



Disease Identification & Management

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Disease Pyramid

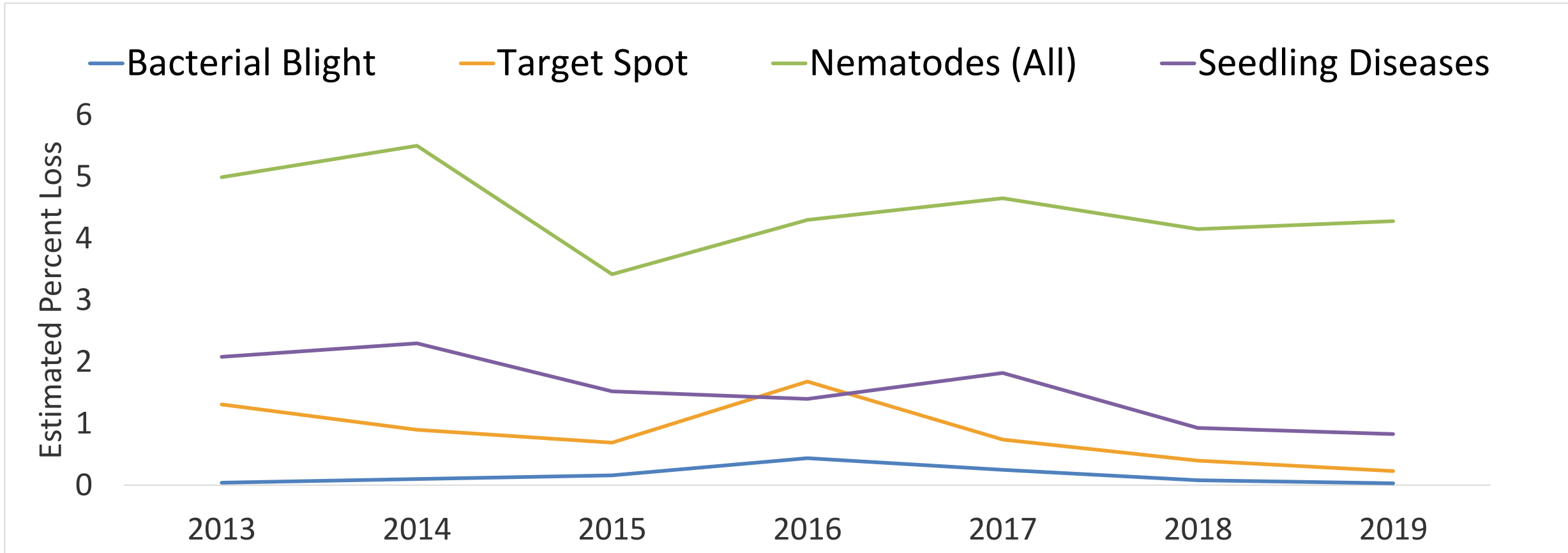


Factors needed to result in economic loss due to disease PEST

1. **Pathogen** → influenced by field history, cover crops, etc.
2. **Environment** → promotes disease development (influenced by planting date and density)
3. **Ssusceptible host** → variety
4. **Time** → all 3 factors have to occur at a critical time/growth stage

Results in economic loss

Yield Loss Estimates – Cotton Beltwide Annual Reports (Lawrence, et al.)



Cotton Diseases

- Nematodes
- Seedling Diseases
- Soil Born & Wilt Diseases
- Leaf Spots
- Boll Rots



