# What's New in Plant Pathology!

Melissa Bartels – Extension Educator

Sarah Sivits – Extension Educator

Tamra Jackson-Ziems – Extension Plant Pathologist

Amy Timmerman – Extension Educator

Stephen Wegulo – Extension Plant Pathologist

Kyle Broderick – Coordinator of Plant Diagnostic Clinic

Bob Harveson – Extension Plant Pathologist

# Crop Production Clinics

## What's New!

- Additions to the Guide for Weed, Disease, and Insect management in Nebraska
- New products for corn, soybean, sugarbeets, and wheat
- New and emerging diseases
- Plant and Pest Diagnostic Clinic
  - Sample fee update
  - How to submit a sample

## Additions to the Disease Management Section

- Additional Plant Pathologist around Nebraska
  - Amy Timmerman, Educator – Holt and Boyd Counties
  - Sarah Sivits, Educator – Dawson, Buffalo, and Hall Counties
  - Melissa Bartels, Educator – Butler and Polk Counties
  - Jenny Rees, Educator – York and Seward Counties
- New Fungicide Tables
  - Potato – seed, soil, and foliar applied
  - Corn – column added to foliar fungicide table
    - Field, sweet, seed and/or popcorn
  - Alfalfa – foliar fungicides

## CORN: New disease management products

| Trade Name | Active Ingredient(s) | Fungicide Class(es) |
|---|---|---|
| Lucento | Flutriafol 26.5% + Bixafen 15.6% | Mixed Modes of Action (Groups 3 + 7) |
| Miravis Neo | Propiconazole 11.6% Pydiflumetofen 7.0% Azoxystrobin 9.3% | Mixed Modes of Action (Groups 3 + 7 + 11) |
| Revytek | Mefentrifluconazole 11.61% Pyraclostrobin 15.49% Fluxapyroxad 7.74% | Mixed Modes of Action (Groups 3 + 7 + 11) |
| Veltyma | Mefentrifluconazole 17.56% Pyraclostrobin 17.56% | Mixed Modes of Action (Groups 3 + 11) |
| Xyway 3D | Flutriafol 26.4% | DMI Triazole (Group 3) |

## SOYBEAN: New disease management products

| Trade Name | Active Ingredient(s) | Fungicide Class(es) | Application |
|---|---|---|---|
| Lucento | Flutriafol 26.5% + Bixafen 15.6% | Mixed Modes of Action (Groups 3 + 7) | Foliar |
| Miravis Neo | Propiconazole 11.6% Pydiflumetofen 7.0% Azoxystrobin 9.3% | Mixed Modes of Action (Groups 3 + 7 + 11) | Foliar |
| Revytek | Mefentrifluconazole 11.61% Pyraclostrobin 15.49% Fluxapyroxad 7.74% | Mixed Modes of Action (Groups 3 + 7 + 11) | Foliar |
| Veltyma | Mefentrifluconazole 17.56% Pyraclostrobin 17.56% | Mixed Modes of Action (Groups 3 + 11) | Foliar |
| Saltro | Pydiflumetofen 41.7% | SDHI (Group 7) | Seed treatment |

## WHEAT: New disease management products

| Trade Name | Active Ingredient(s) | Fungicide Class(es) |
|---|---|---|
| Lucento | Flutriafol 26.5% + Bixafen 15.6% | Mixed Modes of Action (Groups 3 + 7) |
| Miravis Ace | Propiconazole 11.4% Pydiflumetofen 13.7% | Mixed Modes of Action (Groups 3 + 7) |
| Delaro SC | Prothioconazole (16.0%) + Trifloxystrobin (13.7%) | Mixed Modes of Action (Groups 3 + 11) |

| Trade Name | Registered Crops | Applications & Rates | Comments |
|---|---|---|---|
| **PRESTOP WG *Gliocladium catenulatum* J1446 (93%)** | Greenhouse or field grown vegetables, ornamentals, cereals, legumes, fruits, and turf | Foliar spray, drench, and mixing with growth substrate. Rates may vary, see label | Biofungicide against seed-borne fungal diseases including damping-off, root and stem rot, and wilt |

## SUGER BEET: New disease management products Products

| Trade Name | Active Ingredient(s) | Fungicide Class(es) |
|---|---|---|
| Veltyma | Mefentrifluconazole 17.56%<br>Pyraclostrobin 17.56% | Mixed Modes of Action<br>(Groups 3 + 11) |

# Nematicides

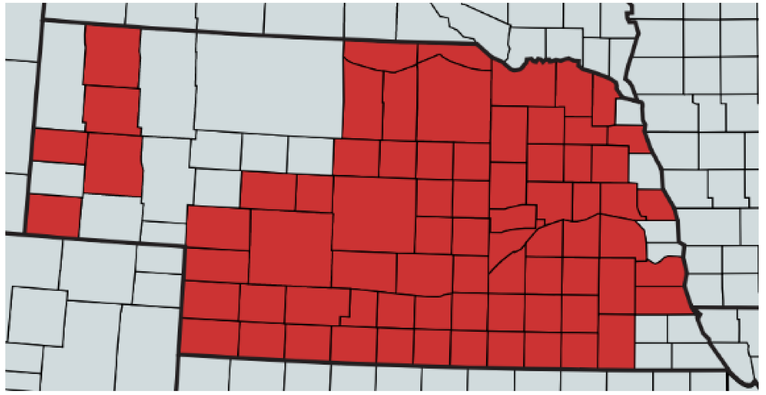
| Trade Name | Registered Crops | Applications & Rates |
|---|---|---|
| **Aveo EZ Nematicide**<br>***Bacillus amyloliquefaciens* – PTA-4838** | Corn, soybean | Seed treatment, Commercially applied |
| **Biost Nematicide 100**<br>**Head-killed *Burkholderia rinojensis* A396 (94.46%) + fermentation media** | Corn (field, popcorn, seed, sweet), sorghum, soybean, wheat | Foliar, seed, soil, Rates see label varies by crop |
| **Trunemco**<br>***Bacillus amyloliquefaciens* MBI600 (1.00%)**<br>**cis-Jasmone (0.88%)** | Corn, soybean | Seed treatment, Commercially applied |
| **Saltro**<br>**Pydiflumetofen (41.7%)** | Soybean | Seed treatment,<br>1.52 fl oz/100 lbs seed<br>0.714 fl oz/140,000 seed |

## New and emerging diseases

- Corn
  - Bacterial leaf streak
  - Physoderma brown spot – node rot phase
  - Tar spot
- Soybeans
  - Frogeye leaf spot – fungicide resistance confirmed
  - Sudden death syndrome
- Wheat
  - *Fusarium boothii* causing head blight

