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# Field screening of early maturity genotypes of maize in North Eastern region of India

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**Abstract**
Maize (*Zea mays* L.) is a vital cereal crop in India, ranking third after rice and wheat in terms of area and production. In Telangana, the crop exhibits remarkable productivity, but its cultivation is increasingly threatened by foliar diseases, particularly *Turcicum* Leaf Blight (TLB), caused by *Exserohilum turcicum*. The disease significantly affects photosynthesis and grain filling, leading to yield losses ranging from 28% to 91%. To identify resistant sources for breeding programs, 32 early-maturing maize genotypes—including eight standard checks and 24 test entries—were evaluated for their response to TLB. Among the test genotypes, one (AH-3254) was moderately susceptible, while 23 genotypes exhibited moderate resistance. The study highlights the availability of diverse genetic material with resistance to TLB, which can be effectively utilized in developing resistant hybrids suited to high-yield environments.

**Keywords:** Maize, *Turcicum* Leaf blight, resistance, genotypes, yield loss, breeding

## Introduction
Maize, recognized for its substantial yield potential among cereal crops, ranks as the third most significant grain after wheat and rice. In India, maize is grown across 11.24 million hectares, yielding a production of 37.66 million tonnes and an average productivity of 3351 kg/ha. In the state of Telangana, the crop covers approximately 0.49 million hectares, with a production output of 2.77 million tonnes and a notably higher productivity of 5671 kg/ha [1]. Maize cultivation faces various biotic stresses, including diseases, insect pests, and parasitic weeds like *Striga* spp. Among these, foliar diseases are particularly damaging, with northern leaf blight (NLB)—locally known as *Turcicum* leaf blight—being a major concern. This disease is caused by the ascomycete fungus *Setosphaeria turcica*, and its conidial form *Exserohilum turcicum* (Pass.) Leonard and Suggs (formerly *Helminthosporium Turcicum* Pass.) [2, 3]. It primarily impacts photosynthesis, leading to kernel yield losses that may range from 28% to as high as 91%. Symptoms of the disease include long, elliptical lesions that appear greyish-green to brown in color, initially emerging on the lower leaves and progressively spreading throughout the plant's foliage. Early infection can result in the premature senescence of leaves, drastically reducing their nutritive value as fodder. The disease also negatively affects seed germination, plant vigor, grain yield, and sugar content [4, 5]. Furthermore, it restricts starch synthesis, results in poorly filled (chaffy) kernels, and increases vulnerability to stalk rots [6]. *Turcicum* leaf blight is prevalent in several Indian states, including Karnataka, Bihar, Himachal Pradesh, Andhra Pradesh, and Maharashtra [7, 8]. To mitigate its impact, several disease management strategies have been advocated. Among these, the cultivation of resistant varieties is considered the most effective and sustainable approach. Breeding for resistance is a vital, cost-efficient tool in disease control and plays a key role in ongoing maize crop improvement programs [9].

## Methodology
### Mass multiplication of pathogen
The mass multiplication of *E. turcicum* was done on sterilised sorghum grains. The sorghum grains weighing 200gm were washed under tap water neatly without stubbles and dust then soaked for 24 Hours in a 500 ml of conical flask. In the next day the excess water was removed and autoclaved at 120 °C for 20 minutes.

These sterilised sorghum was inoculated with *E. turcicum* from the 12 days old pure cultures. After inoculation these grains were kept in BOD at 25 °C for 14 days. After 14 days pathogen was inoculated on maize field at 32 DAS. The disease scoring was taken after 30days of pathogen inoculation. The scoring was given from 1-9 according to scale devised by Lubberstedt *et al.* (1998).

