Plant Pathology Research Updates: Sugarcane Brown Stripe Disease

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Academic and Professional Background

M.Sc. Ag.: Plant Pathology, TU, Nepal

- Rice germplasm evaluation for disease management

Ph.D.: Plant Pathology, NDSU

- Fusarium wilt management in spring wheat

Post-doc/Project Scientist: Plant Pathology, UC Davis

- Soil-borne disease management in vegetable crops

Plant Diagnostic Lab Supervisor: MO Dept. of Agri.

- Disease diagnosis and tree-fruit virus certification

Pictures: APSNET, Stark Bros, NCPN






Research Expertise

- Host resistance and genetic mapping
- Pathogen biology and disease epidemiology
- Soil health and microbial dynamics
- Plant disease diagnosis and detection
- System-Approach of disease management

Program Introduction

- Research + extension mission
- Focus on **Practical Disease Management**
  - Host Resistance and Pathogen Biology

Historical Disease Challenges

Current Disease Issues

Emerging New Disease Threats

Major Diseases in Sugarcane

- Fungal Disease
- Bacterial Disease
- Virus Disease

Rust

Smut

Leaf scald

Ratoon stunt

Mosaic virus

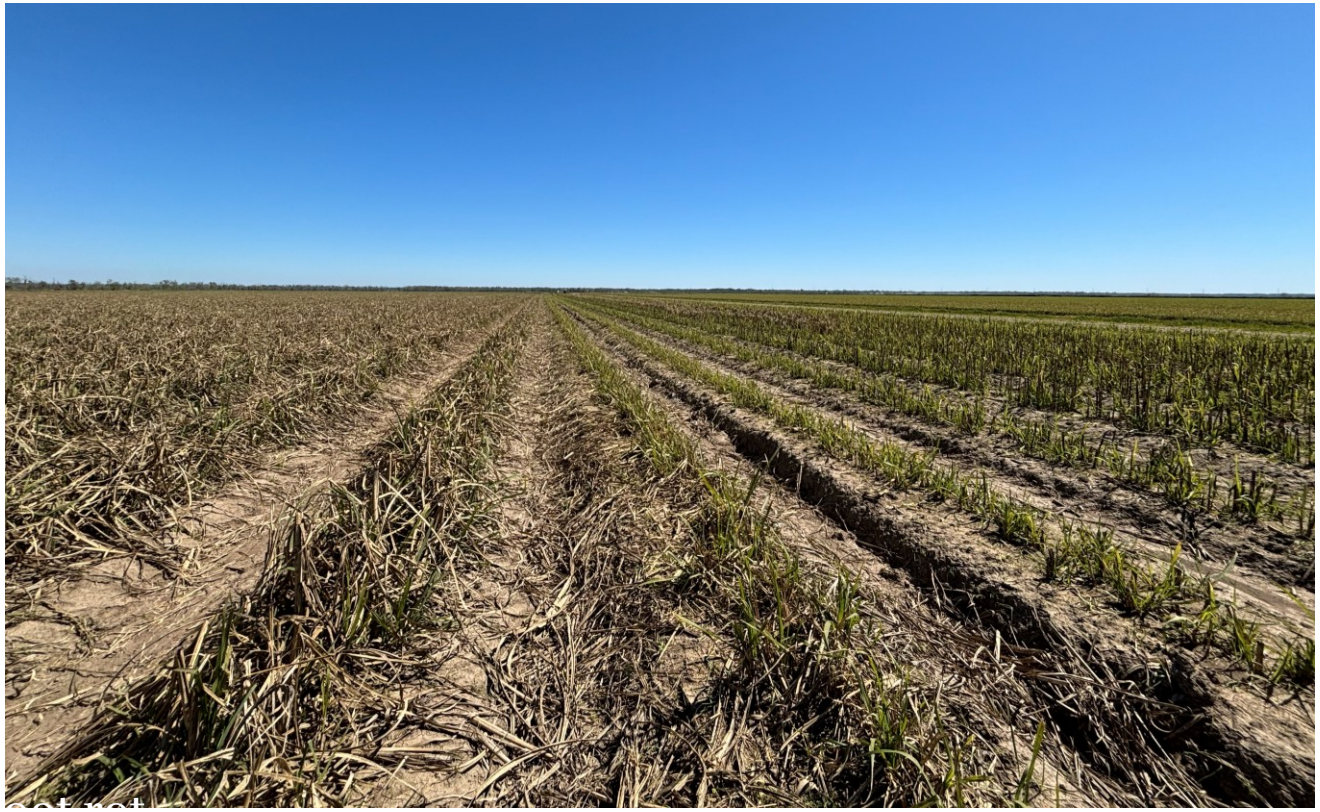
Sugarcane yellow leaf virus

Unknown Disease Threats

Yellow canopy disease

Twisted top and leaf disease

Emerging Threats



Root rot

Brown stripe

Preliminary Research Updates on Brown stripe

Pathogen detection / diagnostics

Baseline disease survey and sampling

Variety response to disease

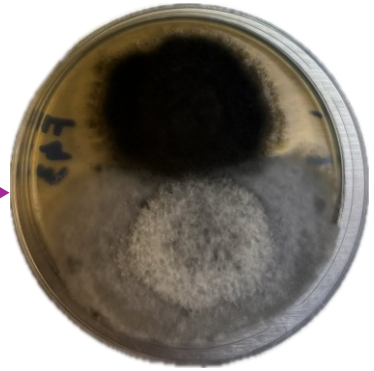
Sugarcane Brown Stripe

- Leaf spots initially appear on the young leaves
- Spots become chlorotic, elliptical, or spindle-shaped
- Distinctive yellow halos surrounding them
- Over time, lesions become wider and longer, reddish-brown
- Leaves turned yellow and gradually dried out
- Impacts photosynthesis and sugar accumulation
- Yield losses can range from 18% to 40%, with sucrose yield reduced by 15% to 30%