# Corn Disease Update - Bacterial leaf streak

- Caused by *Xanthomonas vasicola* pv. *vasculorum*
- Confirmed in 2016 in Nebraska (first time in the U.S.)
  - 75 NE Counties with 2019 expansion in the Panhandle



Hartman, T. M. 2018. University of Nebraska-Lincoln. M.S. Thesis

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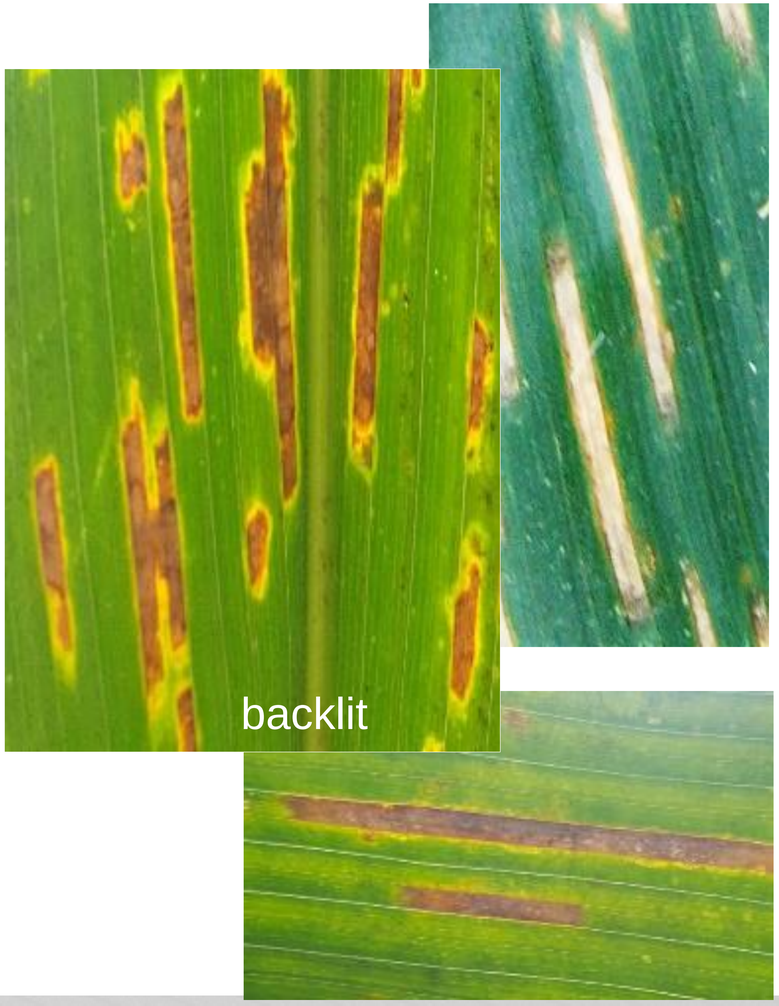
## Bacterial Leaf Streak

backlit

## Gray Leaf Spot (fungal)



backlit

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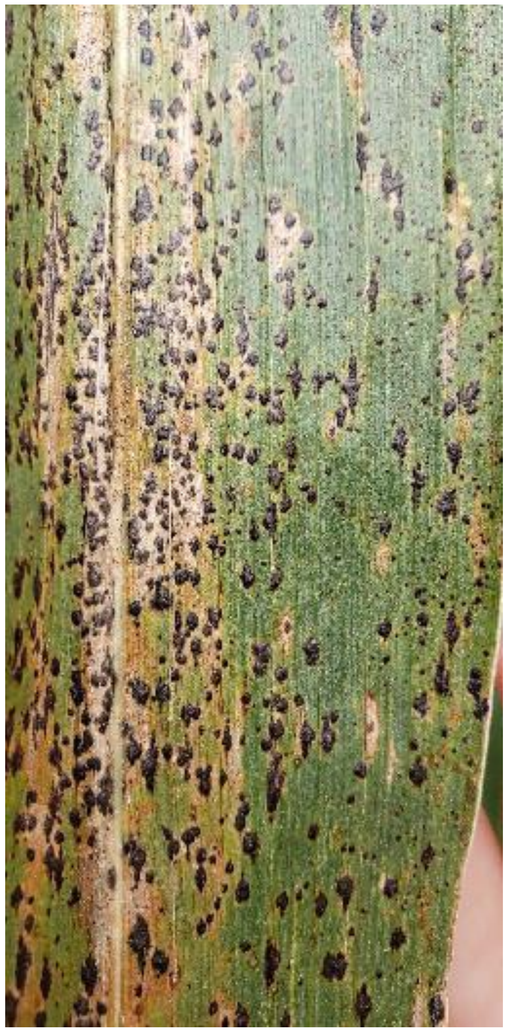
## Corn Disease Update – Physoderma Brown Spot

- *Physoderma maydis*
- More common in 2019
- Infection requires water, esp. early season during whorl stages
- Leaf disease symptoms or node rot
- Hybrids vary in resistance/susceptibility to leaf disease or node rot

