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A STUDY ON FOLIAR DISEASE EPIDEMIOLOGY AND TREATMENT IN BT COTTON

Balwant Singh Rawat,
Associate Professor, School of Agriculture, Graphic Era Hill University,
Dehradun Uttarakhand India

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Abstract

Cotton, often known as "The White Gold" or "The King of Fibres," is the most important cash crop in the nation since it is used in the booming textile sector. About sixty million people depend on it for their survival, and it's a valuable agricultural product that helps millions of farmers in both rich and developing nations make a living. The fungus Alternaria alternata (Fr.) Keissler causes a devastating leaf spot on Bt cotton plants, while the bacterium Xanthomonas citripv. malvacearum (Smith) Dye causes a bacterial blight. Alternaria leaf spot and bacterial blight infections were the most frequent and both are major problems in Gujarat that have particular significance in the current study since they lead to economic yield losses in Gujarat. Corynesporacassiicola, the causal agent of a new and peculiar leaf mark, has been discovered.

Keywords: *Foliar, Disease, Epidemiology, Treatment, BtCotton.*

1. Introduction

The bulk of India's population relies on farming for their livelihood, earning a reputation as an agricultural area. Growing a wide variety of crops is essential for optimising production and ensuring quality control. The incorporation of modern technological methods can only serve to strengthen it. India is a major global player in the cotton industry. Cotton sometimes referred to as "White Gold" or "Emperor Fibres," is one of the most lucrative crops in the world. About sixty million people throughout the world rely on the sales of this vital agricultural produce to support themselves and their families. The textile industry all around the world relies on cotton. India therefore has the distinction of being the first nation to successfully domesticate the cotton plant and use its fibre in the production of textiles. Despite the rise of synthetic fibres, cotton has remained a market leader. It has a considerable economic impact and serves as a key cash crop in many parts of the globe.[1-2]

In both temperate and tropical zones, 34 million acres are devoted to growing cotton, making it the most frequently grown plant fibre crop on the planet. Wool is made by weaving the

outer layer of cotton seeds into the fibre. Certain regions of the United States, India, China, the Middle East, and Australia are ideal for growing cotton due to their consistent temperature extremes, abundant sunshine, and, with the help of irrigation, enough rainfall.[3]

India offers more varieties of cotton and more distinct climates ideal for cultivating cotton than any other major cotton producer. India is the only country in the world where commercial production of all four of the most common cotton cultivars—Gossypium hirsutum, G. arboreum, G. herbaceum, and G. barbadense—occurs.[4]

According to the Committee on Cotton Production and Consumption (COCPC), India's cotton production is expected to generate 371 lakh bales of 170 kg from 129.57 lakh hectares with a yield of 487 kg lint/ha in 2019-20. In 2019-20, the majority of India's cotton was grown in the states of Gujarat, Maharashtra, and Telangana. These three states were responsible for around 68% of India's cotton cultivation (88.3 lakh acre) and 63% of India's cotton output (236 lakh bales). As a consequence of the global lockdown caused by the Coronavirus Disease-2019 (COPV-19), local cotton consumption has dropped in 2019–20, especially in the fourth quarter. In 2019-20, the state of Gujarat is predicted to produce 90.50 lakh bales (170kg) at a productivity of 677 kg/ha, according to the fourth advanced estimate.[5-6]

Cotton was the first crop grown for profit in India. Insect infestations have been causing financial losses for farmers. Bt cotton was introduced as the country's first GM crop in an effort to reduce bollworm populations. Nearly six years of testing were completed before Bt cotton was adopted, during which time agronomic, environmental, and biosafety information was gathered and made public. Pre-commercial testing of Bt cotton demonstrated its greater efficiency via increased yields and less pesticide applications. Indian farmers may benefit from transgenic technology even with their small land sizes. The area where Bt cotton has been planted is projected to expand rapidly over the next several years.[7]

