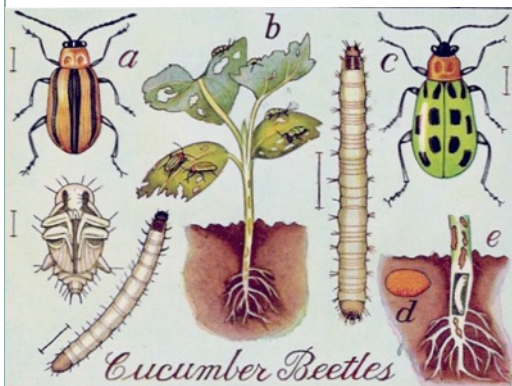


Disease Management in Pumpkins



JIM JASINSKI
OSU EXTENSION, IPM PROGRAM COORDINATOR
CHAMPAIGN COUNTY

CELESTE WELTY - ENTOMOLOGY
SALLY MILLER - PLANT PATHOLOGY



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Objectives



- Basics of IPM
- Review Key Diseases & Management
- Aerial Pest Management - Update
- Additional IPM Resources



General Horticulture



- Pumpkins prefer warm, well drained soil
 - At planting cold + wet = seed rot
- Space requirement
 - 6 sq. ft / plant (small fruit)
 - Over 1500+ sq. ft / plant (giant pumpkin)
- Require about 1' or more of water per week
 - Drip irrigation is best, splashing water is bad!!!
- 25-50 lb N, 100 lb P and K incorporated preplant
- Side dress 25-50 lb N at vine tip
- Over fertilization promotes vegetative growth



IPM Basics



- Scouting / Monitoring
- Identification
- Thresholds
 - Pests/plant, initial disease detection
- Treatment Options
 - Mechanical controls (physical removal),
Biological Control, Pesticides



Spectrum of Pumpkin Pests

• Key Diseases:

- **Powdery mildew**
- **Bacterial wilt**
- Phytophthora
- Fusarium
- Plectosporium
- Angular leaf spot
- **Bacterial leaf spot**
- Anthracnose
- **Downy mildew**
- Yellow vine decline
- **Virus (WMV), others**

• Key Insects:

- **Striped cucumber beetles/larvae**
- Corn rootworm beetles/larvae (W, S, N)
- Squash bug
- Squash vine borer
- **Aphids**

• Key Weeds:

- **Pigweed**
- **Marestail**
- Cocklebur
- Lambsquarters
- Black nightshade
- **G./C. Ragweed**
- Velvetleaf
- **Grasses** (foxtail, barnyard, etc.)



Highlights of Disease Management



- Crop rotation – 3 years minimum (cucurbit, x, y)
- Use cover crops if possible (winter rye)
 - Prevent splash and soil to fruit contact, reduce disease
- Select disease tolerant hybrids when possible
 - PMT vs PMR, Virus
- Scout for Disease (& insect) presence
 - Typically treat at first sign of disease (PM, DM)
- Use fungicides / bactericides properly
 - Contact (Bravo, Manzate, Cu, S) vs. Systemic, 7-14 day intervals
 - Rotate FRAC / MOA numbers!



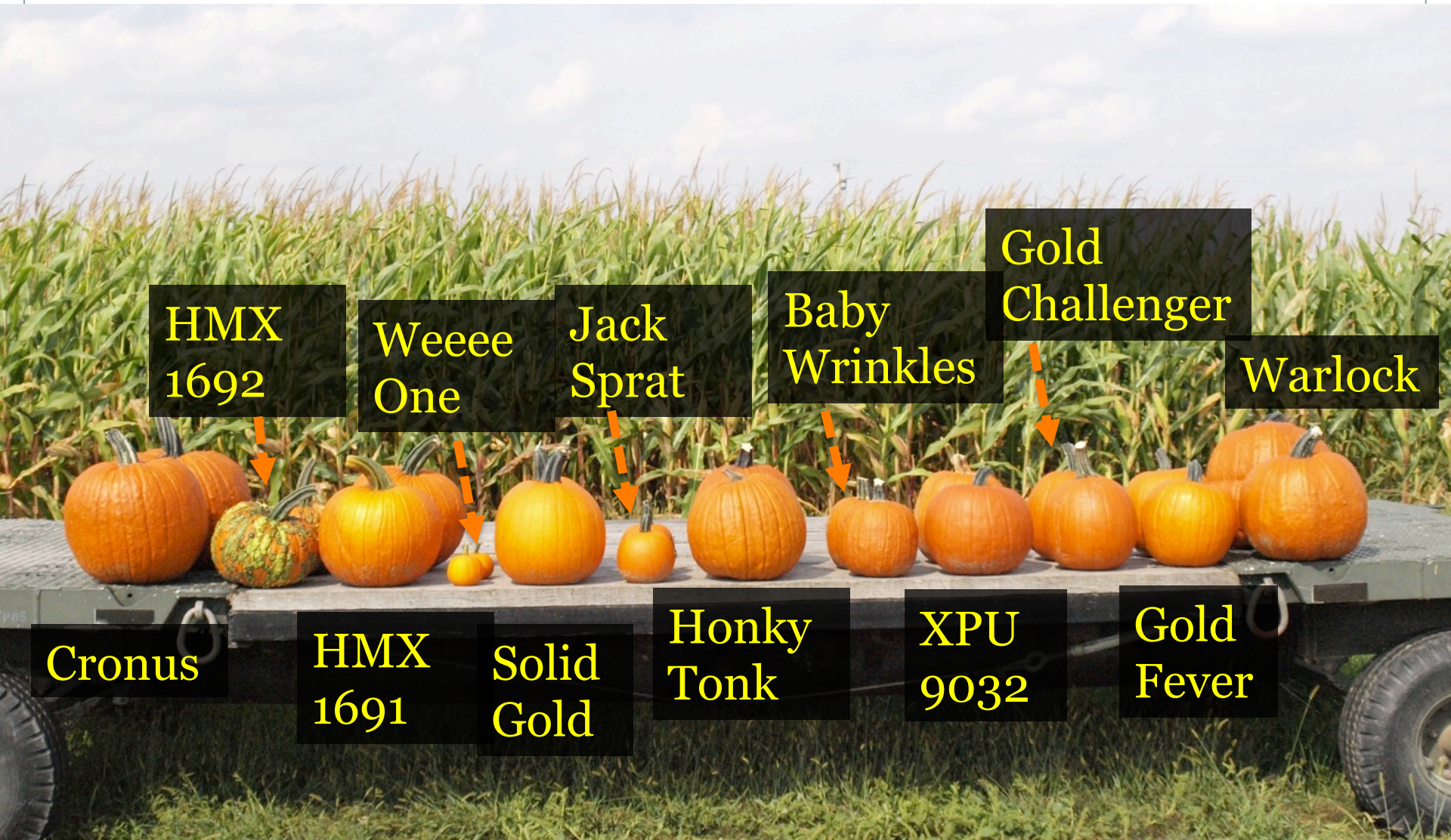
Cover Crop (Winter Rye) Rolled



- Fall planted
- 60-100 lb / A
- Plug drill based on row spacing?
- Roll or crimp after boot stage



