



Plant Archives

Journal homepage: <http://www.plantarchives.org>

DOI Url : <https://doi.org/10.51470/PLANTARCHIVES.2026.v26.supplement-1.357>

EVALUATION OF *CAPSICUM* ACCESSIONS FOR RESISTANCE TO GREEN CHILLI ANTHRACNOSE (*COLLETOTRICHUM SCOVILLEI*)

Karishma Pasupula¹, Sandeep Kumar G.M.², Sriram S.², Madhavi Reddy K.¹, Smaranika Mishra¹, Manoj B.P.¹, Maheebub Shaik¹, Sai Timmarao K.³ and Naresh P.^{1*}

¹Division of Vegetable Crops, ICAR-Indian Institute of Horticultural Research, Bengaluru, Karnataka, India.

²Division of Crop Protection, ICAR-Indian Institute of Horticultural Research, Bengaluru, Karnataka, India.

³Department of Vegetable Science, College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot, Karnataka, India.

*Corresponding author E-mail: nashhorti@gmail.com

(Date of Receiving : 23-10-2025; Date of Acceptance : 02-01-2026)

ABSTRACT

Anthrachnose, caused by *Colletotrichum* species, poses a significant threat to global chilli production, resulting in substantial yield losses. In recent years, anthracnose in green chilli caused by *Colletotrichum scovillei* has emerged as a serious concern. This study evaluated twenty *Capsicum* accessions *C. annuum*, *C. chinense*, *C. frutescens*, and *C. baccatum* by artificial inoculation of *C. scovillei* IHR-GCA Chelur isolate using pin-prick and non-prick inoculation methods. Disease severity was assessed based on lesion length, lesion width, lesion area (cm²), and per cent lesion area (PLA). Among the evaluated accessions, *C. annuum* and *C. frutescens* exhibited high susceptibility with extensive lesion development, while *C. chinense* showed moderate resistance under pin-prick and non-prick inoculation methods. Notably, *C. baccatum* accession PBC81 exhibited restricted lesion development, with PLA values ranging from only 0.12% (non-prick) to 3.42% (pin-prick). Principal component analysis confirmed distinct clustering among species, with *C. baccatum* emerging as the most resistant. The resistance of PBC81 was further validated in a second season (2024), confirming its stability across years. These findings highlight PBC81 as a valuable genetic resource for breeding programs, suggesting its resistance can be introgressed into *C. annuum* backgrounds to develop anthracnose-resistant chilli cultivars.

Keywords: Anthracnose, Capsicum, *Colletotrichum scovillei*, Disease resistance, Genetic resources.

Introduction

Chilli is a major vegetable and spice crop that is grown all over the world in tropical and subtropical regions. India, green and dry chillies have substantial annual production with green chillies and dry chillies cultivated over 433,000 ha and 850,000 ha, respectively, yielding 4,583,000 metric tons (MT) and 2,060,000 MT (NHB, 2023).

Various biotic stresses make chilli cultivation highly challenging, and the production is seriously threatened by fungal diseases, especially anthracnose (also known as dieback or fruit rot), which is spread by the *Colletotrichum* species resulting in substantial pre- and post-harvest losses (Pakdeevaporn *et al.*, 2005;

Mahasuk *et al.*, 2009). The most common pathogenic ones are *C. truncatum* (syn *C. capsici*), *C. gloeosporioides*, *C. scovillei* (a member of the *C. acutatum* species complex) being the most prevalent (Shin *et al.*, 2025). *C. acutatum* and *C. gloeosporioides* infect green and red ripe fruits, whereas *C. capsici* mostly infects ripe fruits. (Than *et al.*, 2008). On mature green chilli fruits, *C. scovillei* produces distinctive sunken patches with concentric rings that range in color from gray-brown to black (Caires *et al.*, 2014).

Globally, *Colletotrichum scovillei* was first reported in Brazil (Caires *et al.*, 2014) and is now recognized as one of the most aggressive

Colletotrichum species infecting chilli in several Asian countries (Oo *et al.*, 2017; de Silva *et al.*, 2019). In India, outbreaks of *C. scovillei* were first observed in 2019 at ICAR-IIHR, Bengaluru, and later in other regions (NICRA, 2020). Earlier Indian studies primarily focused on *C. capsici* or *C. acutatum*, identifying resistance in *C. annuum*, *C. chinense*, and *C. baccatum*. However, resistance effective against these species has shown inconsistent performance against *C. scovillei*, suggesting pathotype-specific host–pathogen interactions. Hence, reassessment of resistance sources against *C. scovillei* is essential.

