



# Industrial Hemp Pilot Program 2019-2020 Hemp Diseases in North Florida

Fanny Iriarte<sup>1</sup>, Josh Freeman<sup>2</sup>, Rui Yang<sup>3</sup> and Mathews Paret<sup>4</sup>

<sup>1</sup>Plant Pathologist/Plant Disease Diagnostician, <sup>2</sup> Associate Professor of Horticultural Science, <sup>3</sup>Postdoctoral Associate, <sup>4</sup>Associate Professor of Plant Pathology

# Industrial Hemp Diseases detected in North Florida 2019-2020

- I. Bacterial spot (*Xanthomonas* spp.)
- II. Bipolaris leaf spot (*Bipolaris* spp.)
- III. Damping off (*Rhizoctonia solani*)
- IV. Fusarium flower blight (*Fusarium* spp.)
- V. Fusarium wilt (*Fusarium oxysporum* f. sp. *vasinfectum*)
- VI. Fusarium Crown/Root Rot (*Fusarium solani*)
- VII. Pythium lower stem, crown and root rot (*Pythium myriotylum*)
- VIII. Pythium lower stem and crown rot (*Pythium aphanidermatum*)
- IX. Southern blight (*Athelia rolfsii*)
- X. References and other online resources



# I. Bacterial spot

*Xanthomonas* spp.



## Symptoms

Small necrotic spots surrounded by chlorotic halo.

Yang, Freeman, and Paret, UF-NFREC, Quincy, 2019



UF IFAS NFREC

Yang R. 2020



# I. Bacterial spot

*Xanthomonas campestris* pv. *campestris* (North FL)\*

*Xanthomonas euvesicatoria* (South FL)

## Management

- In early stages of disease removing infected plant material in lower canopy may help reduce infections.
- Avoid wounding
- Avoid overhead irrigation
- Increase plant spacing to improve air circulation.
- Currently there's no chemicals labeled for Industrial hemp.



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Iriarte F. 2019

\* Based on PCR and sequencing.

08-20-2019

# II. Bipolaris leaf spot

## *Bipolaris spp.*

Reported before  
in Kentucky and  
New York

Detected in Quincy, FL  
6-03-20

### Symptoms

Small tan color  
spots with darker  
brown margins.



Gary Bergstrom, Jennifer Starr, Kevin Myers, and Jaime Cummings  
[CornellCALs](#) - Cornell Hemp



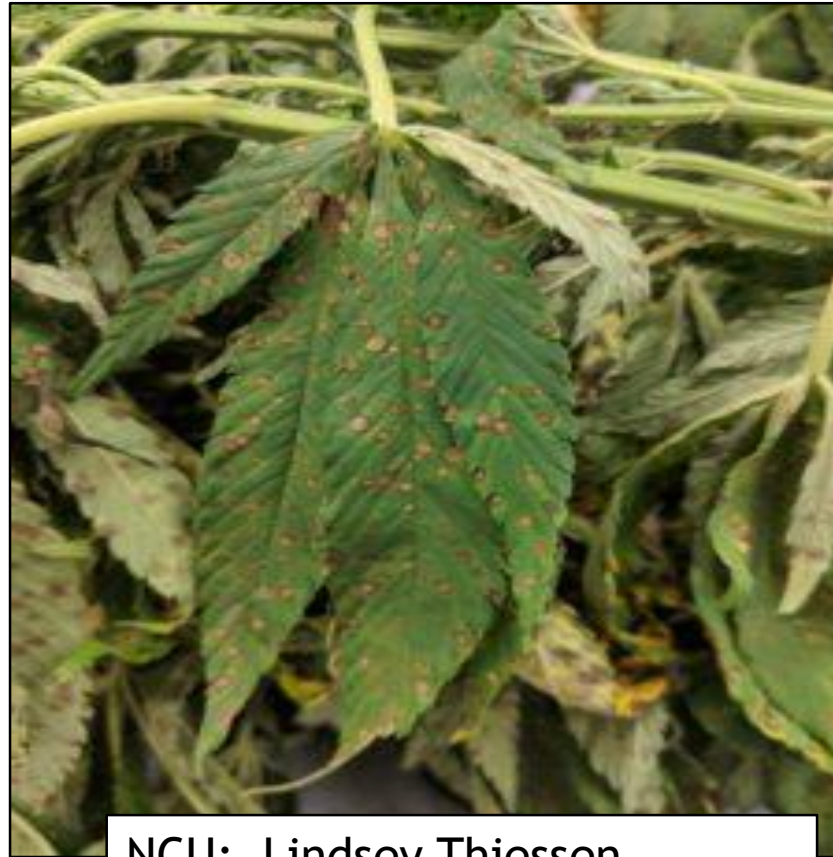
# Other Fungal Leaf Spot diseases

## Septoria Leaf Spot Kentucky University.



UK: Nicole Gauthier

## Exserohilum Leaf Spot (North Carolina)



NCU: Lindsey Thiessen

Also  
see:  
[Diseases  
of  
Hemp in  
Florida](#)

