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SPATIAL VARIATION IN CHILLI ANTHRACNOSE INCIDENCE ACROSS MAJOR GROWING DISTRICTS OF TELANGANA, INDIA: A SYSTEMATIC FIELD SURVEY

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ABSTRACT

Chilli (*Capsicum annuum* L.) is an important spice and vegetable crop in India and contributes significantly to the agricultural economy of Telangana. However, chilli production is often affected by anthracnose, particularly fruit rot and die-back, caused by species of *Colletotrichum*. A field survey was conducted to assess the occurrence and variation in anthracnose incidence across five major chilli-growing districts of Telangana, namely Mulugu, Warangal, Mahabubabad, Bhupalapally and Khammam. Forty farmer fields, with eight fields surveyed in each district, were assessed under natural field conditions during the flowering and pod-formation stages. Disease incidence varied from 10.0% to 65.0%, with an overall mean of 47.98%. Among the districts surveyed, Mahabubabad recorded the highest mean disease incidence (55.38%), followed by Warangal (50.00%), Khammam (48.63%), Bhupalapally (45.75%) and Mulugu (40.13%). At the mandal level, Kuravi in Mahabubabad district recorded the highest mean incidence (57.50%), whereas the lowest mean incidence (33.00%) was recorded in Mulugu mandal. Among the varieties and hybrids represented by multiple field observations, Hanuman (60.00%), US-341 (57.50%), Yashawini (55.00%) and Warangal Chapata (53.33%) recorded relatively higher disease incidence. In contrast, Teja showed a comparatively lower and more consistent incidence (40.83%) across six surveyed fields. Continuous cultivation of chilli was common in most of the surveyed fields and may have favoured the build-up of disease inoculum. The survey showed that anthracnose is widely prevalent in the major chilli-growing areas of Telangana and that disease incidence varies considerably across locations and cultivated varieties or hybrids. The findings provide useful baseline information for developing location-specific disease-management strategies, selecting representative *Colletotrichum* isolates for further studies and identifying suitable locations and genotypes for multi-location screening for anthracnose resistance

Key words : Chilli anthracnose, *Colletotrichum truncatum*, Disease incidence, Spatial variation, Varietal response.

Introduction

Chilli (*Capsicum annuum* L.) is one of the most important spice and vegetable crops cultivated worldwide (Tripodi and Kumar, 2019). It is valued for its pungency (capsaicinoids), colour (carotenoids), flavour and nutritional content and forms an essential ingredient in the cuisines of Asia, Africa and Latin America (Topuz and Özdemir, 2007 and Simonovska *et al*., 2014). India is the largest producer, consumer and exporter of dry chillies. Within India, Telangana has emerged as a major production hub; in recent years the state has ranked among the top three in both area and production, contributing approximately 17% of the national area and more than 25% of national production of dry chilli (Lakshmi, 2022). The crop is cultivated predominantly

under rain-fed and irrigated conditions in the northern and central districts of the state, with Warangal, Khammam, Mahabubabad, Bhupalapally and Mulugu forming the core production belt (Arathi, 2020).

Despite its economic importance, chilli productivity in Telangana and elsewhere in India remains substantially below potential. Chilli production is constrained by a range of biotic and abiotic stresses (Sousheel *et al*., 2022; Poornima *et al*., 2019; Terrance *et al*., 2025; Agurla *et al*., 2026). Among biotic constraints, anthracnose-also referred to as fruit rot or die-back-caused by species of the fungal genus *Colletotrichum* is widely regarded as the most destructive disease of chilli in tropical and subtropical regions (Than *et al*., 2008 and Saxena *et al*., 2016). The disease affects leaves, stems and, most critically, developing and mature fruits (Ridzuan *et al*., 2018) Typical fruit symptoms include sunken, necrotic lesions that frequently bear concentric rings of acervuli; under humid conditions the lesions expand rapidly, rendering fruit unmarketable (Sharma and Chauhan, 2025). Die-back of twigs and branches further reduces plant productivity (Chethana *et al*., 2015). Pre- and post-harvest losses attributed to anthracnose commonly range from 10% to more than 50% and under epidemic conditions losses of 80–89% have been documented in Telangana (Ramesh *et al*., 2018 and Kavya *et al*., 2024). Such losses translate into substantial economic hardship for smallholder farmers who depend on chilli as a cash crop (Machala *et al*., 2022).

Multiple *Colletotrichum* species have been associated with chilli anthracnose worldwide (De Silva *et al*., 2019). In the Indian subcontinent, the dominant pathogen has historically been reported as *Colletotrichum capsici*, although recent multi-locus phylogenetic studies have revealed that several species within the *C. truncatum, C. gloeosporioides* and *C. acutatum* species complexes can cause anthracnose on chilli (Diao *et al*., 2017 and Jayawardena *et al*., 2021). Pathogen populations exhibit considerable morphological, cultural and pathogenic variability, which complicates both diagnosis and the development of durable management strategies (Delai *et al*., 2024). Variation in pathogenicity among *Colletotrichum* isolates collected from different locations in Telangana has been documented. It highlighting the importance of location-specific assessment of disease incidence and pathogen variability (Chowdary and R 2024).

