IKR Publishers

IKR Journal of Agriculture and Biosciences (IKRJAB)
Journal homepage: https://ikrpublishers.com/ikrjab/
Volume-2, Issue-4 (July-August) 2026
OPEN ACCESS
ISSN: 3107-5509 (Online)

Diversity and Pathogenic Potential of Field-Isolated Foliar Fungi Infecting Maize (*Zea mays* L.) in Bayelsa State, Nigeria

Augustus Akayinaboderi Eli[1*] & Gift Evans Fubara[2]
[1]Department of Environmental Management and Toxicology, Federal University Otuoke, Bayelsa State, Nigeria
[2]Department of Biological Sciences, Federal University Otuoke, Bayelsa State, Nigeria

DOI: *10.5281/zenodo.22694212*

ARTICLE INFO

Article history:
Received : 18-08-2026
Accepted : 24-08-2026
Available online : 29-08-2026

Copyright©2026 The Author(s): This is an open-access article distributed under the terms of the Creative Commons Attribution **4.0 International License (CC BY-NC)** which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

Citation: Eli, A. A., & Fubara, G. E. (2026). Diversity and Pathogenic Potential of Field-Isolated Foliar Fungi Infecting Maize (*Zea mays* L.) in Bayelsa State, Nigeria. *IKR Journal of Agriculture and Biosciences (IKRJAB), 2*(4), 5-8.

ABSTRACT **Original Research Article**

Maize (*Zea mays* L.) is one of the most important cereal crops in sub-Saharan Africa, yet its productivity is frequently constrained by foliar fungal diseases. This study investigated the diversity and pathogenic potential of field-isolated foliar fungi infecting maize in Bayelsa State, Nigeria. Symptomatic leaves were collected from the Agricultural Field of the Federal University Otuoke, the surface-sterilized, and cultured on Potato Dextrose Agar (PDA). Fungal isolates were purified and identified based on macroscopic and microscopic features. Pathogenicity was confirmed on healthy maize seedlings using Koch's postulates. Six fungal species were identified: *Bipolaris maydis* (48 %), *Exserohilum turcicum* (34 %), *Curvularia lunata* (28 %), *Phyllosticta maydis/Phoma spp.* (18 %), *Phaeosphaeria maydis* (12 %), and *Cercospora zeae-maydis* (8 %). *B. maydis* and *E. turcicum* were the most frequent and virulent isolates, producing characteristic necrotic lesions on inoculated leaves within seven days. The results highlight the dominance of *Bipolaris* and *Exserohilum* species as major foliar pathogens of maize in the humid tropics. Understanding their prevalence and virulence will aid in targeted breeding and integrated disease management strategies for sustainable maize production in southern Nigeria.

Keywords: Maize (*Zea mays* L.), Foliar Fungi, *Bipolaris maydis*, Pathogen Diversity, Bayelsa State Nigeria.

**Corresponding author: Augustus Akayinaboderi Eli*
Department of Environmental Management and Toxicology, Federal University Otuoke, Bayelsa State, Nigeria

Introduction

Maize (*Zea mays* L.) ranks among the world's most widely cultivated cereals and is vital for food, feed, and industry. In sub-Saharan Africa, it contributes up to 50 % of daily caloric intake (Nuss & Tanumihardjo, 2010). However, foliar fungal diseases severely reduce yield and grain quality, especially in humid zones where high relative humidity favors pathogen proliferation (Munkvold, 2003).

Common maize foliar pathogens include *Bipolaris maydis* (southern corn leaf blight), *Exserohilum turcicum* (northern corn leaf blight), and *Cercospora zeae-maydis* (gray leaf spot) (Sharma *et al.*, 2010). These diseases diminish photosynthetic area, hasten senescence, and predispose plants to secondary infections (Leonard *et al*., 2018).

Although, these fungi have been widely reported globally, data on their occurrence and pathogenicity in Bayelsa State, Nigeria, remain limited. This study therefore aimed to isolate, identify, and assess the pathogenic potential of foliar fungi infecting maize in the region.

Materials and Methods

Study Area

The study was conducted in the Agricultural Field of Federal University Otuoke (4.7950° N, 6.3188° E) in Bayelsa State, Nigeria. The area experiences high humidity (55–74 %) and a mean temperature of 28 °C, typical of tropical rain-forest climate.

Sample Collection and Isolation

Symptomatic maize leaves showing blight and spot lesions were collected and cut into 5 mm² pieces. Samples were surface-sterilized with 1 % sodium hypochlorite for one minute, rinsed twice in sterile distilled water, and plated on Potato Dextrose Agar (PDA). Plates were incubated at 25 ± 2 °C for 5–7 days. Emerging colonies were sub-cultured to obtain pure isolates.

Identification of Fungi

Isolates were characterized macroscopically by colony colour, texture and margin; and microscopically with lactophenol cotton blue staining under × 10 and × 40 magnification. Morphological traits were compared with standard fungal keys (Barnett & Hunter, 1998) to identify species.

