

Growing Pumpkins in Ohio



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CELESTE WELTY
ENTOMOLOGY



SALLY MILLER
PLANT PATH

Objectives



- Basics of IPM
- Pest Complex Overview
- Review Key Pests
 - Diseases, Insects, Weeds, Vertebrates
- Aerial Pest Management
- Additional IPM Resources



General Horticulture



- Pumpkins prefer warm, well drained soil
 - Don't like wet feet; seed will rot in ground
- 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 all vegetative growth



IPM Basics



- Scouting / Monitoring
- Identification
- Thresholds
 - Pests/plant, initial disease detection
- Treatment Options
 - Cultural (Hybrid Selection), 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.)

• Key Vertebrates

- **Mice**, birds, deer

Highlights of Disease Management



- Crop rotation – 3 years minimum (cucurbit, x, y)
- Select disease tolerant hybrids when possible
 - PMR, PMT
- Use cover crops if possible (winter rye)
 - Prevent splash and soil to fruit contact, reduce disease
- Disease presence dictates treatment options
 - 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 numbers!



Hybrid Selection



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



Cover Crop (Winter Rye) Rolled



Powdery Mildew



1. Doesn't overwinter in OH
2. Use resistant or tolerant hybrids
3. Scout in mid July
-Usually underside of leaf 1st
4. When found, treat 7-14 day schedule through harvest

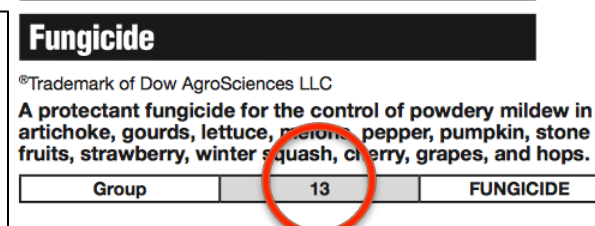
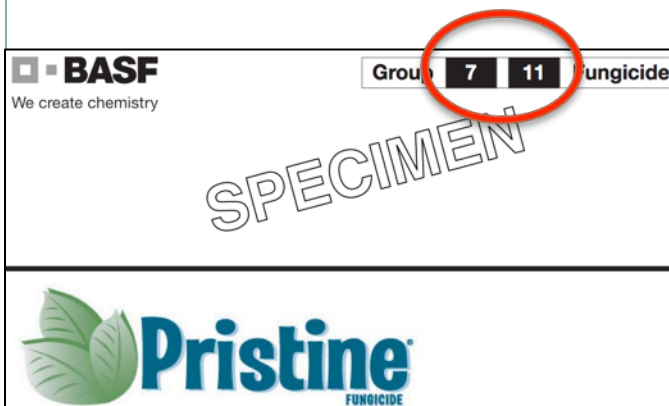


