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Survey for the assessment of severity of turcicum leaf blight in sorghum across major growing areas of North Karnataka

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Abstract
Sorghum (*Sorghum bicolor* [L.] Moench), popularly known as jowar, is one of the oldest cultivated cereal crop and serves as a major source of food, fodder and industrial raw material in many semi-arid regions of the world. However, the productivity and profitability of sorghum cultivation are severely constrained by several diseases, among which turcicum leaf blight, caused by *Exserohilum turcicum* (Pass.) Leonard and Suggs, is one of the most destructive foliar diseases. The disease initially appear as small water-soaked lesions on the lower leaves, which gradually enlarge into characteristic elongated spindle shaped or elliptical tan lesions surrounded by dark reddish-brown margins. Under highly favourable environmental conditions, these lesions coalesce, resulting in extensive leaf blighting, premature drying and early senescence of plants. During 2025-26, an intensive roving survey was conducted to assess the severity of turcicum leaf blight of sorghum in seven different districts of North Karnataka namely Vijayapura, Kalaburagi, Yadgiri, Raichur, Ballari, Koppal and Vijayanagara. The disease was observed in all the surveyed districts. The maximum per cent disease index (PDI) was observed in Yargal village of Sindagi taluk of (66.11 %), while the minimum PDI was observed in Amarapura village of Ballari taluk (20.90 %). The mean PDI of different districts revealed that Vijayapura had the maximum PDI of 43.81 per cent, whereas the minimum was observed in Kalaburagi with 26.47 per cent.

Keywords: *Exserohilum turcicum*, per cent disease index (PDI), sorghum, survey, symptoms

Introduction
Sorghum (*Sorghum bicolor* [L.] Moench) is an important cereal crop of semi-arid regions, particularly in Karnataka, where it is widely cultivated under rainfed conditions for grain and fodder. Despite its adaptability to drought and high temperatures, its productivity is affected by several diseases, among which turcicum leaf blight, caused by *Exserohilum turcicum*, is an important foliar disease. The disease is favoured by high humidity, prolonged leaf wetness and suitable temperatures, resulting in progressive leaf blighting and reduction of photosynthetically active leaf area (Karunakar *et al*., 1995) [2].

Considerable variation in disease severity and pathogenicity of *E. turcicum* has been reported across sorghum-growing regions, emphasizing the importance of regular disease surveillance and pathogen characterization (Bunker and Mathur, 2010; Mathur *et al*., 2011) [1, 4]. Previous surveys in Northern Karnataka have also reported considerable spatial variation in turcicum leaf blight severity (Shivani *et al*., 2024) [5]. Therefore, the present study was undertaken to assess the distribution and severity of turcicum leaf blight in major sorghum-growing areas of Northern Karnataka during 2025-26 and to identify disease-prone locations.

Materials and Methods
1. Study area and survey period
A roving survey was conducted during the *Kharif* and *rabi* seasons of 2025-26 in major sorghum-growing areas of Northern Karnataka. Seven districts, *viz.*, Vijayapura, Kalaburagi, Yadgiri, Raichur, Ballari, Koppal and Vijayanagara, were included in the survey. The surveyed region represents predominantly semi-arid sorghum production systems in which the crop is grown for grain and fodder.

2. Sampling strategy
Within each district, two important sorghum-growing taluks were selected. In each selected taluk, two villages were visited and two farmer fields were selected for observations wherever applicable. Fields ranging from seedling to grain-filling stages were considered. In each field, diseased plants were examined and approximately 5-6 symptomatic leaf samples were collected for further pathogen studies. Overall, 30 villages were covered during the survey.

3. Disease assessment
Ten plants were randomly selected from each farmer field and disease severity was assessed on lower, middle and upper leaves using the 1-9 rating scale described for sorghum leaf blight by Thakur *et al*. (2007) [6]. Ratings ranged from 1, representing negligible symptoms, to 9, representing more than 75 per cent leaf area affected by large coalescing lesions. The scale used in the source research record classified ratings 1-3 as resistant or highly resistant, 4-5 as moderately resistant, 6-7 as susceptible and 8-9 as highly susceptible.

4. Calculation of Per cent Disease Index

The disease ratings were converted into Per cent Disease Index (PDI) using the standard formula of Wheeler (1969) [7]:

PDI = [Σ individual disease ratings / (Number of observations × Maximum disease rating)] × 100

5. Disease symptomatology

During the survey, characteristic symptoms of the disease were recorded on leaves. Representative symptomatic plants leaves were photographed and carefully collected from fields, packed in polythene cover, labelled and brought to the laboratory for further examination.

