



Stopping Xanthomonas And Other Plant Spotters

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Xanthomonas



Xanthomonas (pathogen) names:

Xanthomonas pelargonii

Xanthomonas campestris pv. *pelargonii*
(Xcp)

Xanthomonas hortorum pv. *pelargonii*
(Xhp)

Bacterial blight disease of
geraniums











Pelargonium X hortorum



Geranium sanguineum





Spring 2022



Wilt + yellowing



Tiny spots







SEB1, Sample extract powder
Contains SEB1.
Store at +4°C.



G. SORVISKY

FOR IN VITRO USE ONLY



Agdia

X hp 00033

SAMPLE
SAMPLE



24 hrs













Maryland
Sample
3-2-2022



Karen Rane image

Cultural Controls for Xanthomonas

- Culture-indexed cuttings or hybrid seed
- Sanitation
- Scouting
- Minimize splashing
- NO ivies over zonals
- Keep hybrid seedlings separate from vegetative
- Keep sources separate
- Avoid ebb/flood irrigation or capillary mats

Horizontal spread:
Patriot cultivar with
Bacterial blight



Whole genome sequencing-based tracing of a 2022 introduction and outbreak of *Xanthomonas hortorum* pv. *pelargonii*.

Iruegas Bocado F¹✉, Weisberg Aj¹✉, Riutta ER¹✉, Kilday KB¹✉, Bonkowski JC²✉, Creswell TC³✉, Daughtrey M⁴✉, Rane KK⁵✉, Grünwald NJ¹✉, Chang JH¹✉, Putnam M¹✉

Author information ▶

Phytopathology, 14 Dec 2022,

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27 strains from 2022 – 18 from one company, others proved **horizontal spread** common

Ralstonia

Agent of

Southern Bacterial Wilt

Wilty But No Spots – *Ralstonia solanacearum*



Kathleen Holman

Species complex

Ralstonia solanacearum – endemic

Ralstonia solanacearum Race 3 Biovar 2
– **Select Agent**

Both cause Southern wilt of geranium



Ralstonia R3Bv2 Symptoms

Courtesy of MSU
Plant and Pest
Diagnostic Lab

Symptoms on Geraniums

- Yellowing, wilting and browning of lower leaves
- Vascular discoloration and necrosis of the stem
- Brown discoloration of the roots



Signs on Geraniums

- Bacterial Ooze
- Bacterial streaming: cut stem or petiole placed in water should display cloud generated from bacterial streaming out of plant tissue