Disease development is strongly influenced by prevailing environmental conditions. Warm temperatures (approximately 25–30°C), high relative humidity, prolonged leaf-surface wetness and frequent rainfall favour infection, completion of the latent period and secondary spread via rain-splash and wind-driven aerosols (Park *et al*., 2022). Host genotype, pathogen population structure, inoculum density and agronomic practices particularly continuous mono-cropping, residue retention and irrigation regime further influence epidemic intensity (Sastry and Zitter, 2013). Because *Colletotrichum* species survive readily on infected plant debris and can also be seed-borne, continuous chilli cropping promote inoculum accumulation and elevate disease risk in subsequent seasons (Atiq *et al*., 2022). The widespread practice of chilli monocropping in major production districts of Telangana may favour the persistence and intensification of anthracnose epidemics (Allam *et al*., 2022).

Previous surveys in Telangana have documented substantial spatial variation in anthracnose incidence. (Ramesh *et al*., 2018) assessed four major chilli-growing districts and reported mean disease incidences ranging from 35.54% in Rangareddy to 54.63% in Warangal, with incidence exceeding 56% in some mandals. More recent investigations have continued to record high disease pressure in Warangal, Khammam and adjoining areas, with field-level incidences occasionally surpassing 70% (Kavya *et al*., 2024 and Ashwini *et al*., 2025). These studies indicate that anthracnose remains widespread in chilli growing regions and that disease incidence varies considerably among locations, seasons and cultivars. However, systematic multi-district surveys that capture variation at the district, mandal, village and variety levels during a single economically critical crop stage, from flowering to pod formation, are still limited. Such contemporaneous, multi-scale information is important for identifying current disease hotspots, guiding the collection of representative pathogen isolates for pathogenicity and population studies, developing location-specific disease-management strategies, and establishing a quantitative baseline for monitoring future changes in disease pressure and evaluating the effectiveness of management interventions.

The present study was therefore undertaken with the following specific objectives: (1) to quantify chilli anthracnose incidence under natural field conditions across five major chilli growing districts of Telangana (2) to characterise spatial variation in disease incidence at the district, mandal and village levels (3) to assess patterns of disease incidence among the varieties and hybrids grown under field conditions and (4) to establish a comprehensive baseline dataset to support subsequent epidemiological, pathological and resistance-evaluation studies aimed at reducing the impact of anthracnose on chilli production in the region.

Materials and Methods

Survey area and sampling design

A systematic roving survey was conducted in five major chilli-growing districts of Telangana: Mulugu, Warangal, Mahabubabad, Bhupalapally and Khammam as shown in Fig. 1. These districts collectively represent the principal production belt of the state and encompass a range of soil types (black soils, moderate black soils and sandy clay loams), microclimates and production systems. Within each district, eight farmer fields were selected, yielding a total of 40 fields. Fields were selected to represent the diversity of varieties and hybrids, soil types, and cropping systems prevalent in each district, while considering the practical limitations of a single-season survey. The observations were conducted when the crop was predominantly at the flowering to early and mid-pod formation stages, which represent critical periods for anthracnose infection of reproductive tissues and developing fruits (Sri *et al*., 2026). This phenological window was deliberately selected because infection during this period can directly affect fruit set, fruit development and quality, while latent infections established during flowering may become symptomatic during fruit maturation or even after harvest.

Disease assessment protocol

In each field, disease incidence was assessed by examining plants along a representative diagonal transect or by stratified random sampling of plants across the field to ensure adequate coverage of spatial variation within the field. Typical anthracnose symptoms-sunken necrotic lesions on fruits, often accompanied by concentric rings of acervuli and die-back of twigs-were recorded. Percent disease incidence (PDI) was calculated as the proportion of plants showing symptoms relative to the total number of plants examined (Mayee and Datar, 1986).

PDI (%) = (Number of infected plants / Total number of plants observed) × 100

For each field, the following ancillary information was recorded: village, mandal, district, approximate area under chilli (acres), soil type, cropping system (mono-cropping or intercropping), method of crop establishment (transplanting), variety or hybrid name, crop stage and previous crop (or companion crop in intercropped systems). These variables provide essential context for interpreting variation in disease incidence and for identifying possible associations with agronomic practices.

Data organisation and analysis

Field level PDI values were summarized by calculating the minimum, maximum and arithmetic mean at the district, mandal, village and variety /hybrid levels. Because the survey was observational, varieties and hybrids were unequally represented and were grown under different combinations of location, soil, management practices and microclimatic conditions; therefore, no formal statistical tests were performed to assess varietal resistance or susceptibility. Accordingly, all reported means are descriptive and the results are interpreted as field-associated disease incidence rather than as definitive evidence of genetic resistance or susceptibility. This cautious interpretation is appropriate for a survey-based study and is consistent with standard practices in plant disease epidemiology. The complete 40-field observational

