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Root rots in beans: Generating knowledge and Resources for their control

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Outline

- Root Rots introduction
- Research description
- Main results
- Applications and conclusions

Root Rots in Common beans

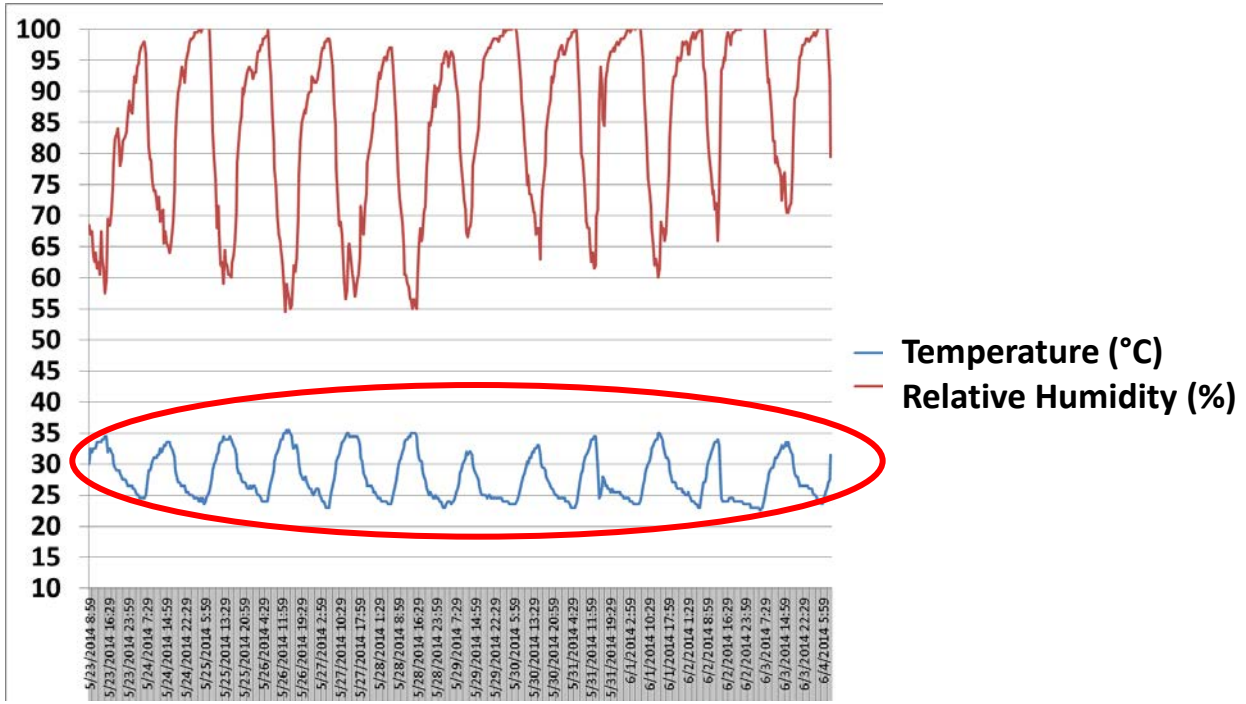
- A complex limitation affecting bean production affecting plants through the whole cycle, from emerging to maturing stage
- Can be produced by fungy and oomycetes. *Rhizoctonia solani*, *Fusarium solani* f. sp. *phaseoli*, *Pythium* sp, *Sclerotium rolfsii* as most common causal agents
- Their control using chemicals is not effective due to the limitation on contact between the active molecule with the pathogen(soil depth)
- Pathogens involved in RR can affect multiple plant species, disease management using crop rotation options are very limited
- *Pythium ultimum* is the most characterized bean disease among the Pythium genera, including bean resistance identification and markers associated to it

Root rot and damping-off caused by Pythium sp.