Photo Margery Daughtrey, Cornell University, www.pdis.org

Bacterial Streaming

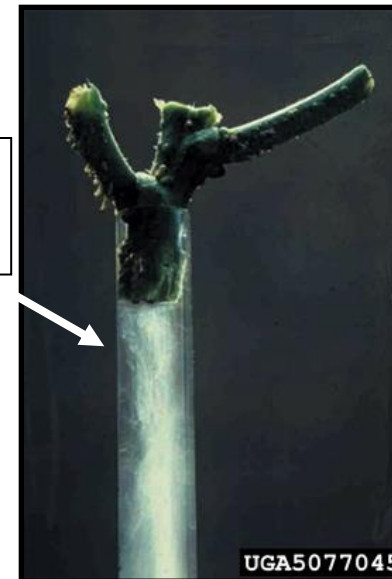


Photo David B. Langston, University of Georgia, www.forestryimages.org



Courtesy of MSU
Plant and Pest
Diagnostic Lab



Bacterial Wilt of Geranium
Ralstonia solanacearum



Wilt
Sometimes
unilateral

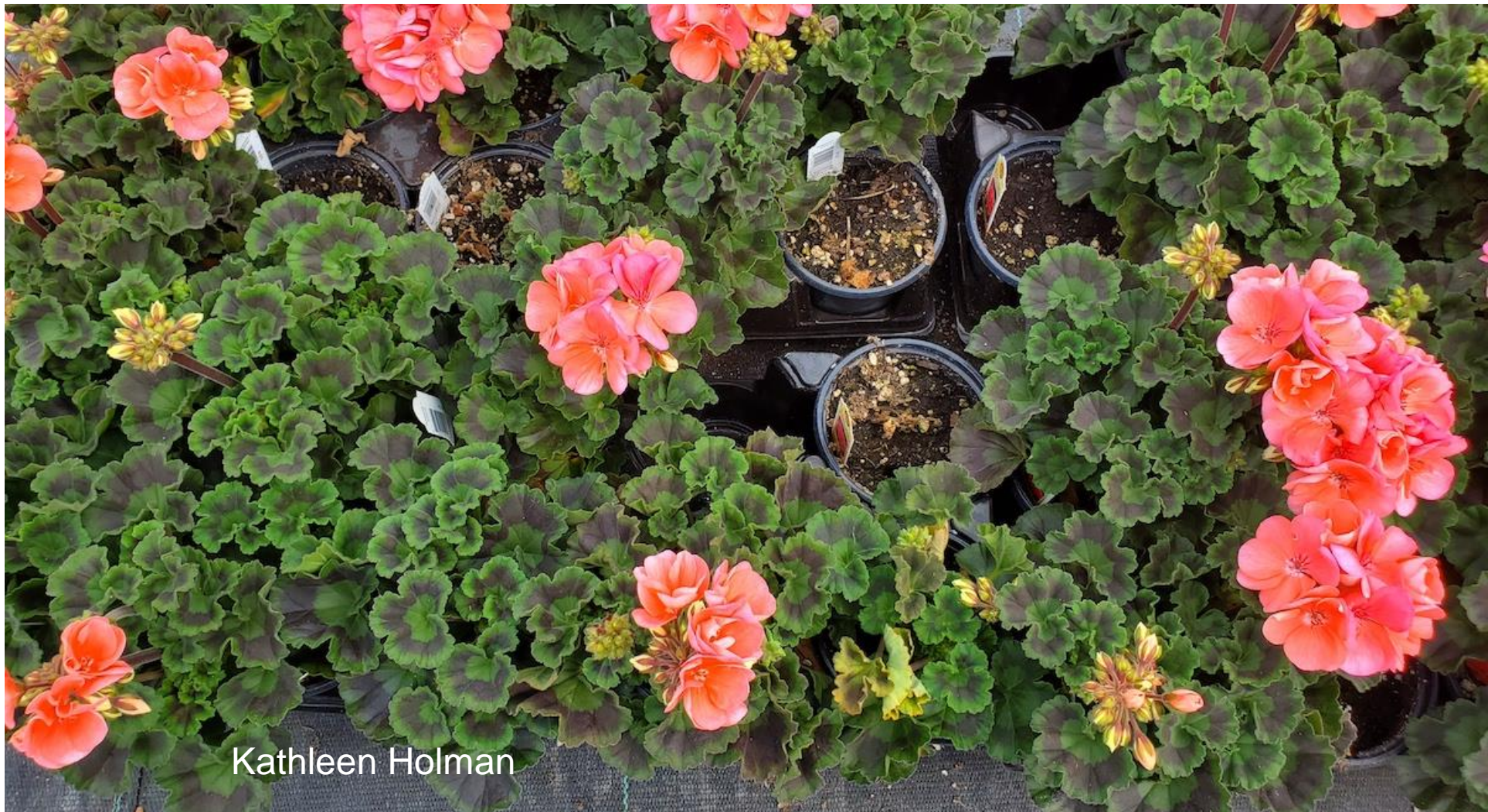


Upcurled leaves



symptoms

Leaf Curl & Melted Out - Ralstonia



Kathleen Holman

Wilty - Ralstonia



Kathleen Holman

Vascular Invasion Look - Ralstonia



Kathleen Holman



Sanitation is Critical at All Stages of Production Against Xanthomonas and Ralstonia on Geraniums

Other Common Hosts of Bacterial Diseases Caused by Xanthomonads:

