

# Emerging Diseases of Corn

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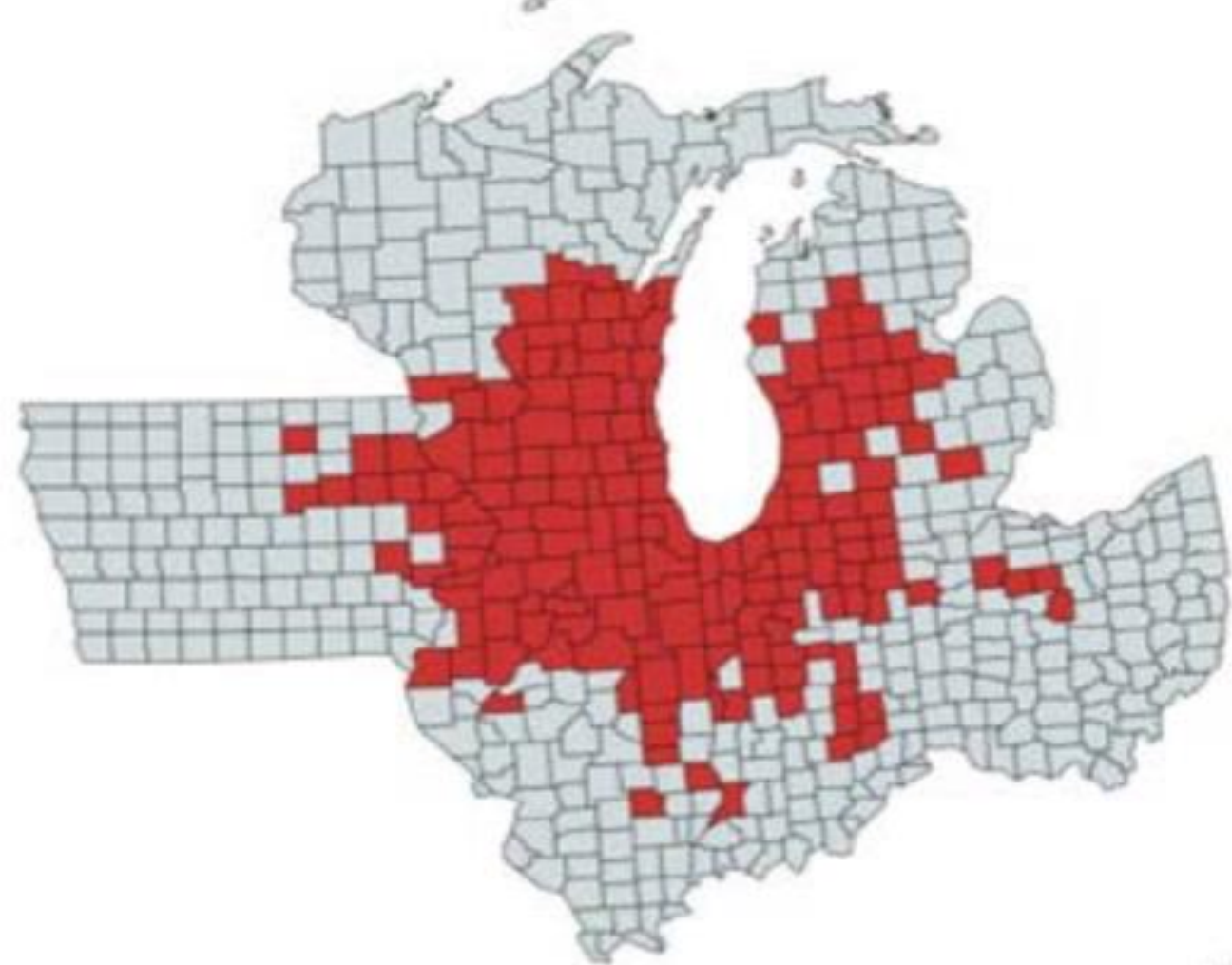
# New and Emerging Diseases

## *Examples and Impacts*

- Sugarcane orange rust
- Basil downy mildew
- Lettuce bacterial leaf spot
- Bacterial blight of parsley
- Stemphylium leaf spot of spinach
- Impatiens downy mildew
- Alternaria leaf spot of cilantro

# Tar Spot on Corn

- Fungal disease historically reported in Mexico, Central America and the Caribbean
- First reported in the U.S. during 2015.
- Original outbreaks reported in northern Indiana and Illinois
- Thought to have arrived on wind currents arriving from areas south of the U.S., primarily Mexico.
- Its late arrival precluded significant yield losses.