2. Literature review

Bashan, Y. & Or, R. (2020) Cotton is susceptible to a wide variety of fungal, bacterial, viral, and nematode infections during its life cycle. Some examples include bacterial blight, leaf spot caused by Alternaria, grey mildew, and rust. Crop loss due to fungal infections, especially foliar diseases in Bt cotton-growing regions, was caused by a combination of biotic and abiotic causes. Leaf spots were the third most prevalent cotton disease in India. Spots on

leaves may be caused by a variety of pathogens, including the bacterium Xanthomonas campestris pv. malvacearum (Smith), the fungus Alternaria macrosporaZimm., and the fungus Ramularia areola (Atkinson, which causes grey mildew). Cotton's bacterial leaf blight is caused by the bacterium Xanthomonas campestris pv. malvacearum, and it manifests itself in two stages: the local phase, in which parenchymal tissues die, and the systemic phase, in which xylem arteries get blocked.[8]

Altschul, S. & Lipman, D. (2019)first documented the presence of A. macrospora outside of South Rhodesia. Cotton leaf spot, caused by Alternaria macrospora and initially reported in Nigeria by Zimmermann in 1904. He isolated the bacteria from contaminated leaves and decaying bolls, demonstrating its pathogenicity. In East Africa, A. macrospora was mostly discovered on the elder leaves of the cotton types Carcabat and Acala. The fungi Alternaria alternata (Fr.) Keissler, Alternaria gossypina (Thum.) Hopk, and Alternaria macrospora (Zimm) are all responsible for the cotton leaf and twig blight. The plant disease index (PDI) for cotton affected by Alternaria leaf spot varies widely throughout India, from 10% in the southernmost regions to 35% in the northernmost and Central regions. This illness was initially identified in India's Dharwad area in Karnataka, as well as Maharashtra's Pune and Ahmednagar regions.[9]

Bayles, M., &Verhalen, L. (2018) Yield drops averaged between 10% and 30% over much of Asia. They were shown to be as high as 50% in several African nations. Yield losses of 37% to 40% were recorded in the Faisalabad area. The pathogen Xam thrived and spread more quickly in environments with high relative humidity. Under normal circumstances, black arm infections in cotton plants are responsible for 35% of the boll damage that occurs. Depending on the kind of crop and its age, losses due to angular leaf spots during harvest might be anywhere from 1% to 27%.[10]

Casson, E. T. & Gholson, R. K. (2017)A spot on the cotyledons of freshly emerging seedlings is the initial sign of the illness. Small brown circular marks with a purple rim first appear on immature cotyledons as a consequence of constant cotton production. Coalesced spots on vulnerable cultivars may weaken the cotyledons to the point that they fall off. On leaves, symptoms of A. macrospora first emerge as a small necrotic spot surrounded by a purple halo; this patch eventually expands to about 1 cm in diameter, becoming grey and fractured in the centre. The zonation is more distinct on the top surface.[11]

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Chakrabarthy, P. K., &Sravankumar, V. (2016)signs such as little lesions ranging in colour from grey to tan to brown on green leaves with purple veins were noted. Spots on older leaves have a diameter of 1 mm to 10 mm and are zoned concentrically. The lesion fuses together, becoming irregular and necrotic as the illness advances. The leaves get weakened and cracked, eventually seeming shot through. Lower leaves are more susceptible to the illness than higher leaves, with the exception of those affected by premature defoliation. Fungal sporulation on necrotic lesions may produce black sooty masses in wet conditions. Stem, bract, and berry lesions are also possible.[12]

3. Methodology

Studies were conducted on "Epidemiology and management of foliar diseases of Bt cotton" at the Plant Pathological Research Farm and the Department of Plant Pathology at the B. A. College of Agriculture, Anand, India, between 2018 and 2020.

3.1 Information about workplace

3.1.1 Location

Located in Anand, Gujarat at 220°35′ North latitude, 720°55′ East longitude, and 45 metres above sea level lies Anand Agricultural University. This area is located inside Agroclimatic Zone III, which is the centre of Gujarat.

3.2 Occurrence of foliar diseases

During kharif 2019-20, a roving survey was conducted in the primary Bt cotton-growing districts of Gujarat to determine the prevalence of foliar diseases.