The present study was undertaken to systematically evaluate diverse Indian *Capsicum* germplasm, including interspecific derivatives, against a characterized *C. scovillei* IIHR-GCA Chelur isolate, with the objectives of screening for resistance, identifying highly resistant and stable accessions, and providing potential donor lines for breeding *C. scovillei*-resistant cultivars in India.

Materials and Methods

Plant material and fungal pathogen

Mature green fruits of *Capsicum* species were collected from field-grown plants of: *C. annuum* (25–35 days after flowering, DAF), *C. chinense* (35–45 DAF), *C. frutescens* (40–50 DAF), and *C. baccatum* (40–50 DAF). A total of twenty *Capsicum* accessions, including ten accessions of *C. annuum*, four of *C. chinense*, five of *C. frutescens*, and one of *C. baccatum* (Table 1) along with ‘Arka Lohit’ as a susceptible check (Mishra *et al.*, 2019), were selected for anthracnose resistance screening.

A highly virulent isolate of *Colletotrichum scovillei* IIHR-GCA Chelur isolate (GenBank accession no. PX504203) which was identified using GAPDH primers and maintained in the Division of Crop Protection, IIHR, Bengaluru was used for resistance screening. The isolate was maintained by periodic culturing and incubated at 28°C ± 2°C on potato dextrose agar (PDA). The screening was carried out in two consecutive seasons. In the first season (August 2023), twenty *Capsicum* accessions were evaluated for resistance against *C. scovillei*. In the second season (September 2024), the resistant genotype identified in the first season (*C. baccatum* accession PBC81) was re-evaluated using the same inoculation protocol to confirm the stability of its resistance reaction. The experiment followed a completely randomized design (CRD) with three replications per accession per inoculation method to ensure statistical reliability.

Resistance evaluation

Mature green chili fruits were surface sterilized by removing the calyx and immersing the fruits in 1% (w/v) sodium hypochlorite for one minute, followed by two rinses with sterile distilled water and drying with sterile paper towels. A spore suspension of *C. scovillei* (IIHR-GCA Chelur isolate), prepared from actively growing cultures on PDA incubated at 28 °C, was used as the inoculum. Conidial suspensions were adjusted to a concentration of 10⁵ spores mL⁻¹, and 5 µL droplets were applied at the designated inoculation sites on five fruits per accession using both the pin-prick (PP) and non-prick (NP) methods. Sterile distilled water served as the control, following the protocol described by Yoon *et al.* (2003). The inoculated fruits were incubated at 25±1°C under a 12-hour light/dark cycle in a humid chamber (>90% RH), maintained using moistened paper towels inside acrylic boxes (20 × 30 × 10 cm).

Anthracnose symptoms were evaluated, and disease severity was assessed based on lesion development at the inoculation sites to facilitate the identification of resistant genotypes. Disease severity was recorded at 14 days after inoculation (DAI). The specific disease reaction for each genotype was classified using an empirical scale based on the percentage of lesion area (PLA) on fruits, following the approach described by Wheeler (1969). Genotypes were categorized into five disease reaction groups: resistant (R, 0.1-10%), moderately resistant (MR, 10.1-25%), moderately susceptible (MS, 25.1-50%), susceptible (S, 50.1-75%), and highly susceptible (HS, 75.1-100%).

Statistical analysis

The data collected on the parameters such as lesion length (LL), lesion width (LW), lesion area (LA), and percent lesion area (PLA) were analyzed using Multivariate analysis of variance (MANOVA) and Tukey's HSD post hoc tests in SPSS software v. 16.0. The data were examined for normality and homogeneity of variance. Principal Component Analysis (PCA) was performed using R Studio v. 4.3.1.

Results

Anthracnose severity across *Capsicum* accessions

The twenty *Capsicum* accessions evaluated using both pin-prick and non-prick inoculation methods showed significant differences with respect to disease development (Table 1, Fig. 1, Supplementary table S1, S2). Symptom development was observed at 3 days post-inoculation (dpi) on *C. annuum*, 5 dpi on *C.*

chinense, and 7 dpi on *C. frutescens*, while PBC81 (*C. baccatum*) exhibited restricted lesion development even after 14 dpi. Among the *C. annuum* accessions, IIHR-B-HP-58 was highly susceptible, with a lesion length of 10.32 cm and PLA of 97.66% under pin-prick method, followed by LCA657 (PLA 96.82%) and LCA334 (PLA 95.40%). IHR-B-HP-2451 and KA-2 showed relatively lower susceptibility, with PLA values of 54.82% and 53.12%, respectively.

In *C. chinense*, the accession Bhut Jolokia was highly susceptible under the pin-prick method, with a lesion area of 9.22 cm² and PLA of 90.93%. Other *C.*

chinense accessions, including Paprika Chapata and IIHR-B-HP-27, showed moderate resistance with lower PLA values.