# Tar Spot of Corn

- Caused by a fungal pathogen complex, which includes *Phyllachora maydis* and *Monographella maydis*.
- In the U.S., only *Phyllachora maydis* has been confirmed thus far. Serious damage occurs in the native range, where co-infections of the two fungi occur.
- The pathogens are obligates, and cannot be cultured in-vitro.
- In the tropics, they most likely persist on the year-round presence of maize.



# Tar Spot Symptoms

- Raised small black specks on leaves, resembling splattered tar.
- Elliptical necrotic lesions with black specks in the center.
- Extensive necrosis and drying down of foliage with heavy infection.



# Tar Spot

## *Symptoms*





# Tar Spot of Corn

*Ascostroma*





# Tar Spot

## *Advanced Symptoms*





# Tar Spot

*Fish Eye Symptom*



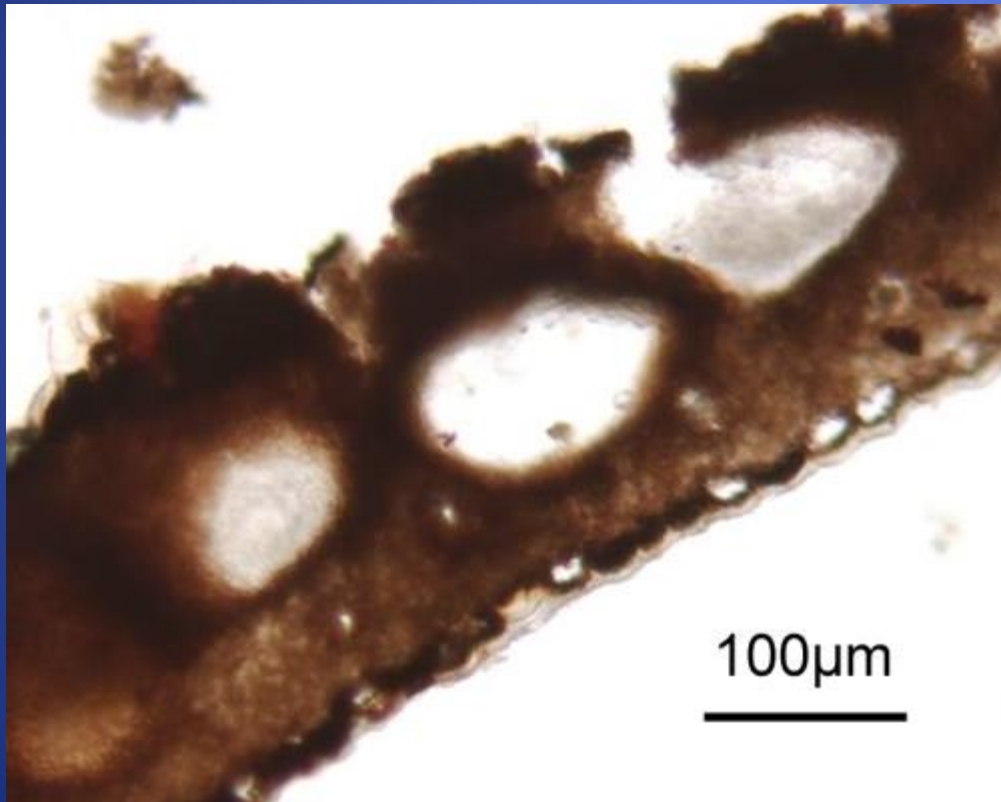
# *Phyllachora maydis*

- Ascomycete
- Ostiolate, aggregated perithecia (fruiting structure) are produced in a thickened black stroma.
- Perithecia are embedded in the stroma and produce slender cylindrical asci, or sacs which contain ascospores.
- Ascospores are single-celled, brown-pigmented, and oval in shape.
- The spores are disseminated by wind currents.