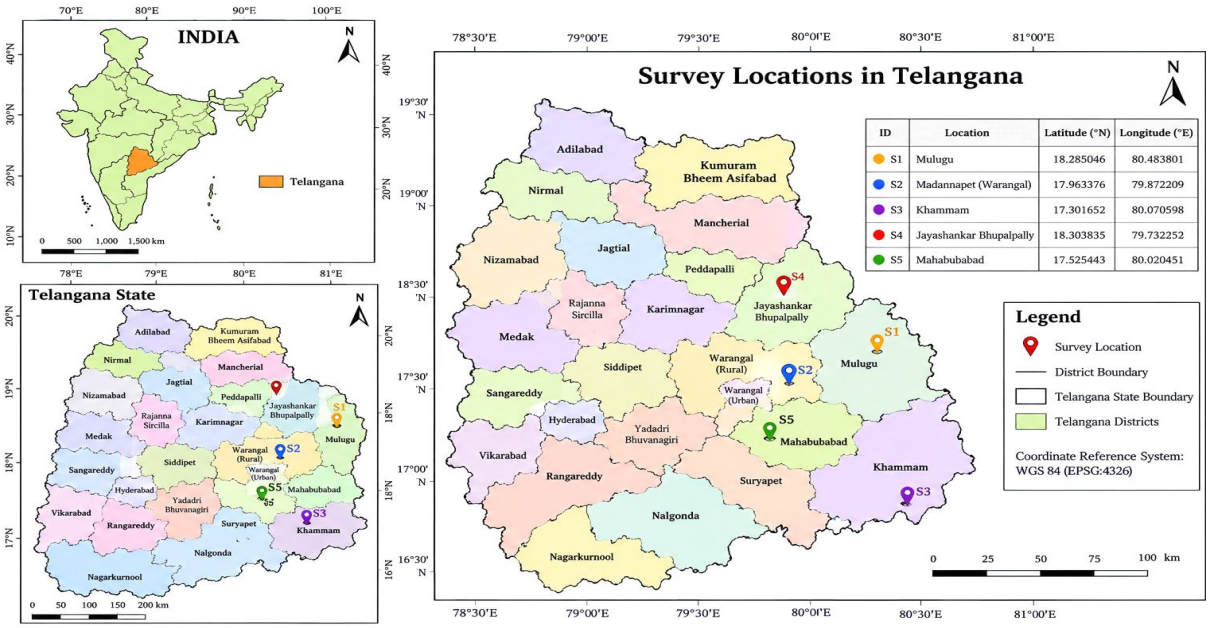


Fig. 1 : Spatial Distribution of the five Survey Locations used for Field Investigation.

dataset served as the primary data source and all summary tables presented in the results section were derived directly from this dataset.

Results

Overall and District-wise Disease incidence

Anthracnose was observed in all 40 surveyed fields across the five districts. Disease incidence ranged from 10.00% to 65.00%, with an overall mean of 47.98 ± 1.78% (SEM) and a coefficient of variation (CV) of 23.43%, indicating moderate to high variability in disease pressure across the surveyed production environments (Table 1). Among the districts, Mahabubabad recorded the highest mean incidence (55.38 ± 2.01%), followed by Warangal (50.00 ± 3.66%), Khammam (48.63 ± 2.44%), Bhupalapally (45.75 ± 2.27%) and Mulugu (40.13 ± 5.38%). The lowest CV was observed in Mahabubabad (10.26%), suggesting relatively consistent high disease pressure within that district, whereas Mulugu exhibited the highest CV (37.90%), reflecting wide field-to-field variation.

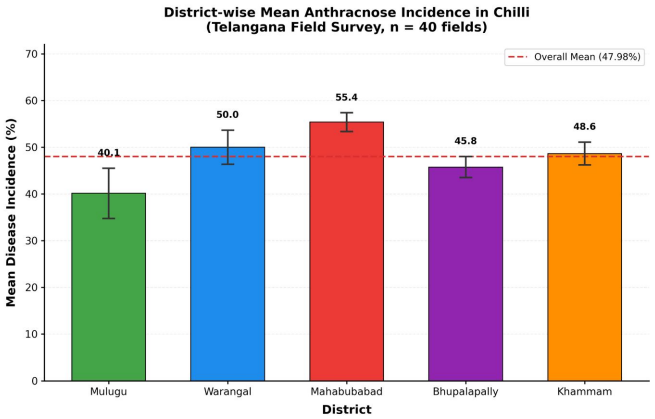


Fig. 2 : District wise mean Anthracnose incidence in Chilli.

Mandal- and Village-level variation

Substantial variation was also evident at the mandal and village levels (Table 2). Kuravi mandal

Table 1 : District-wise variation in chilli anthracnose incidence.

District	Fields (n)	Minimum (%)	Maximum (%)	Mean (%)	SD	SEM	CV (%)
Mulugu	8	10.00	56.00	40.13	15.21	5.38	37.90
Warangal	8	40.00	60.00	50.00	10.35	3.66	20.70
Mahabubabad	8	45.00	65.00	55.38	5.68	2.01	10.26
Bhupalapally	8	40.00	57.00	45.75	6.41	2.27	14.01
Khammam	8	35.00	56.00	48.63	6.89	2.44	14.17
Overall	**40**	**10.00**	**65.00**	**47.98**	**11.24**	**1.78**	**23.43**

Table 2 : Mandal- and village-wise incidence of chilli anthracnose under field conditions.