Hybrid Selection



HMX
1692

Weeee
One

Jack
Sprat

Baby
Wrinkles

Gold
Challenger

Warlock

Cronus

HMX
1691

Solid
Gold

Honky
Tonk

XPU
9032

Gold
Fever



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Hybrid Selection

- Look for size & color appropriate to your market, then search for disease resistance
- Harris Seeds
- Rupp Seeds
- Seedway
- Holler Seeds
- Johnny's Seeds
- Sakata Seeds
- Outstanding Seeds
- Burpee
- Seminis Seeds
- Many others



Powdery Mildew



Basics of Powdery Mildew



- Different species of PM, attack different hosts
- PM on cucurbits (*Podosphaera xanthii*)
 - melons, cucumbers, pumpkin, squash, etc.
- Spores don't overwinter in OH, blown up from the south on weather fronts
- White colonies usually seen mid July to August 1
- Appear **first** on underside of leaf, then top, petioles, and fruit handles
- Can cover leaves causing premature death / canopy loss & potentially yield loss
- Treatment threshold: **1** lesion / 50 **older** leaves
- PM can develop under **dry** conditions



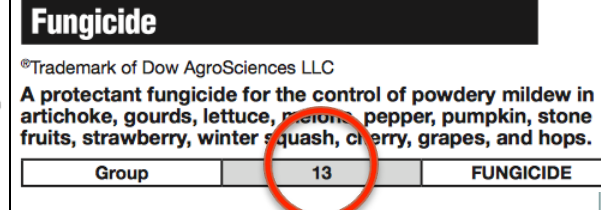
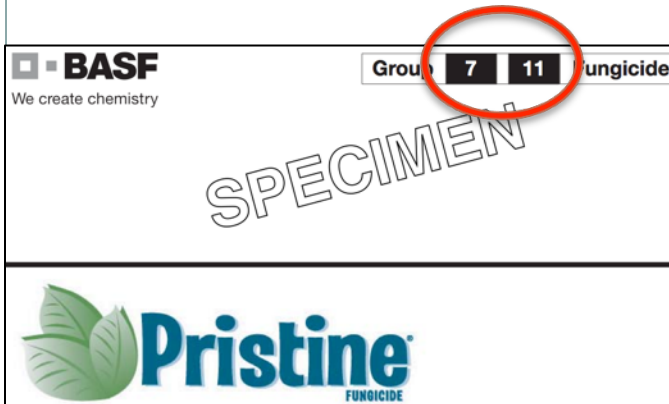
Basic PM Program



- Use PMT/PMR hybrids when possible
- Treat at first sighting of PM colonies
 - Mid July – August 1st
- Treatment length 7 to 14 days
- Utilize broad spectrum & PM specific fungicides
 - Bravo, Manzate, Sulfur*, Copper*
 - Quintec, Merivon, Torino, Procure, Pristine, Rally, etc.
- **Rotate FRAC/MOA numbers on alternate sprays!**
 - Fungicide Resistance Action Committee (on label)



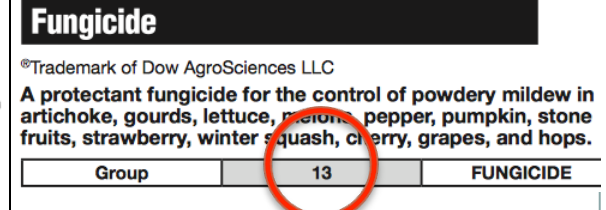
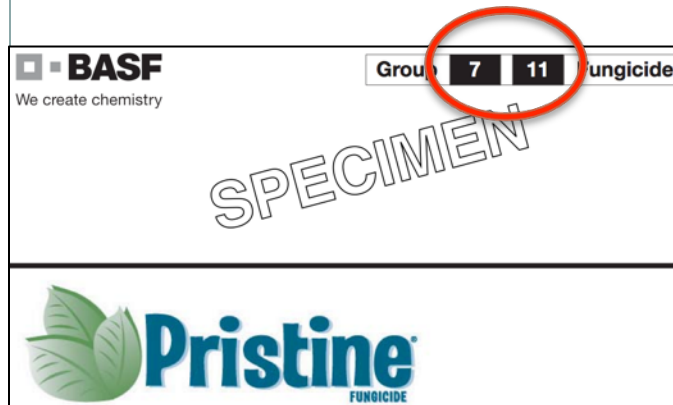
FRAC / MOA's on Label



Rotate FRAC numbers on successive sprays
Do NOT use same FRAC twice in row
***M class fungicides can be used successively**