6. Collection and preservation of diseased samples

Leaves showing characteristic turcicum leaf blight symptoms were collected from surveyed fields and labelled with the location and field information. Samples were surface sterilized with 70 per cent ethanol to reduce saprophytic contamination, rinsed in distilled water, dried at room temperature and stored at 4°C until required for further laboratory investigations.

Results and Discussion

1. Distribution of turcicum leaf blight in Northern Karnataka

Turcicum leaf blight was recorded in all seven districts surveyed during 2025-26, although the intensity of disease varied considerably among locations. The highest district-level value reported in the research record was 66.11 per cent for Vijayapura, followed by Vijayanagara (32.45 %), Ballari (32.18 %), Raichur (31.76 %), Yadgiri (31.54 %), Koppal (28.89 %) and Kalaburagi (26.47 %). The wide range among districts indicates substantial spatial heterogeneity in disease development. Such variation is consistent with earlier reports showing that leaf blight severity differs among locations and seasons in Karnataka (Yelgurty *et al*., 2019; Shivani *et al*., 2024) [5, 8].

The disease intensity observed in Vijayapura was particularly notable. Within the district, Yargal and Sindhagi rural recorded 66.11 and 65.5 per cent disease severity, respectively, while Mangoli and Ukkali recorded 49.44 and 48.88 per cent (Table 1. Fig. 1). The concentration of high disease values in these locations suggests that local environmental conditions, host background and cropping practices may have favoured disease development. However, causal relationships with individual weather variables cannot be established from the present survey alone because the supplied research record does not provide location-wise weather observations.

A- Water soaked lesions on leaves

B- Lesions enlarge and surrounded by reddish brown margins

C- Lesions covered by black to greyish colour spores

D- Blighting and drying of leaves

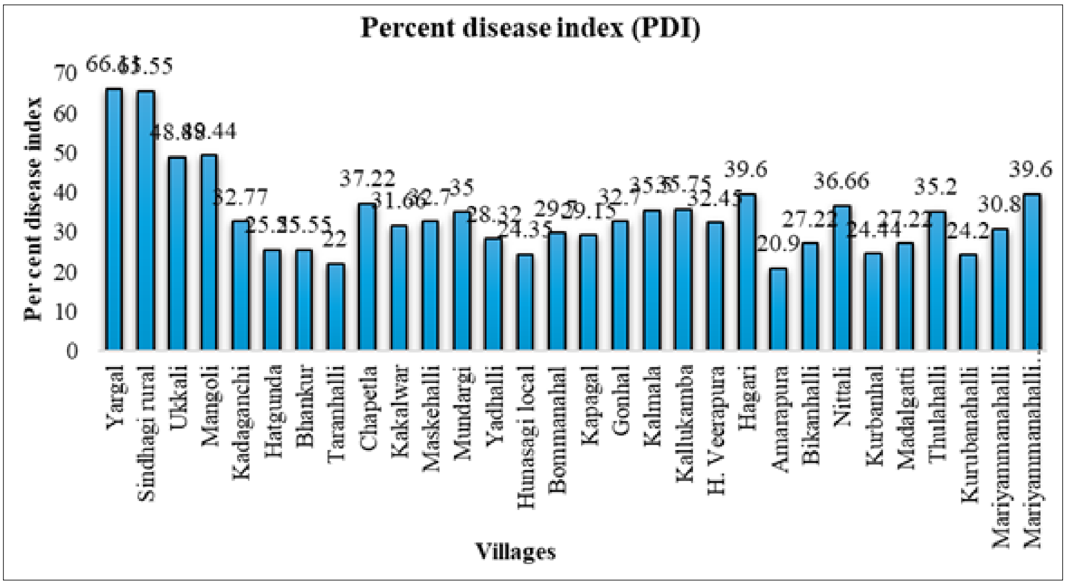

Fig 1: Status of turcicum leaf blight of sorghum in different villages of North Karnataka during 2025-26

Table 1: Status of turcicum leaf blight in major sorghum growing districts of North Karnataka during 2025-26

