

EVALUATION OF HOST RANGE DYNAMICS OF LEAF BLIGHT PATHOGEN (*EXSEROHILUM TURCICUM*) IN SORGHUM [*SORGHUM BICOLOR* (L.)] AND ASSOCIATED HOSTS

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SUMMARY

Leaf blight of sorghum caused by *Exserohilum turcicum* is an important disease affecting crop productivity. The present investigation was undertaken to determine the host range of the pathogen under controlled conditions. Five crop species were evaluated for their susceptibility through artificial inoculation. The results revealed that *E. turcicum* primarily infects members of the Poaceae family. Among the tested hosts, maize, *Sorghum halepense* and johnson grass exhibited susceptibility, showing typical leaf blight symptoms with variable latent periods. In contrast, wheat and oat remained symptomless and no pathogen could be re-isolated from inoculated tissues, confirming their non-host status. The findings indicate a restricted host range of *E. turcicum*, predominantly confined to certain grass species, which has important implications for disease management and crop rotation strategies.

Key words: *Exserohilum turcicum*, host range, latent periods, *Sorghum bicolor*, pathogen

Sorghum (*Sorghum bicolor* L. Moench) is an important cereal crop grown widely in tropical and subtropical regions. In India, it is cultivated during both *kharif* and *rabi* seasons. However, grain quality during *kharif* is often affected by rain, whereas *rabi* sorghum produces superior quality grain due to dry weather conditions (Kleih *et al.*, 2007). Globally, sorghum occupies about 40 million hectares with a production of 58-59 million tonnes (FAOSTAT, 2023). In India, it is grown on 3.81 million hectares with a production of 4.23 million tonnes, while in Gujarat it covers 0.04 million hectares with a production of 0.06 million tonnes (Anon., 2021-23).

Sorghum is well known for its drought tolerance and adaptability to diverse agro-climatic conditions, making it a staple crop for farmers in arid and semi-arid regions (ICRISAT, 2000; Anon., 2000). Despite its resilience, sorghum production is constrained by several biotic stresses, among which diseases play a major role.

Among the important diseases, turcicum leaf blight caused by *Exserohilum turcicum* is one of the most destructive foliar diseases of sorghum and maize.

The disease can cause yield losses exceeding 50 per cent under favorable conditions (Bergquist, 1986). It is characterized by elongated, tan lesions on leaves, which may coalesce and lead to extensive blighting. Susceptibility decreases with crop maturity (Frederiksen, 1980). The disease is favored by moderate temperature and high humidity.

Sorghum is often attacked by multiple pathogens during its growth, making diseases a major constraint to productivity (King and Mukuru, 1994). Turcicum leaf blight is widely distributed across major sorghum-growing regions including the United States, Argentina, Mexico and Israel (Edmunds and Zummo, 1975). In India, it has been reported from several states such as Madhya Pradesh, Rajasthan, Karnataka, Tamil Nadu and Andhra Pradesh (Durga, 2002). The disease was first reported by Butler (1918) and later by Mitra (1923).

The pathogen *E. turcicum* is a hemibiotrophic fungus that survives in infected crop debris and can also be seed-borne (Nobel and Richardson, 1968; Chidambaram *et al.*, 1973; Ahmed and Reddy, 1993). It produces conidia that spread through air and infect

host plants under favorable environmental conditions. The pathogen can infect several grass hosts including maize and johnson grass, indicating its survival across cropping systems. Its persistence is aided by chlamydospore formation (Shree and Luke, 1983) and disease severity is enhanced by monocropping, dense planting and low fertility (Ogolla *et al.*, 2019).

The disease reduces photosynthesis and disrupts normal plant growth, leading to significant yield losses, especially when infection occurs at early growth stages (Frederiksen, 1980; Frederiksen, 1982). Although the disease is well studied globally, information on its host range under Gujarat conditions is limited.

Understanding the host range of *E. turcicum* is essential for identifying alternate hosts and developing effective disease management strategies. Therefore, the present investigation was undertaken to study the host range of *E. turcicum* associated with sorghum.

MATERIALS AND METHODS

The experiment was conducted during the year 2023-24 at the research farm of Krushi Vigyan Kendra (KVK), Navsari Agricultural University (NAU), Waghai, Gujarat, India. A pathogenic culture of *Exserohilum turcicum* was established under laboratory conditions. The culture was maintained on PDA (Potato Dextrose Agar) media presented in figure 1 and used for artificial inoculation.

