

RESEARCH ARTICLE

CURVULARIA LEAF SPOT - AN IMPORTANT DISEASE OF COTTON CAUSED BY *CURVULARIA LUNATA* (WAKKER) BOEDIJN

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Abstract: Cotton (*Gossypium hirsutum* L.) is one of the most important fiber crop playing a key role in the economic and social scenario of the globe. It is also known as "The white gold" or "The king of fibers". It is a premier cash crop of our country and belongs to the family *malvaceae*. Curvularia leaf spot appear initially as small circular brown to brownish black spot surrounding with yellow, later it become dark yellow to brown hallow surrounding to brownish black spots and in severe cases, the leaves turned yellow colour and detached easily from the branch resulting in the defoliation. The survey was conducted in the cotton growing regions of Surat, Bharuch and Narmada districts of South Gujarat in the year 2024-25 to examine the presence of *Curvularia lunata* (Wakker) Boedijn pathogen on cotton plants and to record the observation on per cent disease intensity and per cent disease incidence. The maximum mean per cent disease intensity was found in the Bharuch district with 32.64 per cent, while the lowest disease intensity of *Curvularia lunata* was found in Surat district with 17.45 per cent and the maximum per cent disease incidence was found in Bharuch district with 12.33 per cent, while the lowest per cent disease incidence was found in Surat district with 7.22 per cent.

Keywords: Cotton, Survey, *Curvularia*, Intensity, Incidence

INTRODUCTION

Cotton is the world's most widely grown fibre crop, which belongs to the genus *Gossypium* in the family *Malvaceae* (Anonymous, 2017). It is oldest among the commercial crops of the world and also known as "THE KING OF FIBERS" and "WHITE GOLD". It has delicate, white, soft and fluffy fibre that is made of about 87 to 90 per cent of cellulose. Cotton has been cultivated as over thousands of years for both the food and fibre. It is versatile crop, its fibre is used as raw material in textile, pulp and paper industries and oil extracted from the cotton seed is used in food, cosmetics, chemicals and pharmaceuticals (Proto *et al.*, 2000). The symptoms of Curvularia leaf spot appear initially as small circular brown to brownish black spot surrounding with yellow hallow, later it become dark yellow to brown hallow surrounding to brownish black spots (Joshi *et al.*, 2023).

Curvularia is a wide spread air borne facultative weak pathogen, which mostly survives as a saprophyte in tropical and sub-tropical areas. It is a dematiaceous, filamentous fungus. *Curvularia* spp. are darkly pigmented fungi with spores (conidia) efficiently adapted for most aerial dissemination.

Some species have caused devastating disease epidemics of important food crops such as rice, wheat and maize (Sivanesan, 1987). The Curvularia leaf spot injures or kills the leaf tissues and thereby reduces the area of chlorophyll which involved in photosynthesis. If considerable leaf area is killed, then vigour and yields are reduced drastically.

Unfortunately, in our efforts for maximization of crop production by evolving various operations in crop production system very often tends to increase the potential disease hazards of some diseases which are either new or of major importance to the crop, Curvularia leaf spot disease is one example of a minor disease gaining such importance. Anamorph of *Curvularia lunata* is *Cochliobolus lunatus* (Nelson and Haasis, 1964) has been known to cause a leaf spot of cotton in India (Sharma and Chauhan, 1985). This fungus is found throughout the tropics and has a wide host range in tropical countries of South East Asia such as Thailand, Cambodia, Vietnam, Indonesia and Nepal. Looking into the occurrence of the Curvularia leaf spot disease in cotton crop, it has the potential to spread drastically over a large area. Curvularia leaf spot is becoming an important disease in the cotton growing areas of Gujarat. So, a field survey was conducted to collect the information

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on the severity of Curvularia leaf spot disease of cotton in the selected districts of South Gujarat.

MATERIALS AND METHODS

Survey of Curvularia Leaf Spot Disease

A roving survey of intensity and incidence of Curvularia leaf spot disease of cotton was conducted during *kharif*, 2024 in August to December. The multistage random sampling survey was carried out in Surat, Bharuch and Narmada districts of Gujarat. For this purpose, three taluka in each district was taken and in each taluka three villages was taken for the disease assessment.