# General Management for most leaf spot diseases

## **Management**

- In early stages of disease development, remove infected plant material from field as soon as detected to reduce the amount of fungal inoculum in the field.
- Control weeds, as they can serve as secondary hosts for pathogens and virus insect vectors.
- Remove and/or destroy crop debris at the end of the growing season. This will help get rid of overwintering fungal inoculum.
- Avoid or reduce sprinkle irrigation and improve aeration.

# III. Damping off

## *Rhizoctonia solani*\*

Observed on greenhouse grown hemp seedlings. Damping off fungi invade stems of seedlings at the soil line shortly after they emerge.

### Management

- In greenhouse, growing medium should be sterilized and all containers disinfested before reuse.
- Avoid overwatering and improve drainage.

\* Based on PCR and sequencing.

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### Symptoms

- Wilting
- Necrotic lower stems



Iriarte F. 2019

04-22-2019



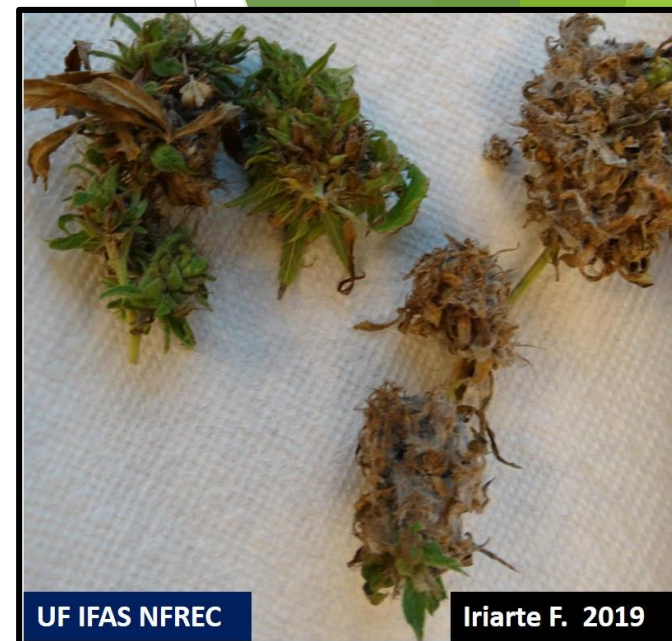
11-14-2019



Yang R. 2020

## IV. Fusarium flower blight *Fusarium* spp.

*Fusarium graminearum*  
and *F. equiseti* have  
been isolated from  
Hemp flowers  
(Thiessen L. 2020)



UF IFAS NFREC

Iriarte F. 2019

### Important note

Infection of female flowers buds and grain may result in contamination by Fusarium mycotoxin.  
Cornell Hemp group have found contamination of hemp grain in excess of 7 ppm of deoxynivalenol (vomitoxin) during a survey in 2019 (Bergstrom et.al. 2019).



# V. Fusarium Wilt

*Fusarium oxysporum* f. sp. *vasinfectum*\*



## Symptoms

- Wilting and chlorosis of plants.
- Vascular discoloration

## Management

- In greenhouse, growing medium should be sterilized and all containers disinfested before reuse.
- Avoid overwatering and improve drainage.



# VI. Fusarium crown/root rot

*Fusarium solani*\*

## Symptoms

- Wilting and chlorosis of plants.
- Crown and root rot

## Management

- Avoid low areas and improve drainage.



UF NFREC

Iriarte F. 2020

\* Based on PCR and sequencing.

8-10-20



# VII. Pythium lower stem, crown and root rot

## *Pythium myriotylum*\*



### Symptoms

- Constricted lower stem
- Necrotic lower stem and crown
- Sloughing off roots

06-11-2020

\* Based on PCR and sequencing.



# VIII. Pythium lower stem and crown rot

*Pythium aphanidermatum*\*



## Symptoms

- Wilted foliage
- Chlorotic/Necrotic leaves
- Soft and easy to remove plant tissue at the soil line.