Sl. No	Districts	Taluks	Villages	Latitude	Longitude	Variety	Crop stage	Other diseases	Disease severity (%)
1.	Vijayapura	Sindhagi	Yargal	16.946854	76.291579	M35-1	Earhead formation	Rust, Anthracnose, Sooty stripes	66.11
			Sindhagi rural	16.910672	76.255638	M35-1	Earhead formation	Rust, Anthracnose, Sooty stripes	65.55
		Taluk mean							**65.83**
		Basavana Bagevadi	Ukkali	16.716224	75.893224	M35-1	Earhead maturity	Rust, Anthracnose, Sooty stripes	48.88
			Mangoli	16.694681	75.847986	M35-1	Earhead maturity	Rust, Anthracnose, Sooty stripes	49.44
		Taluk mean							**49.16**
		District mean							**57.50**
2.	Kalaburagi	Aland	Kadaganchi	17.411218	76.691638	M35-1	Seedling stage	Anthracnose	32.77
			Hatgunda	17.40295	76.701722	M35-1	Seedling stage	Anthracnose	25.55
		Taluk mean							**29.16**
		Shahabad	Bhankur	17.15865	76.93985	M35-1	Seedling stage	Anthracnose	25.55
			Taranhalli	17.20253	77.27298	M35-1	Seedling stage	Anthracnose	22.00
		Taluk mean							**23.78**
		District mean							**26.47**
3.	Yadgiri	Gurmitkal	Chapetla	16.873232	77.350209	Hybrid	Earhead formation	Rust, Anthracnose	37.22
			Kakalwar	16.892315	77.355358	Hybrid	Earhead formation	Rust	31.66
		Taluk mean							**34.44**
		Yadgiri	Maskehalli	16.774640	77.224189	M35-1	Preharvest stage	Rust	32.70
			Mundargi	16.774723	77.225493	M35-1	Seedling stage	Anthracnose	35.00
		Taluk mean							**33.85**
		Hunasagi	Yadhalli	16.540124	76.542113	M35-1	Preharvest stage	Rust, Anthracnose	28.32
			Hunasagi local	16.46664	76.534656	M35-1	Preharvest stage	Rust, Anthracnose	24.35
		Taluk mean							**26.34**
		District mean							**31.54**
4.	Raichur	Manvi	Bommanahal	16.084153	77.160675	Hybrid	Post earhead formation	Rust, Sooty stripes, Anthracnose	29.70
			Kapagal	16.051244	77.143593	Hybrid	Post earhead formation	Rust, Sooty stripes	29.15
		Taluk mean							**29.43**
		Raichur	Gonhal	16.201385	77.258758	Hybrid	Post earhead formation	Rust, Sooty stripes	32.70
			Kalmala	16.200177	77.242631	Hybrid	Post earhead formation	Rust	35.50

		Taluk mean							**34.10**
		District mean							**31.76**
5.	Ballari	Kurgodu	Kallukamba	15.344547	76.780823	Hybrid	Earhead maturity	Rust, Anthracnose	35.75
			H. Veerapura	15.410482	76.780658	Hybrid	Earhead maturity	Rust, Anthracnose	32.45
		Taluk mean							**34.10**
		Ballari	Hagari	15.137601	77.055650	Hybrid	Earhead maturity	Rust, Anthracnose, zonate leaf spot, sooty stripes, Grain mold	39.60
			Amarapura	15.142596	77.016232	Hybrid	Earhead maturity	Rust, Anthracnose	20.90
		Taluk mean							**30.25**
		District mean							**32.18**
6.	Koppal	Koppal	Bikanhalli	15.264028	76.028174	M35-1	Earhead maturity	Rust, Anthracnose	27.22
			Nittali	15.428181	76.021137	M35-1	Earhead maturity	Rust, Anthracnose	36.66
		Taluk mean							**31.94**
		Kushtagi	Kurbanhal	15.715532	76.201389	M35-1	Earhead maturity	Rust, Anthracnose	24.44
			Madalgatti	15.754023	76.167683	M35-1	Earhead maturity	Rust, Anthracnose	27.22
		Taluk mean							**25.83**
		District mean							**28.89**
7.	Vijayanagara	Kotturu	Thulahalli	14.701059	76.240548	Hybrid	Earhead formation	Anthracnose	35.20
			Kurubanahalli	14.698815	76.233488	Hybrid	Earhead maturity	Anthracnose	24.20
		Taluk mean							**29.70**
		Hospet	Mariyammanahalli	14.701059	76.240548	Hybrid	Prematurity stage	Anthracnose, Grain mold	30.80
			Mariyammanahalli Thanda	15.149568	76.357276	Hybrid	Prematurity stage	Anthracnose, Grain mold	39.60
		Taluk mean							**35.20**
		District mean							**32.45**

2. Variation among villages and taluks

Disease severity varied widely among surveyed villages, ranging from 20.90 per cent at Amarapura in Ballari district to 66.11 per cent at Yargal in Vijayapura district. Other locations with relatively high severity included Sindhagi rural (65.55 %), Mangoli (49.44 %), Ukkali (48.88 %), Hagarai (39.60 %), Mariyammanahalli Thanda (39.60 %), Chapetla (37.22 %) and Nittali (36.66 %). In contrast, relatively low values were recorded at Amarapura (20.90 %), Taranhal (22.00 %), Kurbanhal (24.44 %), Madalgatti (27.22 %) and Bikanahalli (27.22 %).