All accessions of *C. frutescens* exhibited lower lesion development, with lesion areas ranging from 0.32 to 0.77 cm² under the pin-prick method, and PLA values below 80% suggesting the potential for partial resistance within this species.

C. baccatum accession PBC81 displayed highest resistance, showing minimal lesion development (PLA 3.42%) under the pin-prick method and restricted lesion formation under the non-prick method.

Table 1: Classification of *Capsicum* genotypes based on disease reaction and associated lesion size ranges following pin-prick and non-prick inoculation with *Colletotrichum scovillei*.

Reaction class	Accessions (PP)	PP PLA range (%)	Accessions (NP)	NP PLA range (%)
Resistant (R)	PBC81 (2023), PBC81 (2024)	0.99 – 3.42	PBC81 (2023), PBC81 (2024)	0.12 – 0.43
Moderately resistant (MR)	—	—	Bhut Jolokia, IIHR-B-HP-27, IIHR-B-HP-145, IIHR-B-HP-89, IIHR-B-HP-92, IHR-B-HP-2451	10.26 – 21.42
Moderately susceptible (MS)	ICPN11#7, IIHR-B-HP-27, IIHR-B-HP-145, IIHR-B-HP-95	42.25 – 49.32	ICPN11#, Mulato, Paprika chapatá, KA-2, IIHR-B-HP-95, IIHR-B-HP-41-1, IIHR-B-HP-16	30.80 – 46.30
Susceptible (S)	Pusa Jwala, IHR-B-HP-2451, KA-2, IIHR-B-HP-16, Paprika chapatá, IIHR-B-HP-89, IIHR-B-HP-92, IIHR-B-HP-41-1	52.63 – 74.19	Pusa Jwala, LCA334, IIHR-B-HP-16, IIHR-B-HP-30	50.54 – 55.00
Highly susceptible (HS)	ICPN11#, LCA657, LCA334, Mulato, IIHR-B-HP-58, Bhut Jolokia, IIHR-B-HP-30	75.06 – 97.66	LCA657	81.30

Effect of inoculation methods on lesion development

The inoculation method significantly influenced lesion development in *Capsicum* accessions infected with *C. scovillei* (Fig. 2, 3). The pin-prick method resulted in larger lesions and higher percent lesion area (PLA), indicating enhanced fungal penetration and infection. In contrast, the non-prick method showed smaller lesions, suggesting a slower infection process. Among the *C. annuum* accessions, IIHR-B-HP-58 and LCA657 displayed the most significant reduction in lesion size under the non-prick method (PLA dropped from ~97% to ~46% and 81%, respectively). Similarly, Bhut Jolokia (*C. chinense*) recorded lesion severity of 90.93% under the pin-prick method and 10.88% under the non-prick method. In comparison, *C. frutescens* accessions showed only slight variation in disease severity between the two inoculation methods. Notably, PBC81 (*C. baccatum*) displayed restricted lesion development under the non-prick method, confirming its strong resistance to *C. scovillei*. Across

all accessions, the pin-prick approach resulted in higher disease severity than the non-prick method, underscoring the significance wounding plays in promoting pathogen infection.

Validation of resistance in *C. baccatum* PBC81 across seasons

The resistance of PBC81 was consistent across both seasons. While the initial screening of 20 accessions in 2023 identified PBC81 as highly resistant, its validation in the 2024 season reconfirmed restricted lesion development (<5% PLA) under both inoculation methods. This reproducibility demonstrates that validation across seasons confirmed the stability of resistance in PBC81.

Variation in anthracnose response among *Capsicum* species

Principal Component Analysis (PCA) was performed to assess the variation in anthracnose disease severity among different *Capsicum* species

under both pin-prick (PP) and non-prick (NP) inoculation methods (Fig. 4). The PCA extracted four components with eigenvalues 2.609, 0.981, 0.471, and 0.041. Sampling adequacy was acceptable (KMO = 0.78). The PCA biplot explains 63.6% of the variation through PC1 and 23.9% through PC2. A scree plot (Supplementary Fig. S1) further supported retention of the first two components. PC1 showed strong positive loadings for LLAvg (0.449), LWAvg (0.481), LAAvg (0.590), and PLA (0.468), representing overall lesion size and disease severity. PC2 captured contrasting contributions between lesion dimensions, with LLAvg (0.594) loading positively and LWAvg (-0.643) negatively, indicating shape-based differences in disease expression.

The clustering patterns revealed distinct disease severity levels among the species. *C. annuum* exhibited the greatest within-species variation and clustered towards higher lesion values, confirming its susceptibility. *C. chinense* showed clear separation between NP and PP methods. *C. frutescens* displayed resistance, and *C. baccatum* demonstrated strong resistance. Notably, PBC81, particularly under the non-prick method, was distinctly separated from susceptible accessions, highlighting its high resistance.