Powdery Mildew Fungicides

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



FRAC Numbers/MOA's



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

Downy Mildew



Purdue Extension BP 140 W

Does not overwinter in OH –
forecast network out of NC

No host plant resistance in
commercial hybrids

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

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

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

If found, treat on 7-10 day interval

Cucurbit Downy Mildew Fungicides

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

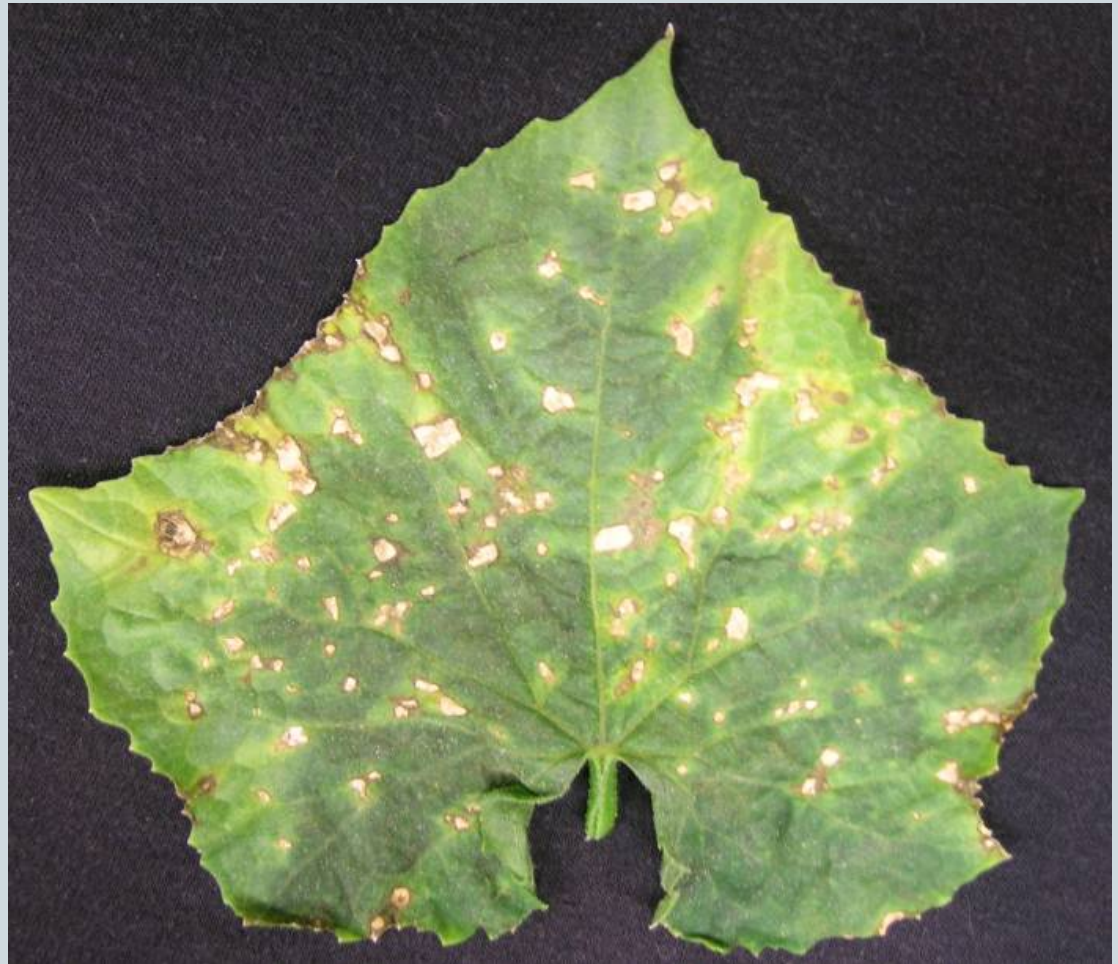
Bacterial Leaf Spot (*Xanthomonas* sp.)

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



Angular Leaf Spot (*Pseudomonas* sp.)

- ALS - seed borne only
- Drips from leaves onto fruit, cause lesions
- May eventually lose fruit
- Prefers **cooler** temperatures
- 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**)
- **Phytophthora** - treatment complicated...need to treat before symptoms are exhibited
- **Plecto** – can be managed with fungicides only, no commercial germplasm resistance



Phytophthora Blight Fungicides

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



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	✓	✓	✓	✓	✓

Basic Disease Program



A basic **Powdery Mildew** program

- Quintec + Bravo/Manzate alternated with Procure/Rally + Bravo/Manzate
- Merivon alternated with Procure or 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



Highlights of Insect Management



- Crop rotation
 - Destroy life stages alive in the ground or nearby
- Avoid Seeding end of May – Mid June
 - Peak Cucumber beetle pressure
- Transplant mid to late June
 - Fewer beetles, maybe more aphids and virus
- Frequent scouting for striped cucumber beetles at seedling stage
- Pay attention to Squash Vine Borer and Squash bugs



Striped Cucumber Beetle

THE key early season pest



Bacterial Wilt

Vectored by Cuke Beetles



Striped Cuke Btl / Bacterial Wilt



- Striped Cuke Beetle vectors bacterial wilt
- **Must protect seedling from cotyledon through 3rd - 4th leaf**
- 0.5 btl / plant (cotyl-1st) to 1 btl / plant (2-4th leaf)
- Shift seeding or transplanting later to avoid beetles
- Use row covers over small plantings (remove at flowering)
- Protect mature fruit from rind feeding (StrCB, SpCB, WCR)