At the taluk level, Sindhagi recorded the highest mean disease severity (65.83 %), followed by Basavana Bagevadi (49.16 %), Hospet (35.20 %), Gurmitkal (34.44 %), Raichur (34.10 %), Kurgodu (34.10 %), Yadgiri (33.85 %), Koppal (31.94 %) and Ballari (30.25 %). Shahabad recorded the lowest mean disease severity (23.78 %), followed by Kushtagi (25.83 %), Hunasagi (26.34 %), Aland (29.16 %), Manvi (29.43 %) and Kotturu (29.70 %).

The observed spatial variability agrees with earlier Karnataka surveys. Yelgurty *et al*. (2019) [8] documented the occurrence of turcicum leaf blight in sorghum-growing areas of the Raichur region, while Shivani *et al*. (2024) [5] reported district and season-dependent variation in leaf blight severity in Northern Karnataka. Differences among locations may arise from the interaction of host genotype, pathogen population, crop stage and environmental conditions. Previous pathogenicity studies have demonstrated that *E. turcicum* isolates can differ in virulence and that sorghum genotypes can show differential reactions to isolates (Bunker and Mathur, 2010; Mathur *et al*., 2011) [1, 4].

3. Effect of crop growth stage on disease severity

Disease severity also varied with crop growth stage. In Vijayapura, the highest values were recorded at earhead formation at Yargal (66.11 %) and Sindhagi rural (65.55 %). Mangoli and Ukkali showed 49.44 and 48.88 per cent severity, respectively at earhead maturity. Chapetla in Gurmitkal recorded 37.22 per cent severity at earhead formation. The greater disease intensity observed during reproductive stages at several sites may reflect cumulative development of lesions and repeated infection cycles over the crop period.

Environmental conditions are important in determining the progress of *E. turcicum*. Controlled studies have shown that temperature and leaf wetness strongly influence leaf blight development with maximum disease development in susceptible sorghum genotypes occurring around 25°C under prolonged leaf wetness (Karunakar *et al*., 1995) [2].

4. Disease symptomatology

Turcicum leaf blight disease in sorghum primarily affects the photosynthetically active leaf area and consequently reduces plant vigour, grain filling and fodder quality. Initial symptoms appear as small water-soaked lesions on the lower leaves, which gradually enlarge into characteristic elongated spindle-shaped or elliptical tan lesions measuring 5 to 15 cm in length and 2 to 4 cm width, surrounded by dark reddish-brown margins. The conidia are olive grey to brownish, and spindle shaped with 1 to 9 septations. Under highly favourable environmental conditions, these lesions coalesce, resulting in extensive leaf blighting, premature drying and early senescence of plants (Plate 1). Similar symptomatic observations were also made by Khedekar *et al.* (2010) [3], Vinay and Sataraddi (2019).

Conclusion
Turcicum leaf blight caused by *Exserohilum turcicum* was widely distributed across the major sorghum-growing districts surveyed in Northern Karnataka during 2025-26, with marked variation in disease severity among districts, taluks and villages. The highest reported disease severity occurred at Yargal in Vijayapura district (66.11 %), whereas Amarapura in Ballari recorded the lowest value (20.90 %). Sindhagi recorded the highest taluk-level mean severity (65.83 %), while Shahabad recorded the lowest (23.78 %). Disease intensity was generally greater at earhead formation and maturity in several locations, indicating progressive disease development during crop growth. Initial symptoms appear as small water-soaked lesions on the lower leaves, which gradually enlarge into characteristic elongated spindle-shaped or elliptical tan lesions surrounded by dark reddish-brown margins. These lesions coalesce, resulting in extensive leaf blighting, premature drying and early senescence of plants. The identified high-disease areas can serve as priority sites for future epidemiological monitoring, pathogen isolation, pathogenicity assessment and resistance screening. Integrating field disease surveys with weather observations and morphological and molecular characterization of *E. turcicum* will provide a stronger basis for understanding disease dynamics and developing durable integrated management strategies.

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