3.3 Pathological investigations

- Sampling for Disease Research or Isolation
- Symptomatology
- Pathogens Responsible for Foliar Diseases Isolated and Purified
- Isolation Devices and Their Upkeep

3.4 screening of bt cotton hybrids for resistance source against foliar diseases (alternaria leaf spot and bacterial blight) under field conditions

In order to pinpoint the genetic source of resistance to foliar diseases under field settings during Kharif 2019–20 and Kharif 2020–21, twenty-seven Bt cotton hybrids were examined

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(each in two rows). The hybrids were raised using conventional methods of agriculture. Neither pesticides nor micronutrient sprays were ever applied to the experimental plot. GSSC (Gujarat State Seeds Corporation Limited) and GEAC (Genetic Engineering Appraisal Committee) authorised hybrids of private businesses were sourced for the Bt cotton seeds used in this study. After sowing two rows of hybrids, a single row of susceptible control LRA 5166 (non-Bt) was seeded between them. These seeds were obtained from the ICAR-Central Institute for Cotton Research in Nagpur.

3.5 Experimental details

a)	Location	:	PlantPathologicalResearchFarm,BACA,AAU, Anand
b)	Yearandseason	:	*Kharif* 2019-20and *Kharif* 2019-20
c)	Crop and variety	:	*Bt*CottonandRCH-2(BG II)
d)	Experimentaldesign	:	Non-replicatedtrial
e)	Plotsize	:	24 x18 m
f)	Spacing	:	120x45 cm
g)	Fertilizerdose	:	240:40:00NPKkg/ha

3.5.1 Inoculum spray

i. Alternaria alternata

The inoculum was sprayed in the evenings at 30 and 50 days post-sowing, in addition to the natural disease pressure. Ten-day-old A. alternata cultures were used to make the spore suspension. Spores were collected by spraying a water suspension of 106 conidia/ml..

ii. Xanthomonas citripv. malvacearum

Active cultures of X. citripv. malvacearum were used for inoculation after being suspended in distilled water at a concentration of 3x107 cfu/ml for 48 hours. Inoculated plants had pinholes made in their lower leaves, and the bacterial suspension was sprayed there.

3.6 Statistical analysis

Statistical analysis, in the form of analysis of variance, was applied to the data collected during the current research. Analysis of variance, a randomised design, and a randomised

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block design were all used in the tests. The significance test between the treatments was calculated using the "F" test. Each case's S.Em standard error of the mean was calculated accurately. The crucial difference (CD) between two treatment means was calculated at the 5% significance level for the treatment effects that were determined to be significant.

4. Results

This paper presents the results of current research into several foliar diseases of Bt cotton. The findings are explained in the context of the work of other scientists whose studies are related to the current ones, either directly or indirectly.

4.1 Occurrence of foliar diseases

The boll rot complex and many foliar diseases have attacked Bt cotton. The results of a roving survey on the incidence of foliar diseases in Gujarat's primary Bt cotton-growing region during Kharif 2019-20 are summarised in Table 4.1. Some illnesses have been seen, although only in small numbers. These include Cercospora leaf spot, Curvularia leaf spot, Helminthosporium leaf spot, anthracnose, grey mildew, and boll rot complex. Significant diseases in Gujarat, such as Alternaria leaf spot and bacterial blight, were the most prevalent causes of death. Since foliar diseases like Alternaria leaf spot and bacterial blight are responsible for economic yield losses in Gujarat, they are of particular interest in the current research.