Discussion

The evaluation of *Capsicum* accessions against *Colletotrichum scovillei* IIHR-GCA Chelur isolate revealed significant variability in resistance among species and genotypes. In our study, *C. baccatum* accession PBC81 demonstrated high resistance, with restricted lesion development under both pin-prick and non-prick methods. This aligns with previous reports by de Almeida *et al.* (2020), where *C. baccatum* genotypes were identified whereas our results show Bhut Jolokia as resistant to *Colletotrichum* isolates using multivariate analysis and hierarchical clustering. Montri *et al.* (2009) found PCc1 isolate can infect all species of *Capsicum* except *C. baccatum* to *C. capsici*. The mechanical basis of resistance in *C. baccatum* genotypes, has been attributed in earlier work to thicker cuticles, higher phenolic and capsaicinoid levels, and rapid hypersensitive responses, all of which impede pathogen penetration and limit lesion expansion (Mahasuk *et al.*, 2009; Montri *et al.*, 2009). These inherent anatomical and biochemical defenses may explain the minimal lesion development observed in PBC81. *C. annuum* accessions exhibited high

susceptibility, as evidenced by significant lesion areas, particularly in Pusa Jwala (9.56 cm² under the pin-prick method). However, the moderate tolerance observed in some *C. frutescens* accessions, including M29 and M63, suggests potential for intermediate resistance levels. Mahasuk *et al.* (2009) identified resistant chili genotypes against various *Colletotrichum* pathogens. Dwivedi *et al.* (2022) also reported variability in resistance among *C. chinense* landraces, with several Bhut Jolokia genotypes showing resistance to multiple *Colletotrichum* species. Mishra *et al.* (2017) identified resistant genotypes like Bhut Jolokia (*C. chinense*) against *C. truncatum* and *C. gloeosporioides*, in our study, Bhut Jolokia showed strong susceptibility under pin-prick inoculation (PLA 90.93%) but low lesion development under non-prick inoculation (PLA 10.88%), indicating that its reported resistance in earlier studies reflects strain- or method-specific responses. This discrepancy may stem from differences in environmental conditions, pathogen strains, or screening methods. Similarly, Oo *et al.* (2017) reported that all cultivars screened in Korea were susceptible to *C. scovillei*, highlighting regional variations in pathogen virulence and host resistance. Although interspecific barriers limit direct transfer of resistance from *C. baccatum* to *C. annuum*, successful introgression has been achieved in specific cases using embryo rescue, bridge crosses, and alien chromosome addition lines (Yoon & Park, 2006; Manzur *et al.*, 2015). Therefore, PBC81 may serve as a useful donor in targeted pre-breeding programmes where such advanced methods are applicable.

Conclusion

The present study revealed significant variability in anthracnose fruit rot resistance among *Capsicum* species and accessions. Across two seasons, *C. baccatum* accession PBC81 consistently exhibited strong resistance to *C. scovillei* (IIHR-GCA Chelur isolate), characterized by restricted lesion development under both inoculation methods. PCA further separated accessions into distinct resistance groups, supporting the stable performance of PBC81. The comparison of inoculation methods also quantified differences in lesion expression.

Overall, PBC81 stands out as a promising resistance source for incorporating durable anthracnose resistance into susceptible *C. annuum* lines through focused breeding programmes.



Fig. 1: Symptoms of anthracnose in *C. scovillei* with pin-prick and non-prick inoculation methods

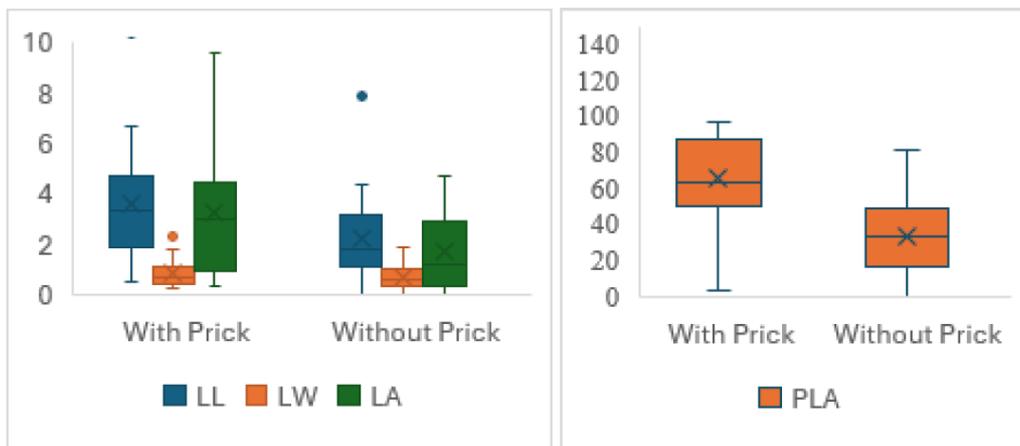


Fig. 2 : Effect of inoculation methods on lesion development in *Capsicum* Accessions under Pin-Prick and Non-Prick Inoculation Methods