FRAC / MOA's on Label

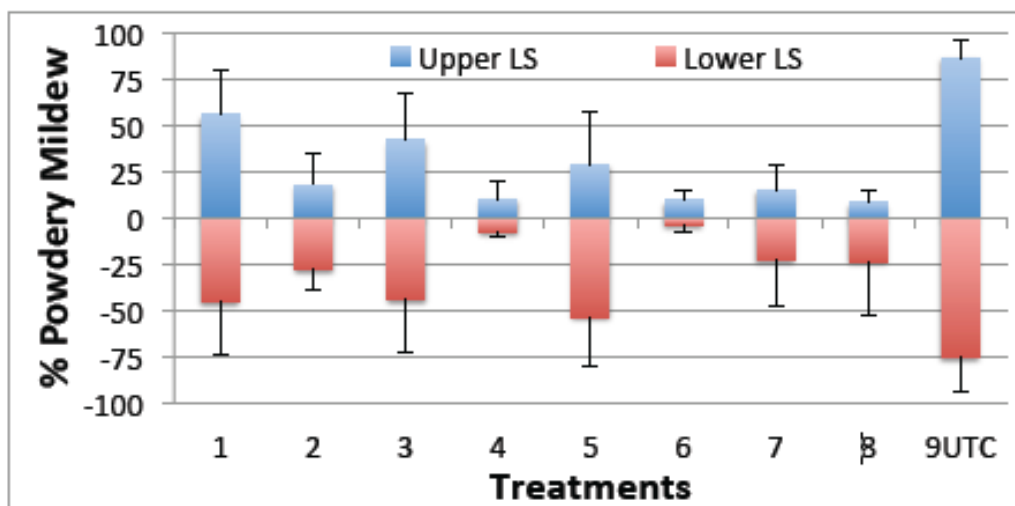
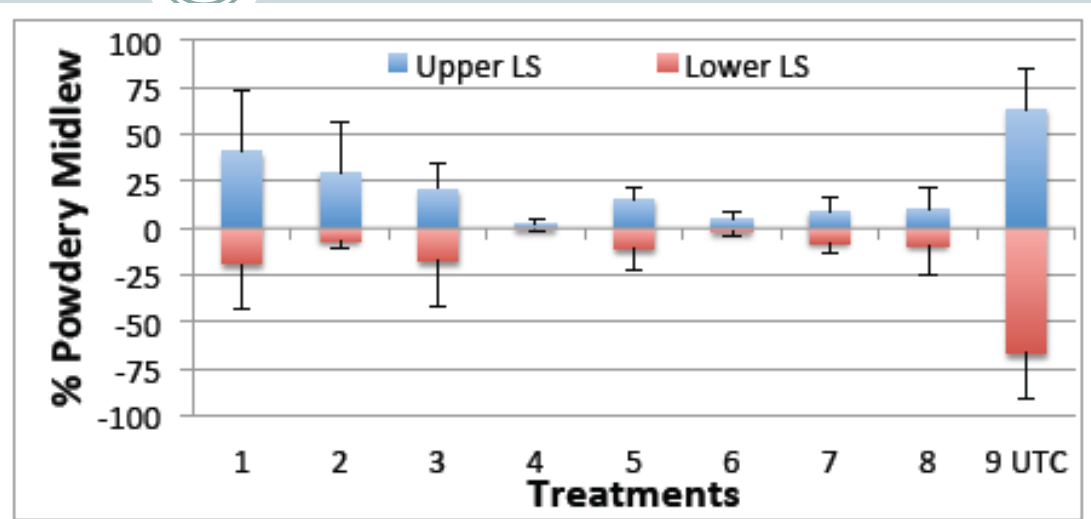
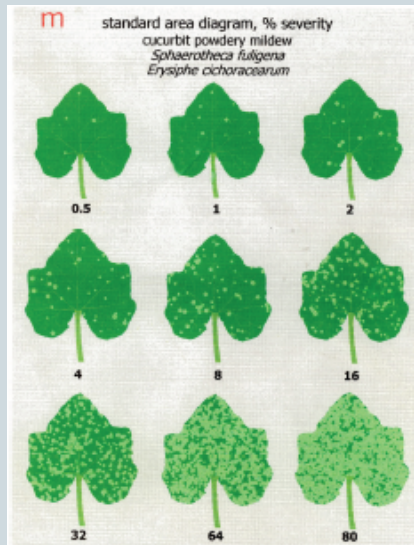


Ex. 1: Procure³ + Bravo^M alt. w/ Quintec¹³ + Sulfur^M

Ex. 2: Pristine^{7,11} alt. w/ Rally³ + Bravo^M



Powdery Mildew Fungicide Trials



2000-2016



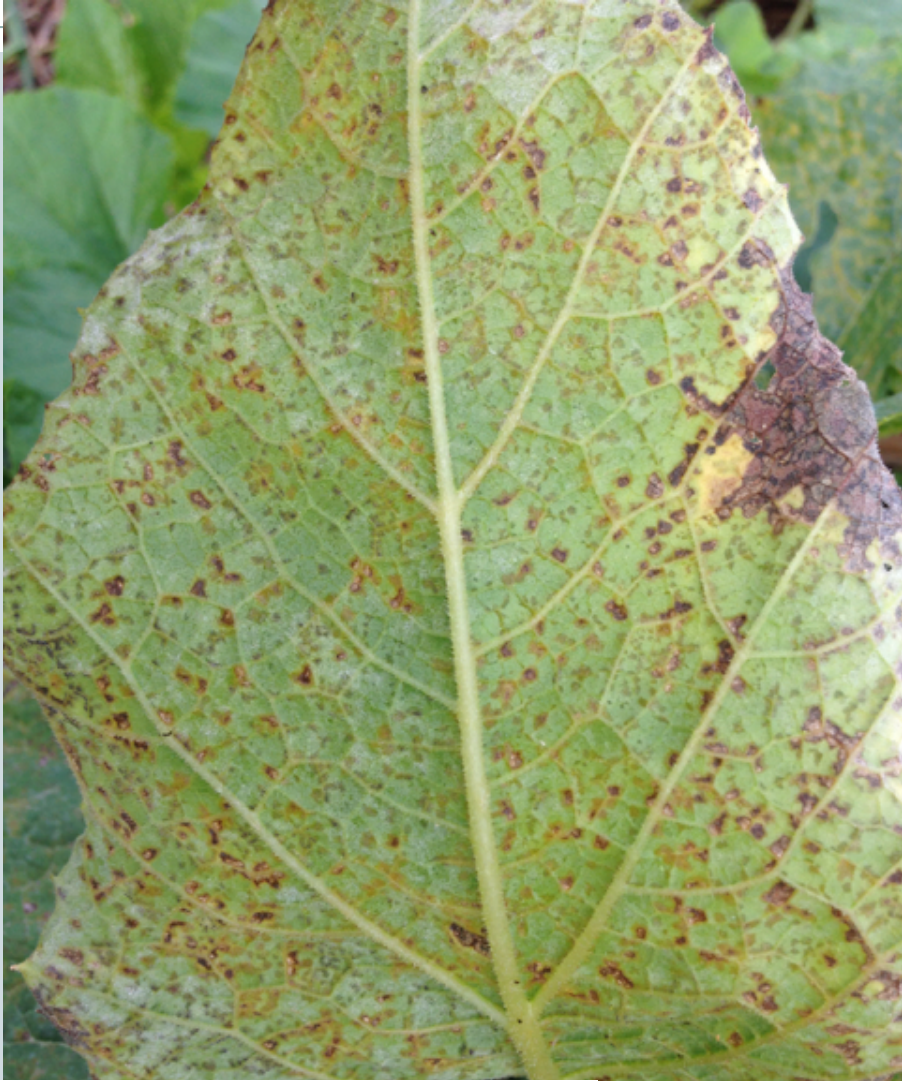
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Powdery Mildew Fungicides