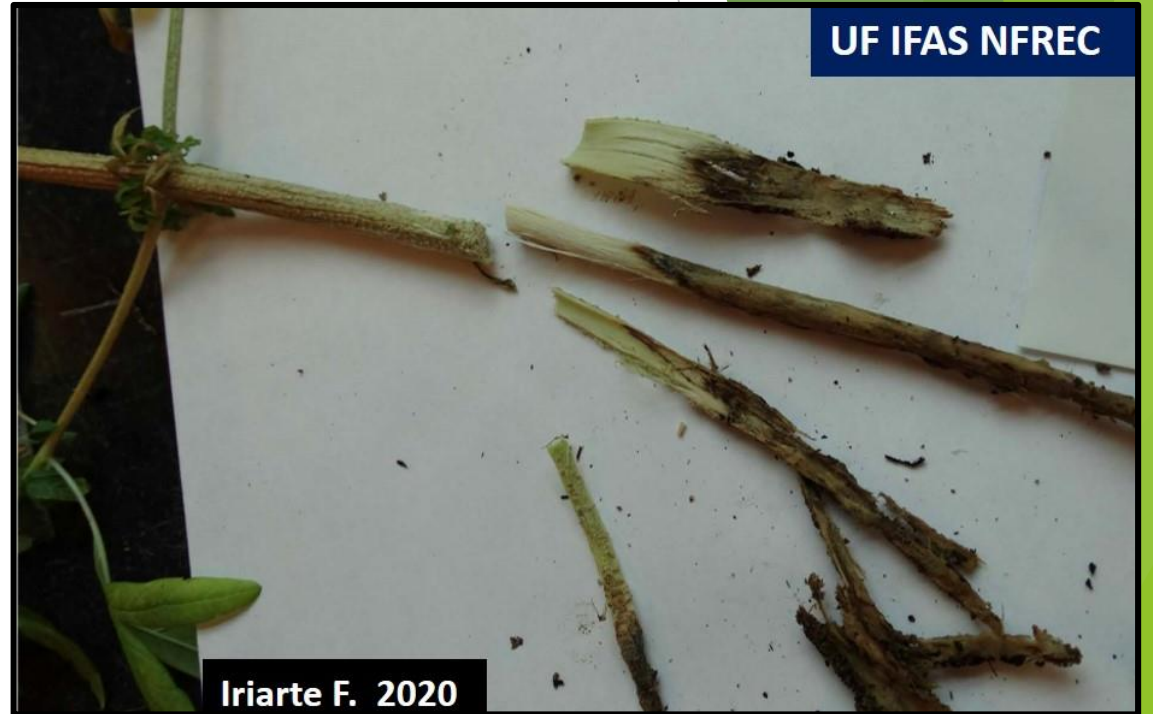


\* Based on PCR and sequencing.



# VIII. Pythium lower stem and crown rot

## *Pythium aphanidermatum*\*



### Symptoms

- Wilted and chlorotic leaves
- Rotted lower stem presents soft and easy to remove and necrotic core tissue.

\* Based on PCR and sequencing.