Cabbage, Kale

Zinnia

Begonia

Hot Water Treatment Of Seed



Xanthomonas leaf spot
of cabbage and kale

Bacterium is **seed-borne**



Xanthomonas leaf spot
of zinnia

Bacterium is seed-borne



Xanthomonas axonopodis pv. *begoniae*

Acidovorax

Vorax



Image from Wikipedia

Didelphodon vorax



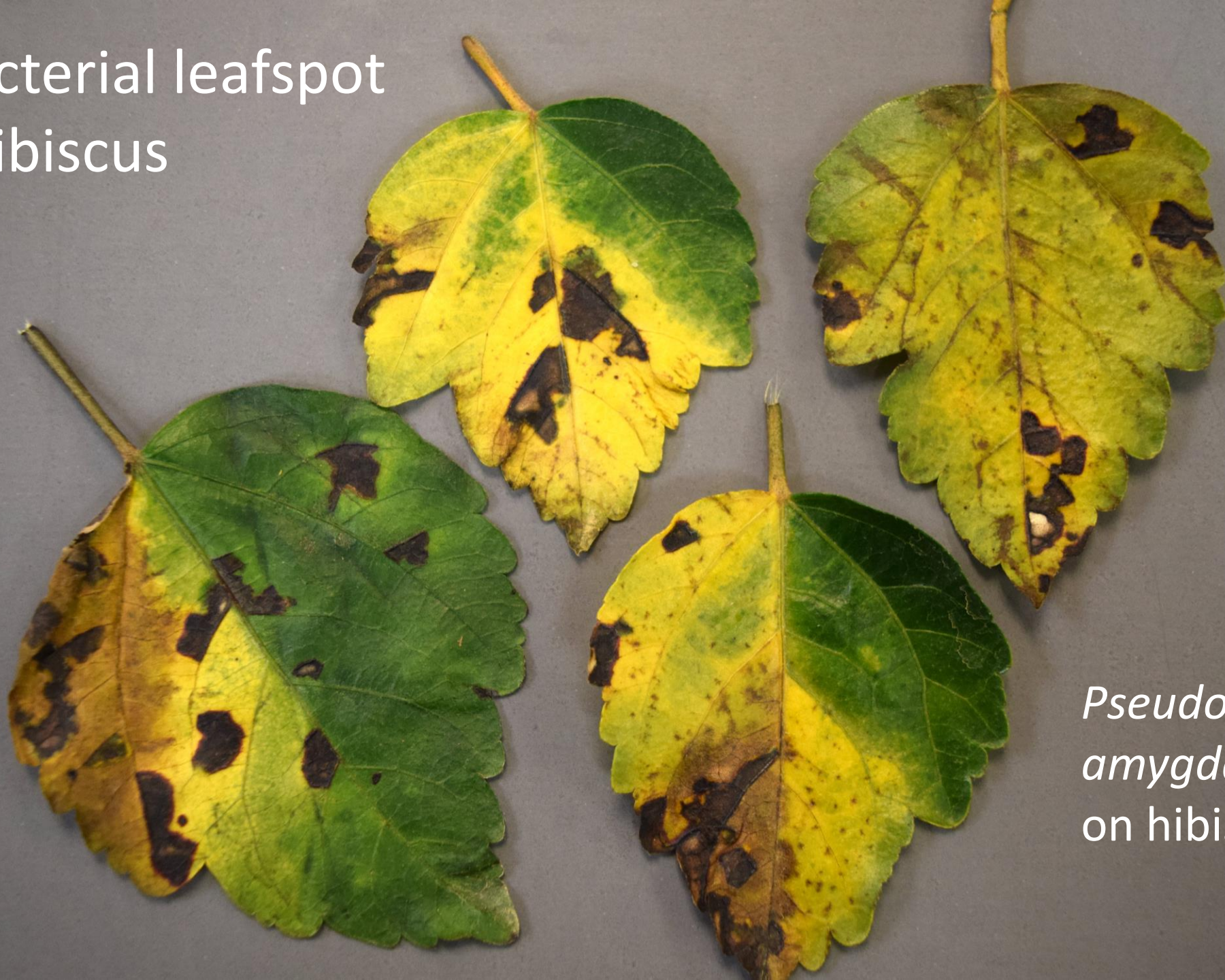
Acidovorax
on canna

A. avenae subsp. *avenae*
Also petunia, *Strelitzia*

Bacterial stripe disease

Pseudomonas

A bacterial leafspot
on hibiscus



*Pseudomonas
amygdali*
on hibiscus



Bacterial leaf spot
of mum

*Pseudomonas
cichorii*

*Pseudomonas
cichorii*



TREATMENT OPTIONS for BACTERIA

Copper sulfate pentahydrate - Phyton 35 (48 hr REI)

Copper salts of fatty & rosin acids – Camelot O

Copper hydroxide – Champ, Kalmor, CuPRO 5000, Nu-Cop . . .