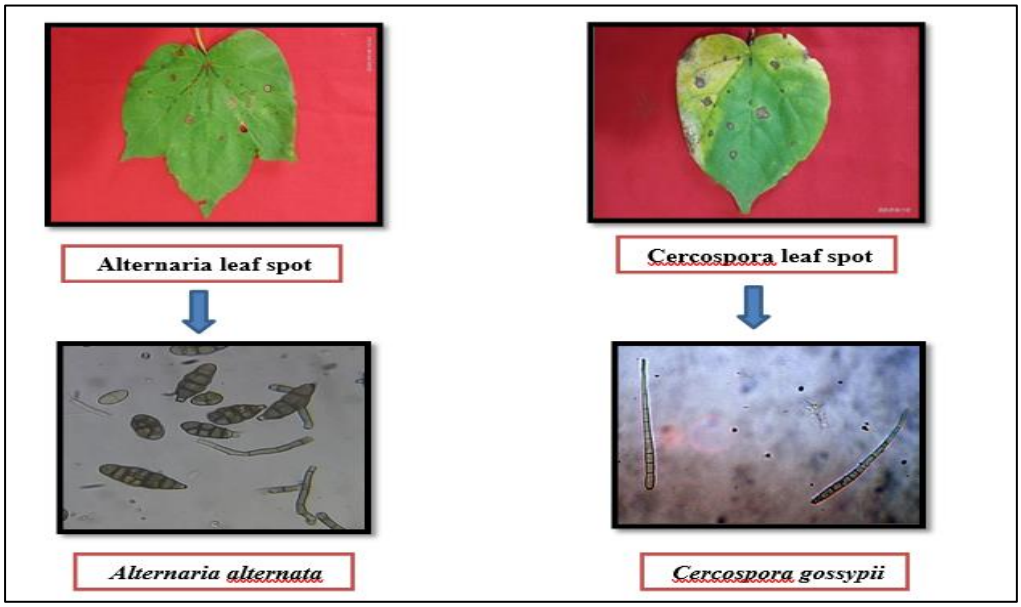

Plate 4: Occurrence of different foliar diseases on Bt cotton

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Table 4.1: Incidence of foliar infections in Gujarat's primary region for cultivating Bt cotton

Parts	**Leaf spots/rot**	**Commonnameof disease**	**Pathogen(s)**	**Occurrence**
Leaf	**Fungal**	Alternarialeafspot	Alternaria*alternata* (NCBIAccession No. MW035008)	Major
		Corynesporaleafspot	*Corynesporacassiicola* (NCBIAccession No.MZ350545)	Trace
		Cercosporaleafspot	*Cercosporagossypii*	Trace
		Curvularialeafspot	*Curvularia*sp.	Trace
		Helminthosporiumleafspot	*Helminthosporium*sp.	Trace
		Anthracnose	*Colletotrichumcapsici*	Trace
		Greymildew	*Ramulariagossypii*	Trace
	Bacterial	BacterialblightorAngularleafspot	*Xanthomonascitri*pv.*malvacearum* (NCBIAccession No.MW867239)	Major
Boll	**Rotcomplex**	*Fusariummoniliforme*,*Colletotrichumcapsici*,*Aspergillusflavus*, *A.niger* and*Rhizopusnigricans*		Trace

4.2 Pathological investigations

The infected samples were gathered from the most important Bt cotton-growing locations in Gujarat and showed symptoms similar to leaf spot and blight. The microscopical analysis of the sick tissue sample from the hand provided conclusive evidence of the presence of the infection. Disease samples were properly dried, tagged, and stored for further analysis. A total of 28 Alternaria sp. isolates and 12 Xanthomonas sp. isolates were obtained during Kharif 2019 (Table 4.2).

Multiple field trips, isolations, and purifications confirmed that the most common pathogens affecting plants in the most important Bt cotton-growing regions of Gujarat were fungi and

bacteria that caused foliar diseases like Alternaria leaf spot, Corynespora leaf spot, and bacterial blight.

This disease often manifests itself on the older, lower leaves after the plant has flowered. On the top surface of older leaves, a tiny necrotic water-soaked patch may be seen. The area will eventually merge into a bigger lesion. The lesion looked as a tiny, round brown patch that was anywhere from grey-brown to black and measured between two and three millimetres in diameter.

Table 4.2: Major Bt cotton-growing districts in Gujarat served as the source for both Alternaria sp. and Xanthomonas sp.

Sr. No.	IsolateNo.	District	Taluka	Place	GPSLocation
(A)*Alternaria* sp.					
1	Aa1	Anand	Anand	Anand(Agronomy farm,BACA, AAU)	22.535885°N 72.972677°W
2	Aa2	Patan	Sami	Sami	23.680304°N 71.774197°W
3	Aa3			Sankheswar	23.641977°N 71.774198°W
4	Aa4		Harij	Harij	23.685940°N 71.893625°W
5	Aa5		Radhanpur	Radhanpur	23.826196°N 71.596119°W
6	Aa6	Ahmedabad	Mandal	Mandal	23.171025°N 71.991370°W
7	Aa7		Dhandhuka	Dhandhuka	22.353182°N 71.975384°W
8	Aa8	Surendranagar	Dasada	Dasaada	23.337332°N 71.809443°W
9	Aa9			Patadi	23.189415°N 71.816830°W
10	Aa10		Lakhtar	Sadad	22.912599°N 71.753180°W
11	Aa11			Lakhtar	22.918572°N 71.750570°W
12	Aa12		Dhrangadhra	Dhrangadhra	23.078343°N 71.528287°W
13	Aa13		Limbdi	Limbdi	22.618802°N 71.824555°W