Pathogenicity Test

Pathogenicity was evaluated on potted maize seedlings (two-leaf stage). Leaves were lightly wounded with sterile needles and inoculated with 2 mL of 1×10^6 spores ml^{-1} suspension. Controls received sterile water. Plants were monitored for 7–14 days, and disease incidence was recorded. Pathogens were re-isolated from infected tissues to satisfy Koch's postulates.

Results

Frequency of Occurrence

Six fungal species: *Bipolaris maydis*, *Exserohilum turcicum*, *Curvularia lunata*, *Phyllosticta maydis/Phoma spp.*, *Phaeosphaeria maydis* and *Cercospora zeae-maydis* were isolated from symptomatic maize leaves (Table 1).

Table 1. Frequency of Foliar Fungal Pathogens Isolated from Maize in Bayelsa State

Fungal Pathogen	Frequency of Occurrence (%)	Pathogenic reaction on Host
Bipolaris maydis	48	Severe leaf blight with elongated necrotic lesions.
Exserohilum turcicum	34	Long grayish lesions; leaf wilting.
Curvularia lunata	28	Small brown spots coalescing at margins.
Phyllosticta maydis/Phoma spp.	18	Circular lesions with yellow halos.
Phaeosphaeria maydis	12	Chlorotic patches with necrotic centers.
Cercospora zeae-maydis	8	Narrow rectangular lesions with gray centers

Bipolaris maydis had the highest incidence (48 %), followed by *Exserohilum turcicum* (34 %) and *Curvularia lunata* (28 %). *Cercospora zeae-maydis* was the least frequent (8 %).

Morphological Features

Although six fungal species were isolated from infected maize leaves, detailed morphological descriptions are presented only for the three most frequent isolates—*Bipolaris maydis*, *Exserohilum turcicum*, and *Curvularia lunata*—which accounted for over 70% of all isolates and exhibited pronounced pathogenicity. These three fungi displayed the most distinct colony and spore characteristics, justifying their detailed documentation. The remaining isolates—*Phyllosticta maydis/Phoma* spp., *Phaeosphaeria maydis*, and *Cercospora zeae-maydis*—occurred less frequently and showed typical morphological features consistent with standard descriptions by Barnett and Hunter (1998). This approach was taken to avoid redundancy while highlighting the most epidemiologically significant pathogens.

Bipolaris maydis colonies appeared dark brown to black with a velvety texture and produced septate, curved conidia. *Exserohilum turcicum* showed grayish-brown colonies with elongated, cylindrical conidia possessing distinct transverse septa. *Curvularia lunata* exhibited olive-brown colonies and produced curved conidia with an enlarged central cell. These morphological features aided in confirming the identity of the predominant foliar pathogens affecting maize under study conditions.

Pathogenicity Confirmation

All isolates produced disease symptoms on healthy maize seedlings within seven (7) days of inoculation, confirming pathogenicity. *B. maydis* and *E. turcicum* caused the most severe symptoms, while *C. zeae-maydis* produced mild lesions.