Photo credits: Dr. Jason Woodward



Nematodes

- Root Knot
- Reniform
- Lance
- Lesion



Photo credit: Kathy Lawrence

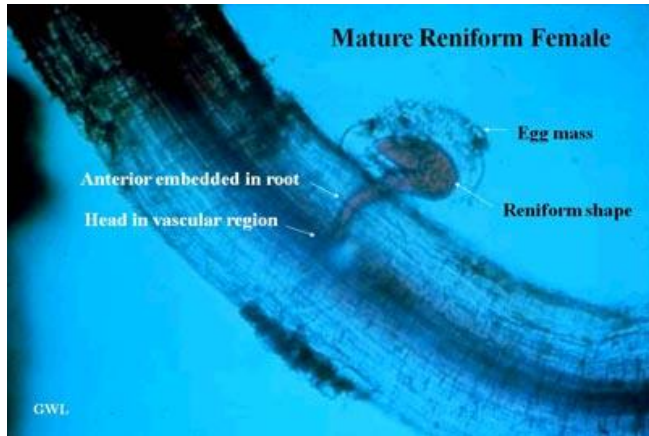
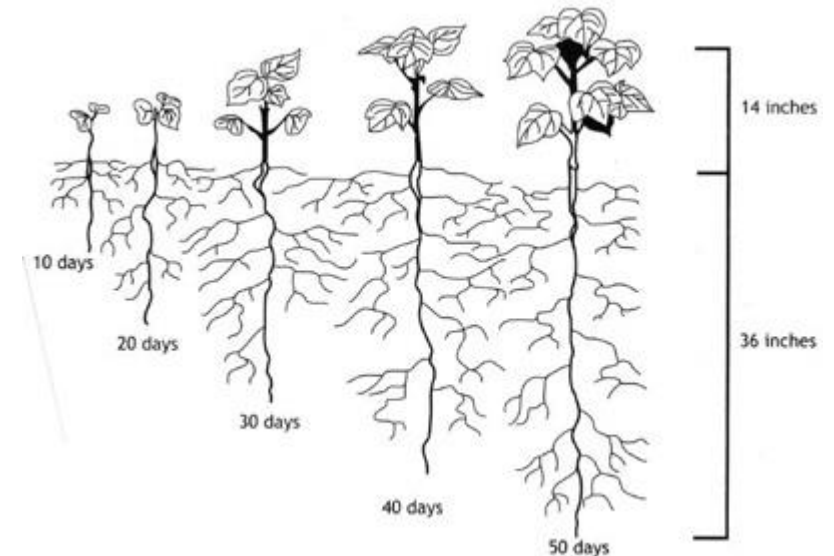


Photo credit: Gary Lawrence

Take the test, bet the pest
Soil sample for nematodes!

Management

- Identify nematode and density
- Rotate to non-host crop
- Resistant varieties
- Nematicide in-furrow and/or seed treatments