14	Aa14	Morbi	Morbi	Morbi	22.846428°N 70.877274°W
15	Aa15			UnchiMandal	22.845048°N 70.926870°W
16	Aa16		Halvad	Halvad	23.010280°N 71.246519°W
17	Aa17			Kadiana	22.917800°N 71.043050°W
18	Aa18		Maliya	Maliya	23.095559°N 70.762197°W
19	Aa19	ChottaUdepur	Bodeli	Bodeli	22.272946°N 73.708245°W
20	Aa20	Vadodara	Dabhoi	Dabhoi	22.132798°N 73.398927°W
21	Aa21		Karjan	Kayavarohan	22.08363°N
					73.23853°W
22	Aa22			Karjan	22.05118°N 73.10172°W
23	Aa23	Junagadh	Junagadh	Junagadh(Main CottonReserach Station-JAU)	21.472977°N 70.430725°W
24	Aa24	Kutch	Rapar	Rapar	23.576762°N 70.662963°W
25	Aa25		Bhachau	Bhachau	23.295717°N 70.368522°W
26	Aa26	Panchmahal	Halol	Champaner	22.484505°N 73.527953°W
27	Aa27		Jambughoda	Zand	22.366996°N 73.644935°W
28	Aa28	Bharuch	Bharuch	Maktampur	21.706515°N 73.004637°W
(B)*Xanthomonas* sp.					
1	Xcm1	ChottaUdepur	Bodeli	Bodeli	22.272946° N 73.708245° W
2	Xcm2	Panchmahal	Halol	Champaner	22.484505° N 73.527953° W
3	Xcm3		Jambughoda	Zand	22.366996° N 73.644935° W
4	Xcm4	Patan	Harij	Harij	23.685940° N 71.893625° W

5	Xcm5		Sami	Panchasar	23.410573° N 71.808186° W
6	Xcm6	Ahmedabad	Dholka	Dholka	22.735818° N 72.426697° W
7	Xcm7	Surendranagar	Dasada	Dasada	23.337332° N 71.809443° W
8	Xcm8		Lakhtar	Lakhtar	22.918572° N 71.750570° W
9	Xcm9		Dhrangadhra	Dhrangadhra	23.078343° N 71.528287° W
10	Xcm10	Morbi	Morbi	Morbi	22.846428° N 70.877274° W
11	Xcm11		Halvad	Halvad	23.010280° N 71.246519° W
12	Xcm12	Surat	Surat	Surat(Main Cotton Reserch Station, NAU)	21.170037° N 72.798891° W

4.3 Screening of bt cotton hybrids for resistance source against foliar diseases (alternaria leaf spot and bacterial blight) under field conditions

The purpose of this research was to locate reservoirs of resistance to the foliar diseases Alternaria leaf spot and bacterial blight that affect Bt cotton. We conducted field trials in Kharif 2018–19 and Kharif 2019–20 on a total of 27 Bt cotton hybrids and one non–Bt variety, LRA-5166 (Check line). These hybrids were separated into groups with varied degrees of reactivity based on the per cent illness severity (Table 4.5 and 4.6).

Tables 4.3 and 4.4 show that there were statistically significant variations in foliar disease resistance across the hybrids. Tables 4.3 and 4.4 provide data collected over a two-year

period, from which we infer the ultimate illness response using the lowest rating scale. None of the hybrids were found to be resistant to Alternaria leaf spot, although two of them were resistant to bacterial blight (Solar 76 and G. Cot. Hy. 10). The hybrids RCH 659, Suraj, and Solar total exhibited a moderately resistant response to bacterial blight, while the hybrids G. Cot. Hy. 12, Solar 76, Bhakti, Modiji, KCH 144, ATM, Surpass, and Solar total showed resistance to Alternaria leaf spot. Against Alternaria leaf spot, hybrids (G. Cot. Hy. 12, Solar 76, Bhakti, Modiji, KCH 144, ATM, Surpass, Solar 77, Savaj 503, Solar total) exhibited a moderately resistant response, while hybrids (RCH 659, Suraj, and Solar total) showed a moderately resistant reaction against bacterial blight.