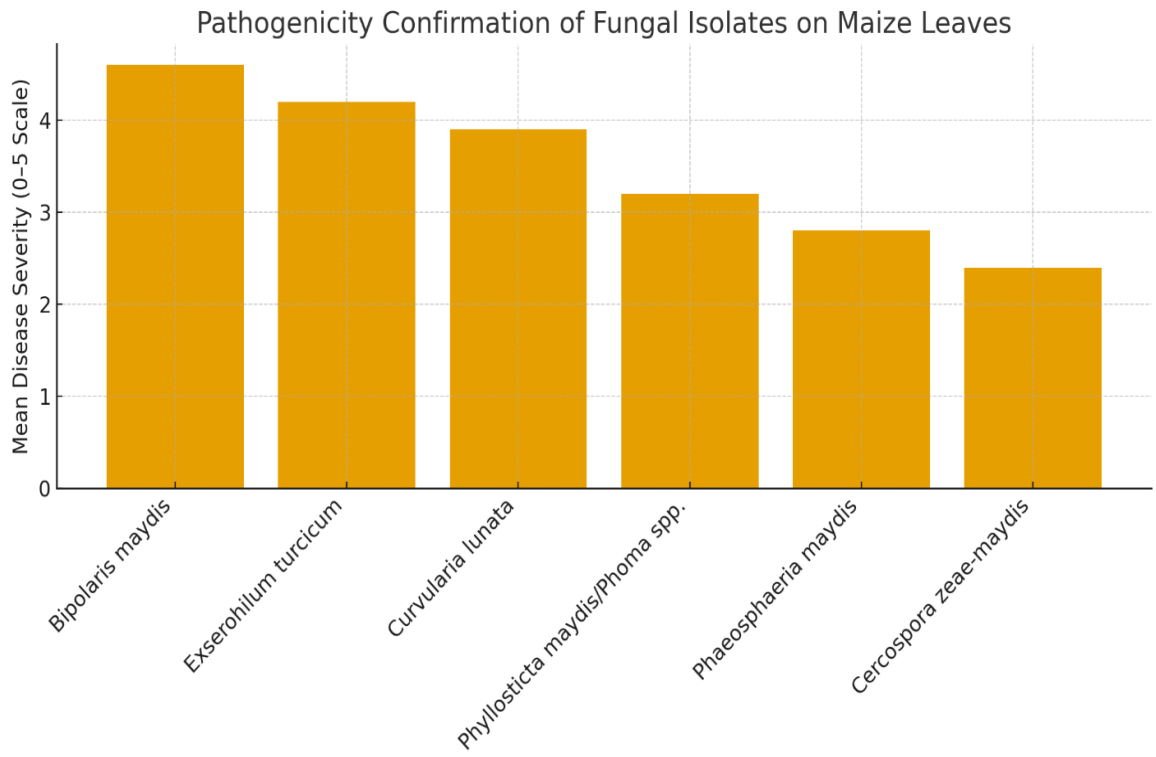

Figure 1. Pathogenicity Confirmation of Fungal Isolates on Maize

Discussion

The isolation of six foliar fungal pathogens corroborates earlier reports of their prevalence in humid tropical maize fields (Garuba *et al.*, 2014; Foster *et al*., 2017). *Bipolaris maydis* was the most prevalent and aggressive in this study, consistent with the report of Ullstrup (1972), who identified it as the causal agent of the southern corn leaf blight epidemic. Environmental factors such as, high humidity and warm temperatures (25–30 °C) in Bayelsa State may favour the sporulation and dissemination of *Bipolaris* and *Exserohilum*. The confirmation of pathogenicity through Koch's postulates reinforces their primary roles as causal agents of maize leaf blight in this region.

The observed variations in the pathogenicity may reflect the genetic diversity among isolates or host-pathogen compatibility differences (Nelson *et al*., 2018). Accurate identification of these fungi is essential for resistance breeding and integrated disease management.

Conclusion

This study established that, *Bipolaris maydis* and *Exserohilum turcicum* are the predominant foliar pathogens of maize in Bayelsa State, Nigeria; exhibiting strong virulence under local climatic conditions. Regular surveillance and accurate diagnosis are recommended to guide breeding for resistant varieties and effective fungicide use. Future studies should include molecular characterization of isolates to complement morphological identification.

References

1. Adie, B. A., Pérez-Pérez, J., Godoy, M., Sánchez-Serrano, J.-J., Schmelz, E. A., & Solano, R. (2007). ABA is an essential signal for plant resistance to drought and disease. *The Plant Cell, 19*(5), 1785–1796. https://doi.org/10.1105/tpc.106.048041
2. Barnett, H. L., & Hunter, B. B. (1998). *Illustrated genera of imperfect fungi* (4th ed.). APS Press.
3. Foster, R. E., Dintinger, J., & Munkvold, G. (2017). Interactions between drought stress and foliar pathogens of maize. *Field Crops Research, 203*, 55–64. https://doi.org/10.1016/j.fcr.2016.11.005
4. Garuba, T., Alegbejo, M. D., & Banwo, O. O. (2014). Pathogenicity of fungi associated with foliar diseases of maize (*Zea mays* L.) in Nigeria. *International Journal of Scientific Research in Agricultural Sciences, 1*(2), 10–19. https://doi.org/10.12983/ijsras-2014-p0109-0119
5. Leonard, K. J., Levy, Y., & Smith, D. R. (2018). Host resistance to *Exserohilum turcicum* and epidemiology of northern corn leaf blight. *Plant Disease, 65*(4), 327–330.
6. Munkvold, G. P. (2003). Epidemiology of maize diseases and implications for technology development. *African Crop Science Journal, 11*(3), 191–203. https://doi.org/10.4314/acsj.v11i3.27553
7. Nelson, R., Wiesner-Hanks, T., Wisser, R., & Balint-Kurti, P. (2018). Navigating complexity to breed disease-resistant crops. *Nature Reviews Genetics, 19*(1), 21–33. https://doi.org/10.1038/nrg.2017.82

8. Nuss, E. T., & Tanumihardjo, S. A. (2010). Maize: A paramount staple crop in the context of global nutrition. *Comprehensive Reviews in Food Science and Food Safety*, *9*(4), 417–436. https://doi.org/10.1111/j.1541-4337.2010.00117.x

9. Sharma, R. C., et al. (2010). Diseases of maize in Asia and approaches to their management. *Asian Journal of Plant Pathology*, *4*(1), 1–14. https://doi.org/10.3923/ajppaj.2010.1.14

10. Ullstrup, A. J. (1972). The southern corn leaf blight epidemic. *Plant Disease Reporter*, *56*, 312–324.