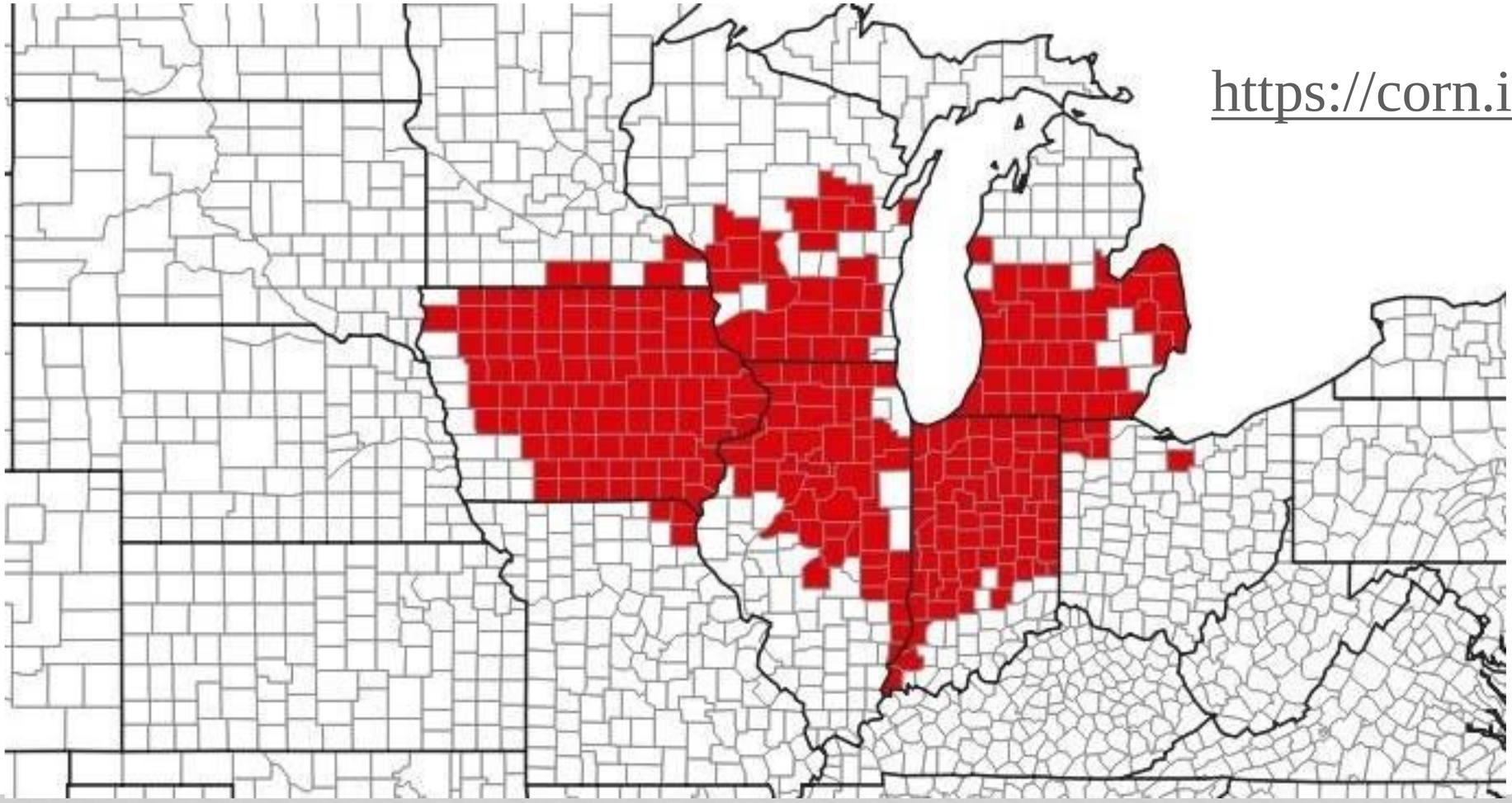
# Corn Disease Update – Watch for Tar Spot in 2020

- *Phyllachora maydis* (and/or *Monographella maydis* in Latin America)
- Confirmed in U.S. 2015
- **Symptoms**
  - Black dots (ascomata)
  - “Fisheye” rings
  - < 50% yield loss

Send samples to:
UNL Plant & Pest Diagnostic Clinic
http://go.unl.edu/plantclinic



## Corn Disease Update – 2019 Tar Spot in the United States



https://corn.ipmpipe.org/tarspot/

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## Soybean Disease Update – Frogeye Leaf Spot

- *Cercospora sojina* (fungus)
- Most soybean-producing areas of the U.S.

**Symptoms**

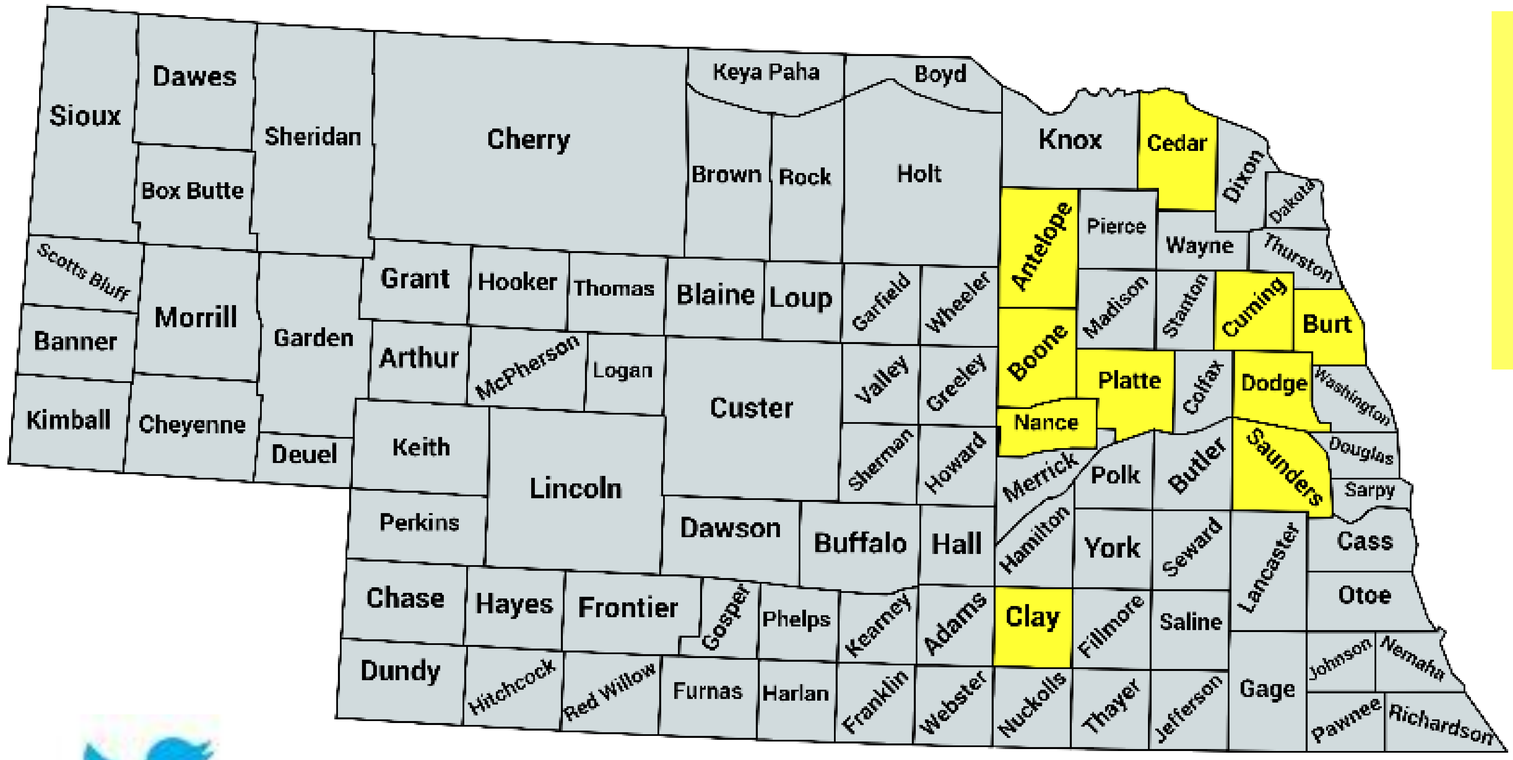
- Small tan/gray lesions
- Red/purpose border
- Upper leaves

**Favorable Conditions**

- Warm, moist/humid

# Crop Production Clinics

## 2019 - QoI Fungicide Resistance Confirmed in *Cercospora sojina* causing Frogeye Leaf Spot in 10 Nebraska Counties




#IRPests

FUNGICIDE RESISTANCE IS HERE!