Pathogen Isolation and Pathogenicity Assay

Isolation

Moist blotting



½ PDA @RT

Conidia and conidiophore

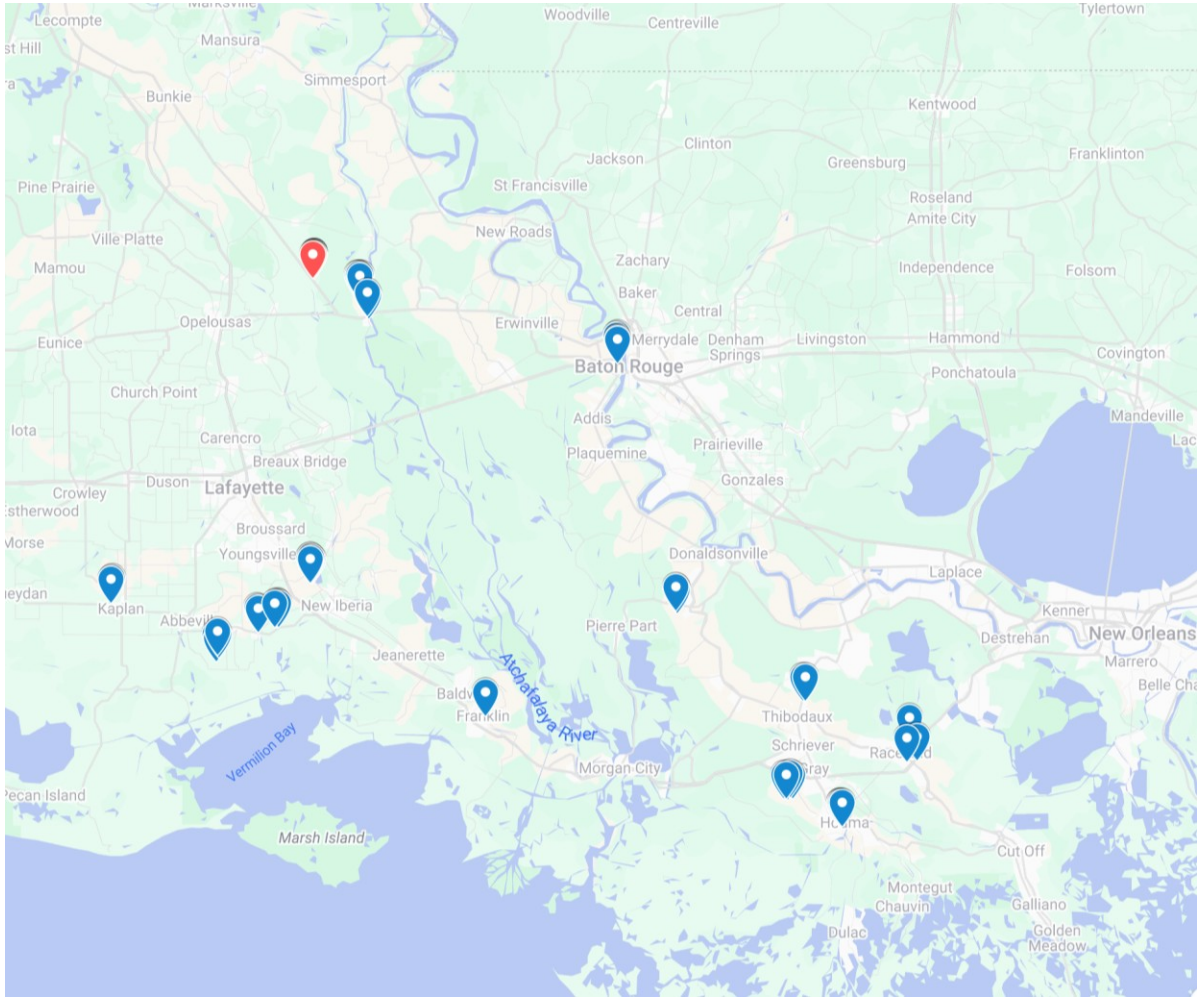
Inoculation
L01-299

10 DAI

Re-isolation

Koch's postulates

Sample Collection



Sample collection sites
(City level only, No individual fields identified)

Isolate information

- Location/Fields: 14