Product	PHI (days)	FRAC Code	Rel. Eff.	Comments
Quintec ★	3	13	++++	
Aprovia Top	0	3+1	+++	
Fontelis ★	1	7	+++	
Inspire Super	7	3+9	+++	
Merivon ★	0	7+11	+++	
Microthiol Disperss ★	0	M2	+++	Crop injury at temp > 90F
Monsoon	7	3	+++	
Procure 50WS ★	0	3	+++	
Rally 40W ★	0	3	+++	
Torino ★	0	U6	+++	
Toledo	7	3	+++	
Pristine 39WG ★	0	7+11	++	Fungicide insensitivity may occur



Downy Mildew



Does not overwinter in OH –
forecast network out of NC

Starts as water soaked blocky lesions

Favors cool (70's- low 80's), wet
weather

No host plant resistance in
commercial hybrids

Multiple strains of DM, not all
cucurbits susceptible to all strains



Downy Mildew



Purdue Extension BP 140 W

Does not overwinter in OH – forecast network out of NC

Starts as water soaked blocky lesions

Favors cool (70's- low 80's), wet weather

No host plant resistance in commercial hybrids

Multiple strains of DM, not all cucurbits susceptible to all strains



Downy Mildew



Lack of treatment may result in total foliage loss in 7-10 days

If found, treat on 7-10 day interval

PM fungicides generally not effective against DM



Downy Mildew Fungicides

Product	PHI (days)	FRAC Code	Rel. Eff.	Comments
Orondis Opti	0	U15	+++++	NEW – highly effective against downy mildews
Ranman	0	21	++++	High rate recommended
Chlorothalanil	0	M5	+++	Protectant –use higher rate w/high pressure
Previcur Flex	2	28	+++	
Zing!	0	22 + M5	+++	Like Gavel but chlorothalanil replaces mancozeb
Zampro	0	40 + 45	+++	
Tanos	3	11 + 27	++	Must be tank mixed with mancozeb or related
Gavel	5	22 + M3	++	
Mancozeb	5	M3	++	Protectant; tank mix partner
Presidio	2	43	-	Failed in many locations in 2015
Curzate	3	27		Up to 2 days curative activity but low residual (3-5 d)



Basic Disease Program



A basic **Powdery Mildew** program

- Quintec + Bravo/Manzate alternated with Procure/Rally + Bravo/Manzate
- Merivon alternated with Procure/Rally + Bravo/Manzate
- Torino alternated with Pristine

If **Downy Mildew** is detected, consider applying

-Zampro, Tanos, Ranman, Orondis, Zing!, Previcur Flex w/
Bravo or Mancozeb



Bacterial Leaf Spot (*Xanthomonas* sp.)

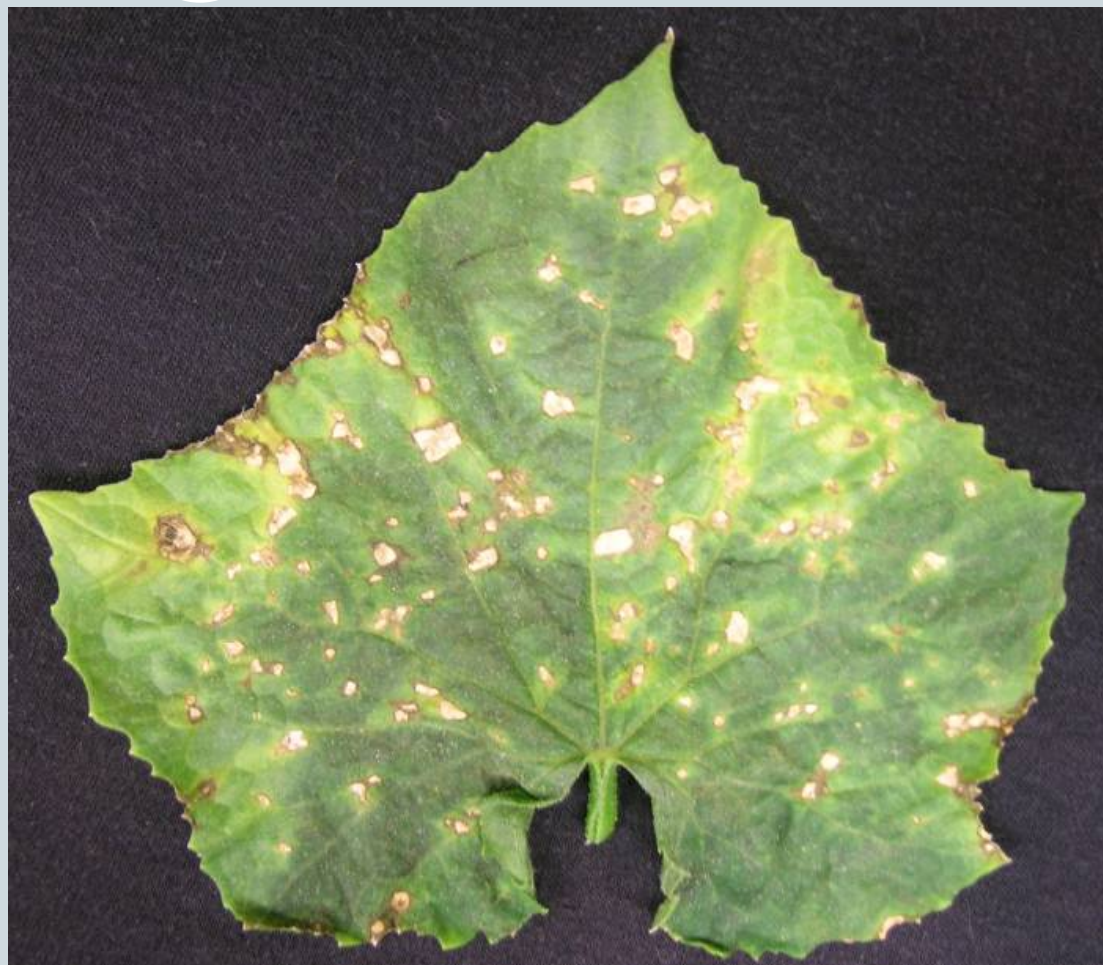


- BLS seed borne or in soil
- Can drip from leaves onto fruit, cause lesions to form
- May eventually lose fruit
- Prefers **warmer** temperatures (summer)
- Copper and Actigard slightly effective



Angular Leaf Spot (*Pseudomonas* sp.)