**Table 1:** Disease scoring according to Lubberstedt *et al.*, (1998)

| Rating scale | Diseased Leaf Area (DLA) | Per cent Disease Index (PDI) | Disease reaction |
|---|---|---|---|
| 1.0 | Nil to very slight infection (<10.0%) | <11.11% | Resistant(R) Score <3.0 DLA <30% PDI< 33.33% |
| 2.0 | Slight infection, a few lesions scattered on two lower leaves (20.1-30%) | 22.22% | |
| 3.0 | Slight infection, a few lesions scattered on two lower leaves (20.1-30%) | 33.33% | |
| 4.0 | Light infection, moderate number of lesions scattered on lower leaves, a few lesions scattered on middle leaves below the cob (30.1-40%) | 44.44% | Moderately resistant (MR) Score 3.1-5 DLA: 30.1-50% PDI: 33.34-55.55 |
| 5.0 | Moderate infection, abundant number of lesions on lower leaves, moderate number of lesions on middle leaves below the cob(40.1-50%) | 55.55% | |
| 6.0 | Heavy infection, abundant number of lesions on lower leaves, moderate infection on middle leaves few lesions on two leaves above the cob (50.1-60%) | 66.66% | Moderately susceptibe(MS) Score: 5.1-7.0 DLA: 50.1-70% PDI: 55.56-77.77 |
| 7.0 | Heavy infection abundant number of lesions scattered on lower and middle leaves and moderate number of lesions on two to four leaves above the cob (60.1-70%) | 77.77% | |
| 8.0 | Very heavy infection, leisons abundant on lower and middle leaves and spreading up to flag leaf (70.1-80%) | 88.88% | Susceptible(S) Score : >7.0 DLA: >70% PDI : >77.77 |
| 9.0 | Very heavy infection, lesions abundant scattered on almost all leaves plant prematurely dried and killed (>80%) | 99.99% | |

**Table 2:** Lay-out of field screening experiment of early maturity, medium maturity and QPM genotypes

| S. No | Type of lines | No. of genotypes | No. of Blocks | No. of Replications | Plot Size | Type of Design |
|---|---|---|---|---|---|---|
| 1 | Early Maturity Genotypes | 32 | 4 | 2 | 1.8×2 $m^2$ | Augmented Design |

**Table 3:** Details of early maturity lines used for field screening experiments

| S. No | Genotype |
|---|---|
| 1 | AH-3254 |
| 2 | AH-4139 |
| 3 | AH-4167 |
| 4 | AH-4654 |
| 5 | AH-4657 |
| 6 | AH-4663 |
| 7 | CP-111 |
| 8 | CP-999 |
| 9 | DH 348 |
| 10 | DH-349 |
| 11 | JH 32573 |
| 12 | JH 32652 |
| 13 | JH 32657 |
| 14 | JH 32662 |
| 15 | KDMH-129 |
| 16 | KDMH 130 |
| 17 | KMH 20-5 |
| 18 | KMH 20-76 |
| 19 | LMH 21147 |
| 20 | LMH 2174 |
| 21 | SMH 4555 |
| 22 | DKC 7211 (IU 7514) |
| 23 | KMH 18-15 |
| 24 | CM 500 |
| 25 | ADV 7022 (CHECK) |
| 26 | Bio 605 (CHECK) |
| 27 | DKC 7074 (CHECK) |
| 28 | Early Composite (CHECK) |
| 29 | RCRMH 4-1 (CHECK) |
| 30 | Surya (CHECK) |
| 31 | VAMH 12014 (CHECK) |
| 32 | Vivek Hybrid 45(CHECK) |

## Results and Discussion

### Screening of early maturity genotypes

A total of 32 early maturity genotypes were taken for this experiment out of which eight checks (ADV-7022, Bio-605, DKC 7074, Early composite, RCRMH 4-1, Surya, VAMH-12014, Vivek hybrid-45) remaining 24 were test genotypes. Among all test genotypes AH-3254 was moderately susceptible and remaining 23 genotypes were moderately resistant namely AH-4139, AH-4167, AH-4654, AH-4657, AH-4663, CP-111, CP-999, DH 348, DH-349, JH 32573, JH 32652, JH 32657, JH 32662, KDMH-129, KDMH 130, KMH 20-5, KMH 20-76, LMH 21147, LMH 2174, SMH 4555, DKC 7211(IU 7514), KMH 18-15, CM 500.