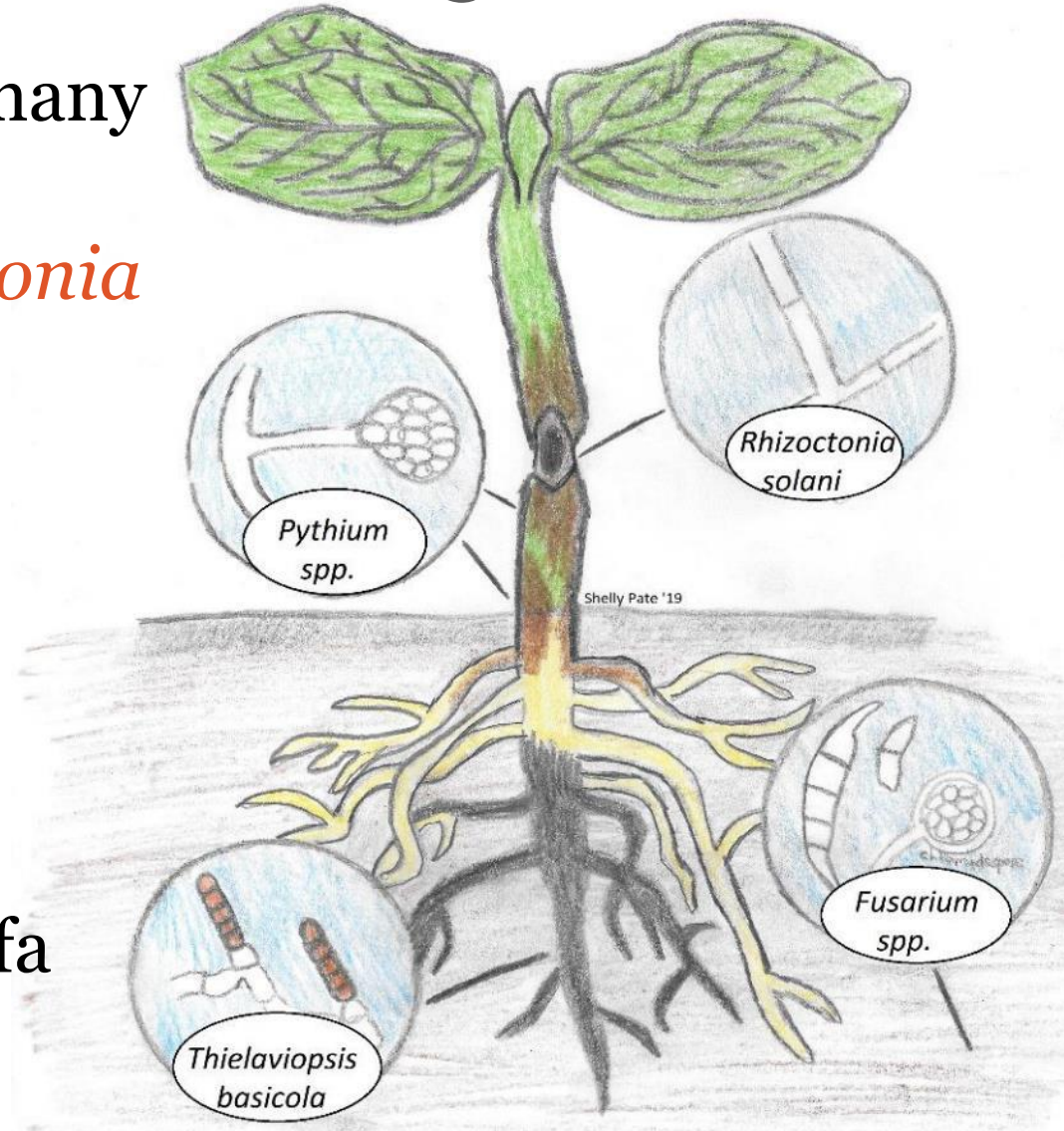


Seedling Disease Symptoms and Pathogens

Seed and seedling diseases are caused by many species of *Pythium* (oomycetes) and *Fusarium*, *Thielaviopsis basicola*, *Rhizoctonia solani* (true fungi) and other genera.

Not to be confused with abiotic issues:

- Cold damage
- Planting issues
- Pre-emergence herbicide injury
- Insect damage (thrips, three-corner alfalfa hoppers, etc.)



Seedling Disease Symptoms and Pathogens



What to look for:

- Patches of stunted and/or wilted seedlings (post-emergence damping off)
- Seed decay/rot; pre-emergence damping off
- Discoloration of roots and/or loss of roots
- Lesions on stem above soil line



Seedling Disease Symptoms

What to do:

- Dig up seedlings, take pictures (symptoms/signs, pattern), get local Extension agent involved
- Use guides, Extension, consultants, cotton.org, PMN, etc. to ID
- Don't plant until the **10-day average soil temperature at the eight-inch depth is 65° F**
- Fungicide seed treatments



Photo credits: Dr. Tyson Raper

Environmental, insect, planting issues

Photo credit: Dr. Scott Stewart



Thrips injury



Seed Cotton Yields Lbs/Acre

FUNGICIDE SEED TREATMENT

Year	None	Apron Maxx	Dynasty CST	Trilex Adv
2013	3,528 a	3,561 a	3,683 a	3,620 a
2014 E	1,378 c	2,001 b	3,008 a	2,673 a
2014 L	2,237 a	2,267 a	2,227 a	2,382 a

PRE-EMERGENCE HERBICIDE

Year	None	Cotoran	Cot + Reflex	Cot + Dual
2013	3,723 a	3,643 a	3,575 ab	3,451 b
2014 E	2,133 a	2,134 a	2,391 a	2,403 a
2014 L	2,317 ab	2,401 a	2243, ab	2,152 b

No interactions were found

Data from MS student Cory Vineyard

Soil Born & Wilt Diseases

- Verticillium Wilt
- Fusarium Wilt (FOV and FOV4)
- Cotton Root Rot



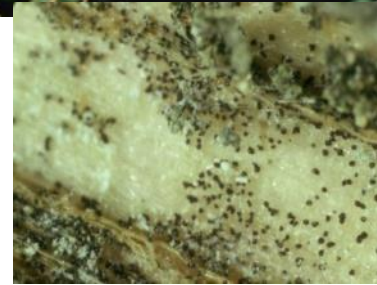
(images provided by Dr. Jason Woodward)

- Infection can appear at any stage
- Time of infection influences extent of yield impact
- Split stem – vascular discoloration



