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Screening of Inbred Lines of Maize against *Turcicum* Leaf Blight (*Exserohilum turcicum*) under Artificial Epiphytotic Conditions

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Aims: Turcicum Leaf Blight (TLB), caused by *Exserohilum turcicum*, significantly affects maize in Karnataka, leading to yield losses of up to 70% in severe cases. To develop tolerant genotypes against this disease, an experiment was conducted using 100 inbred lines collected from the IMIC maize field day in Hyderabad.

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Study Design: Investigation was carried using Randomized complete block design with two replication.

Place and Duration of Study: Maize Research Centre and Seed Farm, Devihosur during kharif-2022.

Methodology: One hundred inbred lines were screened against TLB disease. among them 10 resistant lines were selected based on their maturity, disease reaction, grain yield and per se performance. These inbreds along with the checks (Resistant check CI-4 and Susceptible Check CM-202) were sown in *Kharif* 2022 at Maize Research Centre and Seed Farm Devihosur, UAS, Dharwad. Artificial inoculation was performed 45 days after sowing in the leaf whorls using infected leaves with TLB and the results were evaluated at the silk drying stage. To assess the disease reaction to TLB, we used 1 to 9 scale as established by the Indian Institute of Maize Research, Ludhiana (Anon., 2016). Lines that received disease scores between 1.0 and 3.0 were classified as resistant (R), scores of 4 to 5 as moderately resistant (MR), scores of 6 to 7 as moderately susceptible (MS), and scores of 8 to 9 as susceptible (S).

Results: The performance of these lines were compared with the resistant check CI-4 and susceptible check CM-202. Screening trial revealed that out of hundred inbred lines, eighteen lines Showed highly resistant reaction. This information can be useful for selection of parents and to develop tolerant hybrids in breeding programs or utilize them as source of resistance.

Keywords: TLB; artificial inoculation; resistance; susceptible.

1. INTRODUCTION

Maize is one of the world's staple food crops, ranking third in global production after wheat and rice, and it occupies nearly 22 percent of agricultural land worldwide. Its adaptability to various environments is unparalleled among crops, which is why it is often referred to as the "queen of cereals." Originally native to Central America (Mexico), maize is a tropical crop that has successfully adapted to temperate regions, resulting in significantly higher yields.

Maize (*Zea mays* L.) is cultivated in 170 countries worldwide, covering an area of 193.7 million hectares (mha) and yielding a total production of 1,147.7 million tons (mt), with an average productivity of 5.75 tons per hectare (Anonymous , 2020a). The top five producing countries—USA, China, Brazil, Argentina, and Ukraine—account for 75.18% of global maize production. India ranks fourth in terms of area cultivated (9.89 mha) and seventh in production (31.65 mt) contributing approximately 4% of the world's maize area and 2% of total production. In Karnataka, maize is grown on 1.38 mha, producing 3.96 mt, resulting in a productivity rate of 3.48 t/ha (Anonymous , 2021). In India, maize is traditionally cultivated during the *kharif* season, but its cultivation is increasingly occurring in the rabi and spring seasons as well. The leading states for maize production are Karnataka, Andhra Pradesh, Maharashtra, Tamil Nadu, Rajasthan, Uttar Pradesh, Bihar, and Madhya Pradesh which together account for over 80% of the total area and production. As a food crop, maize has a more diverse range of uses compared to other major crops with various products developed from it. Additionally, different types of maize, such as quality protein maize (QPM), sweet corn, popcorn, and baby corn, are available.

Maize, classified as a C_4 plant, demonstrates high physiological efficiency, leading to increased grain yields. It is known as a “miracle crop” due to its versatility and adaptability across diverse agroclimatic conditions. The maize plant can be utilized at various growth stages: as succulent green fodder in the early stages, as baby corn at the very early cob stage, as mature cobs later on and as fully matured grain. This adaptability earns it the title of “contingent crop.” With rising demand for dairy and meat products in developing countries along with declining rice production in India and China, maize is projected to be a vital crop by 2030 (Salvi et al., 2017). However, throughout its growth period, maize faces various biotic and abiotic stresses with diseases being a significant factor that reduces overall productivity.