Calculation of Per cent Disease Intensity (PDI)

In each field, five spots selected randomly and total of 25 plants were assessed 4 bottoms, 4 middle and 2 top leaves in term of 0-5 scale as given by (Sheoraj, 1989).The PDI was calculated by using following formula given by McKinney (1923).

$$PDI = \frac{\text{Sum of all the diseases rating}}{\text{Total no. of leaves observed}} \times 100 \times \text{Maximum grade}$$

Calculation of Per cent Disease Incidence (DI)

Intensity of Curvularia leaf spot disease was examined on the basis of percentage of severity of disease. Similarly, the per cent disease incidence of Curvularia leaf spot was calculated by using the following formula given by Wheeler, 1969.

$$PDI = \frac{\text{No. of Plants infected}}{\text{Total no. of plants examined}} \times 100$$

The disease reaction was recorded as per the grading system as following:

To record the development of the disease, a scale was used in which the plants were classified into the following (0-5) classes.

Table 1. The disease reaction grade for Curvularia leaf spot disease

Disease rating	Description
0	Plant free from Curvularia leaf spot
1	Infection in traces on lower leaves, covering up to 10 per cent leaf area
2	Slight infection, some spot on leaves 11-25 per cent leaf area, stem showing slight infection, bolls free
3	Moderate infection, covering 26-50 per cent leaf area, middle leaves showing severe infection, bolls usually free
4	Heavy infection, 51-70 per cent leaf area, bolls slightly infected
5	Severe infection, 71-100 per cent leaf area, stems and bolls severely infected defoliation common

RESULT AND DISCUSSION

A roving survey was carried out in the year 2024-2025 to know the presence of Curvularia leaf spot pathogen on the cotton plants and recorded the observations on per cent disease intensity (PDI) and disease incidence (DI) in the cotton growing regions of South Gujarat. In South Gujarat region, three districts were selected viz., Surat, Bharuch and Narmada. In each district, three taluka were taken and in each taluka three villages were taken for the disease assessment. Five spots/places in each field were chosen to determine the severity of the disease.

A total of 25 plants were evaluated from each field to calculate the per cent disease intensity and 100 plants were examined to determine the per cent disease incidence. The severity of the condition was determined by using a 0-5 point disease assessment scale. The survey was conducted for the severity, incidence, distribution and spread of the disease as the results are provided in the chapter.

The data collected from the roving survey in randomly chosen fields across various villages of South Gujarat are presented in Table: 2, Table: 3 and Photo: 4.1.



Chokhvada, Umarpada, Surat



Bhilvada, Mangrol, Surat



Chopadvav, Sagbara, Narmada



Chitrol, Nandod, Narmada



Kathodara, Bharuch, Bharuch



Moriyana, Valiya, Bharuch

Photo 4.1. Survey of *Curvularia* leaf spot disease in South Gujarat during the year 2024-2025

Per cent Disease Intensity of *Curvularia* Leaf Spot Disease of Cotton

The survey was carried out at various locations for the intensity of disease, where the cotton crop was at different growth stages during the field visit. The data of *Curvularia* leaf spot disease for *kharif*, 2024 was described in Table: 2. It was revealed from the table that the disease intensity ranged from 9.50 to

35.10 per cent during the year 2024. The highest mean disease intensity 33.43 per cent was recorded at Bharuch taluka of Bharuch district and the minimum mean disease intensity 14.66 per cent was recorded at Mangrol taluka of Surat district.

Among three districts, the highest mean PDI 32.64 per cent was recorded in Bharuch district. The maximum PDI ranged from 00.00 to 35.10 per cent

was recorded in the Chiklota village of Valia taluka of Bharuch district and Kambodiya village of Netrang taluka with 0.00 to 26.30 per cent was in the tune. The lowest mean PDI 17.45 per cent was in Surat district. In Surat district, the highest PDI ranged from 00.00 to 33.10 per cent was found in Chokhvada village of Umarpada taluka and lowest PDI was observed in Hathoda village of Mangrol taluka with 0.00 to 9.50 per cent of Curvularia leaf spot disease.

In Narmada district, mean PDI was 18.86 per cent was recorded whereas, Kundimba village of Dediypada taluka of Narmada district, the highest PDI ranged from 00.00 to 31.30 per cent was recorded and the minimum PDI was observed in Chopadvav village of Sagbara taluka in the tune of 0.00 to 10.60 per cent. Overall, Curvularia leaf spot disease was observed during middle and the late stages of crop growth on the leaves of cotton plant (Table: 3, Fig. 1, Fig. 2).