Verticillium Wilt (*Verticillium dahlia*)

- Symptoms during flowering, intensifying during boll fill
- Clogged xylem = wilt symptoms
- Often coincides with temp. increase and limited rainfall
- Over-irrigation can exacerbate the problem
- There are **NO FUNGICIDES** with activity on the disease
- Variety selection is the cornerstone



(images provided by Dr. Jason Woodward)

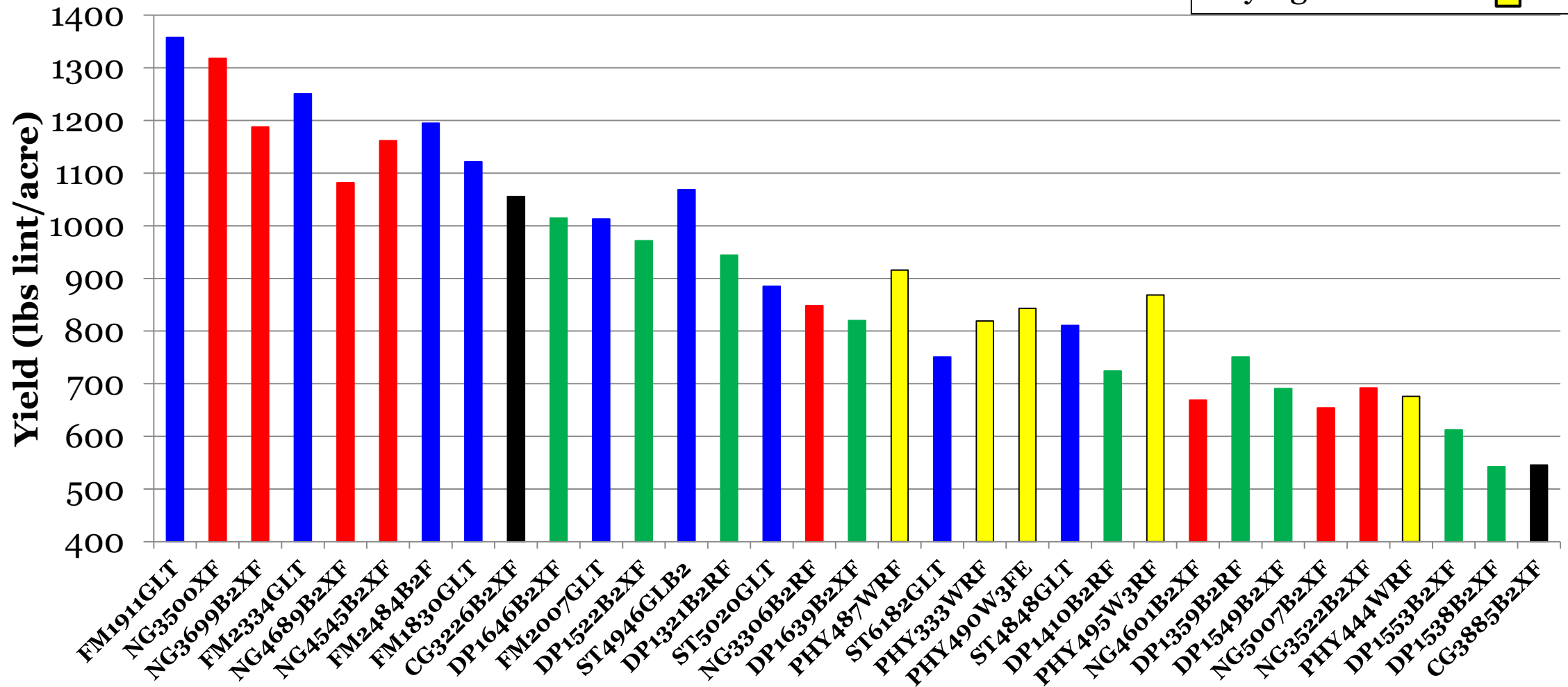
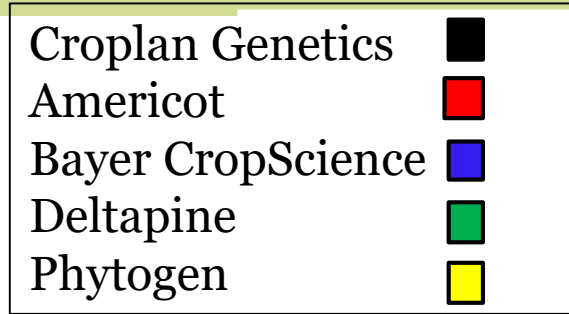