- Seed borne only
- Drips from leaves onto fruit, cause lesions
- May eventually lose fruit
- Prefers **cooler** temperatures (spring)
- Cu & Actigard



Phytophthora, Fusarium, Plectosporium



Phytophthora, Fusarium, Plectosporium



- Soil borne fungi
- Mostly rely on free water / splashing soil to spread
- Rotation, 3-5 years minimum
 - Avoid peppers, tomatoes, eggplant, snap beans, cucurbits
- Use cover crops (winter rye), create barrier from soil & splashing (**Fusarium and Plecto only**)
- **Plecto** – managed with fungicides only (Cabrio, Flint, Quadris), no commercial germplasm resistance
- **Phytophthora** - need to treat before symptoms are exhibited (Orondis Ultra, Ranman, Presidio, Zampro)



Phytophthora Blight Fungicides

Product	PHI (days)	FRAC Code	Rel. Eff.	Comments
Orondis Ultra ★	0	U15	++++	NEW – most effective, foliar applied only prior to symptoms
Ranman 400SC ★	0	21	+++	
Forum 4.18SC	0	40	+++	
Tanos 50WG	3	11 + 27	+++	Foliar/fruit phase only
Gavel 75DF	5	22 + M3	+++	
Presidio 4SC ★	2	43	+++	
Zampro ★	0	40 + 45	+++	
Revus	1	40	+	
Zing!	0	22 + M5		Efficacy data not available



Phytophthora Blight Fungicides – Cucurbit Use Allowed

Fungicide	Cucum- ber	Melon	Summer squash	Winter squash	Pumpkin
Orondis A	✓	✓	✓	✓	✓
Ranman 400 SC	✓	✓	✓	✓	✓
Forum 4.18SC	✓	✓	✓	✓	✓
Tanos	✓	✓	✓	✓	✓
Gavel 75DF	✓	✓	✓		✓
Zing!	✓	✓	✓	✓	✓
Presidio 4SC	✓	✓	✓	✓	✓
Revus 2.08SC	✓	✓	✓	✓	✓
Zampro	✓	✓	✓	✓	✓



Bacterial Wilt

Vectored by Striped and Spotted Cucumber Beetles



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Striped Cucumber Beetle

THE key early season pest



Cucumber Beetles & Bacterial Wilt



- **Must protect seedling from cotyledon through 3rd - 4th leaf**
- Shift seeding or transplanting later to avoid beetles
- Scout and use foliar products when threshold is reached
 - 0.5 btl / plant (cotyl-1st), 1 btl / plant (2-3 leaf), 2 btl / plant >4 leaf
- Use systemic seed treatments
- Use systemic materials as transplant drenches
- Use in-furrow materials during seeding (least desirable)
- Use row covers over small plantings (remove at flowering)

Striped



Spotted



Squash Bugs



- SB overwinter as adults
- Attack plants spring - fall
- Vector Yellow Vine Decline



Yellow Vine Decline



- Bacterial infection
- Bright yellow plant

Brown ring around stem



Yellow Vine Decline



- Squash bugs vector bacteria to plants early to mid season
- Symptoms –yellow plants- appear ca. 30+ days after infection
- Crop rotation – plant fields far apart
- Row covers for small acreages
- Scout seedlings early, treat with foliar insecticides if > 1 egg mass / plant found



UAV Based Disease Detection - 2016

- 3DR Solo & Controller

- \$750



- Red Edge camera

- \$5900



- Sequoia camera

- \$3900



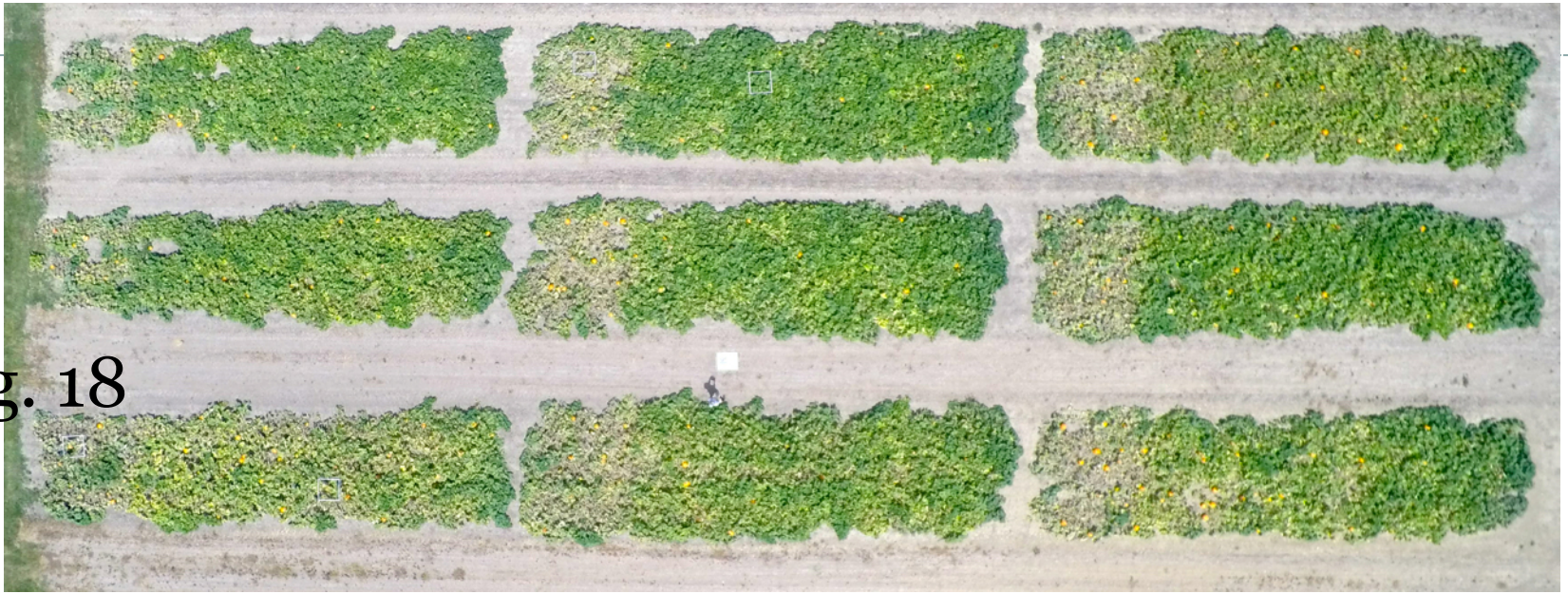
Aerial Pest Management

- UAVs flying over research plots collecting imagery



2015 – PM Treatment Efficacy

Aug. 18



Aug. 31



2016

Update on UAV's in Cucurbits

JIM JASINSKI
INTEGRATED PEST MANAGEMENT PROGRAM

**WEITONG LIANG, DONGFANG YANG, JOHN
SCHOENHALS, WLADIMIRO VILLARROEL, LISA
FIORENTINI**
DEPT. OF ELECTRICAL & COMPUTER ENGINEERING