Striped



Spotted



Western



Beetle Feeding Damage



Squash Bugs



- Overwinter as adults
- Attack vines and fruit
- >1 egg mass / plant, treat nymphs
- Vector Yellow Vine Decline



Yellow Vine Decline



- Vectored by Squash bugs
- Bright yellow plant
- Bacterial infection
- No treatment

Brown ring around stem



Yellow Vine Decline



- Bacteria vectored by squash bugs 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



Squash Vine Borer



Squash vine borer



- No resistant varieties or hybrids
- Frequent scouting at small to medium plant size for moth or wilting, spray when seen **or**
- Use pheromone trap to detect adults around mid June to mid July
- Treat plant crown w/ insecticide based on peak flight activity = max egg laying
- Spray every 7-10 days for 2-4 weeks **at plant base**



Row Covers to Exclude Beetles/Bugs



Basic Insecticide Options



- Don't spray during flowering or when bees are actively foraging nearby
- **Cucumber beetles** – Assail (RR), Belay, Sevin XLR, and Pyrethroids
- **Squash Bugs** – Assail(RR), Azera, Belay, Pyrethroids
- **Squash Vine Borer** – Assail(RR), Belay, Pyrethroids
- **Aphids** - RR (Assail, Fulfill), Actara (BBox), Beleaf, Closer, Exirel (Bbox), M-Pede soap

Bee Advisory Box



- Systemic insecticides
 - Admire, Actara, Exirel (some neonics, some diamides)
- No application during flowering or active foraging, 24-48 hr notice to registered apiaries w/in 1/2 mile



APPLICATION RESTRICTIONS EXIST FOR THIS PRODUCT BECAUSE OF RISK TO BEES AND OTHER INSECT POLLINATORS. FOLLOW APPLICATION RESTRICTIONS FOUND IN THE DIRECTIONS FOR USE TO PROTECT POLLINATORS.



Look for the bee hazard icon in the Directions for Use for each application site for specific use restrictions and instructions to protect bees and other insect pollinators.

This product can kill bees and other insect pollinators.

NeoNicotinoid Update



- Chemistries involved:
 - Imidacloprid (BBox), Dinotefuran, Thiamethoxam (BBox), Clothianidin
- Seed treatments are generally thought to be less risky to pollinators
- In-furrow applications increase risk to bees through accumulation in pollen and nectar
- Foliar applications to flowering crop illegal, drifting onto nearby flowers also possible



Highlights of Weed Management



- **Key control tactics:**
- Site selection
 - Choose fields/areas with low weed pressure
- Conventional till
 - disk lightly 2 weeks ahead of planting
 - finish for seed bed
 - avoid planting into green manure for 2 weeks (Seed Corn Maggot)
- No-till / Covercrop Burndown
 - Glyphosate and/or Gramoxone

Highlights of Weed Management



- **Pre-emerge**
 - Spray **Strategy** (Br & Gr) or **Sandea** (Br) plus **Dual Magnum** (Br & Gr) within a few days of seeding
 -
- **Post-emerge**
 - **Sandea** – Broadcast or shield application to avoid temporary stunting
 - **Poast** or **Select Max** – Grass control
- **Weed control will impact yield & quality**
 - Weed escapes interfere with fungicide application
 - Cultivate, hand pull and hoe to reduce weeds
 - Spot spray with Roundup or use shielded sprayer
 - Prevent weeds from going to seed if possible

Vertebrate Management



Meadow voles, White footed mice

- Eat planted seeds, seedlings, scratch and feed on maturing fruit, loss of sales
- No-till and cover crops increase MV and WFM
 - Spread cracked corn between rows / around field through emergence
 - Prevent/reduce feeding on pumpkin seeds
 - Zinc Phosphide treated grain (buried), need license to buy and spread (RUP)
 - No broadcasting anti-coagulant bait?
 - Increase habitat for hawks, coyotes, foxes, etc.