- **Reported in America, Africa, and Australia**
- **Disease frequently observed in beans associated with high soil moisture**
- **Ideal temperatures favoring disease development 14 to 17°C**

Changes in Pythium disease scope

This pathogen is able to cause disease at higher temperatures



- **Temperature range for disease development is beyond the expected 17°C**
- **Bean plants highly affected by Pythium in heat stress trials**

3 different Pythium species were isolated from disease samples collected in heat stress trials

- *Pythium myriotylum*
- *Pythium aphanidermatum*
- *Pythium deliense*

Population description

211 Lines ALB : P. vulgaris x P. coccineus

(SER 16 X (SER 16x**G 35346**-3Q)F1/-1Q-1Q-1C-1C-MC)
G 35066 **:** Incorporar tolerancia a alto aluminio en frijol mesoamericano con planta tipo vulgaris y de grano comercial

(ICA QUIMBAYA X (ICA QUIMBAYAx **G 35066**-1Q)F1/-1Q-MQ-2Q-MC)
G 35464
Incorporar tolerancia a alto aluminio en frijol andino con planta tipo vulgaris y de grano comercial

78 Lines INB : P.vulgaris x P. acutifolius

(ICA PIJAOx(ICA PIJAOx**G 40102**)F1/-16Q-(NN)Q-(NN)C-(NN)Q-(NN)C-(NN)C)
G 40001-G40102
G 40199: Fuente de R a Bruchidos
Incorporar tolerancia a sequía y altas temperaturas. También tolerancia a CBB (x ej INB 870)

20 Lines MIB : Pv x P. dumosus

(FEB 226 X (FEB 226 x **G 35575-2P**)F1/-1P-3P-8P-MP) Aumentar contenido de Fe en semilla

6 Lines MAB:

Incorporar tolerancia a mancha angular y aumentar contenido de Fe en semilla. Basicamente son Pv x Pv. Las fuentes de Fe en estas cruzas son Pv (G 23818B).

Todos los progenitores son Pv x Pv; excepto MIB 475-1 que tiene aprox. 1.56% de P parvifolius y 0.78% de P acutifolius.
((MAB 484xMIB 158)F1xMIB 475- 1)F2-3 X MIB 602/-1C-4Q-MQ :

Inoculation process for *Pythium*

weight 200 g of sorghum and put into the flask and add 300 ml of distilled water.

Sorghum inoculated with Pythium grown for 7 days

Incubate at 24˚C for 15 days.

