating	Disease incidence (%)	Response
1	Bt-VH 329	4	23.59A	MR
2	Bt-MNH 886	4	48.49B	MR
3	Bt-FH 177	4	45.00C	MR
4	Bt-FH 143	5	68.60D	MS
5	Bt-NS 131	5	62.47E	MS
6	Non Bt-CM 82	5	67.55F	MS
7	Bt-FH 142	6	79.30G	S
8	Bt-4243	6	71.60H	S
9	Bt-FH 169	6	75.71I	S
10	Non Bt-Shahbaz	7	82.40J	HS
11	Non Bt-CRIS 134	7	85.55K	HS

*Mean values in a column sharing similar letters do not differ significantly as determined by the LSD test ($P \leq 0.05$)
MR = Moderately resistant　　　MS = Moderately susceptible　　　S = Susceptible　　HS = Highly susceptible
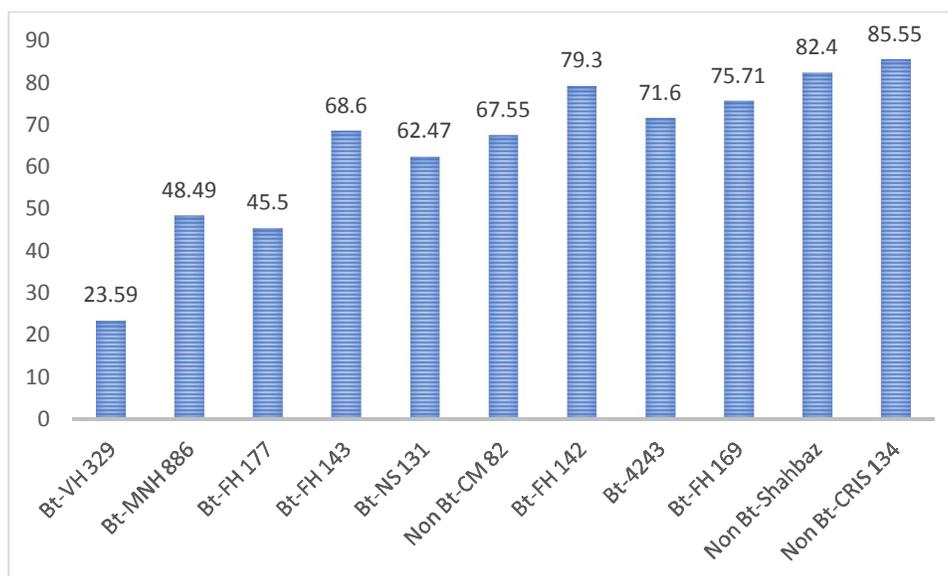
Fig.2.1. Response of cotton germplasm against bacterial blight of cotton under field conditions during 2017

During 2017, three varieties (Bt-4243, Bt-FH 169 and Bt-FH 142) showed susceptible response with 71.60, 75.71 and 79.30 percent disease incidence (rating 6) while BT-NS 131(62.47), Non Bt-CM 82 (67.55) and Bt-FH 143 expressed moderately susceptible response with 68.60% disease incidence (rating 5) and Non Bt-Shahbaz and Non Bt-CRIS 134 showed highly susceptible response with 82.40 and 85.55 percent disease incidence (rating 7). Three varieties (Bt-MNH 886, Bt-FH 177 and Bt-VH 329

expressed moderately resistant response with 48.49, 45.00 and 23.59 disease incidence with rating 4.

4. Conclusion: No variety expressed highly resistant response while few varieties expressed moderately resistant cotton varieties should be recommended for farmers with exploitation of their high yielding potential and selection of planting dates is very important.

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