Table 4.3: Varieties of Bt cotton (BG II) in response to the Alternaria leaf spot disease

Sr. No.	Hybrids	Diseaseintensity(%)		Diseasereactions		
		2019-20	2019-20	2019-20	2019-20	Finalreaction
1.	G.Cot.Hy. 8	33.67	18.23	MS	MR	MS
2.	G.Cot. Hy.10	29.41	27.82	MS	MS	MS
3.	G.Cot. Hy.12	8.22	15.50	MR	MR	MR
4.	GTTH49	34.25	20.44	MS	MS	MS
5.	RCH2	44.33	58.61	S	S	S
6.	RCH659	25.24	19.85	MS	MR	MS
7.	Ajeet-155	38.16	51.53	MS	S	S
8.	Ajeet199	36.72	27.05	MS	MS	MS
9.	Solar 76	8.84	18.63	MR	MR	MR
10.	Bhakti	18.22	3.91	MR	R	MR
11.	Modiji	9.12	18.38	MR	MR	MR
12.	KCH144	17.85	20.31	MR	MS	MS
13.	ATM	19.66	8.24	MR	MR	MR
14.	Surpass	14.94	10.45	MR	MR	MR
15.	NC1125	42.77	34.89	S	MS	S
16.	Solar 77	11.35	19.54	MR	MR	MR
17.	Solar 96	15.16	27.82	MR	MS	MS
18.	25D25	30.14	41.88	MS	MS	MS
19.	Neck 303	23.34	45.67	MS	S	S
20.	Raja	18.50	20.66	MR	MS	MS
21.	Mahasangram	17.91	29.14	MR	MS	MS

22.	Savaj503	13.51	19.12	MR	MR	MR
23.	Suraj	22.14	35.87	MS	MS	MS
24.	Solartotal	9.81	18.77	MR	MR	MR
25.	Neck 2108	26.57	38.15	MS	MS	MS
26.	Goldstar	36.53	14.11	MS	MR	MS
27.	Solar 60	43.38	50.62	S	S	S
28.	LRA5166 Non-*Bt*(Checkline)	58.81	55.46	S	S	S

Table 4.4: Field response of several Bt cotton (BG II) hybrids to bacterial blight

Sr. No	Hybrids	Diseaseintensity(%)		Diseasereactions		
		2019-20	2019-20	2019-20	2019-20	Finalreaction
1.	G.Cot.Hy. 8	21.02	19.49	S	MS	S
2.	G.Cot. Hy.10	2.17	4.98	R	R	R
3.	G.Cot. Hy.12	12.00	18.82	MS	MS	MS
4.	GTTH49	33.50	15.23	S	MS	S
5.	RCH2	32.50	41.61	S	S	S
6.	RCH659	10.00	9.88	MR	MR	MR
7.	Ajeet155	12.00	31.32	MS	S	S
8.	Ajeet199	39.89	20.82	S	S	S
9.	Solar 76	4.50	5.84	R	R	R
10.	Bhakti	14.50	9.71	MS	MR	MS
11.	Modiji	16.23	14.54	MS	MS	MS
12.	KCH144	18.62	22.60	MS	S	S
13.	ATM	13.88	18.95	MS	MS	MS
14.	Surpass	17.92	26.18	MS	S	S
15.	NC1125	51.64	43.81	S	S	S
16.	Solar 77	8.62	15.39	MR	MS	MS
17.	Solar 96	4.35	20.02	R	MS	MS
18.	25D25	11.73	23.87	MS	S	S
19.	Neck 303	33.36	26.58	S	S	S
20.	Raja	19.81	24.95	MS	S	S
21.	Mahasangram	39.12	26.66	S	S	S

22.	Savaj503	16.30	9.36	MS	MR	MS
23.	Suraj	9.81	3.17	MR	R	MR
24.	Solartotal	9.52	4.23	MR	R	MR
25.	Neck 2108	27.50	36.50	S	S	S
26.	Goldstar	18.25	27.89	MS	S	S
27.	Solar 60	15.60	16.35	MS	MS	MS
28.	LRA5166 Non-*Bt* (Checkline)	31.55	28.29	S	S	S

Table 4.5: Alternaria leaf spot disease susceptibility clustering in Bt cotton (BG II) hybrids