# *Phyllachora maydis*

Ascostroma



Asci



Ascospores



# *Phyllachora maydis*



# *Phyllachora maydis*

## *Epidemiology*

- Infection favored by 17-23° C temperatures
- Favored by high humidity (>85%)
- Requires a minimum of 7 hrs of moisture for germination and infection
- Ascospore release highest in late afternoon
- Incubation period is typically 12-15 days
- Inoculum loses viability by 90% within 3 to 4 months



# Tar Spot on field corn

- Tar Spot decreases the leaf area available for photosynthesis.
- Can lead to premature death of leaf tissue, reducing the resources available during grain fill
- Reduced yields
- Due to weaker stalks, it's important to prioritize harvest of Tar Spot-infested fields



# Scouting for Tar Spot

- Focus should be primarily in the spring.
- Most likely to be observed on field corn.
- Initial symptoms, raised tar-like black spots, most prevalent in lower canopy, moving up.
- Fish-eye symptoms developing later.
- Notify FDACS if observed.
- Fungicide sprays could be justified if outbreak is early enough.

# Threat to the U.S?

- Tar spot has now become established in a number of important corn belt states, namely IA, IN, IL, WI, OH, and MI
- This is due to the survival of the pathogen from year to year on corn stubble and debris (no-till), and favorable moderate temperatures, particularly in the fall
- There is the potential for significant losses in some areas of the U.S.
- In FL, the risk is reduced due to: 1) more rapid breakdown of corn debris, 2) higher than optimal temperatures, and 3) more frequent use of fungicides, particularly on sweet corn.



# Tar Spot

## *Conclusions*

- Tar spot has been observed in FL in three of the last four years, but only *P. maydis* was confirmed.
- Presence of *Monographella maydis* could change things.
- Limited yield losses have been observed on early-planted spring field corn due to favorable env. conditions, but secondary spread has been limited by high temperatures.
- If steps are taken to decompose corn debris between crops, it is unlikely that tar spot can survive from year to year in FL.
- Tar spot can also be effectively managed with fungicides, therefore losses to FL sweet corn should be non-existent to minimal, since it is sprayed for numerous other diseases.
- Bottom line: Don't obsess over tar spot, but keep it in mind.