Maize is susceptible to approximately 61 diseases, with 16 of these identified as major threats. Among these, foliar diseases play a significant role in reducing both the yield and quality of maize. One notable foliar disease is Turcicum leaf blight (TLB), also known as northern corn leaf blight (NCLB), which is caused by the ascomycete fungus *Exserohilum turcicum Pass*. This widespread foliar disease can lead to substantial yield losses in maize, ranging from

25% to 90% in different regions of India, depending on the severity of TLB outbreaks (Chenulu et al., 1962).

TLB resistance can be classified as either qualitative or quantitative. Qualitative resistance is usually race-specific and controlled by single genes, while quantitative resistance is race non-specific and involves multiple genes (oligogenic or polygenic). It's important to note that the terms qualitative and quantitative refer to how a trait is distributed within a population, not to its level of effectiveness; thus, one cannot assume that qualitative resistance is always complete and quantitative resistance is always partial. Key qualitative genes that confer resistance to TLB include Ht1, Ht2, and Ht3, which promote resistance by causing small chlorotic lesions and reducing necrotic tissue, fungal sporulation, and inoculum levels for secondary infections. The HtN gene delays lesion development until after flowering (Juliana et al., 2007).

While TLB disease can be managed through chemical treatments and crop management practices, the most effective and cost-efficient strategy is to utilize host plant resistance. Resistant varieties are not only environmentally friendly but also easy for farmers to adopt. Given that new pathogen races will continually emerge and some resistance sources may eventually become susceptible, it is essential to identify new resistance sources through artificial epiphytotics each year to support the resistance breeding program.

Keeping all these facts in view, the present investigation was undertaken with the following objective “Screening of inbred lines of maize against Turcicum leaf blight (*Exserohilum Turcicum*) under artificial ephiphyotic conditions”.

2. MATERIALS AND METHODS

In an effort to screen for tolerant genotypes against TLB disease, an experiment was conducted using 100 inbred lines. Each line was planted in two rows, each 4 meters long, with a spacing of 60 cm, to assess resistance to TLB disease. Susceptible check variety CM-202 was planted as infector rows along the borders and after every ten rows to provide a source of secondary inoculum for disease development. The recommended agricultural practices were followed during the crop's growth 9 (Anonymous 2012). These lines, along with resistant check CI-4 and susceptible check CM-202, were also grown in *kharif* 2022 under artificially induced epiphytotic conditions in a randomized block design with two replications. The performance of these lines was compared with that of the resistant check CI-4 and the susceptible check CM-202 (Table 1).

2.1 Inoculation of Pathogen on Host

Artificial inoculation was carried out using heavily infected leaves collected from the previous season. These leaves were stored in large gunny bags in dry conditions to protect them from moisture and rodents. A pure culture of the fungus was prepared through the hyphal tip isolation method, and multiplication was achieved using sorghum grain. Inoculation occurred 45 days after sowing, when the plants reached a height of 30-45 cm, by placing a pinch of leaf meal into the whorl of each plant. To counteract the prevailing dry weather, water was applied to the whorls using a sprayer, as high humidity is conducive to the establishment and spread of the disease.

2.2 Evaluation and Recording of Disease Reaction

The scale includes five broad categories numbered from 1 to 9, as outlined by the Indian Institute of Maize Research in Ludhiana (Anonymous 2021). Scoring was performed during the silk drying stage of the plant, with the classification presented in Table 2.

3. RESULTS

Totally 100 maize inbred lines were screened against *Exserohilum turcicum* under artificially inoculated conditions during *kharif* 2022. Grouping of genotypes was done on the basis of TLB severity at maturity stage using 1-9 scale. Out of 100 inbred lines, 18 inbred lines *viz.,* VL21943, VL20300, VL18167, VL21988, VL21989, VL18397, KL20264, VL18718, VL18727, VL18914, VL22297, VL22347, VL20840, VL20900, VL14390, VL10765, VL18587 and VL18407 recorded less than score 3 and grouped them as resistant lines. Thirty nine inbred lines *viz.,* VL19978, VL21952, VL21969, VL18896, VL19103, VL18911, VL22292, VL19100, VL21968, VL18558, VL18456, VL10109, VL18722, VL22282, VL22319, VL22337, VL10945, VL14391, ZL19634, ZL17518, VL18141, VL21943, VL21978, VL21980, VL21990, VL18465, VL18472, VL18729, VL18901, VL18909, VL18910, VL22301, VL22306, VL22345, VL22346, VL22350, VL16229, VL10136 and VL19109 recorded less than score 5 and grouped them as moderately resistant lines.