S. no.	District	Mandal	Village	n	Min (%)	Max (%)	Mean (%)
1	Mulugu	Etunagaram	Kamalapuram	2	30.00	40.00	35.00
2	Mulugu	Etunagaram	Royurr	2	50.00	55.00	52.50
3	Mulugu	Mulugu	Pathepalli	2	10.00	56.00	33.00
4	Mulugu	Mulugu	Ramchandrapuram-2	2	35.00	45.00	40.00
5	Warangal	Narsampet	Madanapeta	2	40.00	60.00	50.00
6	Warangal	Narsampet	Dasarapalli	2	40.00	60.00	50.00
7	Warangal	Nabelli	Narakapeta	2	40.00	60.00	50.00
8	Warangal	Nabelli	Kondauilapalli	2	40.00	60.00	50.00
9	Mahabubabad	Kuravi	Mogilicherlla	2	55.00	55.00	55.00
10	Mahabubabad	Kuravi	Meghya Thanda	2	55.00	65.00	60.00
11	Mahabubabad	Betholu	Malyala	2	55.00	58.00	56.50
12	Mahabubabad	Betholu	Betholu	2	45.00	55.00	50.00
13	Bhupalapally	Chityala	Chellagaria	2	45.00	57.00	51.00
14	Bhupalapally	Chityala	Julkal	2	42.00	45.00	43.50
15	Bhupalapally	Regonda	Ragayapally	2	40.00	42.00	41.00
16	Bhupalapally	Regonda	Regonda	2	40.00	55.00	47.50
17	Khammam	Thirumalayapalem	Kokireni	2	35.00	56.00	45.50
18	Khammam	Thirumalayapalem	Thirumalayapalem	2	50.00	56.00	53.00
19	Khammam	Khammam Rural	Arekodu	2	46.00	50.00	48.00
20	Khammam	Khammam Rural	Venkatayapallem	2	48.00	48.00	48.00

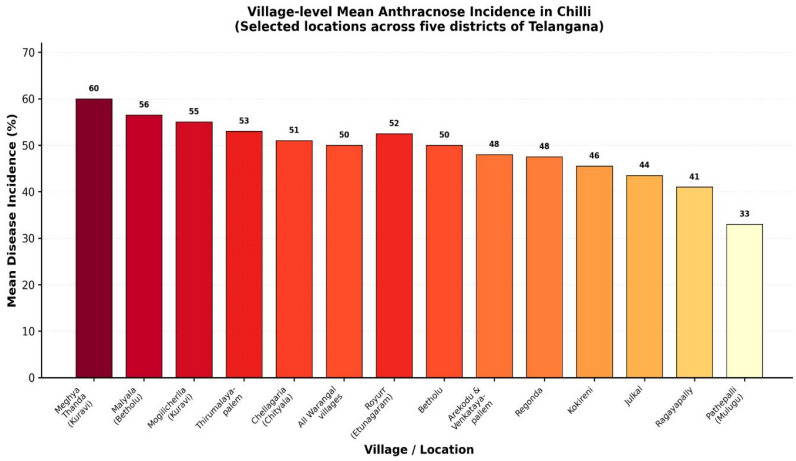


Fig. 3 : Village level mean Anthracnose incidence in Chilli.

recorded the lowest mean (33.00%), primarily because of the very low incidence (10%) observed in one field of Teja Semnesis-2222 at Pathepalli.

In Warangal, all four location groups (Madanapeta, Dasarapalli, Narakapeta and Kondauilapalli) showed identical mean incidence of 50.00%, indicating uniformly high disease pressure across the surveyed sites in this district.

Variety and hybrid-associated incidence

A total of 26 chilli varieties and hybrids were recorded across the 40 surveyed fields

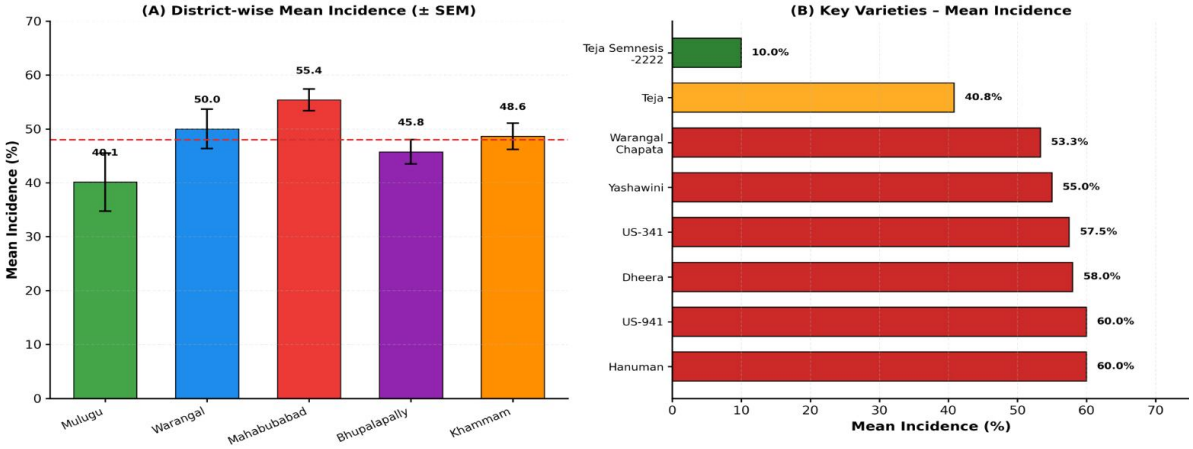


Fig. 4 : (A) District wise mean incidence **(B)** Key varieties mean incidence.