RedEdge, Sequoia⁷

10'

The Disease Detection Crew

20'



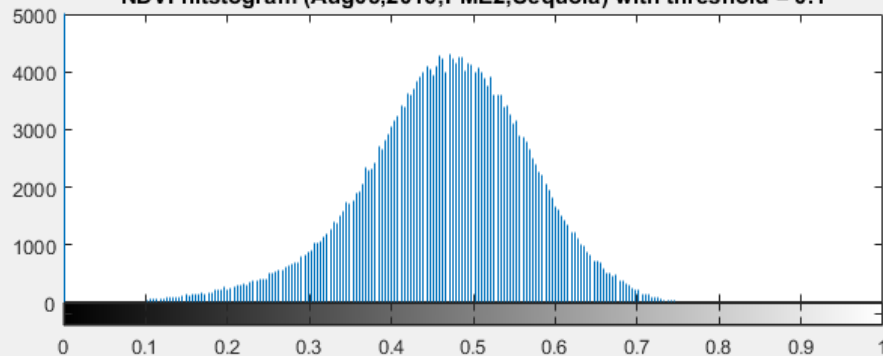
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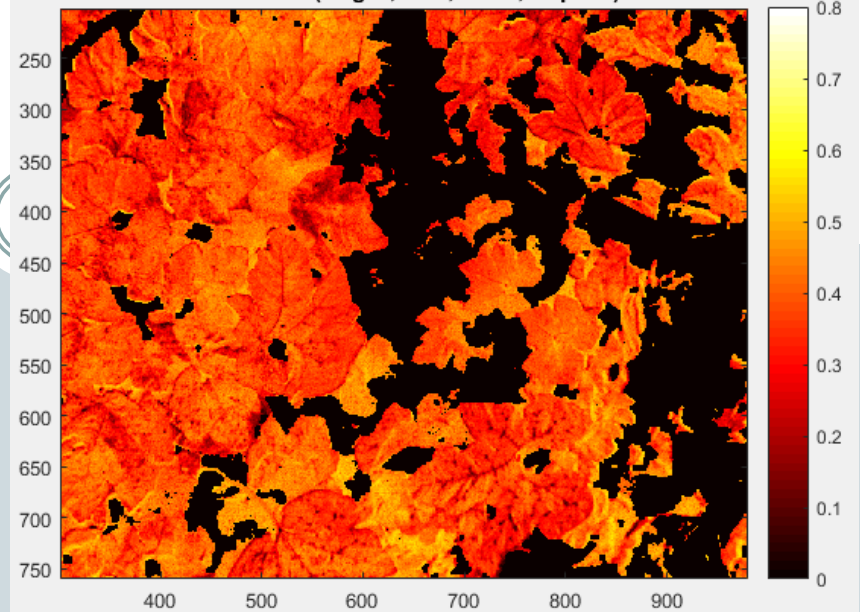
RGB image - resized (Aug05,2016;PME2;Sequoia)



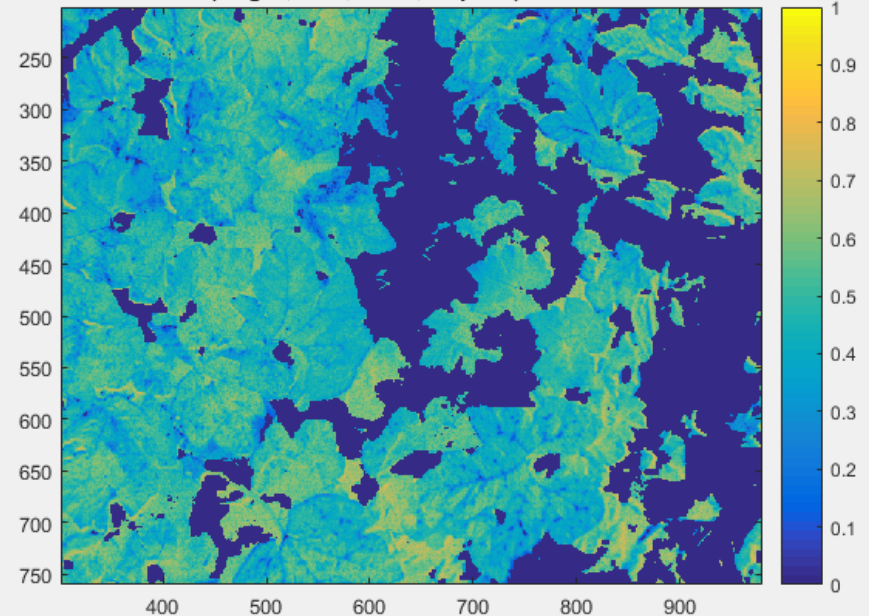
NDVI histogram (Aug05,2016;PME2;Sequoia) with threshold = 0.1



SAM result (Aug05,2016;PME2;Sequoia)