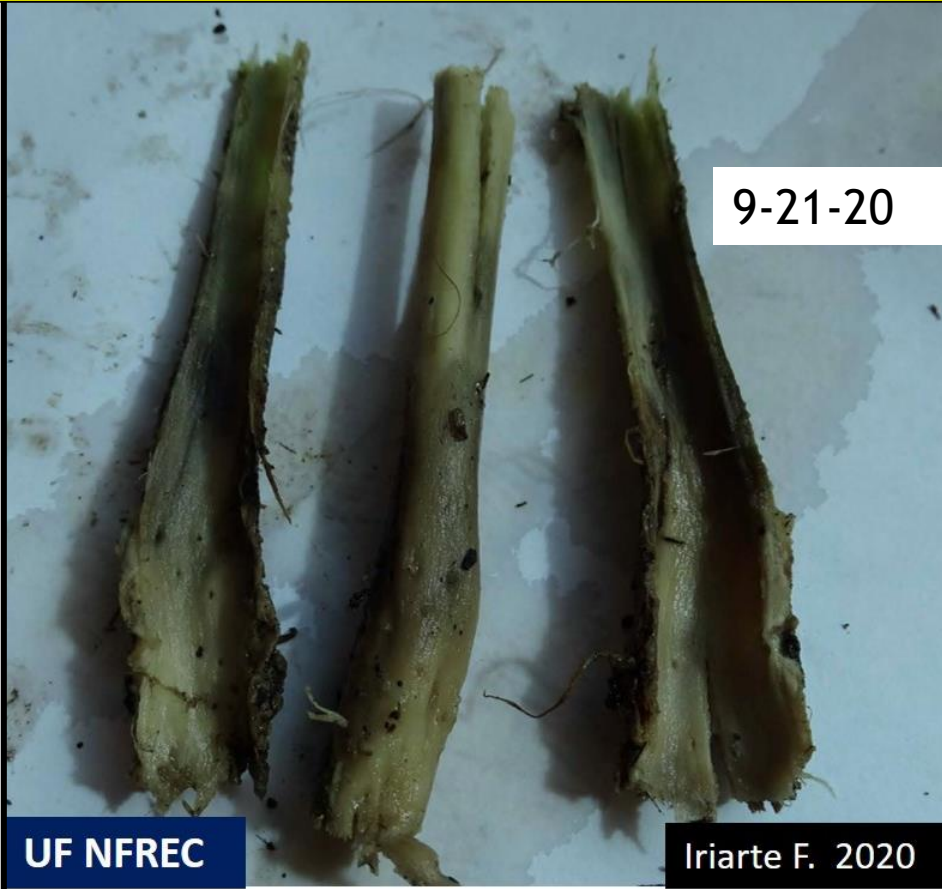


# VIII. Pythium lower stem and crown rot

## *Pythium aphanidermatum*\*

### Symptoms

Easily detached outer layer of necrotic lower stem.



### Management

- In greenhouse, growing medium should be sterilized and all containers disinfested before reuse.
- Avoid low and poorly drained areas.
- Remove and discard infected plant material away from the site to avoid spread of the pathogen in the field.
- Fungicide treatment studies are under way.

\* Based on PCR and sequencing.



# IX. Southern blight

*Athelia rolfsii* (= *Sclerotium rolfsii*)



08-20-2019



Warm  
temperature  
and high  
humidity

## Symptoms

- Plant shows wilting and chlorotic leaves.
- White fungal mycelia mats may be present at the crown area.
- Abundant small cream to tan-colored **sclerotia** may also be present at the base of the plant.



# IX. Hemp Southern blight

## *Athelia rolfsii* also (= *Sclerotium rolfsii*)

### Management

- ▶ Avoid planting hemp in areas with history of Southern Blight.
- ▶ Plant healthy transplants.
- ▶ Remove and discard away from the field infected plant material as well as soil around it to avoid spread of the pathogen.
- ▶ Increase plant spacing to improve air circulation.
- ▶ After harvesting, deep plowing to bury pathogen sclerotia is recommended to reduce fungal inoculum in the soil profile.
- ▶ Currently there's no chemicals labeled for Industrial hemp.

For more information see: [Southern Blight of Industrial Hemp \(lsuagcenter.com\)](https://lsuagcenter.com)

# X. References and other Online Resources

## FLORIDA

- Diseases of Hemp in Florida **UF IFAS University of Florida**
- Nick Dufault. 2020. Industrial Hemp Diseases in Florida: What We Know So Far **UF IFAS Extension University of Florida**
- Josh Freeman. 2021. After Another Year of Industrial Hemp Research, the Risks Remain the Same **UF IFAS Extension University of Florida**

## OTHER STATES

- Gary Bergstrom, Jennifer Starr, Kevin Myers and Jaime Cummings. Diseases Affecting Hemp in New York **Cornell Hemp.** <http://hemp.cals.cornell.edu>
- Thiessen L., Schappe T., Cochran S., Kichs K., and R. Angela. 2020. Surveying for Potential Diseases and Abiotic Disorders of Industrial Hemp (*Cannabis sativa*) Production. **North Carolina State University.** <https://doi.org/10.1094/PHP-03-20-0017-RS>
- Zachariah H., Bernard E., Grant J., Gwinn K., Hale F., Kelly H., Stewart S. HEMP Disease and Pest Management **Institute of Agriculture The University of Tennessee.** [W916.pdf \(tennessee.edu\)](#)



# INDUSTRIAL HEMP DISEASE TESTING



UF IFAS NFREC Plant Diagnostic Clinic  
155 Research Road, Quincy, FL 32351  
850-875-7140/7154; [fbiriarte@ufl.edu](mailto:fbiriarte@ufl.edu); [paret@ufl.edu](mailto:paret@ufl.edu)  
<https://plantpath.ifas.ufl.edu/u-scout/index.html>



Division of Plant Industry, FDACS  
1911 SW 34th Street, Gainesville, FL 32608  
(352) 395-4761; [David.Davison@freshfromflorida.com](mailto:David.Davison@freshfromflorida.com)  
<http://www.freshfromflorida.com/Divisions-Offices/Plant-Industry>



UF/IFAS Plant Diagnostic Center  
Department of Plant Pathology, University of Florida  
Building 1291, 2570 Hull Road Gainesville, FL 32611-0830  
352-392-1795, [clharmon@ufl.edu](mailto:clharmon@ufl.edu)  
<http://plantpath.ifas.ufl.edu/Clinic/index.shtml>