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Screening of different genotype of cotton for resistance against Alternaria leaf blight disease

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Abstract

Alternaria leaf blight of cotton is important disease of cotton. Among the evaluated thirteen varieties against Alternaria leaf blight of cotton, two varieties viz., AKH-2013-3, AKH-8828 showed resistant reaction, two varieties viz., AKH-09-5, AKH-13-0-1 recorded moderately resistant reaction, seven varieties AKH-10-3, AKH-10-4, AKH-10-10, AKH-20-12-8, AKH-13-2, AKH-293-2, PKV-Rajat were moderately susceptible reaction, two variety AKH-10-2, AKH-2013-6 recorded susceptible reaction to Alternaria leaf spot.

Keywords: Alternaria, cotton, screening, resistance, genotype

Introduction

Cotton is one of the most important fiber and cash crop of India and plays a dominant role in the industrial and agricultural economy of the country. India is the largest cotton growing country in the world with in area around country 10.5 M ha and shares in global cotton exports around 25%. During the year 2017-18, Gujarat, Maharashtra and Telangana were the major cotton growing states covering around 71% (86.4 lakh hectare) in area under cotton cultivation and 65% (246 lakh bales) of cotton production in India (AICCIP, 2017)^[1]. There has also been a manifold improvement in production, productivity and quality with virtual increase in area. In present situation cultivated cotton varieties by the farmers are susceptible to the diseases. The disease can be managed by chemicals but increase the ecological pollution and to reduce the input cost use of resistant varieties against diseases is of prime importance to overcome these losses. Use of resistant cultivar of crop plays an important role in combating the losses caused by diseases as it is eco-friendly, easy and cost-effective disease management strategy. A genotype with disease resistance and high yield potential offered scope in breeding programme to evolve multiple tolerance genotypes combined with good yield. Keeping in view the importance of crop, disease and considering scope of resistant varieties in IDM technology, the present study was conducted to screen the cotton advance lines against Alternaria leaf blight diseases with high yield superiority for the identification of resistant sources in available lines accessions.

Materials and Methods

Cotton genotype seed

The seeds of cotton variety/genotype along with checks were received from Cotton Research Unit, Dr. PDKV, Akola.

Screening of cotton genotypes *in vivo*

Under natural field conditions, 13 cotton genotypes along with checks were evaluated at the field of Cotton Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola in a non-replicated manner with 3 rows of 3 meter length.

1. Location : Plant Pathology field, Dr. PDKV. AKOLA
2. Soil type : Vertisol.
3. Design : Non replicated trials
4. Plot size : 3.60 x 2.40 m²
5. Season : Kharif
6. Entries : 13
7. Date of sowing : 05 July 2018

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8. Method of sowing : Dibbling
9. Fertilizer dose : 50 kg N, 50 kg P, 50 kg K/ha.
10. Plant protection measures: Nil

The observation on leaf spot infection were recorded at 30, 60 and 90 days after sowing by selecting three leaves each from top, middle and lower portion of the plant. The observations were recorded on the basis of 0-4 scale (Grade and disease reaction of *Alternaria* leaf spot CICR, Nagpur 1988.)

Disease rating scale

Grade	Disease reaction	Description
0	Immune (I)	Plants completely free from infection
1	Resistant (R)	Spot few scattered nearly 1 mm diameter, dry not coalescing, redish, angular, vein free, infection area covered upto 5%
2	Moderately Resistant (MR)	Spot initially wet but rapidly drying, redish brown veins And vein lets free or with dry lesions. Leaf area covered 6-10%.
3	Moderately susceptible (MS)	Lesions larger than 2 mm or more in diameter, angular turning brown and black coalescing, spreading linearly along the smaller veins. 11-20% leaf area covered or water soaked., vein infection along the main veins.
4	Susceptible	Lesions larger, water soaked coalescing as above but covering more than 20 % leaf area or veins infected and extending up to pulvinus and petioles. Lesions larger and coalescing, water soaked at first, later turning to brown black in severe cases branches and stem also attacked.

(Grade and disease reaction of *Alternaria* leaf spot CICR, Nagpur 1988.)