Vertebrate Management



Black birds

- Pull seedlings out of ground, peck fruit
- Prevention – noise makers and increased traffic

Ground hogs, Deer

- Eat seedlings and plants; bite or kick fruit
- Trapping, fumigation, nuisance/damage permits
- Fencing / Electrical fencing (deer, \$\$\$)
- Chemical repellents (deer)



Aerial Pest Management

- Effective and efficient use of UAV's (drones) to detect insects, diseases, weeds, etc.



Aerial Pest Management



- How I spent my summer at the research station...



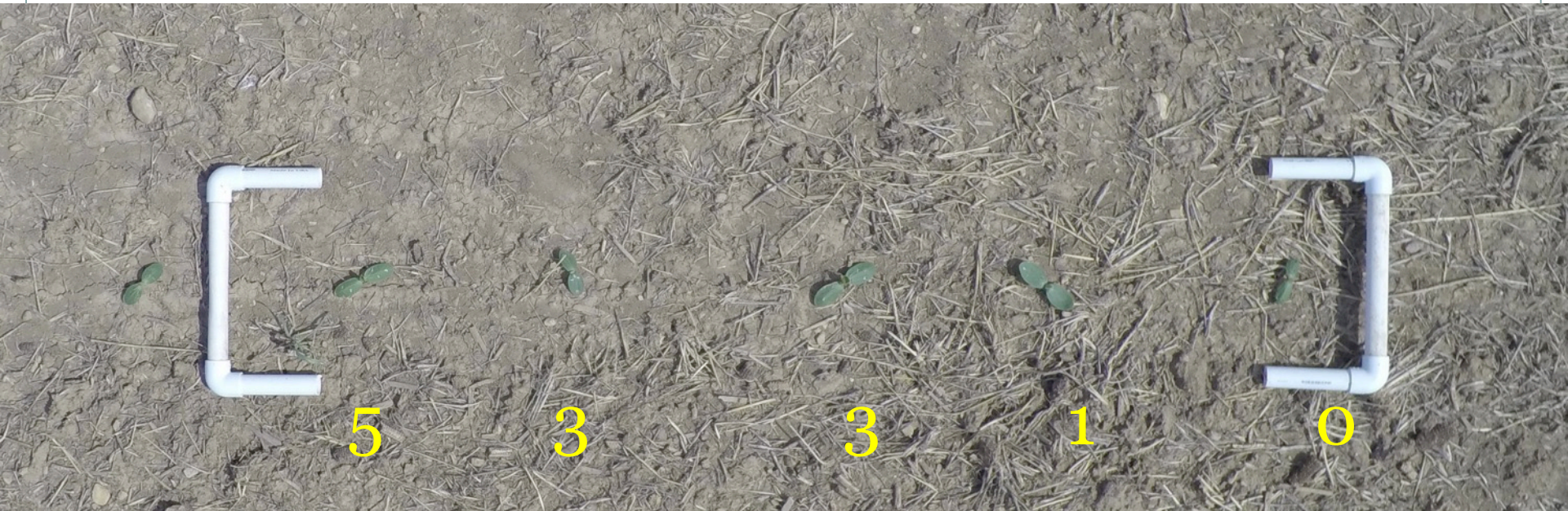
Detecting Faux Cucumber Beetles 3m



How Many Striped Cuke Beetles
Between the White Brackets?