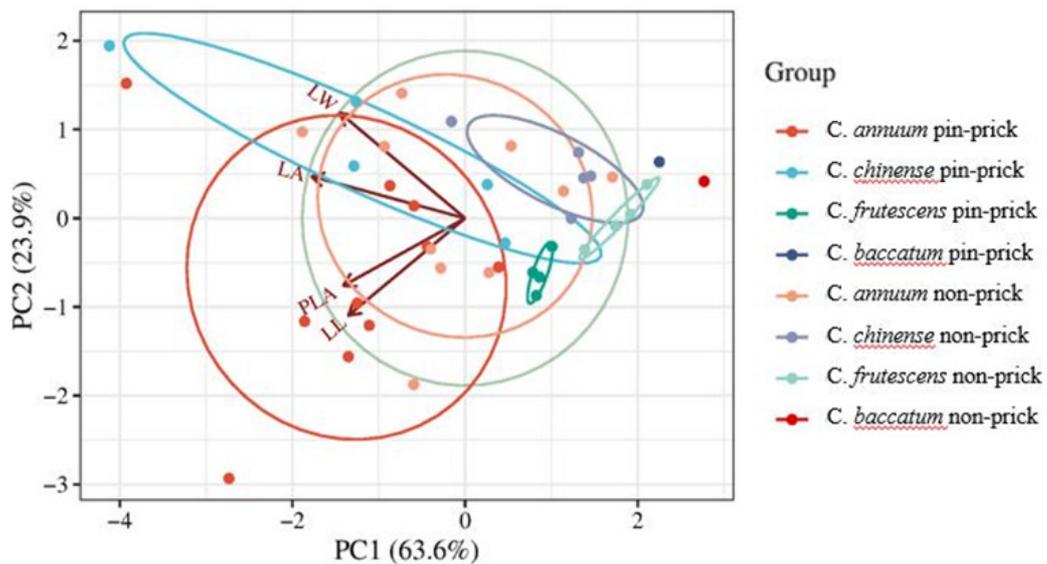
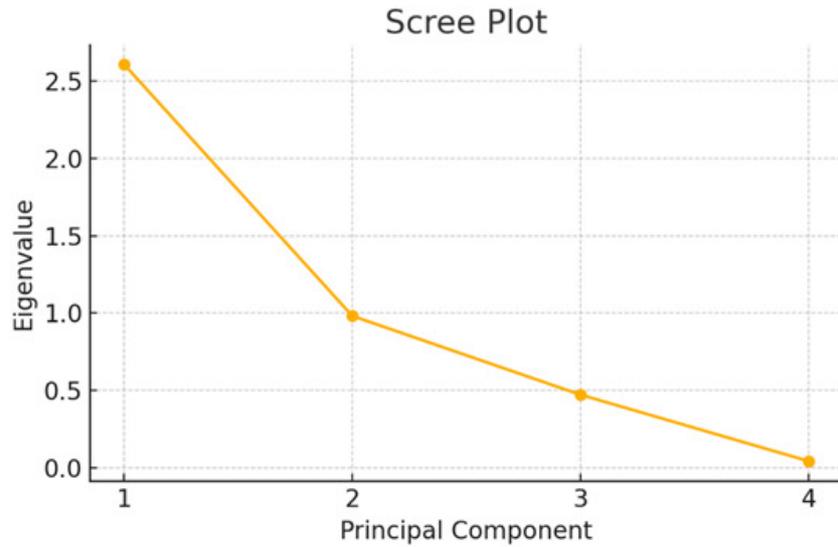


Fig. 3 : Principal Component Analysis of Lesion characteristics in *Capsicum* accessions



Supplementary Fig. S1. Scree plot showing eigenvalues of the four principal components.

Supplementary Table S1: Evaluation of *Capsicum* accessions for resistance to *Colletotrichum scovillei*.