The above rating scales or grades are utilized for the calculation of PDI using the following formula -
The average intensity of each plot was worked out by using formula

$$\text{Percent Disease Intensity (PDI)} = \frac{\sum \text{of all numerical ratings}}{\text{Total number} \times \text{maximum of leaves ratings examined}} \times 100$$

On the basis of PDI, the entry/variety can be classified as follows:

PDI	Resistant category
1 st = 0	= Absolutely Resistant (AR)
2 nd = 0.01 – 11.11	= Highly Resistant (HR)
3 rd = 12.22 – 33.33	= Moderately Resistant (MR)
4 th = 34.44 – 55.55	= Moderately Susceptible (MS)
5 th = 56.66 – 77.77	= Susceptible (S)
6 th = 78.88 – 100.00	= Highly Susceptible (HS)

Results and Discussion

Screening of cotton genotypes against *Alternaria* blight of cotton

Thirteen genotypes along with checks were screened against *Alternaria* leaf spot of cotton under natural field condition during kharif season and data presented in Table 1. Data shows that, among 13 genotypes including checks of cotton, AKH-10-2, and AKH-2013-6 shows maximum per cent disease intensity *i.e.* 20.45 and 60.15 respectively. Lowest per cent disease intensity was recorded in AKH-8828 (5.37%).

None of the tested genotype showed immune reaction; however two genotypes namely AKH-2013-3, and AKH-8828 exhibited Resistant (R) reaction while 2 AKH-09-5 and AKH-13-0-1 genotype shown Moderately Resistant (MR) reaction and 7 genotype *viz.* AKH-10-3, AKH-10-4, AKH-10-10, AKH-20-12-8, AKH-13-2, AKH-293-2, PKV Rajat exhibited Moderately Susceptible (MS) reaction. Rest of genotypes including checks *viz.* AKH-10-2 and AKH-2013-6 shown susceptible (S) reaction. Data in respect of yield, highest yield was recorded in genotype AKH-2013-3 (1495.76 kg ha⁻¹) followed by AKH-8828 (1475.63 kg ha⁻¹), AKH-13-0-1

Percent diseases intensity

Five plants were selected randomly in each plot and observation on severity of the disease on the foliage (using 0-4 scale) was recorded under different treatments one day before each spray and 15 days after the final spray. The cotton yield in each treatment was recorded and the data were statistically analyzed.

(1470.87 kg ha⁻¹), AKH-09-5 (1420.67 kg ha⁻¹) and AKH-10-10 (1370.20 kg ha⁻¹).

Table 1: Screening of cotton genotype against *Alternaria* blight of cotton

SN.	Varieties	Percent disease intensity			Reaction R*	Yield kg/ha
		30 DAS	60 DAS	90 DAS		
1	AKH-09-5	00.00	0.50	9.21	MR	1420.67
2	AKH-10-2	3.50	8.05	20.45	S	1130.45
3	AKH-10-3	00.00	4.40	14.25	MS	1210.50
4	AKH-10-4	2.00	4.50	16.25	MS	1190.33
5	AKH-10-10	00.00	2.00	10.84	MS	1370.20
6	AKH-20-12-8	00.00	2.50	12.44	MS	1245.47
7	AKH-13-0-1	00.00	0.00	9.15	MR	1470.87
8	AKH-13-2	00.00	3.50	12.77	MS	1230.37
9	AKH-293-2	2.50	6.03	17.90	MS	1090.87
10	AKH-2013-3	00.00	0.00	5.49	R	1495.76
11	AKH-2013-6	6.50	27.68	60.15	S	820.00
12	AKH-8828	00.00	0.00	5.37	R	1475.63
13	PKV Rajat	00.00	2.00	10.36	MS	1340.73

R*-Reaction DAS*- Days after sowing

Table 2: Grades and disease reaction of *Alternaria macrospora* CICR, Nagpur 1988

SN	Genotype	Reaction at 90 DAS
1	Nil	I (0)
2	AKH-2013-3, AKH-8828	R (2)
3	AKH-09-5, AKH-13-0-1	MR (2)
4	AKH-10-3, AKH-10-4, AKH-10-10, AKH-20-12-8, AKH-13-2, AKH-293-2, PKV Rajat	MS (7)
5	AKH-10-2, AKH-2013-6	S (2)

The work on identification of multiple disease resistance genotypes of cotton has been undertaken by many workers like Desai (1979) [5]; Cotty, (1987) [4]; Chattannavar *et al.*, (2004) [3] and Zhu *et al.*, (2017) [7].

In present findings, genotypes showed varied reaction ranging from R to S. This might be due to the availability of inoculums or differential interactions of host genotype with different varieties.

The present findings are in accordance with the Hosagoudar *et al.* (2008)^[6] who reported that among the eighty six non-Bt and nine Bt cotton genotypes tested under natural field conditions none of the variety/hybrid/genotype showed immune and highly resistant reaction to *Alternaria* blight. Similarly Bhattiprolu and Rao (2013)^[2] and Zhu *et al.*, (2017)^[7] reported significant genotypic differences in disease severity index of *Alternaria* blight of cotton.

Conclusions

In current investigation genotype like AKH-2013-3, AKH-8828 exhibited resistant reaction with considerable yield potential. Thus this resistant source of cotton genotype may have scope in future for breeding in development of variety.

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