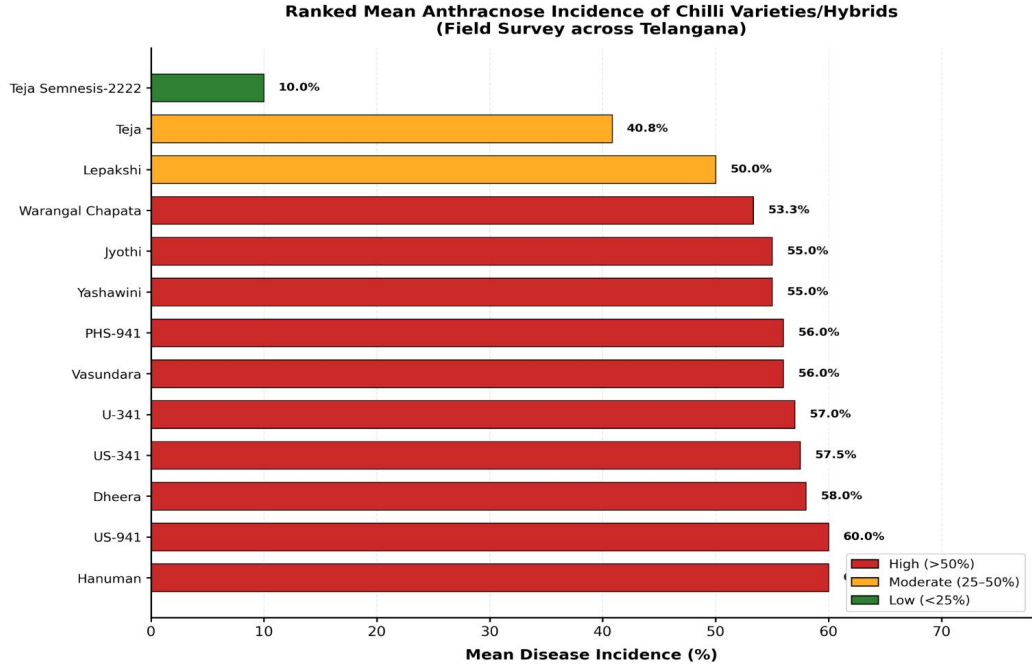


Fig. 5 : Ranked disease incidence among chilli varieties/hybrids.

(Mahabubabad) recorded the highest mean incidence (57.50%), driven largely by the high values at Meghya Thanda (mean 60.00%). In contrast, Mulugu mandal

(Table 3). Considerable variation in anthracnose incidence was observed among these genotypes under natural field conditions. Among the entries represented by more than

Table 3 : Variety/hybrid-wise variation in chilli disease incidence under field conditions.

S. no.	Variety/hybrid	No. of fields (n)	Minimum disease incidence (%)	Maximum disease incidence (%)	Mean disease incidence (%)
1	Warangal Chapata	3	40.00	60.00	**53.33**
2	Kaprika	1	30.00	30.00	30.00
3	Lepakshi	1	50.00	50.00	50.00
4	Jyothi	1	55.00	55.00	55.00
5	Teja Semnesis-2222	1	10.00	10.00	10.00
6	PHS-941	1	56.00	56.00	56.00
7	Red Eyes	1	45.00	45.00	45.00
8	Wonder Heart	1	35.00	35.00	35.00
9	Teja	6	40.00	45.00	40.83
10	US-941	1	60.00	60.00	60.00
11	US-341	2	55.00	60.00	57.50
12	Teja-341	1	40.00	40.00	40.00
13	Yashawini	4	55.00	55.00	55.00
14	Hanuman	2	55.00	65.00	60.00
15	Dheera	1	58.00	58.00	58.00
16	RR-66	1	45.00	45.00	45.00
17	U-341	1	57.00	57.00	57.00
18	VNR	1	42.00	42.00	42.00
19	Segment 341	1	45.00	45.00	45.00
20	Semenis 2222	1	42.00	42.00	42.00
21	Sarkar-22	1	35.00	35.00	35.00
22	Vasundara	2	56.00	56.00	56.00
23	Jamindar	1	50.00	50.00	50.00
24	Blazu	1	50.00	50.00	50.00
25	US-22	2	46.00	48.00	47.00
26	Thufan	1	48.00	48.00	48.00

one field, variety **Hanuman** recorded the highest mean disease incidence (60.00%; range 55–65%), followed by US-341 (57.50%; range 55–60%), Yashawini (55.00%) and Warangal Chapata (53.33%; range 40–60%). Vasundara and PHS-941 also showed high mean incidence (56.00%). In contrast, Teja the most widely cultivated variety in the survey (n = 6), exhibited a comparatively lower and more consistent mean incidence of 40.83% (range 40–45%). The lowest disease incidence (10.00%) was recorded in a single field of Teja Semnesis-2222 in Mulugu district.