- Resistance confirmed in 111 out of 113 *C. sojina* isolates (98%)

# Crop Production Clinics

## Soybean Disease Update – Sudden Death Syndrome

Chlorotic spots

Interveinal chlorosis and necrosis

Premature defoliation

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# Soybean Disease Update – Sudden Death Syndrome

- Management starts with a resistant variety
- Still many susceptible varieties on the market
- As new germplasm enters the market, consistent levels of SDS resistance are not always retained

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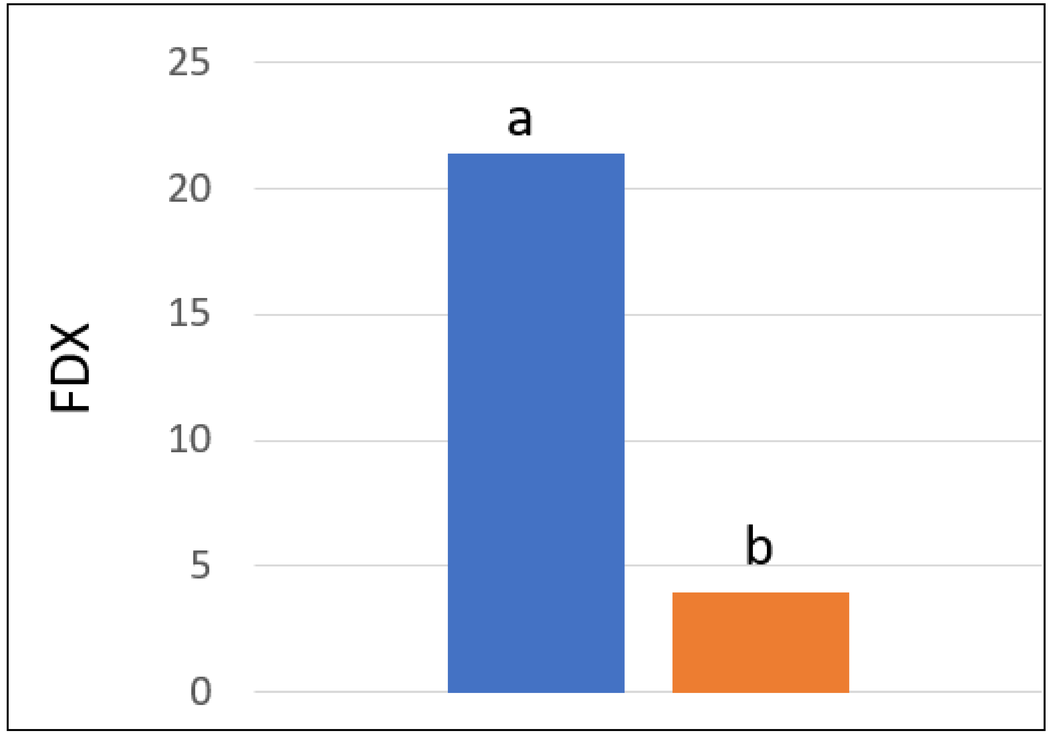
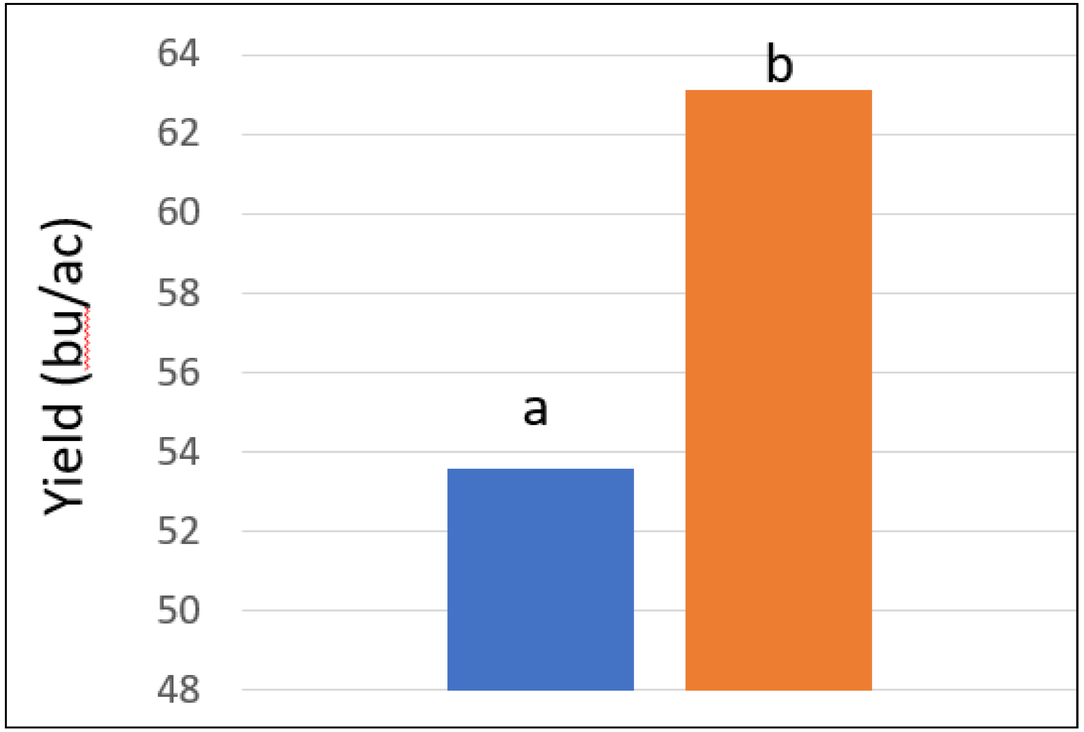
## From all 52 seed treatment trials