Table 1. List of Maize inbred lines used for Screening against *Turcicum* leaf blight during Kharif-2022

SL. NO	Inbred line	Pedigree/source population	SL. NO	Inbred line	pedigree/source population
1	VL19978	HYDTSyn16HG(A)-8-2-1-B-B1-BB	26	VL185877	((CAL1821/CML165-B*9)-B)DH126-BB
2	VL191001	HYDTSyn16HG(B)-10-1-1-B-B1-8	27	VL184659	CML581/CML161X165-16-2-1-B*8) HB)DH12-BB
3	VL20300	SUWANI(5)C9-#-9-1-B1-B	28	VL184725	((CML581/CML161X165-16-2-1-B*8) DH78-BB
4	VL18775	CL02450-B 5/G9BCORL23-1P-2P-3-2P-3G9BCORL34-2P-IP-1-1-1)7-1-3-3-2-1-B*8) B-2-BB-B1-B	29	VL184560	((CML581/CML165-B*9)-B)DH44-BB
5	VL18246	(ICMLAS1/OFP67//CML451)-12 B*5/Composite4)-B-B2-1-B(DM)-BBB-B2-B	30	VL184578	((CML581/CML165-B*9)-B)DH62-BB
6	VL20157	(Composite 15-BBB-1-B-1-B-BICTS013008/AMATLCOHS71-1-1-2-1-1-1-HY: B 5/Nei402020)-B 12)-B-24-B-BI-B	31	VL184076	(CML581/CML161X165-16-2-1 B*8/CML581)DH106-BB
7	VL20160	Composite15-BBB-1-B-1-B-#BCA14517/P145CAMH7-1-B-1-1-B-1-1 B-17-1-B-22-B-B1-BB	32	VL183975	CML581/CML161X165-16-2-1 B*8//CML581)DH5-BB
8	VL143905	CML444/VL111354)-38-B-4-BB-4-85	33	VL184330	CML582/CML165-B*9//CML582)DH5-BB
9	VL107657	85 (CML474/S92145-2EV-7-3-B 5)-F2-58-19 V1825-6	34	VL1010960	PHG47-BBB-#-B
10	VL1016532	CML161X165-16-2-1-B 13	35	KL141702	PHR63-BBB-#-B
11	VL21943	CL106712/LH195)-B/CLHP0003)-B-6-1-11-BBB	36	KL20264	P73TLC3#-111-2-4-##-BB)x(RCW01)]-1 150-B 4/(CML474/S92145-2EV-7-3-B*5)-F2 25-1-B 11//[(P73TLC3#-111-2-4-##BB)x(RCW01)]-1-150-B 5)-B-5(0)-B(DM)B1-BBB
12	VL181619	(CL106728/LH213)-B/CML575)-B-6-3-1-1-1BBB	37	VL20269	HYDTSyn16HG(A)-1-1-2(DM)-B1-BBB
13	VL21952	(CML31/2FADB//CML486))DH0-46-B8	38	VL18720	((CML465/CML165-B//CML465)-BB-36 B*5/((CML161xCML451)-B-18-1 BBB/CML161-B)-B-13-BB(NonQ)-BBB-B1)B-3-B-B1-B
14	VL181565	((CMLS22/PHN82)-B/CML551)-B-6-3-1-1-1 BBB	39	VL18722	(CML465/CML165-B//CML465)-BB-36 B*5/((CML161xCML451)-B-18-1BBB/CML161-B)-B-13-BB(NonQ)-BBB-B1)B-6-B-BI-B
15	VL181675	((CMLS22/PHN82)-B/CML551)-B-6-8-1-1-1 BBB	40	VL18718	CML466/CML165-B//CML466)-BB-9 B*4/(CML465/CML165-B//CML465)-BB-36 B*5)-B-10- B-BI-B