Ranked disease incidence among chilli varieties

When varieties were ranked according to mean disease incidence (Table 4), ten genotypes fell into the High disease-response category (>50%) fifteen into the Moderate category (25–50%) and only one genotype (Teja Semnesis-2222) into the Low category (<25%). It should be noted that most varieties were represented by only one or two fields; therefore, the ranking reflects observed field-associated incidence rather than confirmed genetic resistance or susceptibility.

District-wise Disease incidence among Chilli Varieties/Hybrids

District-wise distribution of varieties further revealed clear spatial patterns. (High-incidence varieties such as Hanuman, Yashawini and Dheera were predominantly recorded in Mahabubabad, while US-941 and US-341 were mainly observed in Warangal. Teja variety was distributed across Warangal and Bhupalapally and consistently showed moderate incidence. The single low-incidence observation of Teja Semnesis-2222 was confined to Mulugu district.

Overall, the variety-level data indicate that several popular hybrids currently grown in Telangana are associated with high anthracnose pressure under field conditions, whereas Teja and Teja Semnesis-2222 showed relatively lower observed incidence. These findings provide useful leads for prioritising genotypes in future

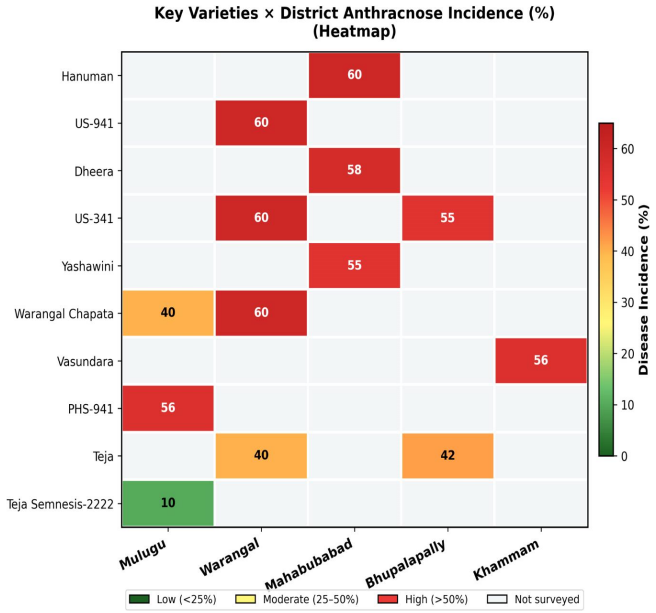


Fig. 6 : District-wise anthracnose incidence (%) among chilli varieties/hybrids (Heatmap).

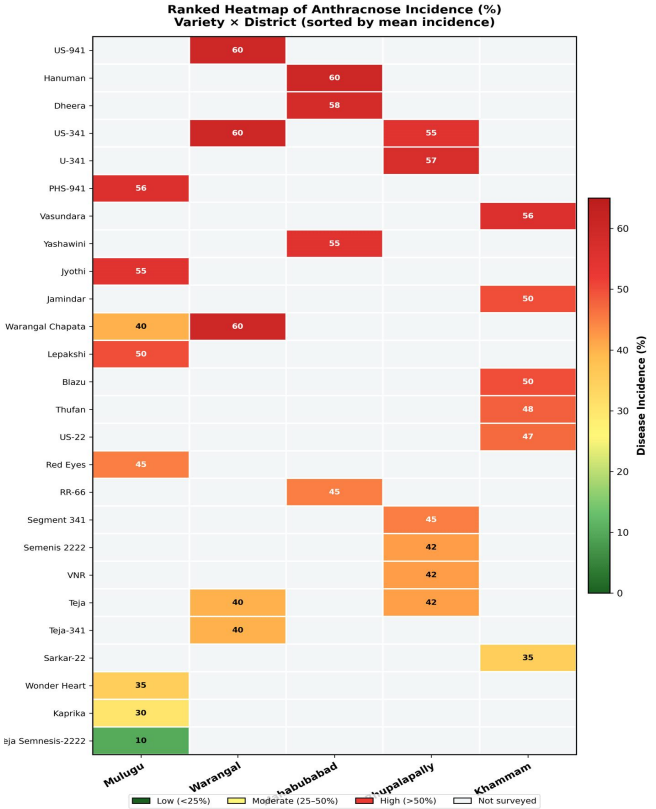


Fig. 7 : Ranked heatmap of anthracnose incidence (Variety × District).

resistance screening programmes.

Heatmap showing the spatial distribution of anthracnose disease incidence across five major chilli-growing districts of Telangana. Each cell represents the mean percent disease incidence (PDI) recorded for a particular variety or hybrid in a given district under natural