Susceptible

Resistant




Resistant varieties

81.3% less SDS FDX

15.1% more yield

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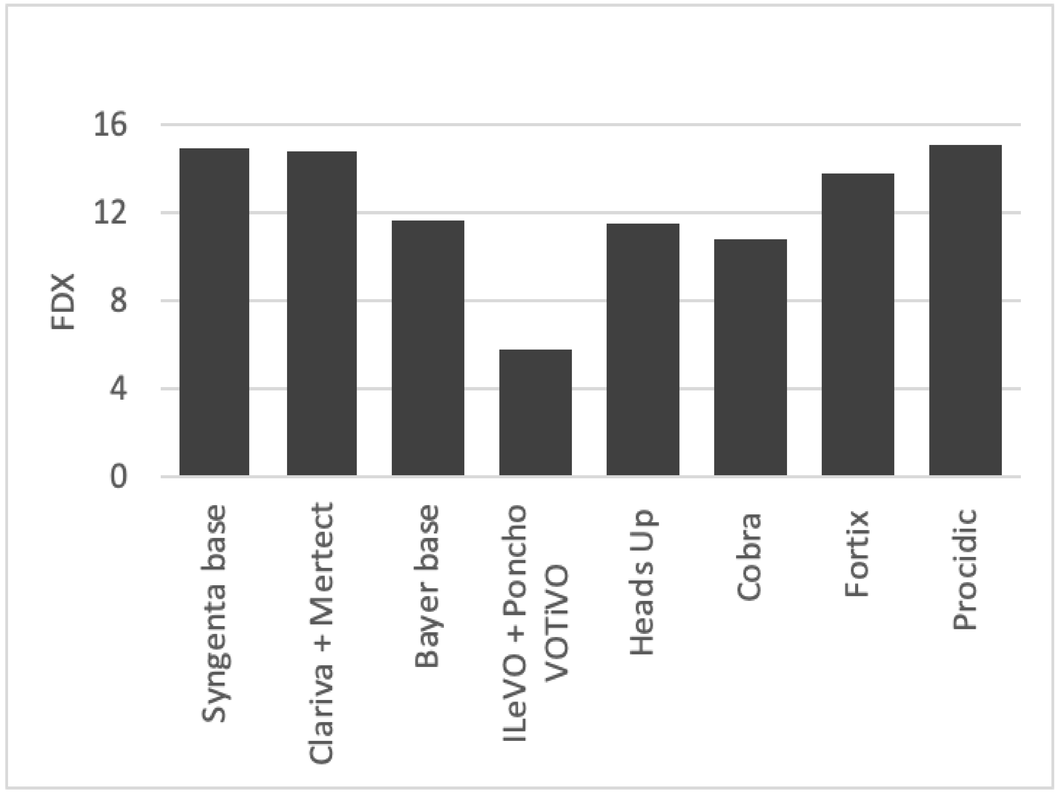
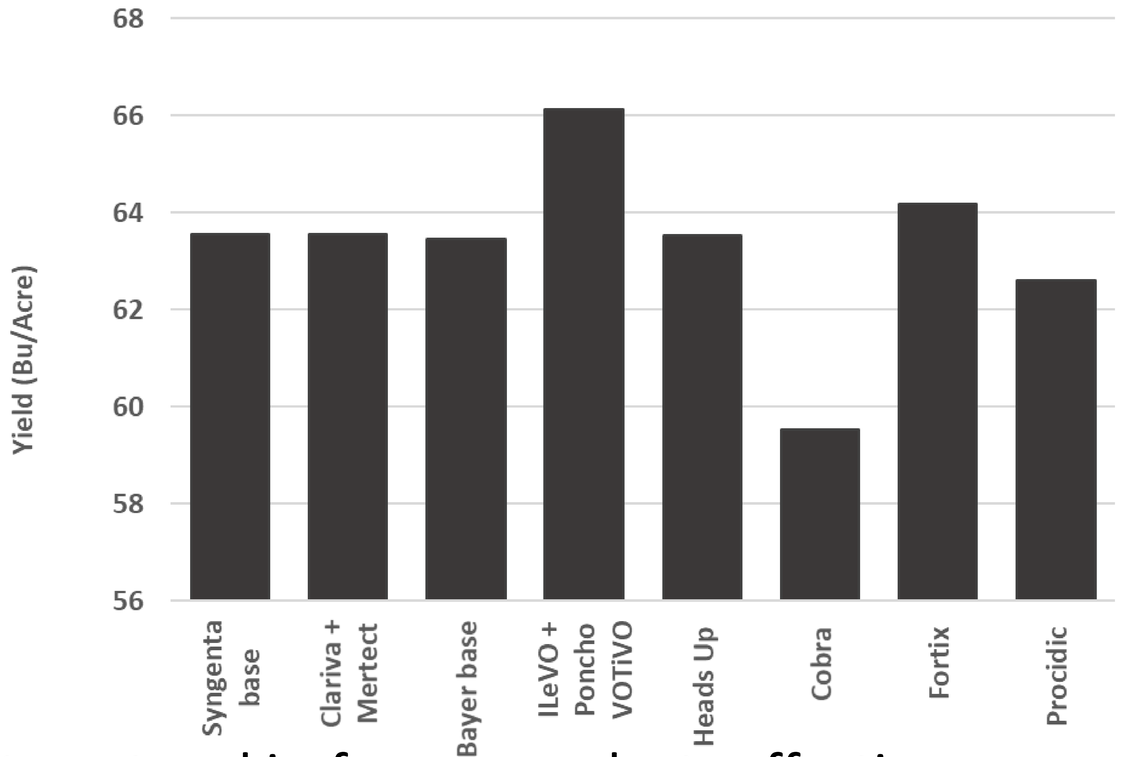
# Crop Production Clinics

## North Central SDS Product Evaluation Trials




- Some seed treatment and in-furrow products effective
- All foliar products ineffective
- ILeVO most effective

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# First Report of *Fusarium boothii* Causing Head Blight of Wheat in the United States