Table 2. Survey of Curvularia leaf spot disease intensity in different villages under South Gujarat during the year 2024-25

Sr. No.	District	Taluka	Village	Variety/ Hybrids	GPS Location	PDI range (%)	Mean disease intensity (PDI) of Taluka
1.	Surat	Mangrol	Bhilvada	BG II	21.48°21'00"N 73.21°02'00"E	00.00-19.30	14.66
			Amkhuta	BG II	21.41°44'00"N 73.21°91'00"E	00.00-15.20	
			Hathoda	BG II	21.42°53'00"N 72.99°09'00"E	00.00-9.50	
		Olpad	Saroli	BG II	21.11°41' °N 72.53°41' °E	00.00-11.20	15.30
			Masma	BG II	21.17°46' °N 72.45°42' °E	00.00-16.50	
			Asnabad	BG II	21.19°35' °N 72.45°13' °E	00.00-18.20	
		Umarpada	Pinpur	BG II	21.44°54' °N 73.48°35' °E	00.00-22.60	22.40
			Umargot	BG II	21.43°73' °N 73.52°29' °E	00.00-11.50	
			Chokhvada	BG II	21.43°33' °N 73.54°79' °E	00.00-33.10	
District mean							17.45
2.	Bharuch	Valia	Chiklota	BG II	21.63°38' °N 73.31°46' °E	00.00-35.10	32.60
			Moriyana	BG II	21.64°89' °N 73.33°95' °E	00.00-30.50	
			Hirapor	BG II	21.35°22' °N 73.08°39' °E	00.00-32.20	
		Netrang	Netrang	BG II	21.38°24' °N 73.21°37' °E	00.00-33.10	31.90
			Kelvikuva	BG II	21.37°15' °N 73.21°23' °E	00.00-31.30	
			Kambodiya	BG II	21.36°12' °N 73.21°40' °E	00.00-26.30	
		Bharuch	Derol	BG II	21.46°06' °N 72.55°57' °E	00.00-32.80	33.43
			Kathodara	BG II	21.31°56' °N 72.53°45' °E	00.00-34.50	
			Nabipur	BG II	21.48°34' °N 73.01°50' °E	00.00-32.00	
District mean							32.64
3.	Narmada	Nandod	Chitrol	BG II	21.49°11' °N 73.26°30' °E	00.00-16.50	18.36
			Virsingpura	BG II	21.53°32' °N 73.39°07' °E	00.00-23.90	
			Akuwada	BG II	21.40°19' °N 73.08°09' °E	00.00-14.70	
		Dediypad	Jargam	BG II	21.55°23' °N	00.00-12.50	20.93

	a			73.61'88"E		17.30
		Kundiamba	BG II	21.52'36" °N 73.63'09"E	00.00-31.30	
		Ghankhetar	BG II	21.60'24" °N 73.59'77"E	00.00-19.00	
	Sagbara	Chopadvav	BG II	21.33'62" °N 73.44'60"E	00.00-10.60	
		Dudhaliver	BG II	21.33'13" °N 73.43'53"E	00.00-19.50	
		Amiyar	BG II	21.33'08" °N 73.45'12"E	00.00-21.80	
District mean						18.86

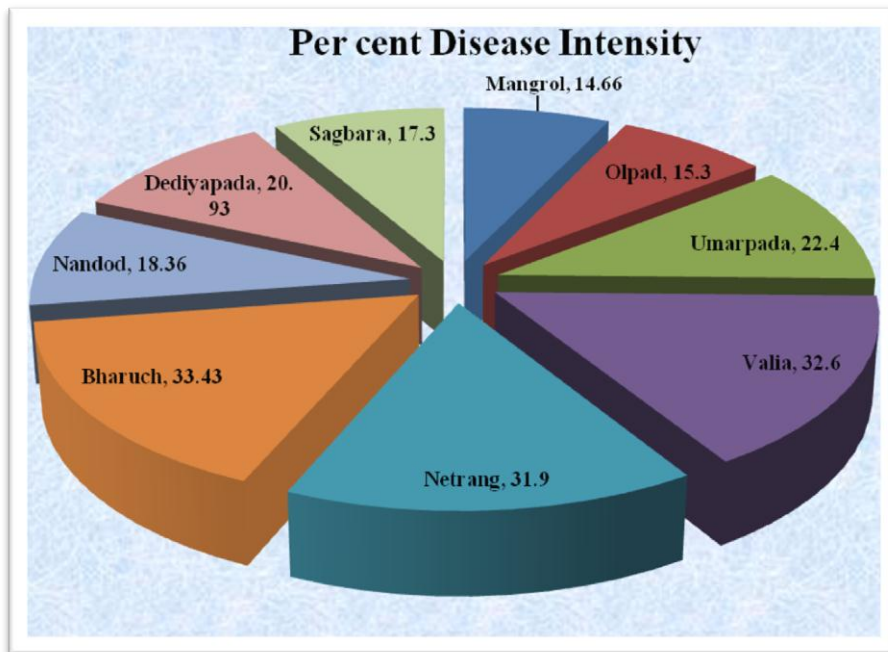


Fig. 1. Mean per cent disease intensity of *Curvularia* leaf spot of cotton in different taluka of South Gujarat during the year 2024-25