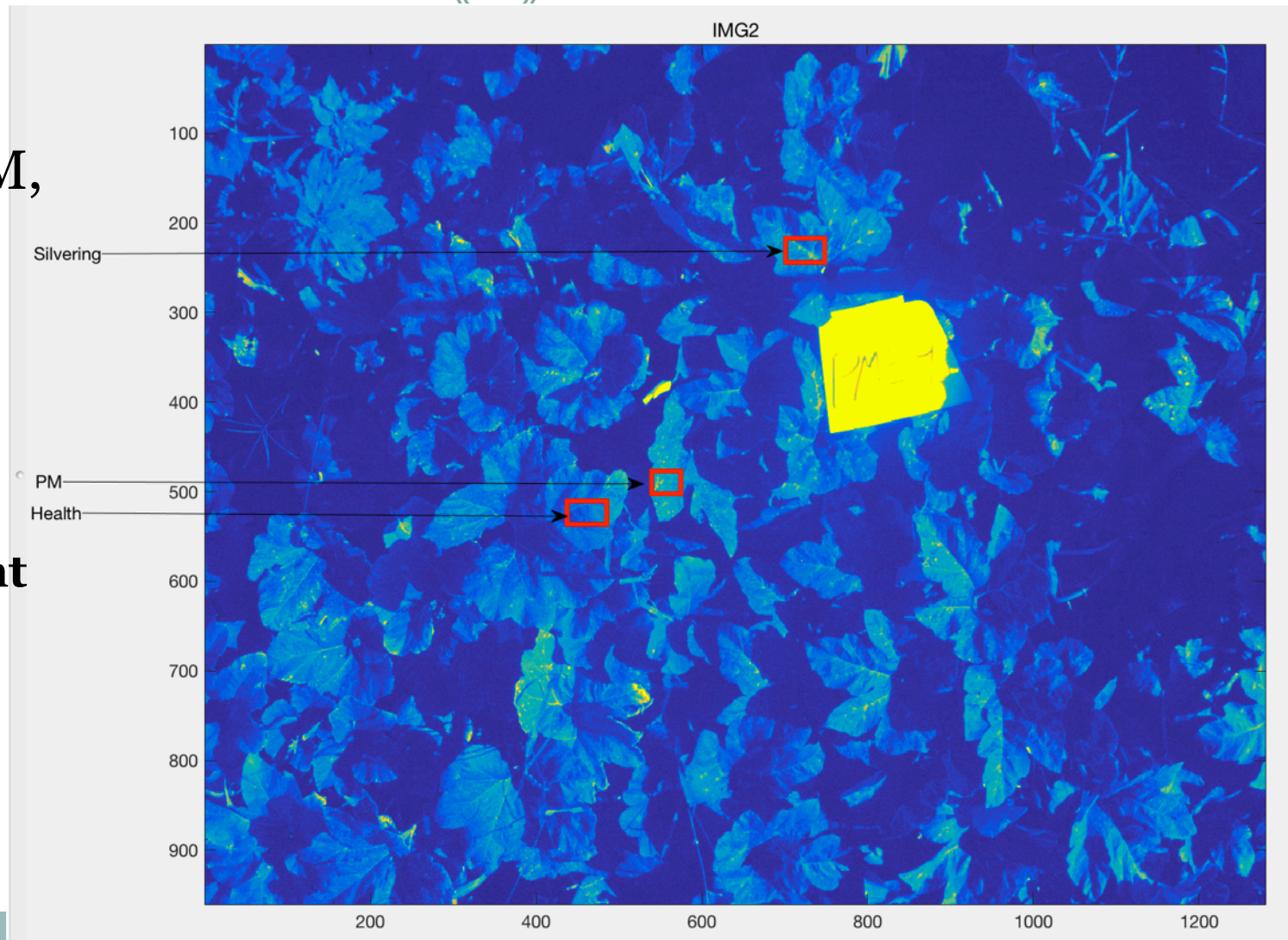


NDVI result (Aug05,2016;PME2;Sequoia) with threshold = 0.1



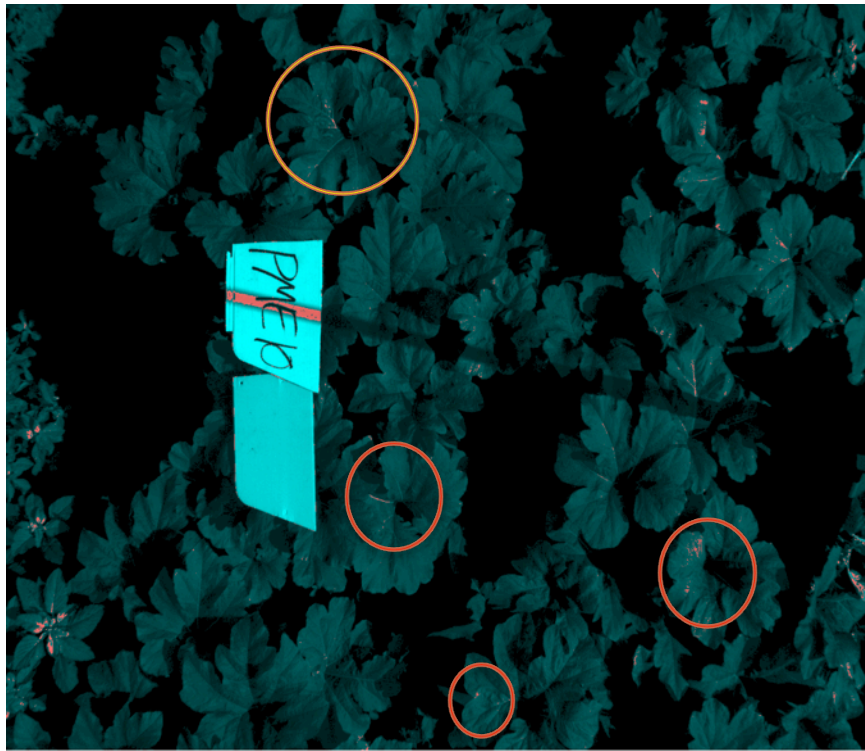
Laws Texture Measurement Energy

Define the
Silvering, PM,
Healthy
tissue, then
we apply
**Laws
Texture
Measurement
Energy**
algorithm



Laws Texture Measurement Energy

- The pink indicates high pixel intensity, which could be PM.
- Yellow and Red circle area is confirmed to be affected by PM.