- Sugarcane: 105
- Rice: 12
- Grass: 1
- Sugarcane genotypes: 14

Identification

Morphology and molecular diagnosis

- *Bipolaris setariae* (Sugarcane) (Not *B. stenospila*)
- *Bipolaris oryzae* (Rice)

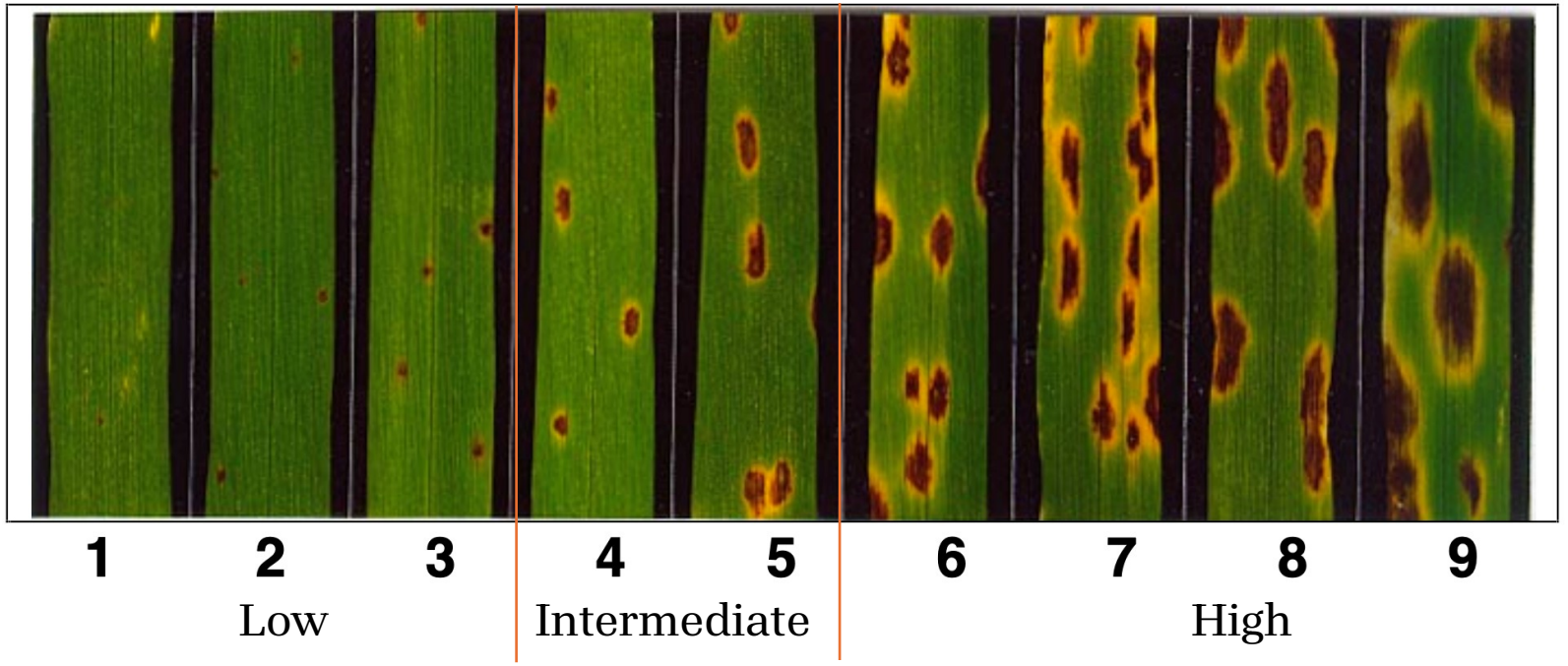
1. Species confirmation
2. Pathotype/Race structure ??
3. Mating type ??
4. Host-pathogen interaction ??