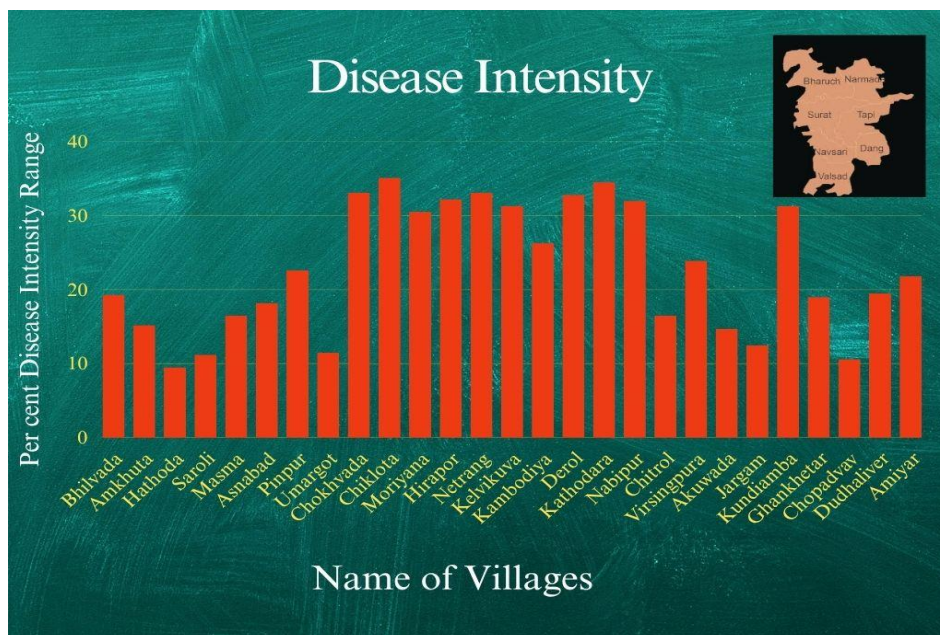


Fig. 2. Range of per cent disease intensity of *Curvularia* leaf spot of cotton in different villages of South Gujarat during the year 2024-25

Per cent Disease Incidence of Curvularia leaf spot Disease of Cotton

Data pertaining to the percentage of disease incidence of Curvularia leaf spot of cotton in three districts of South Gujarat are presented in Table: 3. It is evident from the data that the disease incidence prevails in all the cotton growing areas of South Gujarat with the incidence varying from 3.00 to 19.00 per cent at various locations surveyed. The maximum disease incidence 19.00 per cent was recorded at Hirapor village of Valia taluka of Bharuch district followed by 16.00 per cent at Derol village of Bharuch taluka and 14.00 per cent at Kelvikuva village of Netrang taluka of Bharuch district (Table: 3, Fig. 3, Fig. 4).

In Surat district, the maximum per cent disease incidence was recorded in Hathoda village with 12.00 per cent followed by Amkhuta village with 10.00 per cent of Mangrol taluka and Pinpur village with 10.00 per cent of Umapada taluka of Surat district, respectively.

In Narmada district, the highest 15.00 per cent disease incidence was observed in Chitrol village of Nandod taluka followed by Chopadvav village of Sagbara taluka with 13.00 per cent and 11.00 per cent in Kundiamba village of Dediypada taluka of Narmada district (Table: 3, Fig. 3, Fig. 4).

Among all the three districts surveyed, the highest Curvularia leaf spot mean disease incidence 12.33 per cent was recorded in Bharuch district followed by Narmada district with 8.00 per cent. In Surat

district, the lowest mean incidence 7.22 per cent disease was recorded (Table: 3).