SL. NO	Inbred line	Pedigree/source population	SL. NO	Inbred line	pedigree/source population
16	VL21968	((CML539/2FADB//CML486))DH0-7-B*7	41	VL18686	(CML466/CML165-B//CML466)-BB-9 B*4/(CML465/CML165-B//CML465)-BB-36-HY2 B*S)-B-3-BBB
17	VL21969	((CML545/PHHB9)-B/CML496)-B-81-2-1-1 BBB	42	VL18716	((CML466/CML165-B//CML466)-BB-9 B*4/(CML465/CML165-B//CML465)-BB-36-HYZB*5)-B-8-B-B1-B
18	VL181580	((CML78/PHG39)-B/CML486)-B-6-3-1-1-1 BBB	43	VL18726	[(P73TLC3#-111-2-4-##-BB)x(RCW01)]-1 150-B*4/(CML474/S92145-2EV-7-3-B*5)-F2-HY 58-1-B*12)-B-2-B-B1-B1
19	VL21976	CL106941/PHR03//CML451)-7-2-1-1-1-B*4	44	VL18727	[(P73TLC3#-112-2-4-##-BB)x(RCW02)]-1 150-B*4/(CML474/S84146-2EV-7-3-B*5)-F2 58-1-B*13)-B-4-B-B1-B
20	VL21978	CML311/2FADB//CML486)-89-1-1-1-1-1 B*5	45	VL18729	[CML327xCML287]F2-32-1-B*5-1 B*10/[(P73TLC3#-111-2-4-## BB)x(RCW01)]-1-150-B*4)-B-3-B-B1-B
21	VL21980	CML519/LH213//CML323)-9-3-1-1-1-B*4	46	VL18911	(CL02450 B*5/(CLRCY015/[CML373xCML361]-BB-2-E BBB)-B*4-1)-B-4-B-B1-B
22	VL21988	SUWANDMR-C3-35-1-1-1-1-1-B*4	47	VL18901	CL02450 B*5/(CLRCY015/[CML373xCML361]-BB-2 BBB)-B*4-1)-B-5-1-BB
23	VL21989	SUWANDMR-C3-43-1-1-1-0-1-B*4	48	VL18914	CL02450 B*5/(CLRCY015/[CML373xCML361]-BB-2 BBB)-B*4-1)-B-5-3-B1-B
24	VL21990	SUWANDMR-C3-54-1-1-1-1-1-B*4	49	VL18896	(CML451-B*7/((CLA37/CLA42)-BBB 40/CLA18)-B*4-1)-B-2-BBB
25	VL185586	(((CLQ-RCYQ31xCLQ-RCYQ35)-B-36-2 *4/CML581)- B)DH31-BB	50	VL18909	CML581/CML161X165-16-2-1 B*8//CML581)DH5-BB