(images provided by Dr. Jason Woodward)

Verticillium Wilt Resistant variety (left) versus Susceptible variety

(data provided by Dr. Jason Woodward)

Verticillium Wilt Lint Yield



Fusarium Wilt (FOV) (*Fusarium oxysporum* f. sp. *vasinfectum*)

- Information on resistant upland varieties is limited
 - Screening is actively being conducted (industry wide)
- Note unexplainable stand loss and/or rapid expansion following tillage
 - Examine vascular system below soil line for discoloration
- There are no fungicide or chemical management options
- Limit movement of soil or plant material from infected areas



(images provided by Dr. Jason Woodward)

Cotton Root Rot (*Phymatotrichum omnivorum*)

- Symptoms development is very sudden
 - Leaves stick to dead plants
- Infected areas are circular in nature
 - Show up in same areas year after year
 - Severity is dependent on weather conditions (rainfall pre-bloom is needed)
- There are no known forms of resistance in cotton
 - Crop rotation is not effective (wide range of dicot hosts)
 - Grass crops are not affected, but the fungus survives long periods of time in soil

(image provided by Dr. Jason Woodward)



Rolling Plains Topguard Trials (T-Band vs. Y-Split)

Treatment	Plant population (no. per foot)	Disease incidence (%)	Lint yield (lbs per acre)
1.0 pt T-Band	1.9 a	0.0 b	978 a
1.0 pt Y-Split	1.3 c	0.0 b	980 a
1.5 pt T-Band	2.1 a	0.0 b	985 a
1.5 pt Y-Split	1.5 b	0.0 b	972 a
2.0 pt T-Band	1.7 ab	0.0 b	960 a
2.0 pt Y-Split	0.7 d	0.0 b	937 b
Non-treated	1.9 a	15.8 a	871 c



(images and data provided by Dr. Jason Woodward)

Considerations when using Topguard Terra (flutriafol)

- Potential for phytotoxicity
 - Rainfall or irrigation (0.5 in) after planting
- Placement may reduce risk
 - Preplant & place below seed 14-28 days before planting
 - Use split or T-band to avoid direct contact on seed
- Site-specific applications
 - Using field history or maps to determine where to treat

(image provided by Dr. Jason Woodward)



Leaf Spot Diseases

- Alternaria, Cercospora, Stemphylium Leaf Spots (Complex)
 - Ascochyta/Wet Weather Blight
 - Target Spot
 - Bacterial Blight
-
- Cotton Inc. publication – Diagnosis and Management of Foliar Diseases
 - Key to differentiate foliar spots
 - Mobile friendly and interactive key at Guide.UTcrops.com

Cotton Foliar Diseases

> [Key to Differentiating Spots](#)

> [Alternaria Leaf Spot](#)

> [Areolate Mildew](#)

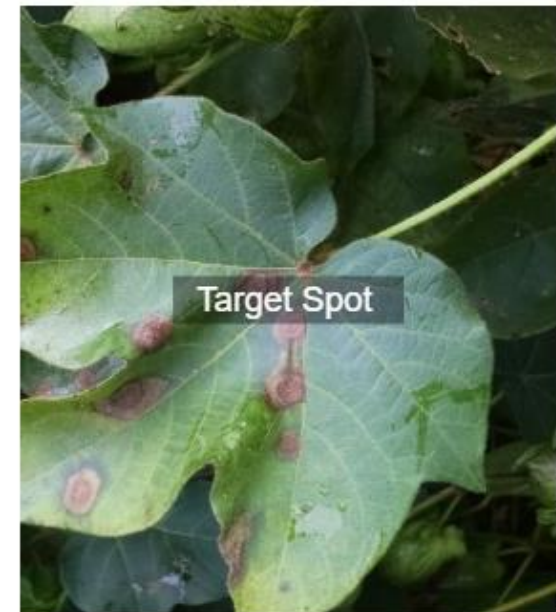
> [Ascochyta Blight \(Wet Weather Blight\)](#)

> [Bacterial Blight \(Angular Leaf Spot, Black Arm\)](#)