**Table 4:** Disease reaction of early maturity maize genotypes

| S. No | Genotype | Score | Reaction |
|---|---|---|---|
| 1 | AH-3254 | 5.1 | MS |
| 2 | AH-4139 | 4.0 | MR |
| 3 | AH-4167 | 4.3 | MR |
| 4 | AH-4654 | 4.2 | MR |
| 5 | AH-4657 | 4.2 | MR |
| 6 | AH-4663 | 3.7 | MR |
| 7 | CP-111 | 4.1 | MR |
| 8 | CP-999 | 3.8 | MR |
| 9 | DH 348 | 4.4 | MR |
| 10 | DH-349 | 4.3 | MR |
| 11 | JH 32573 | 4.6 | MR |
| 12 | JH 32652 | 3.7 | MR |
| 13 | JH 32657 | 4.9 | MR |
| 14 | JH 32662 | 3.8 | MR |
| 15 | KDMH-129 | 3.6 | MR |
| 16 | KDMH 130 | 5.0 | MR |
| 17 | KMH 20-5 | 3.8 | MR |
| 18 | KMH 20-76 | 4.5 | MR |
| 19 | LMH 21147 | 3.8 | MR |
| 20 | LMH 2174 | 3.9 | MR |
| 21 | SMH 4555 | 3.9 | MR |
| 22 | DKC 7211(IU 7514) | 4.5 | MR |
| 23 | KMH 18-15 | 3.9 | MR |
| 24 | CM 500 | 4.0 | MR |
| 25 | ADV 7022(CHECK) | 8.1 | S |
| 26 | Bio 605(CHECK) | 1.9 | R |
| 27 | DKC 7074(CHECK) | 2.1 | R |
| 28 | Early Composite(CHECK) | 8.8 | S |
| 29 | RCRMH 4-1(CHECK) | 2.1 | R |
| 30 | Surya(CHECK) | 7.6 | S |
| 31 | VAMH 12014(CHECK) | 2.8 | R |
| 32 | Vivek Hybrid 45(CHECK) | 2.5 | R |
| | CV (%) | 12.0 | |
| | F (Prob) | 0.2 | |
| | CD (5%) | 1.0 | |
| | CD (1%) | 1.4 | |

**Table 5:** Classification of early maturity maize genotypes on basis of disease against TLB maize

| S. No | Disease Reaction | Genotypes | No. of Genotypes |
|---|---|---|---|
| 1 | Resistant | - | - |
| 2 | Moderately Resistant | AH-4139, AH-4167, AH-4654, AH-4657, AH-4663, CP-111, CP-999, DH 348, DH-349, JH 32573, JH 32652, JH 32657, JH 32662, KDMH-129, KDMH 130, KMH 20-5, KMH 20-76, LMH 21147, LMH 2174, SMH 4555, DKC 7211(IU 7514), KMH 18-15, CM 500. | 23 |
| 3 | Moderately Susceptible | AH-3254. | 1 |
| 4 | Susceptible | - | - |
| 5 | Resistant Checks | Bio 605, DKC 7074, RCRMH 4-1, VAMH 12014, Vivek Hybrid 45. | 5 |
| 6 | Susceptible Checks | ADV 7022, Early Composite, Surya. | 3 |

## Conclusion

Among 32 early maturity genotypes which were taken for this experiment out of which eight checks (ADV-7022, Bio-605, DKC 7074, Early composite, RCRMH 4-1, Surya, VAMH-12014, Vivek hybrid-45) remaining 24 were test genotypes. Among all these genotypes 23 were determined as moderately resistant namely AH-4139, AH-4167, AH-4654, AH-4657, AH-4663, CP-111, CP-999, DH 348, DH-349, JH 32573, JH 32652, JH 32657, JH 32662, KDMH-129, KDMH 130, KMH 20-5, KMH 20-76, LMH 21147, LMH 2174, SMH 4555, DKC 7211(IU 7514), KMH 18-15, CM 500 and one genotype determined as moderately susceptible namely AH-3254.

**References**


1. Ministry of Agriculture & Farmers Welfare. Govt. of India. Indiastat; 2023-24. Available from: https://www.indiastat.com
2. Robert AL. Some of the leaf blights of corn. Year Book of Agriculture. United States Department of Agriculture, North Carolina. 1953;380-385.
3. Bindhu KG, Pandurangegowda KT, Lohithaswa HC, Madhuri R, Mallikarjuna N. Genetics of resistance to *Turcicum* leaf blight caused by *Exserohilum turcicum* (Pass.) Leonard and Suggs in maize (*Zea mays* L.). International Journal of Current and Applied Microbiology. 2017;6(11):964-969.
4. Payak MM, Renfro BL. Combating maize disease. Indian Farmer Digest. 1968;1:53-58.
5. Ferguson LM, Carson ML. Spatial diversity of *Setosphaeria turcica* sampled from the Eastern United States. Phytopathology. 2004;94:892-900.
6. Cuq FS, Herrmann-Golrline, Klaebe S, Rossignol M. Monocerin in *Exserohilum turcicum*. Phytochemistry. 1993;34:1265-1270.
7. Singh R, Srivastava RP, Mani VP, Khandelwal RS, Ram L. Screening of maize genotypes against Northern corn leaf blight. The Bioscan. 2014;9(4):1689-1693.
8. Jakhar DS, Singh R, Kumar S, Singh P, Ojha V. *Turcicum* leaf blight: A ubiquitous foliar disease of maize (*Zea mays* L.). International Journal of Current Microbiology and Applied Sciences. 2017;6(3):825-831.
9. Fehr WR. Principles of cultivar development. New York: Macmillan Co.; 1987.