Evaluation interspecific cross lines of bean

Mix the inoculum whit the soil
0.15g inoculum per 1kg of soil

Evaluation for *Pythium myriotylum* disease

AUDPC measured by evaluating disease progress at 7, 14 , 21, and 28 days

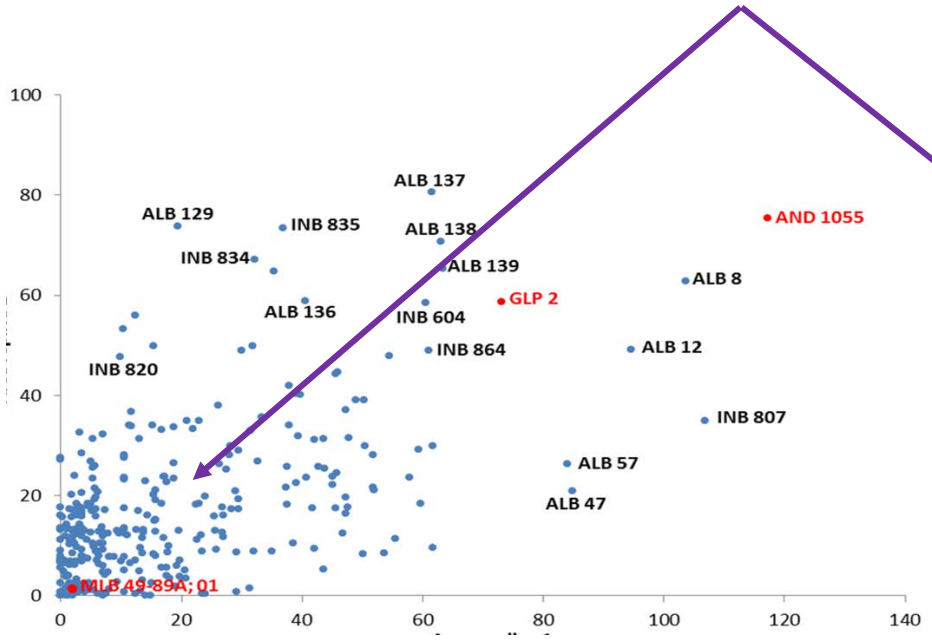
CIAT Scale 1-9

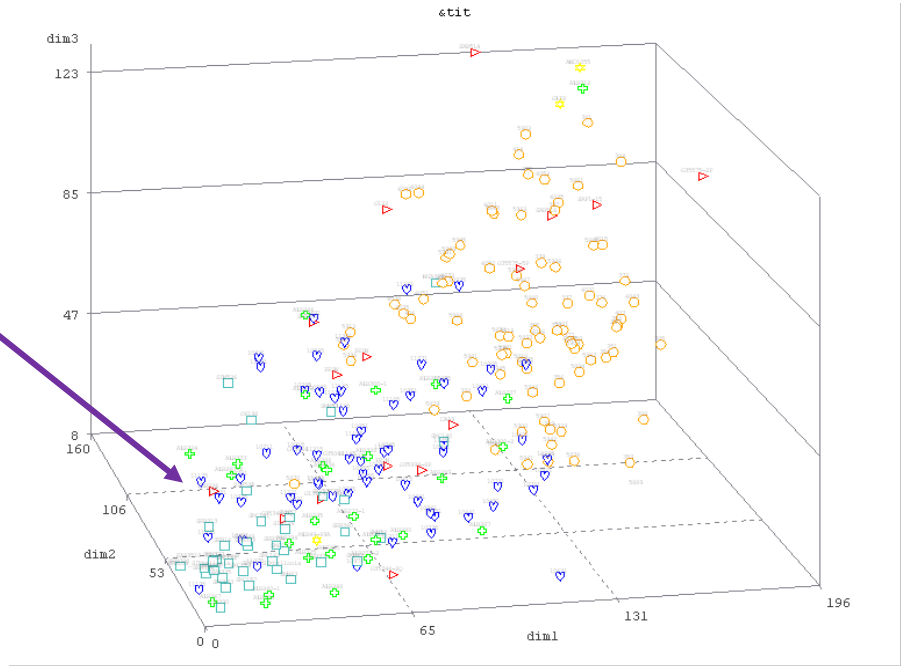
Pythium confirmed as main pathogen causing damping-off at higher temperatures

✓ **3 different Pythium species were isolated from disease samples collected in heat stress trials**

- ***Pythium myriotylum***
- ***Pythium aphanidermatum***
- ***Pythium deliense***

Inoculation of two bean germplasm sets with *P. myriotylum* identified several resistance lines





Questions we want to answer in the near future (work in progress)

1. *Are P. myriotylum, P. aphanidermatum, P. deliense the only species to cause disease at higher temperature?*

2. *Bean lines resistant to P. myriotylum are also resistant to other Pythium species?*

3. *Is the resistance response influenced by soil humidity only? what about temperature?*

Conclusions

- *Pythium* can produce severe infections in beans growing under high soil moisture at cool temperatures and high temperatures
- *Pythium* belonging to three different species were found to be reponsible for infections observed in heat stress trials in Colombia during 2014 season
- These observations put in evidence a wider spectrum in *Pythium* favorable climatic conditions, more geographical regions are prone to suffer negative impact due to this pathogen
- Greenhouse assays identified resistant bean lines to *P. myriotylum*
- More studies are in progress to have more information about interactions among host-pathogen-environment

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Thank you!