SL. NO	Inbred line	Pedigree/source population	SL. NO	Inbred line	Pedigree/source population
51	VL18910	(CML451-B*7/PobSA3-106-BBB-5)-B-4-B B1-B	76	VL2088	GS13C2F2-40-BB-B1-BB
52	VL22280	CA34505xCA00302)-B-2-1-B-1-BB(T)-BS< #17-3-B-2-B*5/(LaPostaSeqC7-F64-2-7-2-1 B*4/LaPostaSeqC7-F55-2-2-2-1-B*5)-18 BBB-#-B//(CA34505xCA00302)-B-2-1-B-1 BB(T)-B5-#17-3-B-2-B*5/PHG39-BB)-B-1 BB	77	VL109452	(CLQ-6601xCL-02843)-B-26-3-1-BB-2-B*8 1-B 4
53	VL22282	(CA34505xCA00302)-B-2-1-B-1-BB(T)-B5 #17-3-B-2-B*5/(LaPostaSeqC7-F64-2-7-2- 1B*4/LaPostaSeqC7-F55-2-2-2-1-B*5)-18 BBB-#-B//(CA34505xCA00302)-B-2-1-B-1 BB(T)-B5-#17-3-B-2-B*5/PHG39-BB)-B-12 B1-B	78	VL143915	(VL111354/CML472)-7-B-1-B*4-#-B2-B
54	VL22292	CML165/OFP9//CML165)-7-B*5-3 BBB/Composite18-B(Fat)-BB-3-BBB)-B-1 BB	79	ZL19359	MPS-1-C2GS)DH16-BBB-B1
55	VL22297	(CML563/POB45c9F22-18-3-1-B*4-1-B*8-#B)-B-7-BB	80	ZL19467	(MPS-2-C1)DH17-B*4
56	VL22301	(CML563-B/(CML466/CML165-B//CML466) BB-11-B*6-B1)-B-8-BB	81	ZL19634	MPS-2-C3GS)DH73-B*4
57	VL22303	CML466/CML165-B//CML466) DUAL CAMERAS-B1)-B-12-BB	82	ZL153633	EYSyn-A-#-27-#-B-2-BB-BI-#-1-B
58	VL22306	(CML451-B*7/PobSA3-106-BBB-5)-B-4-B B1-B	83	ZL155281	((Pop61C1QPMTEYF-40-1-1-1-2-B 1/(CML161xCML451)-B-23-1-B*4-1)-B-5 BB/G18SeqC5F19-1-2-1-2-4-B*5)DH35-B-#I-B
59	VL22308	((CA34505xCA00302)-B-2-1-B-1-BB(T)-B5#17-3-B-2 B*4/CML582//(CA34505xCA00302)-B-2-1-B 1-BB(T)-B5-#17-3-B-2-B*5)-B-6-BB	84	ZL155285	Pop61CIQPMTEYF-40-1-1-1-2-B 1/(CML161XCML451)-B-23-1-B*4-1)-B-5 BB/G18SeqC5F19-1-2-1-2-4-B*5)DH42-B-# B
60	VL22310	CA34505xCA00302)-B-2-1-B-1-BB(T)-B5 #17-3-BB*4/CMLS82//(CA34505xCA00302)-B-2-1-B 1-BB(T)-B5-#17-3-B-2-B*5)-B-11- BB	85	ZL17518	(HSBC1F1-3)DH75-B-#-BB
61	VL22319	(((CML161xCML451)-B-18-1-BBB/CML161B)-B-13-BB(NonQ)-BBB-B1 CML465/CML165-B//CML465)-B-15B1-B 5)-B-9-BB	86	ZL17578	HSBCIF1-4)DH2-B-#-BB
62	VL22324	(CA03147-B*8-1/CA00360F2-3-5-6-1-B*11#-B)-B-6-BB	87	CAL1733	WLCY2-7-1-2-1-5-B-2-3-1-2-2-B*8-#-B2-B
63	VL22326	(CL02450-B*6-#/CML452=Ac8328BNC6 166-1-1-1-	88	CAL14137	WLCY2-7-1-2-1-5-B-2-2-2-2-1-B*9-#-B2-BH