Detecting Faux Cucumber Beetles 3m



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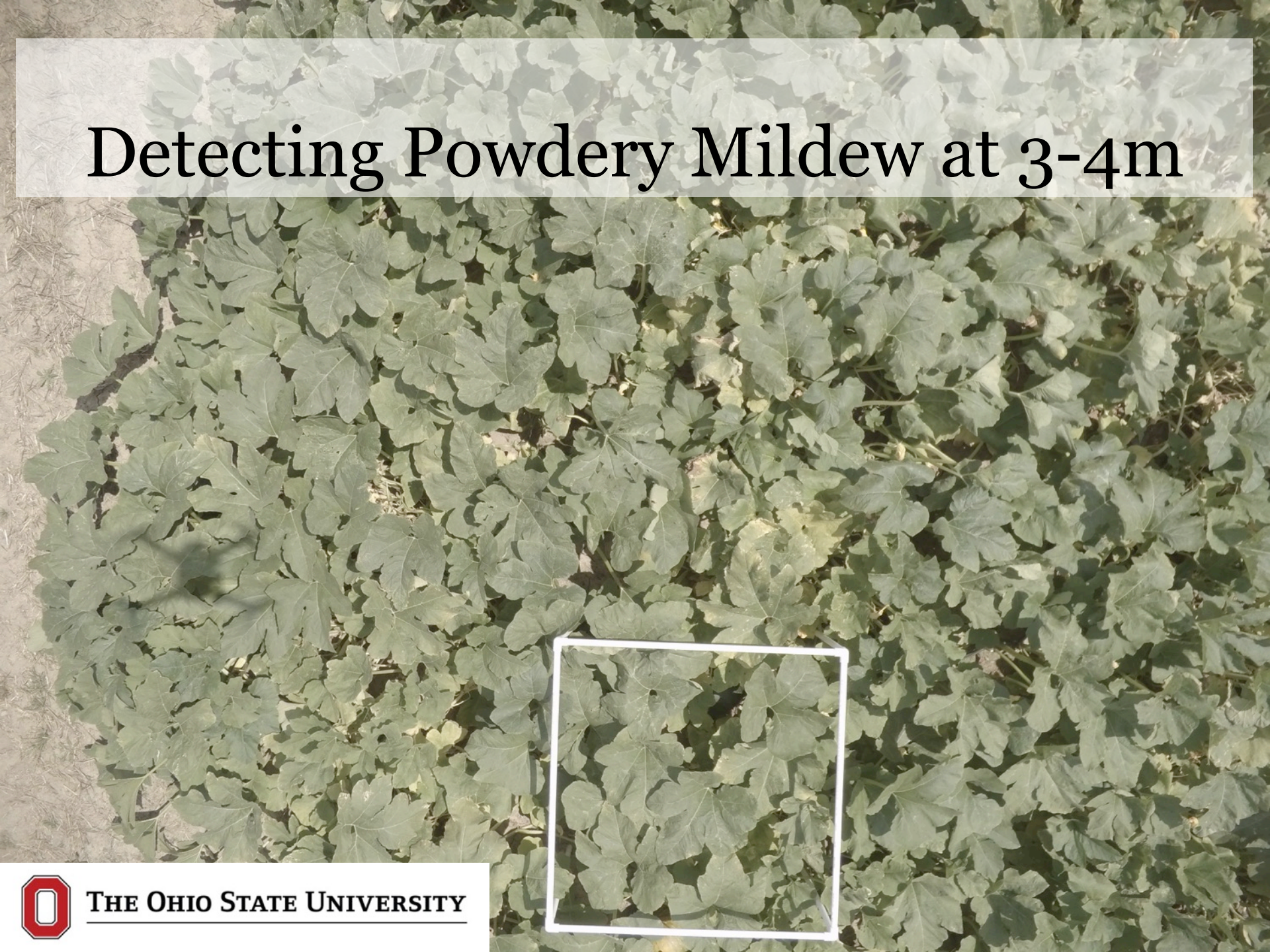
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Detecting Faux Cucumber Beetles 3m

How Many Striped Cuke Beetles
Between the White Brackets?