> [Cercospora Leaf Spot](#)

> [Stemphylium Leaf Spot](#)

> [Target Spot](#)

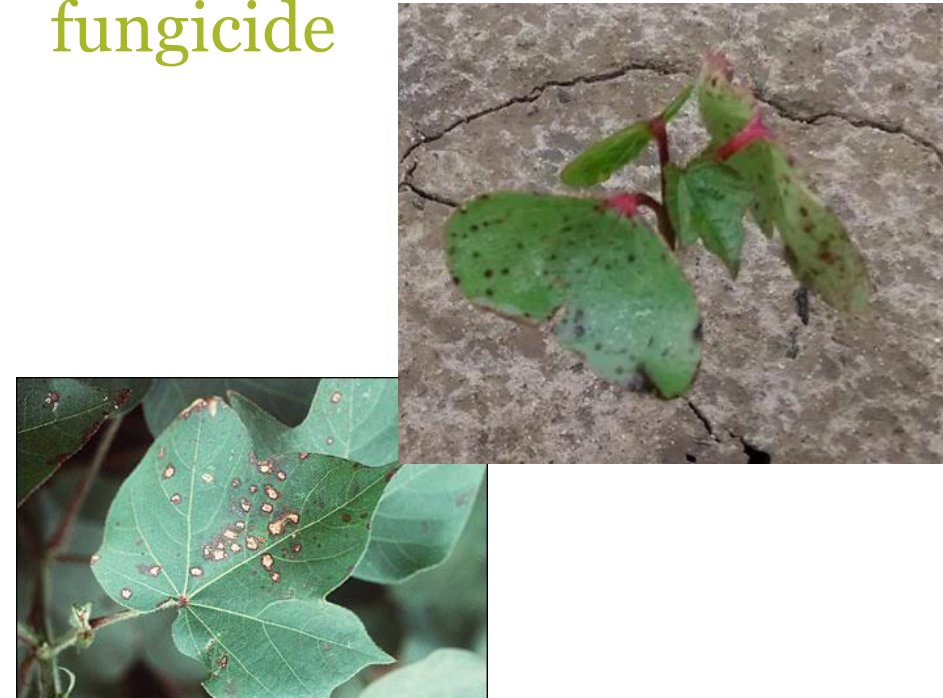


Leaf Spot Diseases

- Alternaria, Cercospora, Stemphylium Leaf Spots (Complex)
 - Opportunistic parasites
 - Causing disease during periods of stress (e.g. drought, pest damage, other physiological stress, and nutrient deficiency – especially potassium)
 - Throughout the canopy



- Ascochyta/Wet Weather Blight
 - Can occur on seedlings
 - Abundant wet weather
 - Rarely recommend fungicide



Target Spot (*Corynespora cassicola*)

Pathogen → Can survive in debris, zonate/target lesions in lower canopy

Environment → wet/humid, hot; develops after canopy closure

Susceptible host → all varieties susceptible, but different levels

Time → earlier disease develops > the chance of effecting yield

late enough in season = helps defoliate



Consistency of Target Spot Impact on Yield

- Based on regional data from 2014 – 2016, using 15 site-years, 4 to 6% yield protection observed with fungicide
 - Dependent upon disease pressure, environment, timing of fungicide, and variety
- Later timed applications (waiting to see lesions) provided most consistent yield protection



Bacterial Blight (*Xanthomonas citri* pv. *malvacearum* (race 18))