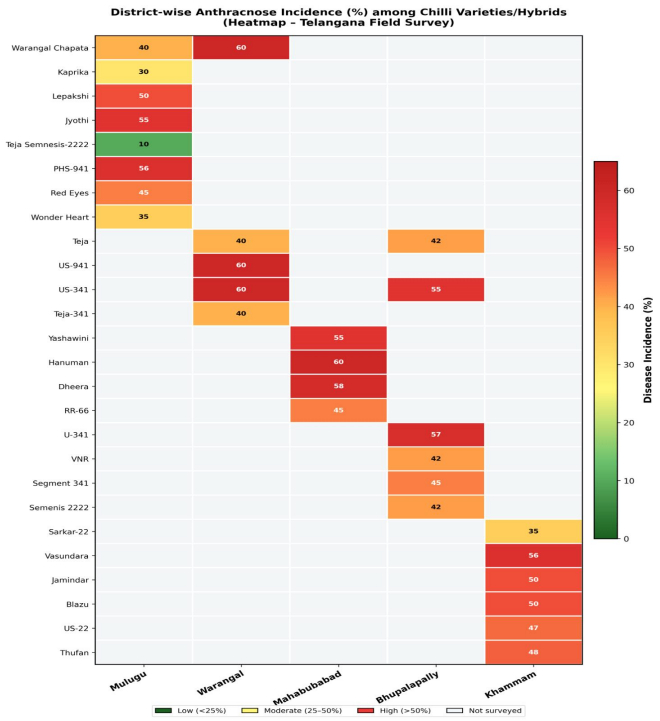


Fig. 8 : Key varieties × district anthracnose incidence heatmap. **Disease incidence (%) recorded under field conditions; blank cells indicate that the variety/hybrid was not surveyed in that district.

field conditions. Colour intensity corresponds to disease severity: green indicates low incidence (50%). Grey cells denote varieties that were not encountered in that district during the survey. Numerical values inside the cells represent the actual mean PDI (%).

The same dataset as Fig. 7, but varieties/hybrids are arranged in descending order of their overall mean disease incidence. This ranked presentation allows rapid visual identification of genotypes associated with consistently high disease pressure (top of the heatmap) versus those showing relatively lower incidence (bottom of the heatmap). The colour scale and interpretation remain identical to Fig. 7.

A focused heatmap highlighting the most frequently encountered and economically important varieties/hybrids. This condensed version is particularly useful for identifying genotype-by-location patterns of disease expression under farmer field conditions.

Discussion

The present survey demonstrates that chilli anthracnose remains a widespread and economically important constraint across the major chilli-growing districts of Telangana. The overall mean incidence of 47.98%, together with the high proportion of fields recording more than 40% disease incidence, is comparable with levels reported in earlier studies from

Table 4 : Ranked disease incidence among chilli varieties/hybrids surveyed under field conditions.

Rank	Variety/Hybrid	n	Mean disease incidence (%)	Range (%)	Disease-response category*
1	Hanuman	2	60.00	55–65	High
2	US-941	1	60.00	60–60	High
3	US-341	2	57.50	55–60	High
4	U-341	1	57.00	57–57	High
5	PHS-941	1	56.00	56–56	High
6	Vasundara	2	56.00	56–56	High
7	Dheera	1	58.00	58–58	High
8	Warangal Chapata	3	53.33	40–60	High
9	Yashawini	4	55.00	55–55	High
10	Jyothi	1	55.00	55–55	High
11	Lepakshi	1	50.00	50–50	Moderate
12	Jamindar	1	50.00	50–50	Moderate
13	Blazu	1	50.00	50–50	Moderate
14	Thufan	1	48.00	48–48	Moderate
15	US-22	2	47.00	46–48	Moderate
16	Red Eyes	1	45.00	45–45	Moderate
17	RR-66	1	45.00	45–45	Moderate
18	Segment 341	1	45.00	45–45	Moderate
19	VNR	1	42.00	42–42	Moderate
20	Semenis 2222	1	42.00	42–42	Moderate
21	Teja-341	1	40.00	40–40	Moderate
22	Teja	6	40.83	40–45	Moderate
23	Wonder Heart	1	35.00	35–35	Moderate
24	Sarkar-22	1	35.00	35–35	Moderate
25	Kaprika	1	30.00	30–30	Moderate
26	Teja Semnesis-2222	1	10.00	10–10	Low

the state (Ramesh *et al*., 2018 and Rao *et al*., 2020) reported a mean incidence of 54.63% in Warangal, which is comparable with the 50.00% recorded in the present survey, along with substantial disease incidence in other districts. More recent surveys have also reported high disease incidence in Warangal, Khammam and Mahabubabad, with individual fields occasionally showing incidence above 60–70% (Kavya *et al.*, 2024; Ashwini *et al.*, 2025). The consistency of disease incidence reported across different surveys, seasons and years indicates that anthracnose is a persistent disease problem in Telangana rather than an isolated or sporadic occurrence (Saini *et al.*, 2025) The observation of anthracnose in all 40 fields surveyed in the present study further supports its widespread occurrence across the major chilli-growing areas of the state.

Spatial variation at the district and mandal levels appears to be an important feature of chilli anthracnose incidence in Telangana. In the present study, Mahabubabad, particularly Kuravi and Malyala, and Warangal recorded relatively high disease incidence, whereas Mulugu showed greater variation among fields within the district. Such spatial variation may reflect differences in local environmental conditions, inoculum levels, cultivated varieties and crop-management practices. Anthracnose development is influenced by environmental factors such as temperature, humidity and leaf wetness, as well as by host and pathogen factors (Park *et al.*, 2022). Continuous chilli monocropping, which was observed in most of the surveyed fields, may also favour the persistence and accumulation of pathogen inoculum. *Colletotrichum* species can survive in infected crop residues, and repeated cultivation of chilli on the same land may provide a continuous host source that supports pathogen persistence and disease development (Sharma *et al.*, 2026). Thus, the widespread absence of crop rotation in the surveyed production systems may represent an important agronomic factor associated with the high disease incidence observed across the region (Su *et al*., 2026).