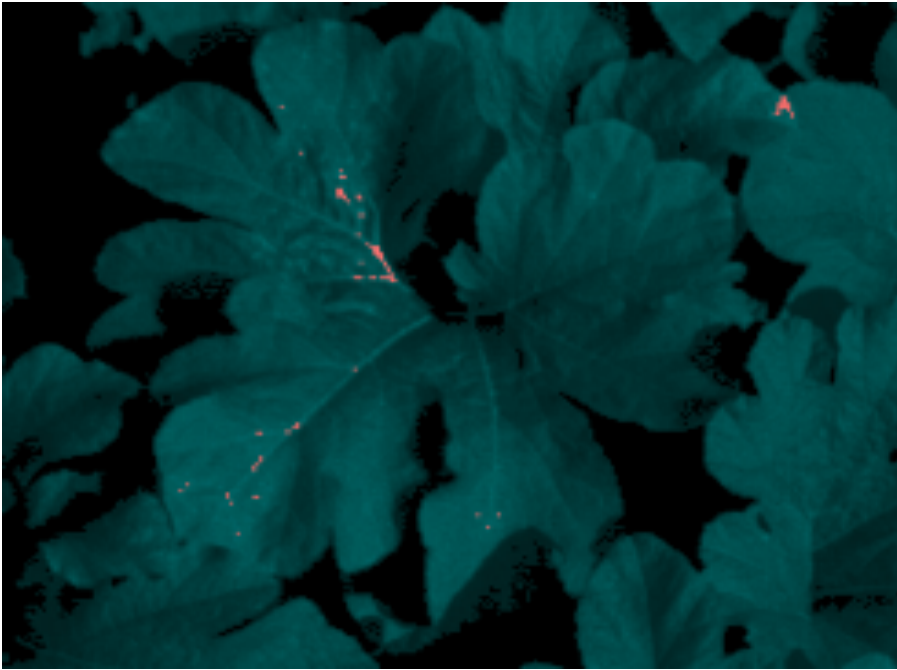
Taken @ 10' by RedEdge on Aug,5



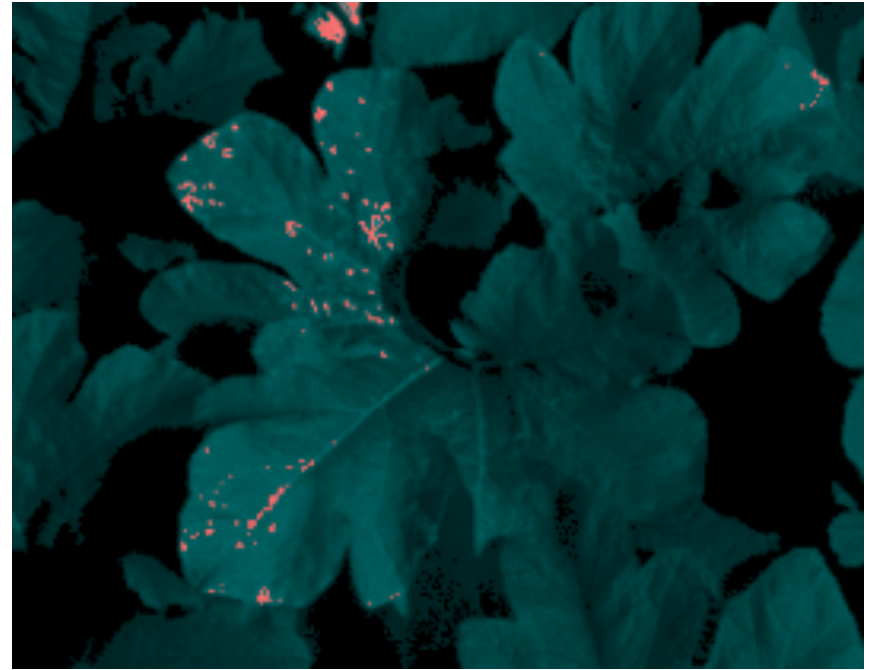
Taken @ 10' by RedEdge on Aug,9

Laws Texture Measurement Energy

- Pink highlights represent PM colonies on leaf
- PM spots are spreading on the leaf from Aug 5 to Aug. 9



Magnified from Aug. 5

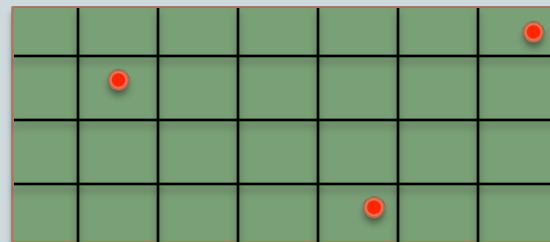


Magnified from Aug. 9

Preliminary Conclusions



- Making progress on ID PM in pumpkin using automated algorithm
- Next apply this process to find DM in cucumber
- These images will be used to pinpoint scouting efforts (ground truth)

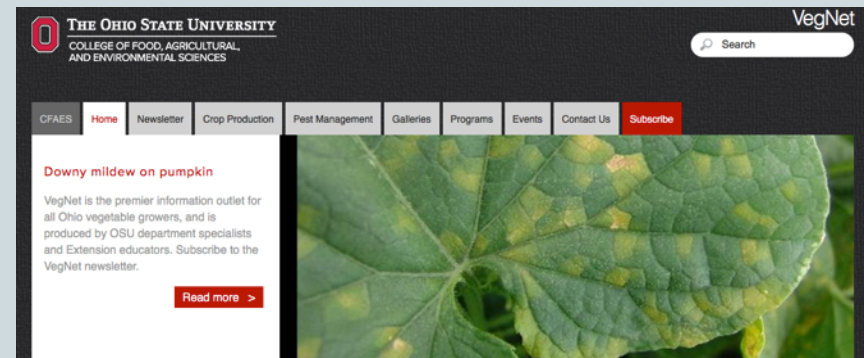


Current Sources of IPM Information

- VegNet Newsletter
 - Updated weekly through the season



- VegNet.OSU.EDU
 - Archived reports, pictures

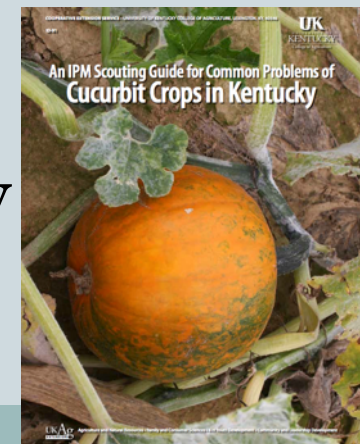
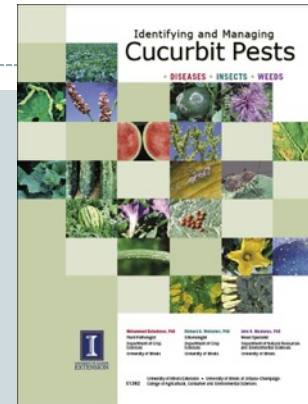


- Midwest Vegetable Production Guide
 - Updated annually by OSU & regional specialists



Pumpkin IPM Publications

- Identifying and Managing Cucurbit Pests (IL) \$11
- Pumpkin Production Guide (NRAES-123) \$39
- IPM Scouting Guide for Common Problems of Cucurbit Crops in Kentucky




Current Pumpkin Field Days

- Western Ag Research Station
 - South Charleston
 - Mid August
- South Centers at Piketon
 - End of September – Mid October
- Questions?
 - Jasinski.4@osu.edu
 - 937-484-1526



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PUMPKIN / UAV FIELD DAY

TOPICS:
UAV and Imagery basics
Update on UAV / Downy & Powdery mildew project
UAV flight & mapping demonstration
Insect update
Disease update
8 Powdery mildew fungicide demonstration plots
12 Powdery mildew tolerant/resistant hybrids variety trial

PRESENTERS:
Logan Dyer
John Fulton
Sally Miller
Claudio Wisman
Lisa Fiorentini
Jim Jasinski
Wladimiro Villarreal
Celeste Welty

**THURSDAY
AUG. 18TH
6 - 8 P.M.**

Western Ag Research Station
7721 South Charleston Pike,
South Charleston, OH 45368
Cost: \$5 / person
Pre-register by August 15th
send email to:
Jasinski.4@osu.edu

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COLLEGE OF FOOD, AGRICULTURAL
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