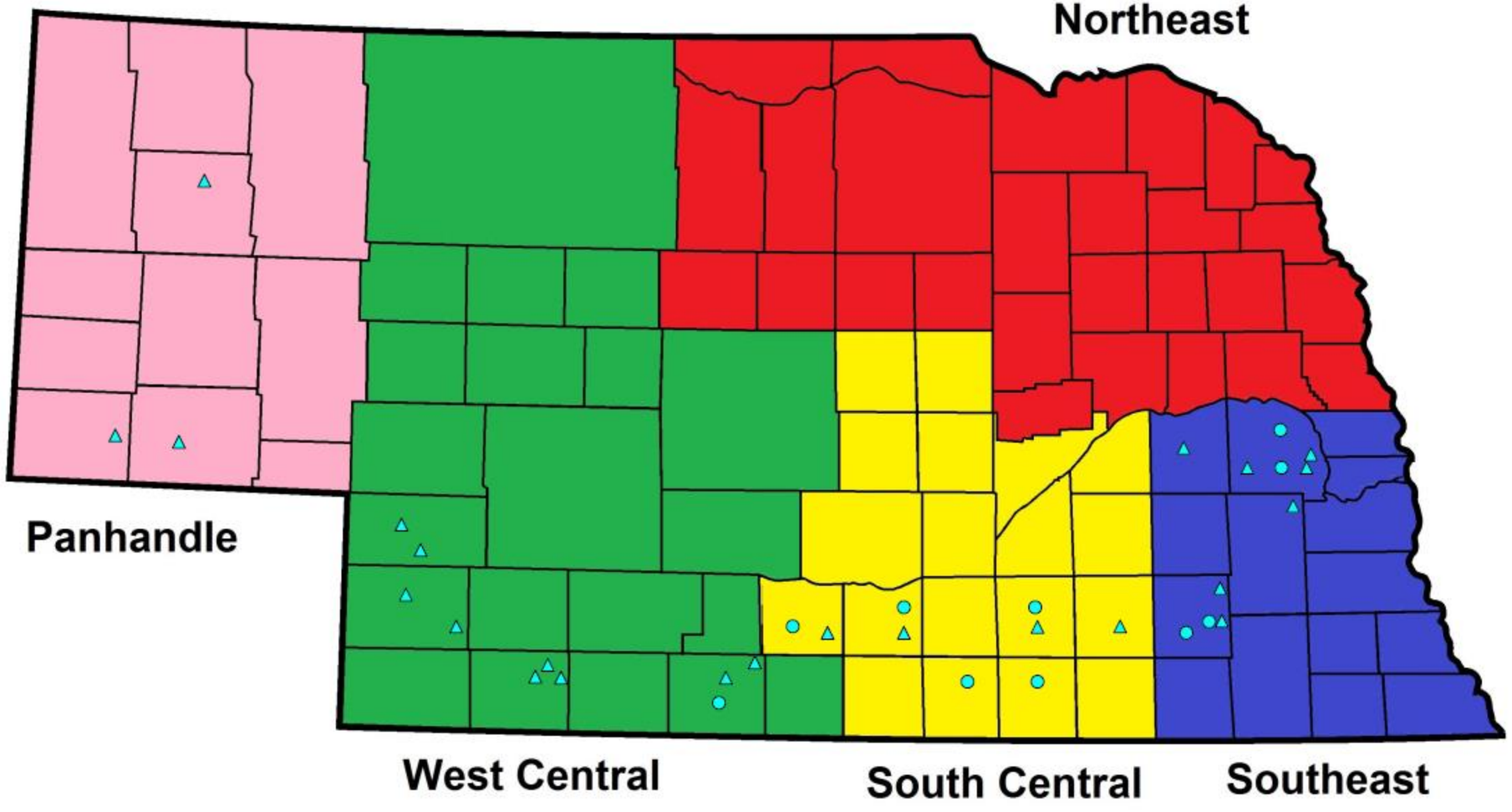
- In 2015 there were widespread Fusarium head blight (FHB) epidemics in Nebraska wheat fields
- Symptomatic wheat heads were collected during wheat disease surveys

**Stephen Wegulo**
**Esteban Valverde-Bogantes**
**Carlos Bolanos-Carriel**
**Heather Hallen-Adams**
**Andreia Bianchini**
**Niki McMaster**
**David G. Schmale III**

**Plant Disease Online**
**September 28, 2018**

# Crop Production Clinics

**Figure 2.1: Map showing the different wheat growing regions in Nebraska, as well as the sampling sites where wheat heads were obtained. Triangles (Δ) represent samples from 2015 and circles (○) represent samples from 2016.**




**Map credit:**
**Esteban**
**Valverde-Bogantes**

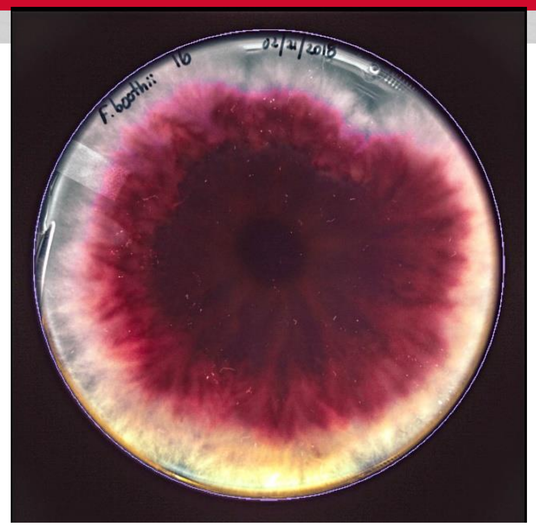
# Crop Production Clinics

- Pure isolates of *Fusarium* were obtained from the heads
- Traditional and molecular methods were used to identify the isolates
- Three isolates from western Nebraska were identified as *Fusarium boothii*, two from Chase County and one from Box Butte County
- The rest were identified as *F. graminearum*

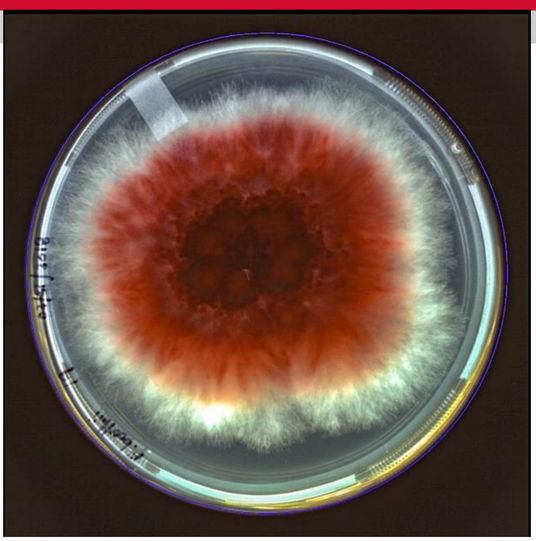
# Crop Production Clinics

- This is the first report of *F. boothii* causing FHB of wheat in the United States
- Previously *F. graminearum* was the only known cause of FHB in the U.S.
- Both pathogens belong the *Fusarium graminearum* species complex (FGSC) that is made up of 15 different species of Fusarium
- *F. boothii* has been reported in Texas and South Dakota on corn and as the cause of FHB of wheat and *Gibberella* ear rot of corn in several countries including Mexico and South Africa

# Crop Production Clinics

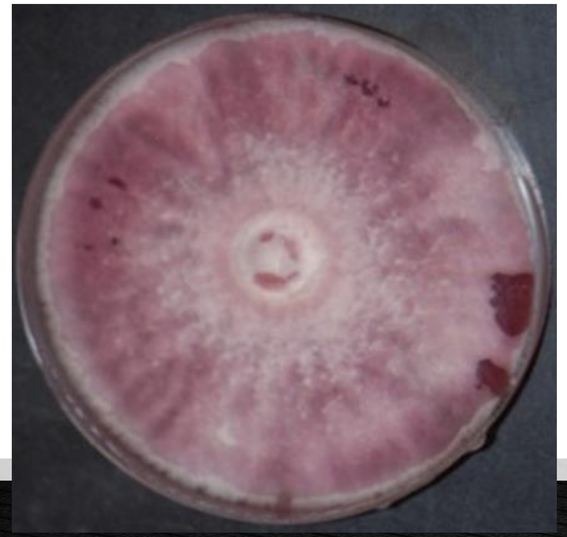


*F. boothii* Isolate NE16-15Fb (2015)