Detecting Powdery Mildew at 3-4m

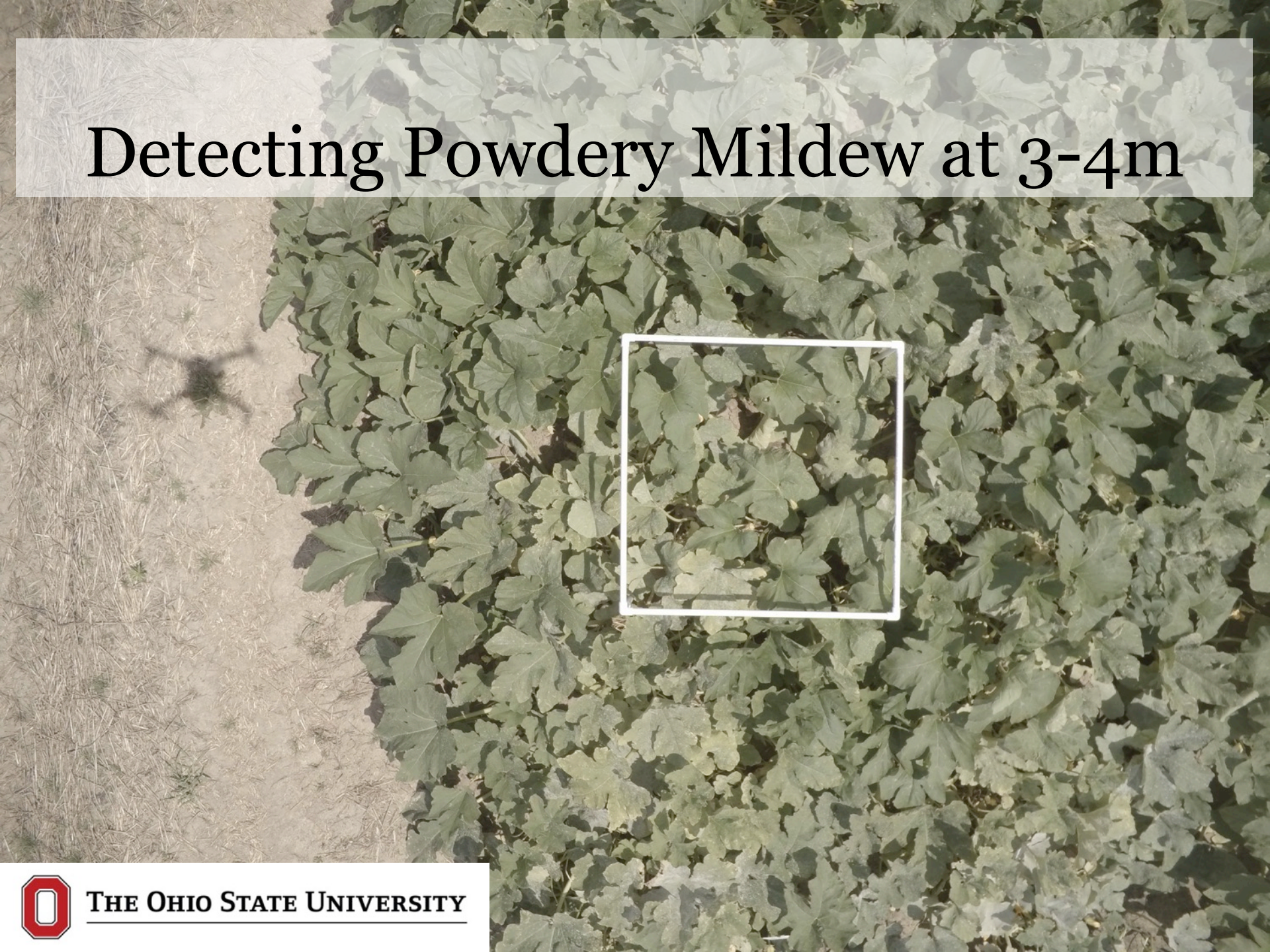


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Detecting Powdery Mildew at 3-4m