The present work was more or less corroborate with the research findings reported by Singh (2006) carried out a roving survey on the severity of Curvularia leaf spot disease of cotton at Oilseed Research Farm, Kalyanpur, Kanpur of C.S. Azad University of Agriculture and Technology, Kanpur and farmers' fields. He reported that the disease severity ranged from 1.0 to 36.0 per cent. Shirsath *et al.* (2018) also reported the incidence of leaf spot disease on cotton caused by *Curvularia verruculosa* Ellis. The disease incidence and disease severity index (DSI) were 36.00 and 49.38 per cent, respectively. Jatwa *et al.* (2021) conducted an extensive and regular survey in the month of September for the two crops to record Curvularia leaf spot incidence. Distribution and prevalence of Curvularia leaf spot disease of maize was observed in the five districts viz., Udaipur, Chittorgarh, Bhilwara, Banswara and Dungarpur. In *kharif* 2017 and 2018, disease prevalence was ranged between 91.66 to 34.28 per cent in all the surveyed areas and the severity scale was in the tune of 1.50 to 8.00 which, indicates that the disease was present in traces to severe form in most of the surveyed areas. During the survey, leaf spot disease was found prevalent in the three major districts of Gujarat as Panchmahal, Dahod and Mahisagar. They revealed that Curvularia leaf spot (CLS) disease severity varied from 13.12 to 55.12 per cent.

Table 3. Survey of Curvularia leaf spot disease incidence in different villages of cotton under South Gujarat during the year 2024-25

Sr. No	District	Taluka	Village	Variety/ Hybrids	GPS Location	Total no of plant examined	Total no of infected plant	Per cent Disease Incidence (PDI) (%)	Mean disease Incidence of Taluka (%)
1.	Surat	Mangrol	Bhilvada	BG II	21.48'21''°N 73.21'02''°E	100	8	8.00	10.00
			Amkhuta	BG II	21.41'44''°N 73.21'91''°E	100	10	10.00	
			Hathoda	BG II	21.42'53''°N 72.99'09''°E	100	12	12.00	
		Olpad	Saroli	BG II	21.11'41''°N 72.53'41''°E	100	5	5.00	5.00
			Masma	BG II	21.17'46''°N 72.45'42''°E	100	3	3.00	
			Asnabad	BG II	21.19'35''°N 72.45'13''°E	100	7	7.00	
		Umapada	Pinpur	BG II	21.44'54''°N 73.48'35''°E	100	10	10.00	6.66
			Umargot	BG II	21.43'73''°N 73.52'29''°E	100	6	6.00	
			Chokhvada	BG II	21.43'33''°N 73.54'79''°E	100	4	4.00	
District mean									7.22
2.		Valia	Chiklota	BG II	21.63'38''°N 73.31'46''°E	100	11	11.00	14.00

	Bharuch		Moriyana	BG II	21.64'89" °N 73.33'95" °E	100	12	12.00	11.33			
			Hirapor	BG II	21.35'22" °N 73.08'39" °E	100	19	19.00				
		Netrang	Netrang	BG II	21.38'24" °N 73.21'37" °E	100	12	12.00				
			Kelvikuva	BG II	21.37'15" °N 73.21'23" °E	100	14	14.00				
			Kambodiy a	BG II	21.36'12" °N 73.21'40" °E	100	8	8.00				
		Bharuch	Derol	BG II	21.46'06" °N 72.55'57" °E	100	16	16.00		11.66		
			Kathodara	BG II	21.31'56" °N 72.53'45" °E	100	11	11.00				
			Nabipur	BG II	21.48'34" °N 73.01'50" °E	100	8	8.00				
		District mean									12.33	
		3.	Narmada	Nandod	Chitrol	BG II	21.49'11" °N 73.26'30" °E	100		15	15.00	8.00
Virsingpur a	BG II				21.53'32" °N 73.39'07" °E	100	4	4.00				
Akuwada	BG II				21.40'19" °N 73.08'09" °E	100	5	5.00				
Dediyapa da	Jargam			BG II	21.55'23" °N 73.61'88" °E	100	9	9.00	9.00			
	Kundiamb a			BG II	21.52'36" °N 73.63'09" °E	100	11	11.00				
	Ghankheta r			BG II	21.60'24" °N 73.59'77" °E	100	7	7.00				
Sagbara	Chopadvav			BG II	21.33'62" °N 73.44'60" °E	100	13	13.00	7.00			
	Dudhaliver			BG II	21.33'13" °N 73.43'53" °E	100	3	3.00				
	Amiyar			BG II	21.33'08" °N 73.45'12" °E	100	6	6.00				
District mean									8.00			