Diseasereactions	**2019-20**		**2019-20**		**Finalreactions**	
	No.of hybrids	**Hybrids**	**No.of Hybrids**	**Hybrids**	**No.of hybrids**	**Hybrids**
I	00	----	00	---	00	----
R	00	---	01	Bhakti	00	----
MR	13	.Cot.Hy.12,Solar76,Bhakti, Modiji, KCH144,ATM, Surpass, Solar77, Solar96, Raja, ngram, Savaj 503,Solartotal	12	.Cot.Hy.8,G.Cot.Hy.12,RCH 659, Solar76, Modiji, ATM,Surpass,Solar77, Solar96,Savaj-503, Solartotal,Goldstar	10	G. Cot. Hy. 12, Solar 76,Bhakti, Modiji, KCH 144,ATM,Surpass, Solar77, Savaj503, Solartotal
MS	11	G.Cot.Hy.8,G.Cot. Hy. 10, GTTH 49,RCH 659, Ajeet 199,Ajeet155, 25D25, Neck303,Suraj, Neck2108,Goldstar	09	G. Cot. Hy. 10, GTTH 49,Ajeet 199, KCH 144, 25D25,Raja,Mahasangram,Suraj, Neck2108,	12	ot.Hy.8,G.Cot.Hy.10, GTTH49, RCH659, Ajeet 199, Solar 96, 25D25,Mahasangram, Suraj, Raja,Neck2108, Goldstar
S	03	Solar60, NC1125, RCH2	05	Solar60, Ajeet 155,RCH 2, NC1125,Neck303	05	Solar60, Ajeet155, RCH2,NC 1125,Neck303
Total	27		27		27	

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Table 4.6: Hybrids resistant to bacterial blight (Bt) cotton fall under the BG II category.

Diseasereactions	2019-20		2019-20		Finalreactions	
	No.of hybrids	Hybrids	No.of Hybrids	Hybrids	No.of hybrids	Hybrids
I	00	--	00	--	00	---
R	03	Solar76, G. Cot.Hy10, Solar96	04	Solar76,G. Cot.Hy.10, Suraj,Solartotal	02	Solar76,G. Cot.Hy. 10
MR	04	RCH659, Solar 77, Suraj,Solartotal	03	RCH659,Bhakti,Savaj 503	03	RCH659, Suraj,Solar total
MS	12	Bhakti, G. Cot. Hy. 12,Modiji,KCH144,ATM, Surpass, Ajeet 155,25D25,Raja, Savaj503, Goldstar,Solar60	10	ot.Hy.8,G.Cot.Hy.12,GTTH49, Ajeet155, Ajeet 199, Modiji, ATM,Solar77,Solar96, Solar60	08	ot.Hy.12,Bhakti,Modiji, ATM, Solar77, Solar96, Savaj503, Solar60
S	08	Cot.Hy.8,GTTH49 ,RCH2, Ajeet 199, NC1125,Neck303 , Mahasangram,Neck2108.	10	RCH2,KCH 144,Surpass, NC1125, Neck303, 25D25, Raja, Mahasangram,Neck2108,Goldstar	14	G. Cot. Hy. 8, GTTH 49,RCH 2, Ajeet 155, Ajeet199, KCH 144, Surpass,NC1125,Neck303,Raja, 5D25, Mahasangram,Neck2108,Goldstar
Total	27		27		27	

5. Conclusion

Diseases such as bacterial blight (X. citripv. malvacearum) and Alternaria leaf spot (A. alternata) are major problems in Bt cotton-growing districts of Gujarat. The fungus Corynesporacassiicola has been identified as the source of a new and peculiar leaf spot. After several isolation attempts, we were able to identify A. alternata, X. citripv. malvacearum, and C. cassiicola. Diseased samples were analysed, and 28 isolates of A. alternata and 12 isolates of X. citripv. malvacearum were found. On Bt cotton leaves, each individual pathogen tested

positive for Koch's postulates. On various mediums, A. alternata and X. citripv. malvacearum isolates displayed strikingly diverse cultural and morphological characteristics. Intensity of Alternaria leaf spot and bacterial blight were all negatively connected with maximum and lowest temperature, rainfall, wind speed, and relative humidity, whereas bright sunlight hour was favourably correlated and had a significant impact.

6. References

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