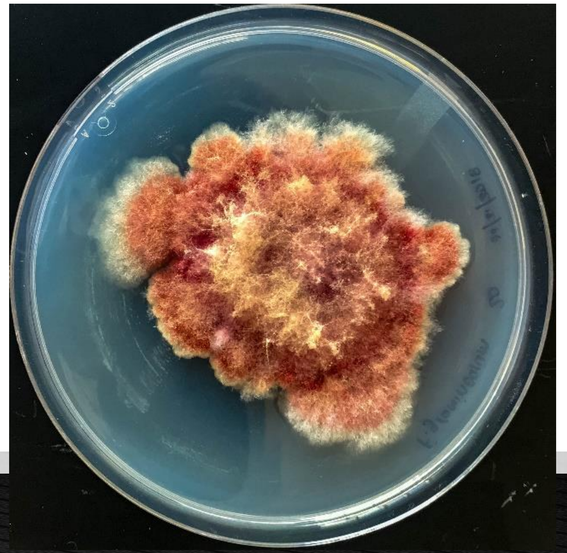
*F. boothii* Isolate NE19-15Fb (2015)

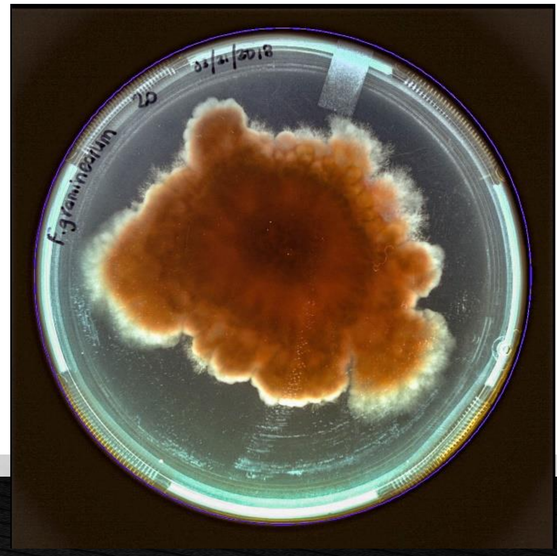
*F. graminearum* Isolate NE20-15Fg (2015)



**Cultures on PDA**

*F. g.* NE121 (2008)





# Crop Production Clinics

*F. boothii* NE16-15Fb

Nov 12, 2017

*F. boothii* NE19-15Fb

Nov 12, 2017

*F. graminearum* NE20-15Fg

Nov 12, 2017

Check – water treatment

Nov 12, 2017

**Symptoms on wheat heads in the greenhouse – indistinguishable between the two species. Inoculated Oct 26, 2017**

*F. boothii* NE16-15Fb

Nov 22, 2017

*F. boothii* NE19-15Fb

Nov 22, 2017

*F. graminearum* NE20-15Fg

Nov 22, 2017

Check – water treatment

Nov 22, 2017

***Management of FHB caused by F. boothii is the same as that for F. graminearum***

- Cultivar resistance
- Crop rotation
- Residue management
- Irrigation management
- Chemical control

# Crop Production Clinics

## Virus Samples Requested from All Crops

- Hernan Ruiz-Garcia, Virologist
- Reduced fees for virus testing

Send samples to the UNL P&PDC
http://go.unl.edu/plantclinic

### Common Virus Symptoms

- Mosaic or mottling patterns
- Wrinkled or misshapened leaves
- Stunted plants

# Crop Production Clinics

## Plant and Pest Diagnostic Clinic Fee Increase

- Credit card payments are now accepted
  - Due to associated costs, there will be a slight increase in clinic fees
- Basic diagnosis costs $20
  - Includes visual and microscopic pathogen ID and management recommendations
- More intensive diagnostic tests typically require additional $10 – $40
  - Corn nematode testing: $40
  - SCN testing: FREE
- Confirmation of uncommon pathogens may require testing at outside labs, which may carry additional charges

# Crop Production Clinics

## Services provided by Plant and Pest Diagnostic Clinic

- ID and provide management for biotic and abiotic diseases
  - Biotic: Fungi, bacteria, nematodes, viruses
  - Abiotic: Environmental stresses, nutrient deficiencies, etc.
- ID arthropod pests and provide management recommendations
  - Insects, mites, etc.
- ID unknown weeds
- Diagnose herbicide injury based on visual symptoms

## Services Not Provided

- Herbicide injury is determined solely on a visual inspection and no chemical analysis is performed
  - If more testing is desired, clients will be directed to outside labs that provide residue analysis
- The clinic is unable to provide soil nutrient testing or residue testing
- The clinic is not set up to test for mycotoxins. Fungal pathogens known to produce mycotoxins can be ID'd, but further analysis will need to be done at an outside lab