Why do we consider pathogen diversity ?

- Adopt effective disease management
- Avoids rapid resistance breakdown
- Identify novel resistance sources
- Ensures varieties work across regions
- Develop durable resistance varieties

Susceptibility of Major Sugarcane Cultivars

- Optimum inoculum, inoculation methods, time and conditions
- Standardize a disease rating scale / infection response (IR)



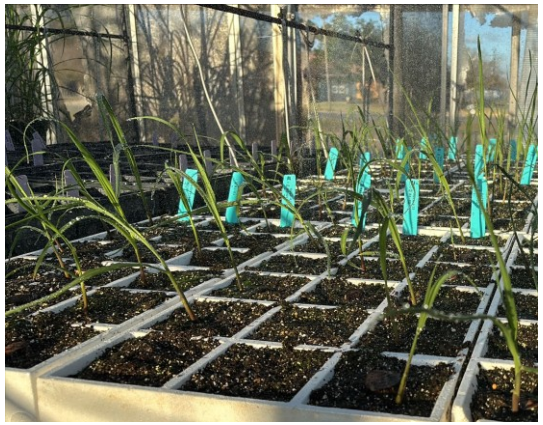
Host-parasite compatibility scale

Infection response (IR) rating scale for barley seedlings infected with *Cochliobolus sativus* **(Fetch et al., 1999)**

Susceptibility of Major Sugarcane Cultivars

Research in Progress

Cultivars	Isolates	Exp. Design
1. L01-299 2. Ho12-615 3. HoCP09-804 4. HoCP96-540 5. HoCP14-885 6. L01-283	• Four	• RCBD- Greenhouse • Three replications • 6 seedlings/replications



Planted: 11/25/2025

Inoculated: 01/06/26
~ 1m old seedlings

3 Days AI (01/09)

30 Days AI (02/06)

Susceptibility of Major Sugarcane Cultivars

Conclusions

- Preliminary results confirm *Bipolaris setariae* as the causal agent of brown stripe
- Koch's postulates were successfully completed, confirming pathogenicity
- Sugarcane varieties showed differential responses to brown stripe infection, indicating variation in resistance levels


Bipolaris setariae


Bipolaris oryzae

Future Direction

Pathogen	Host	Management
• Pathotype/race structure • Mating type • Host-pathogen interaction	• Screening disease resistance • Identify genetic loci associated with disease resistance	• Sugarcane yield impact • Fungicides and bio-fungicides • Soil nutrients and soil type

Acknowledgement

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Thank you..!