SL. NO	Inbred line	Pedigree/source population	SL. NO	Inbred line	Pedigree/source population
		B*15-#)-B-2-BB			
64	VL22336	CML563/(POP501C5#8/GEMS-0039)-B-10 1-1-1-BB)-B-15-BB	89	ZL18910	G18SeqC5F19-1-2-1-2-4BB/CL02450)DH18-B*4
65	VL22337	CML563/(POP501C5#8/GEMS-0039)-B-10 1-1-1-BB)-B-27-BB	90	ZL19872	MPS-5-C1)DH62-B*4
66	VL22344	Composite15-BBB-1-B-1-B-# B/(CTS013004/AMATLCOHS71-1-1-2-1-1-1-HY B*5/Ki45)-B*6)-B-16-BB	91	ZL19611	MPS-2-C3GS)DH47-BBB
67	VL22345	(Composite15-BBB-1-B-1-B-# B/(CTS013008/AMATLCOHS71-1-1-2-1-1-1-HY B*5/Nei402020)-B*12)-B-15-BB	92	VL181418	CML566-B
68	VL22346	(Composite15-BBB-1-B-1-B-# B/(CTS013008/AMATLCOHS71-1-1-2-1-1-1-HY B*5/Nei402020)-B*12)-B-4-BB	93	VL21943	CML608B-B
69	VL22347	(Composite 15-BBB-1-B-1-B-# /CA14517/P145C4MH7-1-B-1-1-B-1-1 B*17-1)-B-7-BB	94	VL1013612	(CLG2309x([(P390bcoC3F191-1-1-1-4 B*4)x(P73TLC3#-96-3-4- #)]-2-2-3))-1-29-1-F153[((P390bcoC3F191-1-1-1-4-B*4)x(P73 TLC3# 115-1-4-#))-1-2-8)xRCW01]-1-167-BB-1BBB
70	VL22350	(CML444/VL111354)-42-B-#-B14-B	95	VL108153	(CAL1533/CML571)-BB-2-B2-BBB
71	VL22351	(CML444/VL111354)-42-B-#-B15-B	96	VL2084	CAL191/(Composite 15)-B-11-BBB)-BB-17B2-BBB
72	VL18580	(CML451-B*4//CML451 BBB/LaPostaSeqC7-F18-3-2-2-3B*7///CML451-B*4//CML451-BBB/DRB-F2 60-1-1-1-BBB-3-B)-BB/(ATZTRLBA905-3-3P-1P-4P-2P-1-1-1- B/G9BC0RL23-1P-2P-3 2P-3-2P-1P-BBB)-B-57TL-2-1-1-B*5)-B-3	97	VL2061	GS14C2F2-19-BB-B1-BBB
73	VL18670	((CA34505xCA00302)-B-2-1-B-1 B(T)/ZEWBC1F2-216-2-2-B-2-B*4-1-B-1 BBB)-B-BI-B-5-BB1-B1-B	98	VL2090	(Composite15)-B-11-B-#-B11-B
74	VL162291	AMDROUT2c3-B-4-B(DM)-BB-B1-2-B-B1	99	VL191090	(Composite 15)-B-11-B-#-B12-B
75	VL2049	((Composite 15)-B-11BBB/(CML466/CML165-B//CML466)-BB-11 HY21R-YB*4,-BB-8-B1-B	100	VL191093	(Composite 15)-B-11-B-#-B14-B

Table 2. Disease scale for *Turcicum l*eaf blight (TLB) in maize

Rating Scale	Degree of infection (per cent DLA)	Disease reaction
1.0	Nil to very slight infection (< 10%)	Resistant (R)
2.0	Slight infection, a few lesions scattered on two lower leaves (10.1-20%).	(Score: ≤ 3.0) (PDI: ≤ 33.33)
3.0	Light infection with a moderate number of lesions scattered across four lower leaves (20.1-30%).	
4.0	Light infection with a moderate number of lesions distributed across the lower leaves, and a few lesions present on the middle leaves below the cob (30.1-40%).	Moderately resistant (MR) (Score: 3.1–5.0) (PDI: 33.34-55.55)
5.0	Moderate infection observed, with a significant number of lesions scattered on the lower leaves and a moderate number present on the middle leaves below the cob (40.1-50%).	
6.0	Severe infection is present, with numerous lesions scattered across the lower leaves, moderate infection on the middle leaves, and a few lesions on two leaves above the cob (50.1-60%).	Moderately susceptible (MS) (Score: 5.1-7.0) (PDI: 55.56-77.77)
7.0	Severe infection is present, with numerous lesions scattered across the lower and middle leaves, along with a moderate number of lesions on two to four leaves above the cob, affecting 60.1% to 70% of the plant.	
8.0	There is a severe infection with numerous lesions scattered across the lower and middle leaves, spreading up to the flag leaf, affecting 70.1% to 80% of the plant.	Susceptible (S) (Score: >7.0) (PDI: >77.77)
9.0	A severe infection has caused abundant lesions scattered across nearly all the leaves, resulting in the plant prematurely drying out and dying, affecting over 80% of it	

Thirty four inbred lines *viz.,* VL18775, VL20157, VL18161, VL18158, VL21976, VL18457, VL18433, VL20269, VL22280, VL22310, VL22336, VL18580, VL18670, ZL19359, CAL14137, ZL18190, VL21943, VL20610, VL18246, KL14170, VL18720, VL18686, VL18716, VL18726, VL22303, VL22308, VL22324 VL22326, VL22351, ZL15528, CAL1733, ZL19872, ZL19611 and VL22344 recorded less than score 7 and grouped them as moderately susceptible lines lines. Nine inbred lines *viz.,* VL20160, VL18156, VL20490, VL20880, ZL15363, ZL17578, ZL19467, VL10815 and ZL15528 recorded less than score 9 and grouped them as susceptible lines lines presented in Table 3.