S.No.	Accession Name	Anthracnose lesion development									
		Pin-Prick Method				Response	Non-Prick Method				Response
		LL (cm)	LW (cm)	LA (cm ²)	PLA (%)		LL (cm)	LW (cm)	LA (cm ²)	PLA (%)	
<i>C. annuum</i>											
1	Pusa Jwala	5.34 ± 0.72 ^q	0.74 ± 0.06 ^k	3.85 ± 0.48 ⁿ	73.27 ± 9.36 ^r	S	3.94 ± 0.22 ^q	0.76 ± 0.06 ⁿ	2.96 ± 0.24 ^q	53.87 ± 3.64 ^s	S
2	ICPN11#7	4.00 ± 0.58 ^m	1.12 ± 0.19 ^o	4.36 ± 1.11 ^p	42.32 ± 4.66 ^l	MS	2.44 ± 0.45 ^m	1.56 ± 0.22 ^r	4.28 ± 1.38 ^s	33.82 ± 6.90 ^l	MS
3	ICPN11#	4.78 ± 1.06 ^p	2.29 ± 0.39 ^s	9.57 ± 1.36 ^u	75.06 ± 7.37 ^s	HS	3.44 ± 0.50 ^p	1.30 ± 0.08 ^p	4.68 ± 0.90 ^t	39.27 ± 8.49 ^o	MS
4	LCA657	5.44 ± 0.72 ^r	0.88 ± 0.21 ^m	4.10 ± 0.46 ^o	96.82 ± 1.20 ^u	HS	2.72 ± 0.69 ⁿ	1.90 ± 0.27 ^s	4.24 ± 0.17 ^r	81.30 ± 5.00 ^u	HS
5	LCA334	4.34 ± 0.22 ^o	0.66 ± 0.06 ^l	2.91 ± 0.37 ^k	95.40 ± 1.90 ^t	HS	3.28 ± 0.07 ^o	0.50 ± 0.06 ⁱ	1.65 ± 0.22 ^l	55.00 ± 7.16 ^t	S
6	IHR-B-HP-2451	3.00 ± 0.38 ^k	0.50 ± 0.05 ^g	1.46 ± 0.23 ^g	54.82 ± 8.25 ^j	S	1.06 ± 0.09 ^e	0.50 ± 0.07 ⁱ	0.51 ± 0.04 ^g	16.82 ± 1.34 ^f	MR
7	Mulato	1.24 ± 0.14 ^d	1.24 ± 0.10 ^p	1.58 ± 0.28 ⁱ	96.00 ± 3.57 ^s	HS	1.16 ± 0.03 ^f	0.65 ± 0.03 ^j	0.75 ± 0.55 ^h	37.79 ± 2.41 ⁿ	MS
8	KA-2	4.00 ± 0.92 ^m	0.78 ± 0.05 ^l	3.05 ± 0.65 ^l	53.12 ± 10.23 ^j	S	1.60 ± 0.24 ^h	1.05 ± 0.15 ^o	1.77 ± 0.33 ^m	32.97 ± 6.95 ^k	MS
9	IIHR-B-HP-16	6.64 ± 0.44 ^t	0.55 ± 0.06 ^h	3.72 ± 0.58 ^m	74.19 ± 6.07 ^q	S	4.34 ± 0.18 ^r	0.64 ± 0.06 ^m	2.80 ± 0.40 ^p	50.54 ± 5.65 ^r	S
10	IIHR-B-HP-58	10.32 ± 0.27 ^u	0.46 ± 0.04 ^f	4.75 ± 0.50 ^q	97.66 ± 1.67 ^v	HS	7.84 ± 0.23 ^u	0.31 ± 0.03 ^c	2.46 ± 0.32 ^o	46.30 ± 5.03 ^p	MS
<i>C. chinense</i>											
11	Bhut Jolokia	3.56 ± 0.17 ^l	2.62 ± 0.20 ^t	9.22 ± 0.54 ^t	90.93 ± 2.62 ^p	HS	2.00 ± 0.06 ^l	0.58 ± 0.03 ^h	1.17 ± 0.09 ^f	10.88 ± 0.80 ^b	MR
12	Paprika chapatá	2.52 ± 0.14 ^j	1.74 ± 0.26 ^q	4.42 ± 0.71 ^r	52.63 ± 7.67 ⁱ	S	2.18 ± 0.39 ^m	1.35 ± 0.19 ^p	2.92 ± 0.65 ^q	34.21 ± 6.36 ^m	MS
13	IIHR-B-HP-27	4.02 ± 0.07 ⁿ	1.29 ± 0.07 ⁿ	5.18 ± 0.30 ^s	45.70 ± 4.81 ^k	MS	1.66 ± 0.17 ^g	0.74 ± 0.03 ⁿ	1.22 ± 0.13 ^g	10.26 ± 1.26 ^a	MR
14	IIHR-B-HP-145	2.26 ± 0.05 ⁱ	0.92 ± 0.01 ⁿ	2.08 ± 0.03 ^j	42.25 ± 4.54 ^j	MS	1.46 ± 0.05 ^f	0.58 ± 0.17 ^h	0.87 ± 0.03 ^e	17.35 ± 6.00 ^g	MR
15	IIHR-B-HP-95	2.68 ± 0.10 ^j	0.58 ± 0.01 ^h	1.55 ± 0.04 ^h	49.32 ± 6.41 ^k	MS	1.88 ± 0.07 ⁱ	0.45 ± 0.08 ^d	0.87 ± 0.57 ^e	31.40 ± 7.90 ^j	MS
<i>C. frutescens</i>											
16	IIHR-B-HP-89	1.06 ± 0.11 ^b	0.42 ± 0.03 ⁱ	0.44 ± 0.06 ^a	61.96 ± 7.52 ⁿ	S	0.50 ± 0.05 ^a	0.30 ± 0.02 ^d	0.15 ± 0.13 ^a	15.65 ± 1.66 ^e	MR