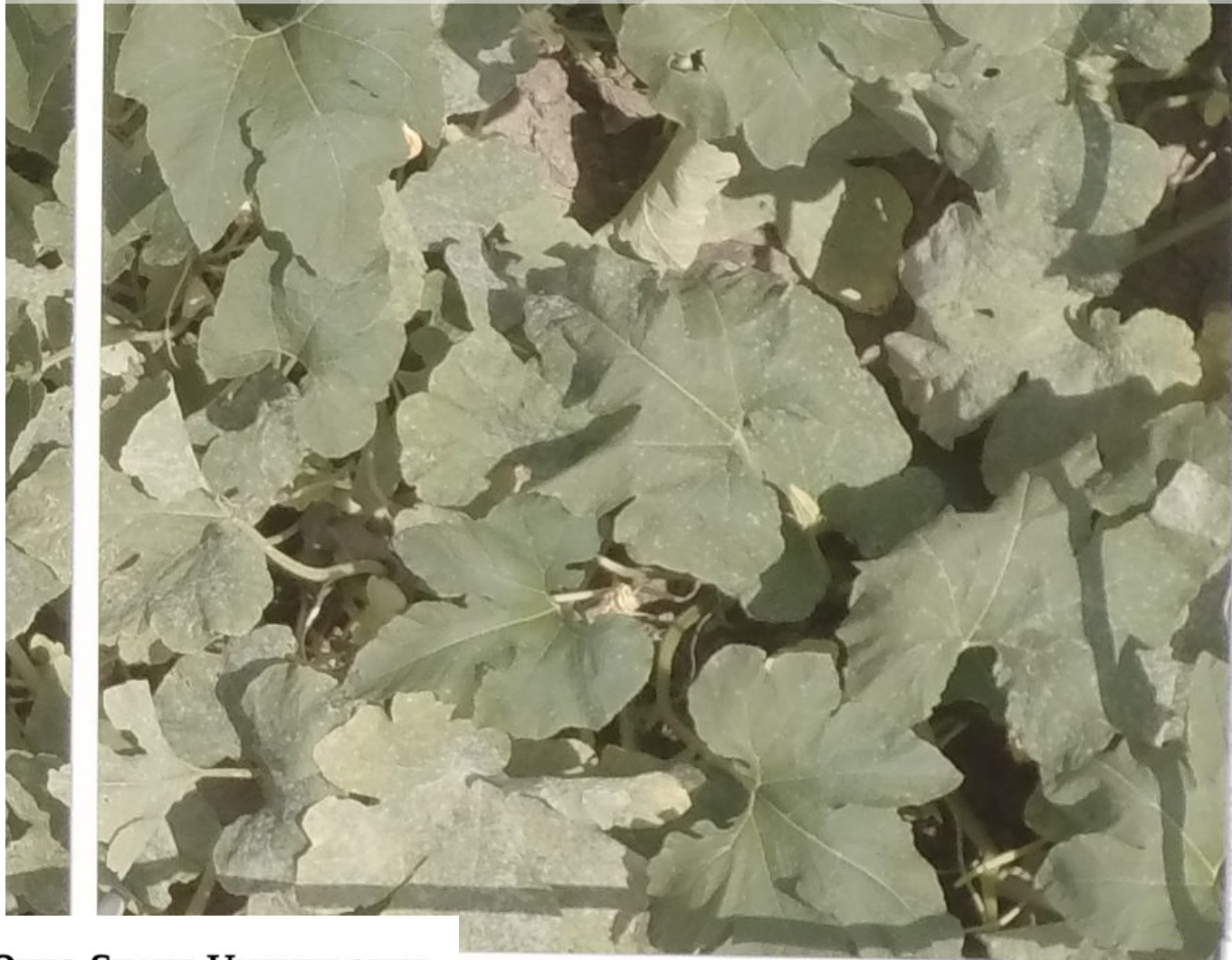


Detecting Powdery Mildew at 3-4m



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Detecting Powdery Mildew at 3-4m



2014
PM Demo
Trial

Aug. 19th

VS.