# Crop Production Clinics

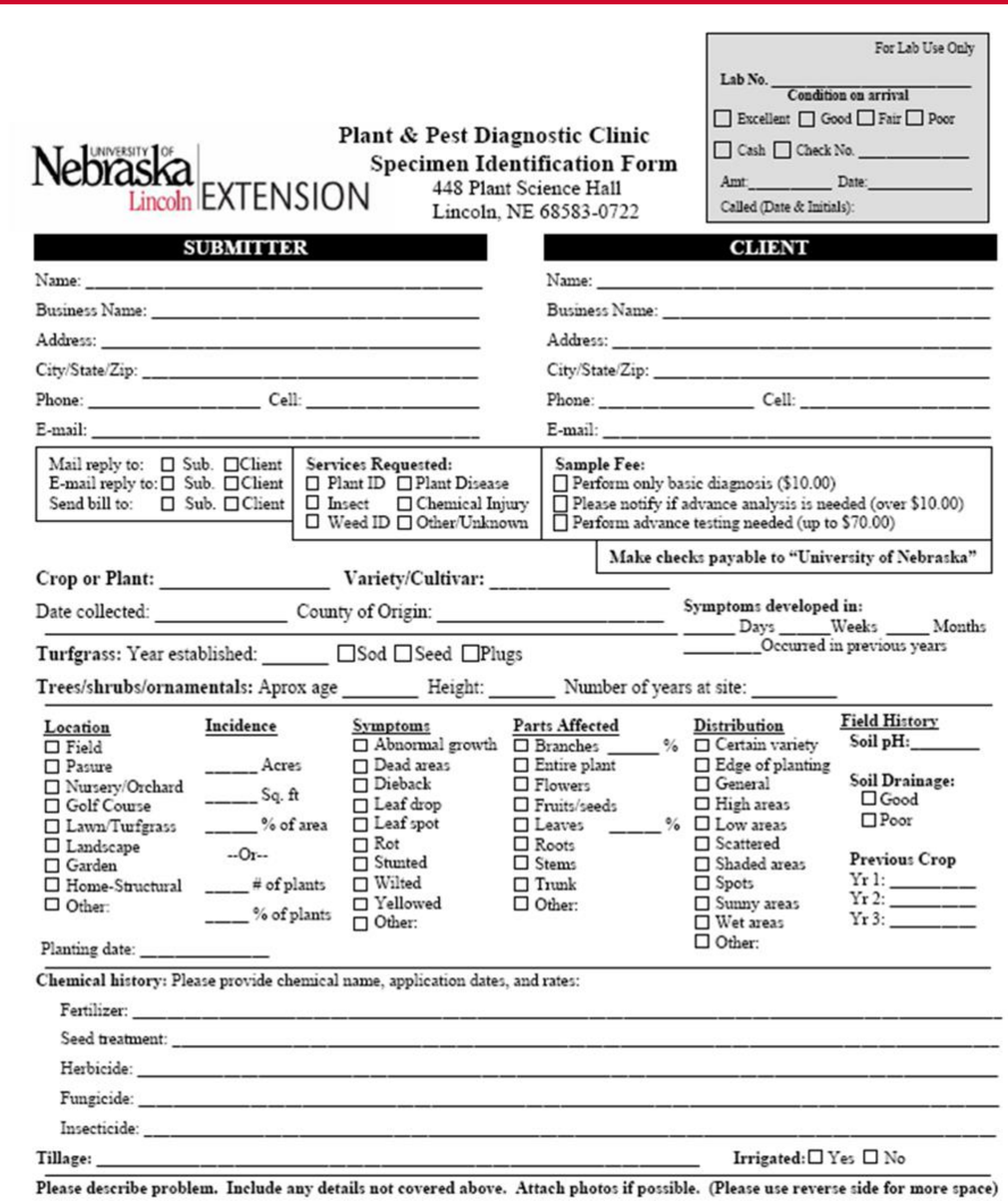
## How to submit a sample

- Send several whole plants, roots and all stages of the symptoms
- Include “normal” plants
- Enclose the root ball in a plastic bag separate from the leaf material
- Place entire sample into a plastic bag
- Provide as much information as possible
  - Crop growth stage
  - Symptom distribution
  - Description of the symptom
  - How many plants in area affected?
- Mail sample Monday through Wednesday via FedEx or UPS

## How to submit a sample

- DON'T Add water
  - If there is excess water with the sample add dry towels to absorb the moisture
- DON'T Leave sample on the dash of the pickup
  - Keep samples cool.  Store in a refrigerator overnight/weekend if needed
- DON'T Place samples in paper bags (especially leaf samples)
- DON'T Mail Thursday or Friday

# Crop Production Clinics



University of Nebraska Lincoln EXTENSION

**Plant & Pest Diagnostic Clinic**
**Specimen Identification Form**
448 Plant Science Hall
Lincoln, NE 68583-0722

For Lab Use Only
Lab No. _____
Condition on arrival
☐ Excellent ☐ Good ☐ Fair ☐ Poor
☐ Cash ☐ Check No. _____
Amt: _____ Date: _____
Called (Date & Initials):

**SUBMITTER**

Name: _____
Business Name: _____
Address: _____
City/State/Zip: _____
Phone: _____ Cell: _____
E-mail: _____

**CLIENT**

Name: _____
Business Name: _____
Address: _____
City/State/Zip: _____
Phone: _____ Cell: _____
E-mail: _____

Mail reply to: ☐ Sub. ☐ Client
E-mail reply to: ☐ Sub. ☐ Client
Send bill to: ☐ Sub. ☐ Client

**Services Requested:**
☐ Plant ID ☐ Plant Disease
☐ Insect ☐ Chemical Injury
☐ Weed ID ☐ Other/Unknown

**Sample Fee:**
☐ Perform only basic diagnosis ($10.00)
☐ Please notify if advance analysis is needed (over $10.00)
☐ Perform advance testing needed (up to $70.00)

**Make checks payable to "University of Nebraska"**

**Crop or Plant:** _____ **Variety/Cultivar:** _____
Date collected: _____ County of Origin: _____
**Symptoms developed in:** _____ Days _____ Weeks _____ Months _____ Occurred in previous years
**Turfgrass:** Year established: _____ ☐ Sod ☐ Seed ☐ Plugs
**Trees/shrubs/ornamentals:** Aprox age _____ Height: _____ Number of years at site: _____

**Location**
☐ Field
☐ Pasture
☐ Nursery/Orchard
☐ Golf Course
☐ Lawn/Turfgrass
☐ Landscape
☐ Garden
☐ Home-Structural
☐ Other:

**Incidence**
_____ Acres
_____ Sq. ft
_____ % of area
--Or--
_____ # of plants
_____ % of plants

**Symptoms**
☐ Abnormal growth
☐ Dead areas
☐ Dieback
☐ Leaf drop
☐ Leaf spot
☐ Rot
☐ Stunted
☐ Wilted
☐ Yellowed
☐ Other:

**Parts Affected**
☐ Branches _____ %
☐ Entire plant
☐ Flowers
☐ Fruits/seeds
☐ Leaves _____ %
☐ Roots
☐ Stems
☐ Trunk
☐ Other:

**Distribution**
☐ Certain variety
☐ Edge of planting
☐ General
☐ High areas
☐ Low areas
☐ Scattered
☐ Shaded areas
☐ Spots
☐ Sunny areas
☐ Wet areas
☐ Other:

**Field History**
Soil pH: _____
**Soil Drainage:**
☐ Good
☐ Poor
**Previous Crop**
Yr 1: _____
Yr 2: _____
Yr 3: _____

Planting date: _____
**Chemical history:** Please provide chemical name, application dates, and rates:
Fertilizer: _____
Seed treatment: _____
Herbicide: _____
Fungicide: _____
Insecticide: _____
**Tillage:** _____ **Irrigated:** ☐ Yes ☐ No
**Please describe problem. Include any details not covered above. Attach photos if possible. (Please use reverse side for more space)**

Available on-line at:
https://bit.ly/2Aw2DTo

Kyle Broderick,
Diagnostician

@UNLPlantClinic

Plant & Pest Diagnostic Clinic
Website QR Code

# Crop Production Clinics

## Crop Disease Resources

- Crop Watch - http://cropwatch.unl.edu/
  - Newsletter, efficacy trial data, podcast and publications
- Market Journal – weekly episode or see videos at: http://marketjournal.unl.edu/
- Videos – YouTube – UNL CropWatch channel
  - short Corn and Soybean Disease videos
- Crop Protection Network http://cropprotectionnetwork.org
- Twitter: @Crops_MelissaB, @tjcksn, @UNLPlantClinic, @centralNE_crop, @AmyTimmerman2, @swegulo2, @jenreesources
- Contact local county Extension office