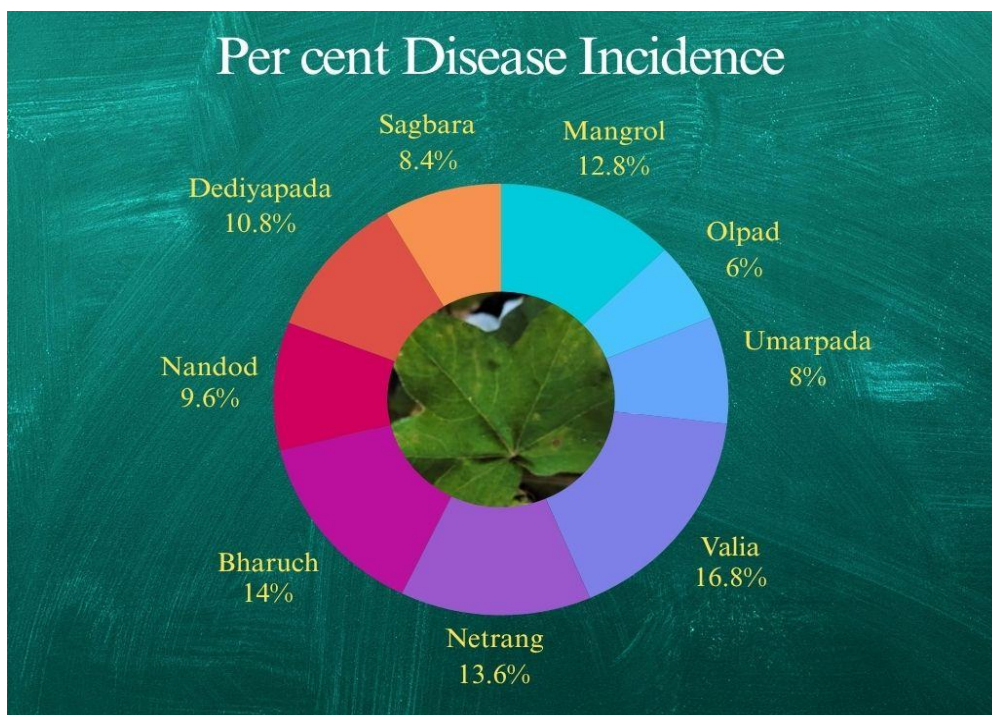


Fig. 3. Disease Incidence of Curvularia leaf spot of cotton in different talukas of South Gujarat during the year 2024-25

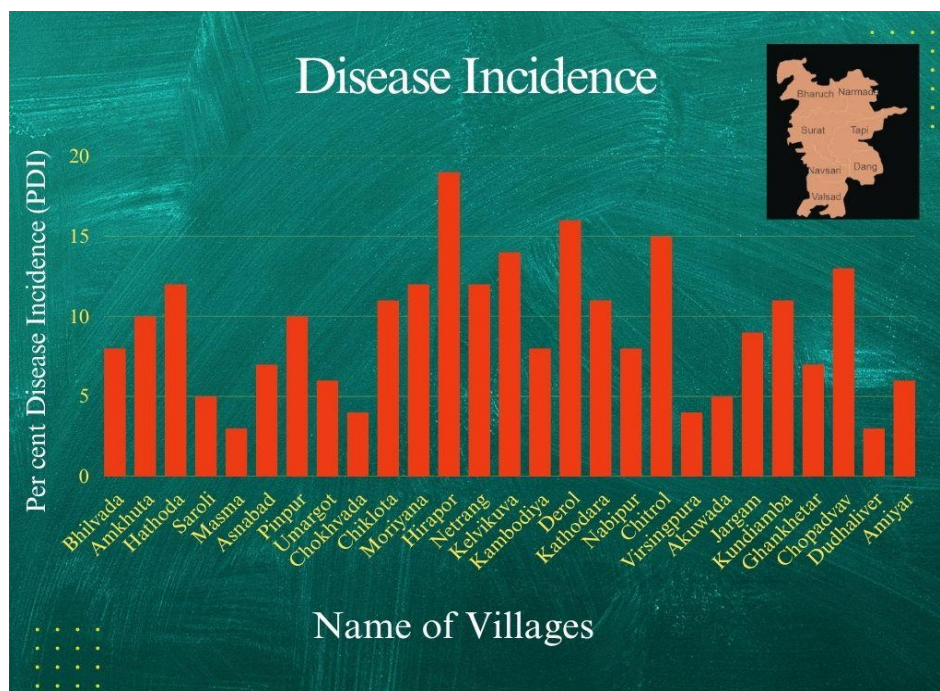


Fig. 4. Disease Incidence of Curvularia leaf spot of cotton in different talukas of South Gujarat during the year 2024-25

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