Aug. 29th



2015 – PM Treatment Efficacy

Aug. 7

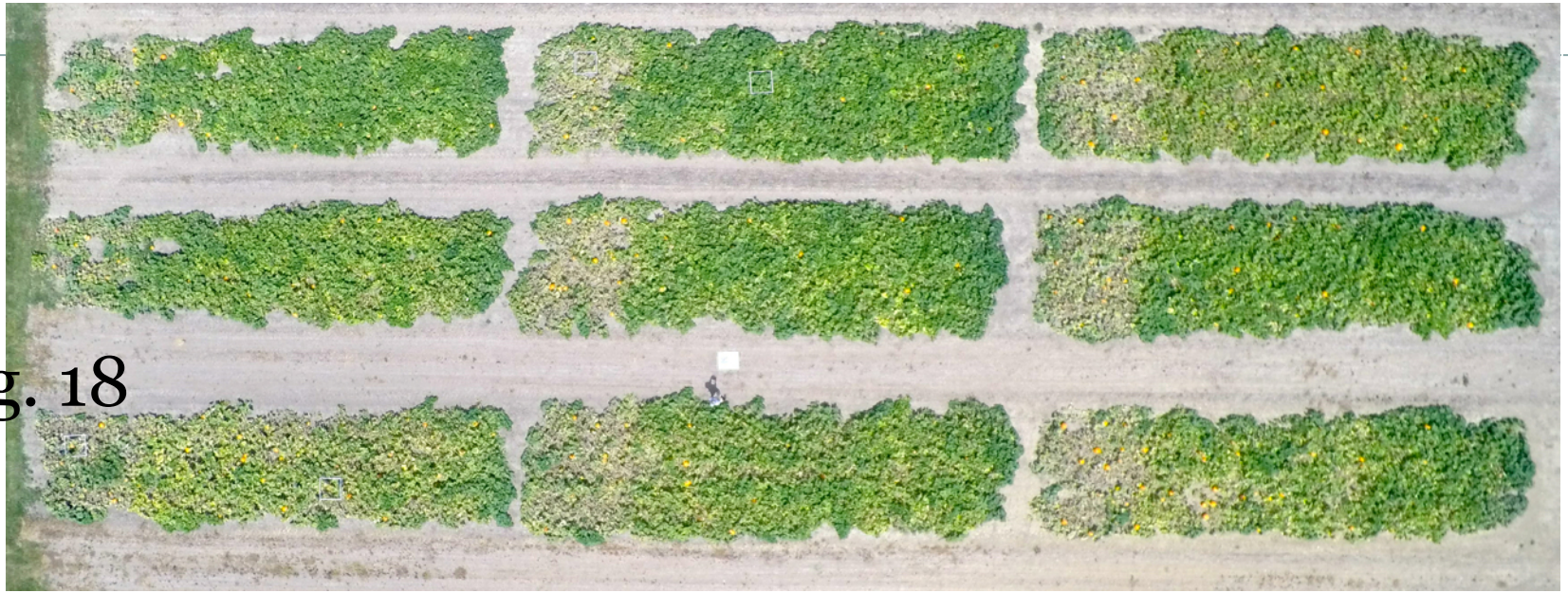


Aug. 18



2015 – PM Treatment Efficacy

Aug. 18



Aug. 31



Preliminary Conclusions

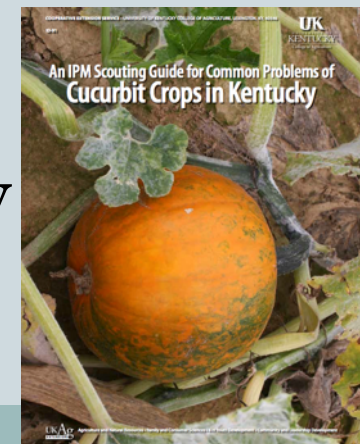
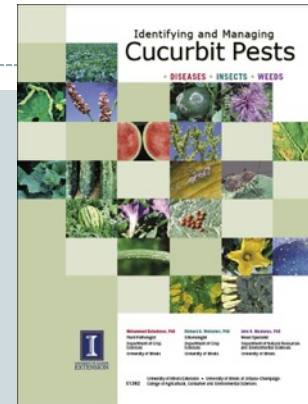


- Successful on a case by case basis
 - Early detection, Quantify infestation
- Pest's on lower leaf surface????
 - Not RGB, Maybe IR?
- Identification of species?
- Need better optics, zoom, IR cameras?
- Eliminate rotor wash on plants – frighten insects away, blur images?



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



Pumpkin Field Day

- Western Ag Research Station, South Charleston
- August 18th
- Any Questions?
- Jasinski.4@osu.edu
- 937-484-1526



The Dr. Mark Bennett Memorial Scholarship Fund

- Professor of HCS
1986-2015 (29 years)
- Died 60 years young;
brain cancer
- Establish scholarship fund
for undergrad students
interested in fruit and veg
production
- See handout for
contribution details



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