Variation in disease incidence among varieties and hybrids should be interpreted with caution. Although Hanuman, US-341, Yashawini and Warangal Chapata recorded relatively higher mean incidences, while Teja showed a comparatively lower and more consistent mean incidence, the survey design does not allow these differences to be attributed to host genotype alone. The same variety or hybrid showed different levels of disease incidence across locations. Likewise, Warangal Chapata recorded 40% incidence in Mulugu compared with 60% in Warangal, while US-341 recorded 60% in Warangal and 55% in Bhupalapally. These differences suggest that environmental conditions, pathogen populations and field-management practices may have contributed to the observed variation in disease incidence (Amente *et al*., 2026). Therefore, the present findings should be considered descriptive of disease incidence under the surveyed field conditions rather than as evidence for ranking genotypes for genetic resistance or susceptibility. Definitive assessment of varietal responses requires replicated, multi-location trials conducted under comparable agronomic conditions and, preferably, standardized pathogen pressure. Such evaluations would help clarify the relative contribution of host genotype and environmental factors to anthracnose

development (Ramesh *et al.*, 2020 and Kavya *et al.*, 2024). The timing of the survey during flowering and pod formation is biologically and economically important because infection of reproductive tissues and developing fruits can directly affect marketable yield and fruit quality. Latent infections established during this period may become symptomatic during fruit maturation or even after harvest, potentially contributing to post-harvest losses (Than *et al.*, 2008). The relatively high disease incidence recorded at this critical growth stage highlights the importance of protecting the crop during the early reproductive phase. Management measures, including appropriate fungicide applications, biological control and cultural practices, may therefore be most effective when implemented before or around the onset of flowering and early fruit development, rather than after substantial disease development has occurred (Kamble *et al.*, 2015 and Madhavan *et al.*, 2017).

From a practical disease-management perspective, the findings highlight several important priorities. First, continuous chilli monocropping should be avoided where feasible, and crop rotation with non-host crops may help reduce the carry-over of pathogen inoculum from infected crop residues (Su *et al.*, 2026). Second, the identification of areas with relatively high disease incidence, including Kuravi and selected locations in Warangal, Mahabubabad and Khammam, provides a basis for intensified disease surveillance, timely management interventions and the collection of representative pathogen isolates for further pathological and population studies (Madhavan *et al.*, 2017 and Loganathan *et al.*, 2015). Third, promising genotypes identified through rigorous replicated, multi-location evaluations under disease-prone conditions could contribute to integrated disease management programmes (Prasath and Ponnuswami, 2008; Tiwari *et al.*, 2024). In addition, effective management of infected crop residues and irrigation practices that minimise prolonged leaf wetness may complement chemical and host-based approaches. Overall, an integrated strategy combining cultural practices, timely chemical or biological interventions and, where available, genetically based resistance is likely to provide a more sustainable approach to managing chilli anthracnose than reliance on a single control measure.

Finally, the present study provides a contemporaneous, multi-scale baseline dataset that can be used to monitor future changes in disease pressure, assess the effects of disease-management interventions and identify priority locations for resistance-screening programmes. In the context of changing climatic conditions and increasingly intensive production systems, such baseline information provides an important foundation for evidence-based and adaptive disease management. Future research should build on these findings by (i) characterising the species composition and pathogenic variability of *Colletotrichum* populations from the high-incidence locations identified in the present survey (Chethana *et al.*, 2015 and Ramesh *et al.*, 2020); (ii) evaluating promising genotypes for anthracnose resistance through replicated, multi-location trials under comparable disease pressure (Prasath and Ponnuswami, 2008; Tiwari *et al.*, 2024); and (iii) evaluating integrated disease-management strategies that combine crop rotation, residue management, appropriately timed fungicide or biocontrol applications, and the use of less susceptible cultivars (Sharma *et al.*, 2005 and Madhavan *et al.*, 2017).

Conclusion

A systematic field survey of 40 farmer fields across five major chilli-growing districts of Telangana showed that anthracnose caused by *Colletotrichum* spp. is widespread, with substantial variation in disease incidence among locations. Disease incidence ranged from 10.0% to 65.0%, with an overall mean of 47.98%. Mahabubabad recorded the highest district mean incidence (55.38%), whereas Mulugu recorded the lowest (40.13%). At the mandal level, Kuravi recorded the highest mean incidence (57.50%). Among varieties and hybrids represented by multiple observations, Hanuman, US-341 and Yashawini recorded relatively higher mean incidence, whereas Teja showed a comparatively lower and more consistent incidence under the surveyed field conditions. Continuous chilli monocropping was prevalent across the surveyed fields and may favour the persistence and accumulation of pathogen inoculum. Overall, the findings highlight anthracnose as an important production constraint in the major chilli-growing areas of Telangana and provide a quantitative baseline for future epidemiological, pathological and resistance-evaluation studies. Location-specific disease surveillance and management, crop rotation, effective residue management, and replicated multi-location evaluation of promising genotypes under comparable disease pressure should be considered important priorities for reducing the impact of anthracnose on chilli production in the region.

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