# Bacterial Leaf Streak

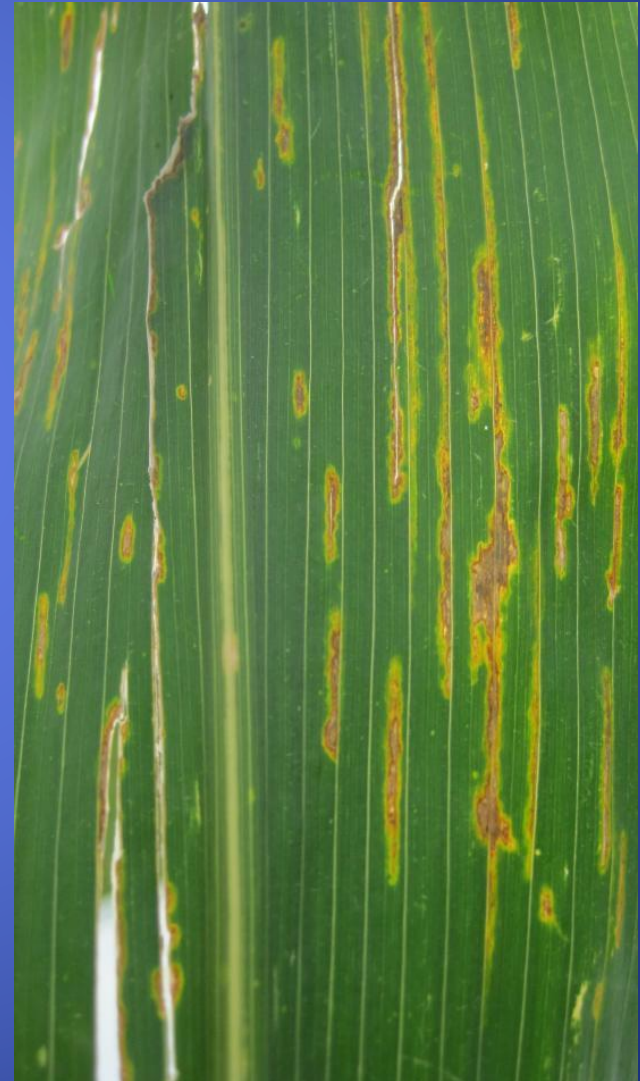
## *Background*

- Caused by the bacterium *Xanthomonas vasicola* pv. *vasculorum*
- The disease was first reported in the Republic of South Africa in 1949.
- The disease was confirmed on Aug. 26, 2016, in Nebraska, Colorado, Illinois, Iowa and Kansas.

# Bacterial Leaf Streak

## *Symptoms*

- Causes tan to brown leaf streaks, measuring from less than 1" to several inches in length
- Can resemble others diseases initially, but has wavy edged lesions rather than straight edges
- When backlit, shows yellow margins around the lesion





# Bacterial Leaf Streak

- Now confirmed in 9 states, primarily in the Midwest (CO, IL, IA, KS, MN, NE, OK, SD, TX)
- Has been observed every year since 2016 and is now thought to be established in U.S.
- Thought to have arrived in U.S. on infested seed

# Bacterial Leaf Streak

## *Symptoms*



- Symptoms may appear as early as V7 stage and lesions may expand to turn leaf necrotic
- Starts low in the canopy and moves up
- Spread by hard rain splash, wind, and equipment

# Gray Leaf spot

- Bacterial leaf streak symptoms look similar to other diseases, particularly the fungal disease gray leaf spot.
- Gray leaf spot produces lesions with straight margins along the veins of the leaf, unlike bacterial leaf streak, which produces wavy margins





# Bacterial Leaf Streak

## *Epidemiology*

- Once established, the pathogen survives in and on infected plant debris
- Observed to be capable of surviving across soybean rotations with corn in northern states
- No research data is available to predict potential impact of this disease on yield.
- However, the bacterium also infects sugarcane, causing gumming disease, and may cause very heavy losses on that crop
- It has not yet been observed on sugarcane in the U.S.

# Bacterial Leaf Streak



- As the disease is caused by a bacterial pathogen, fungicides will not control this disease.
- Although bactericides are labelled for use on corn, their practicality and potential efficacy is limited.

# Bacterial Leaf Streak

## *Management*

- Once established, BLS is best managed by reducing the primary source of inoculum ... infected debris
- Crop rotation is helpful but may require more than one year
- Tillage to incorporate debris into the soil is also helpful and may be justified when severe
- Fungicides are not effective
- Host-plant resistance is still unknown



# Bacterial Leaf Streak

- Florida's warm, moist climate with frequent heavy rainfalls would seem prime for the disease.
- However, the rapid decomposition of corn debris, particularly when soil incorporated, should help to minimize its survival.
- At this point in time, be mindful and vigilant, report it if suspected, and avoid corn after corn rotations.

# New and Emerging Diseases

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- What's next??

# What's Next?

- Since November 2018, APHIS has tested imported tomato seed to manage the risks of seed-borne pathogens.
- The test used by APHIS detects the following six pospiviroids of quarantine significance for the United States: Columnnea latent viroid (CLVd), Pepper chat fruit viroid (PCFVd), Potato spindle tuber viroid (PSTVd), Tomato apical stunt viroid (TASVd), Tomato chlorotic dwarf viroid (TCDVd) and Tomato planta macho viroid (TPMVd; synonym Mexican papita viroid).



# Pospiviroids

- Known to cause disease in potatoes, tomatoes, peppers, and other crops.
- Disease symptoms including severe stunting, leaf or stem necrosis, flowering alterations, and foliar and fruit deformation.
- Transmitted mechanically, e.g. by tools and farm machinery, or by infected seed, aphids, or pollen.
- APHIS has amended entry requirements for importation of tomato and pepper seed from all countries

**Thank you!**

**QUESTIONS?**