17	IIHR-B-HP-92	2.12 ± 0.05 ^h	0.36 ± 0.04 ^g	0.77 ± 0.08 ^c	59.72 ± 3.52 ^m	S	1.11 ± 0.11 ^e	0.22 ± 0.05 ^b	0.25 ± 0.12 ^b	21.42 ± 3.73 ^g	MR
18	IIHR-B-HP-41-1	1.80 ± 0.07 ^g	0.31 ± 0.01 ^f	0.57 ± 0.02 ^b	64.37 ± 9.44 ^o	S	1.11 ± 0.10 ^e	0.23 ± 0.11 ^c	0.26 ± 0.25 ^b	30.80 ± 2.98 ⁱ	MS
19	IIHR-B-HP-30	1.32 ± 0.08 ^e	0.24 ± 0.13 ^e	0.32 ± 0.10 ^a	79.56 ± 2.38 ^t	HS	1.07 ± 0.25 ^d	0.25 ± 0.05 ^c	0.27 ± 0.07 ^b	50.73 ± 5.60 ^q	S
C. baccatum											
20	PBC81 (2023)	0.48 ± 0.19 ^a	0.34 ± 0.14 ^f	0.30 ± 0.15 ^a	3.42 ± 1.74 ^a	R	0.10 ± 0.45 ^a	0.10 ± 0.06 ^a	0.01 ± 0.27 ^a	0.12 ± 1.35 ^a	R
21	PBC81 (2024)	0.28 ± 0.41 ^a	0.24 ± 0.14 ^e	0.11 ± 0.55 ^a	0.99 ± 6.90 ^a	R	0.10 ± 0.17 ^a	0.20 ± 0.09 ^b	0.02 ± 0.15 ^a	0.43 ± 2.98 ^a	R
C.D (p < 0.001)		1.44	0.45	1.68	18.97	-	0.84	0.63	1.37	19.5	-

Values represent mean of five replications, (n=5) **LL**: Lesion Length (cm), **LW**: Lesion Width (cm), **LA**: Lesion Area (cm²), **PLA**: Percentage Lesion Area (%)

Supplementary Table S2: Statistical Analysis of Lesion Characteristics in *Capsicum* Accessions Inoculated with *Colletotrichum scovillei*

Dependent Variable	Type III Sum of Squares	df	Mean Square	F	p-value	R Squared	Adjusted R Squared
Lesion Length	871.66	39	22.35	26.42	< 0.0001	0.866	0.833
Lesion Area	998.22	39	25.6	17.16	< 0.0001	0.807	0.76
Percent Lesion Area	141557.2	39	3629.67	15.23	< 0.0001	0.788	0.736
Lesion Width	66.83	39	1.71	17.03	< 0.0001	0.806	0.759

Acknowledgments

The authors acknowledge the Director, ICAR-Indian Institute of Horticultural Research, Bengaluru for providing research facilities and support in carrying out this study.

Author’s contribution

Karishma conducted experiments, collected data, and drafted the manuscript. Co-authors contributed to germplasm evaluation, pathogen screening, and data analysis. Naresh P. conceived and supervised the study and finalized the manuscript.

Conflict of Interest

The authors declare no conflict of interest.

References

Caires, N. P., Pinho, D. B., Souza, J. S. C., Silva, M. A., Lisboa, D. O., Pereira, O. L., & Furtado, G. Q. (2014). First report of anthracnose on pepper fruit caused by *Colletotrichum scovillei* in Brazil. *Plant Disease*, **98**(10), 1437.

de Almeida, C. L. P., dos Santos Bento, C., Sudré, C. P., Pimenta, S., Gonçalves, L. S. A., & Rodrigues, R. (2020). Genotype–ideotype distance index and multivariate analysis to select sources of anthracnose resistance in *Capsicum* spp. *European Journal of Plant Pathology*, **156**(1), 223–236.

de Silva, D. D., Groenewald, J. Z., Crous, P. W., Ades, P. K., Nasruddin, A., Mongkolporn, O., & Taylor, P. W. J. (2019). Identification, prevalence and pathogenicity of *Colletotrichum* species causing anthracnose of *Capsicum annum* in Asia. *IMA Fungus*, **10**, 8.