4. DISCUSSION

In India, maize is affected by 18 different foliar diseases, with *Turcicum* leaf blight caused by *Exserohilum turcicum* (Pass.) Leonard and Suggs being the most significant. This disease can lead to yield losses ranging from 28% to 91% (Kachapur et al., 1988, Harlapur et al., 2000) and has become a major production challenge in several maize-growing regions of Karnataka. Therefore, it is essential to develop high-yielding maize cultivars that are resistant to turcicum leaf blight and make them available to farmers to improve maize production and ensure food security.

Diseases are significant constraints on maize production, with turcicum leaf blight being a major one that can lead to substantial yield losses. This disease can affect maize from the seedling stage all the way to harvest, with the most severe losses occurring during the flowering, silking, and grain-filling stages (Harlapur et al., 2005). Host plant resistance is considered the most practical, feasible, and economical approach to managing plant diseases. Therefore, it is crucial to screen parental lines under controlled conditions to identify resistant sources that can be used in breeding programs aimed at managing this disease. Field studies have shown a clear differential response of inbred lines to turcicum leaf blight, indicating varying levels of susceptibility and resistance.

The present study found that out of 100 tested maize inbred lines, 18 exhibited a resistant reaction with a disease rating below 3.0, while 39 lines showed moderate resistance with ratings under 5.0. Additionally, 34 inbred lines were classified as moderately susceptible, with ratings below 7.0. The remaining 9 lines had ratings under 9.0, indicating susceptibility to turcicum leaf blight (TLB). These findings align with previous research by Pandurangegowda et al. (2002), Harlapur et al. (2008), Ramdutta et al. (2005), and Khot et al. (2005) that also examined inbred lines for TLB resistance in maize (Anon, 2016, Anonymous2020b, Leonardet al., 1974, Leonard 1989, Pant et al., 2000, Payaket al., 1968, Vanderplanket al., 1963).

Table 3. Categorisation of maize inbred lines based on the reaction to E. turcicum under artificial epiphytotic condition

Group	Source	Inbred lines
Resistant	1-3	VL21943, VL20300, VL18167, VL21988, VL21989, VL18397, KL20264, VL18718, VL18727, VL18914, VL22297, VL22347, VL20840, VL20900, VL14390, VL10765, VL18587, VL18407
Moderately resistant	4-5	VL19978, VL21952, VL21969, VL18896, VL19103, VL18911, VL22292, VL19100, VL21968, VL18558, VL18456, VL10109, VL18722, VL22282, VL22319, VL22337, VL10945, VL14391, ZL19634, ZL17518, VL18141, VL21943, VL21978, VL21980, VL21990, VL18465, VL18472, VL18729, VL18901, VL18909, VL18910, VL22301, VL22306, VL22345, VL22346, VL22350, VL16229, VL10136, VL19109
Moderately susceptible	6-7	VL18775, VL20157, VL18161, VL18158, VL21976, VL18457, VL18433, VL20269, VL22280, VL22310, VL22336, VL18580, VL18670, ZL19359, CAL14137, ZL18190, VL21943, VL20610, VL18246, KL14170, VL18720, VL18686, VL18716,VL18726, VL22303, VL22308, VL22324 VL22326, VL22351, ZL15528, CAL1733, ZL19872, ZL19611, VL22344
Susceptible	8-9	VL20160, VL18156, VL20490, VL20880, ZL15363, ZL17578, ZL19467, VL10815, ZL15528

Fig. 1. Foliar symptoms of *Turcicum* leaf blight

Fig. 2. Susceptible check CM-202

Fig. 3. Resistant inbred lines of maize for Turcicum leaf blight

4. CONCLUSION

Continuous efforts to locate the resistant source and utilization in resistant breeding programmes are imperative to manage the disease in the long run. Disease reaction indicated a satisfactory level of disease development. Screening of inbred lines and identifying the best resistant lines play a major role in hybrid breeding. The present study was aimed to identify TLB resistant maize inbred lines. Among hundred inbred inbred, eighteen lines found to resistant. Among these best ten lines will be selected and crossed in half diallel fashion to obtain resistant hybrids. This information is very useful in development of resistance and development of resistant hybrids.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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