Pathogen → can survive in debris and soil

Environment → rain/irrigation splash

Susceptible host → resistant vs. susceptible varieties

Time → build up of inoculum and infection of bolls = boll rot

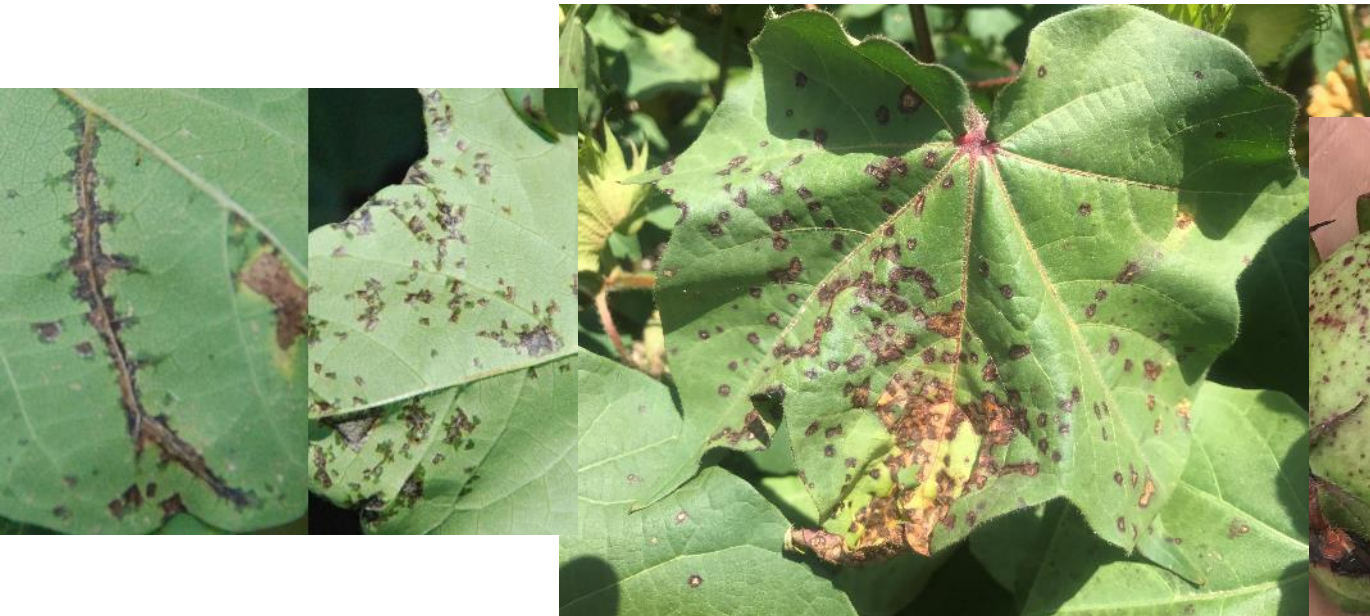


Photo credit: Dr. Scott Stewart



Boll Rots

- Bacterial
 - Fungal
 - Hardlock
-
- Manage insects that wound bolls
 - Canopy management
 - Plant population
 - Timely harvest



Photo credit: Dr. Scott Stewart



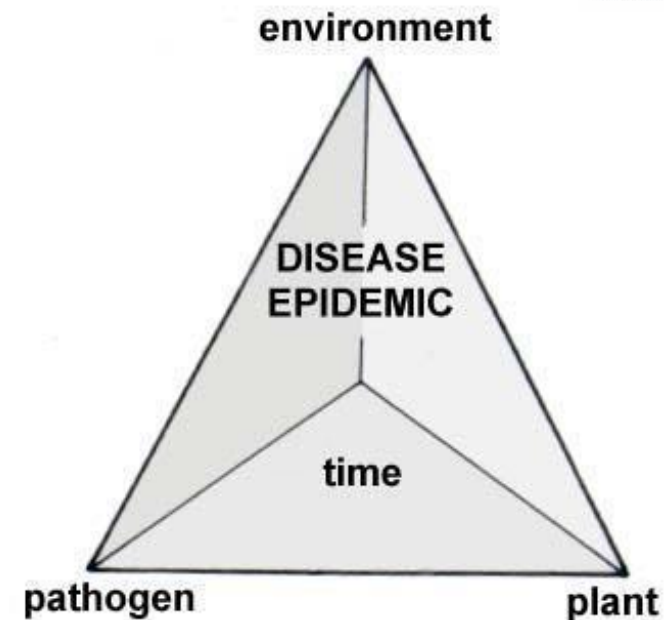
Photo credit: Dr. Tom Allen



Photo credit: Dr. Austin Hagan

Cotton Diseases

- PATHOGEN – know and ID your disease
 - Use guides, Univ. Extension, cotton.org, Plant Management Network
- ENVIRONMENT – be mindful of planting conditions
 - Know soil conditions
- SSUSCEPTIBLE HOST – know your cultivar
 - Variety databases
- TIME – growth stage and year are important
 - Think about social media
 - [@UTCrops](#), [@TNplantDR](#)



Disease and Insect Field Guides

Soybean	Corn	Cotton	Wheat	Sorghum

Thanks for your attention!

Questions?

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