Healthy seeds of different host plants, namely sorghum (*Sorghum halepense*), maize (*Zea mays*), wheat (*Triticum aestivum*), oat (*Avena sativa*) and johnson grass (*Sorghum halepense*) were sown in pots under controlled conditions. Each pot contained five plants and the experiment was laid out with two replications.

At 28 days after sowing, plants were artificially inoculated by spraying a spore suspension (10^4) of *E. turcicum* uniformly on the foliage to ensure proper infection. After inoculation, plants were

maintained under favorable environmental conditions to promote disease development.

Observations Recorded

Latent Period: The latent period, defined as the time (in hours) between inoculation and the appearance of the first chlorotic or necrotic lesions, was recorded. Observations were initiated from the second day after inoculation and continued until symptom appearance.

Disease Severity: Disease severity was recorded 20 days after inoculation using a 1–5 disease rating scale (Table 1).

Host Reaction Classification: Based on the disease severity scores, host plants were classified into different reaction categories following the scale proposed by Bunker and Mathur (2006):

Resistant (R) : No visible symptoms, score 1.0–2.0

Moderately Resistant (MR) : Score 2.1–3.0

Susceptible (S) : Score 3.1–5.0

RESULTS AND DISCUSSION

The weeds, grasses and cultivated field crops found in and around the sorghum field were included in this study. The weeds and grasses were identified according Kaul (1986), Sharma and Nayital (1993), Dangwal *et al.* (2011).

The possibility of existence of hosts was studied. The results of disease reaction on different test hosts are presented in Table 2, Fig. 2 and it is confirmed that *E. turcicum* has a host range within the Poaceae family, primarily affecting maize, *Sorghum halepense* and johnson grass, as evident by the positive pathogen association and symptom development. Among these, maize exhibited the shortest latent period (96-120 hours), indicating its high susceptibility and suitability for rapid disease development. In contrast, *Sorghum halepense* and johnson grass, although

TABLE 1
Disease Rating Scale of *Exserohilum turcicum*

Score	Leaf area infected (%)	Description
0	0	No visible symptoms
1	1–10	Few small, scattered lesions
2	11–25	Small elongated lesions with limited spread
3	26–50	Typical elongated lesions with moderate spread
4	51–75	Large coalescing lesions with extensive blighting
5	>75	Severe blighting and drying of leaves

TABLE 2
Susceptibility of different weed and cultivated field crops to *E. turcicum*

No.	Host plant	Family	Association of pathogen	Latent Period (Observation in hours)	Host classification
1	<i>Sorghum halepense</i>	Poaceae	+	120-144 hours (5-6 days)	Susceptible
2	Maize	Poaceae	+	96-120 hours (4-5 days)	Susceptible
3	Wheat	Poaceae	-	-	Resistance
4	Oat	Poaceae	-	-	Resistance
5	Johnsongrass	Poaceae	+	120-144 hours (5-6 days)	Susceptible

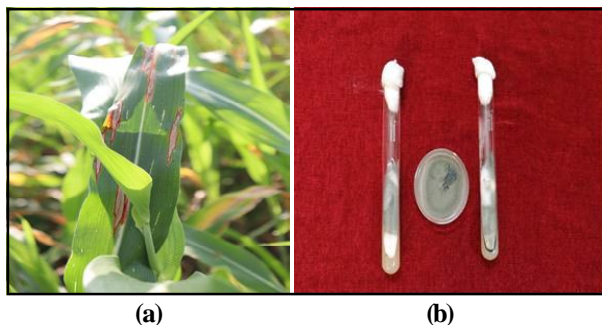


Fig. 1. (a) Diseased plant exhibiting symptoms of Turcicum leaf blight and (b) pure culture of *Exserohilum turcicum*, the causal pathogen.



Fig. 2. Susceptibility of different weed and cultivated field crops to *E. turcicum*. (a) Johnson grass (b) *Sorghum Halepense* (c) Maize (d) Oat (e) Wheat.

susceptible, showed a longer latent period (120–144 hours), suggesting they act more as alternate or collateral hosts. Wheat and oat showed no symptom expression and no detectable pathogen association, confirming their non-host (resistant) status under the experimental conditions.

CONCLUSIONS

The results of disease reaction on different test hosts are confirmed that *Exserohilum turcicum* has a host range within the Poaceae family, primarily affecting maize, *Sorghum halepense*, and Johnson

grass, as evident by the positive pathogen association and symptom development.

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