Dwivedi, N., Tirkey, D. S., Katoch, S., & Prasad, L. (2021). Evaluation of resistance against anthracnose (*Colletotrichum capsici* and *C. gloeosporioides*) in chilli landraces collected from northeastern India. *Plant Genetic Resources*, **19**(6), 538–544.

Gong, G. S., Xu, Q., Zhang, M., Yang, J. Z., Chen, H. B., Shen, S. A., & Tang, T. F. (2010). A simple method for single fungal spore isolation. *Journal of Maize Sciences*, **18**, 126–127, 134.

Mahasuk, P., Khumpeng, N., Wasee, S., Taylor, P. W. J., & Mongkolporn, O. (2009). Inheritance of resistance to anthracnose (*Colletotrichum capsici*) at seedling and fruiting stages in chilli pepper (*Capsicum* spp.). *Plant Breeding*, **128**(6), 701–706.

Manzur, J. P., Fita, A., Prohens, J., & Rodríguez-Burruezo, A. (2015). Successful wide hybridization and introgression breeding in common peppers using diverse *Capsicum baccatum* donors. *PLoS ONE*, **10**(12), e0144142.

Mishra, R., Rout, E., & Joshi, R. K. (2019). Identification of resistant sources against anthracnose caused by *Colletotrichum truncatum* and *C. gloeosporioides* in *Capsicum annum*. *Proceedings of the National Academy of Sciences, India Section B: Biological Sciences*, **89**, 517–524.

Mongkolporn, O., & Taylor, P. W. J. (2011). *Capsicum*. In C. Kole (Ed.), *Wild crop relatives: Genomic and breeding resources* (pp. 43–57). Springer.

Montri, P., Taylor, P. W. J., & Mongkolporn, O. (2009). Pathotypes of *Colletotrichum capsici* causing chilli anthracnose in Thailand. *Plant Disease*, **93**(1), 17–20.

National Horticulture Board. (2023). *Second advance estimates of 2022–23: Highlights*. Government of India.

National Innovations in Climate Resilient Agriculture (NICRA). (2020). *Annual report 2019–20*. Central Research Institute for Dryland Agriculture.

Oo, M. M., Lim, G., Jang, H. A., & Oh, S. K. (2017). Characterization and pathogenicity of *Colletotrichum scovillei* causing chilli anthracnose in Korea. *Mycobiology*, **45**(3), 184–191.

- Pakdeevaporn, P., Wasee, S., Taylor, P. W. J., & Mongkolporn, O. (2005). Inheritance of resistance to anthracnose caused by *Colletotrichum capsici* in *Capsicum*. *Plant Breeding*, **124**(2), 206–208.
- Ramdial, H., & Rampersad, S. N. (2015). Characterization of *Colletotrichum* spp. causing anthracnose of bell pepper in Trinidad. *Phytoparasitica*, **43**(1), 37–49.
- Saini, T. J., Tiwari, A., Yeole, M., & Gupta, S. (2021). Effect of pungency levels of *Capsicum* spp. fruit on tolerance to anthracnose. *Physiology and Molecular Plant Pathology*, **116**, 101720.
- Shin, Y. U., Hassan, O., & Chang, T. (2025). Characterization and fungicide sensitivity of *Colletotrichum* spp. from *Capsicum* peppers in South Korea. *Plant Disease*, **109**(3), 542–553.
- Than, P. P., Jeewon, R., Hyde, K. D., Pongsupasamit, S., Mongkolporn, O., & Taylor, P. W. J. (2008). 1. Characterization and pathogenicity of *Colletotrichum* species associated with chilli anthracnose in Thailand. *Plant Pathology*, **57**(3), 562–572.
- Vanlalneihi, B., Radha, P. L., Sriram, S., & Reddy, K. M. (2023). Evaluation of screening methods for anthracnose fruit rot resistance in chilli. *Journal of Horticultural Science*, **18**(2).
- Wheeler, B. E. J. (1969). *An introduction to plant diseases*. John Wiley & Sons.
- Yoon, J. B. (2003). *Identification of genetic resources, hybridization and inheritance analysis for breeding pepper resistant to anthracnose* (Doctoral dissertation). Seoul National University.
- Yoon, J. B., & Park, H. G. (2005). Trispecies bridge crosses for introgression of anthracnose resistance from *Capsicum baccatum* into *C. annuum*. *Horticulture, Environment, and Biotechnology*, **46**(1), 5–9.