Copper + mancozebs - Junction, etc.

Streptomycin - Agri-Mycin (but bleaches geraniums)

***Bacillus* – Cease, Companion, Triathlon BA, Stargus**

Phosphorous acid materials - K-Phite, Areca, etc.

Powdery Mildews

Most damaging when they fool you

Powdery Mildew



It comes back!



PM



calibrachoa

A top-down view of a black plastic seedling tray containing several Calibrachoa plants. The plants are small with clusters of light green, lanceolate leaves. Some leaves show signs of powdery mildew, appearing as pale, fuzzy patches. The soil in the tray is dark and moist. The plants are arranged in a grid pattern, with some showing more advanced symptoms of the disease than others.

**Powdery Mildew on
Calibrachoa**



Powdery Mildew on
Calibrachoa



But sometimes
PM can fool you!





Powdery Mildew on Rex Begonia

Cultural control of PM

Avoid highly susceptible cultivars

Keep humidity down

Circulate the air

Fungicide FRAC Groups for PM Management

(some examples):

GROUP 11: strobilurins

GROUP 3: DMIs

Also 11 + 7 . . .

GROUP 5

GROUP 19

Also 9 + 12

GROUP NC

GROUP 44

GROUP BM01, BM02

Fungicide FRAC Groups for PM Management (some examples):

GP 11: strobilurins

e.g. Compass, Pageant Intrinsic

GP 3: DMIs

**e.g. Terraguard, Hoist/Eagle, Avelyo
(& BannerMAXX, Tourney outside)**

Also 11 + 7 . . .

Combo for PM Management (+ leaf spots)

GP 11 + 7 (strobilurin + SDHI):

Orkestra (pyraclostrobin + fluxapyroxad) G,N,RN,L

Broadform (trifloxystrobin and fluopyram) G,N,L
(neither for LI use)

Mural (azoxystrobin + benzovindiflupyr) G,N,L

Fungicides for PM Management (cont'd)

GP 5: piperalin – Pipron [G only]

GP 19: polyoxin D – Affirm [G, hoop house etc]

GP 9 + 12: Palladium (cyprodinil + fludioxonil) [production]

GP NC: Milstop, Hort oil, Neem oil, Regalia GNF

GP 44 or BM 02: Cease, Companion, Triathlon BA (*Bacillus subtilis* and *B. amyloliquefaciens*) GN(some L)

BM 02: Actinovate (*Streptomyces griseoviridis*) GNL

BM-01: Regime (BLAD, from lupines)

Leaf Spots



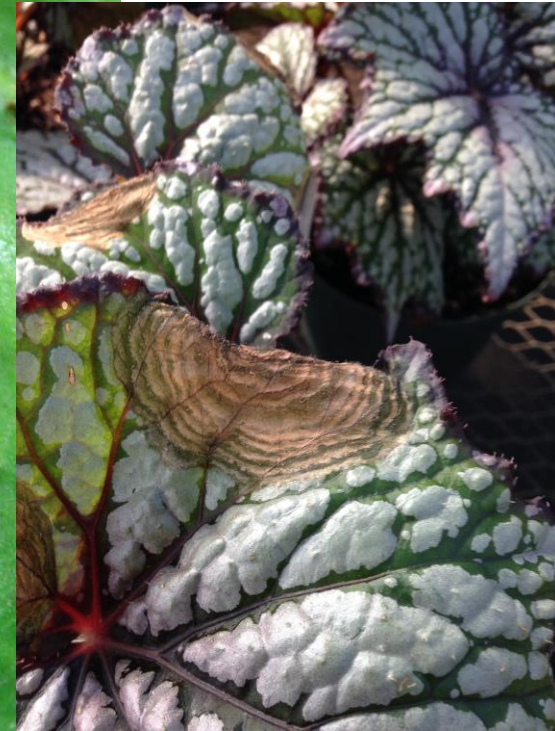
Stemphylium
On Kalanchoe



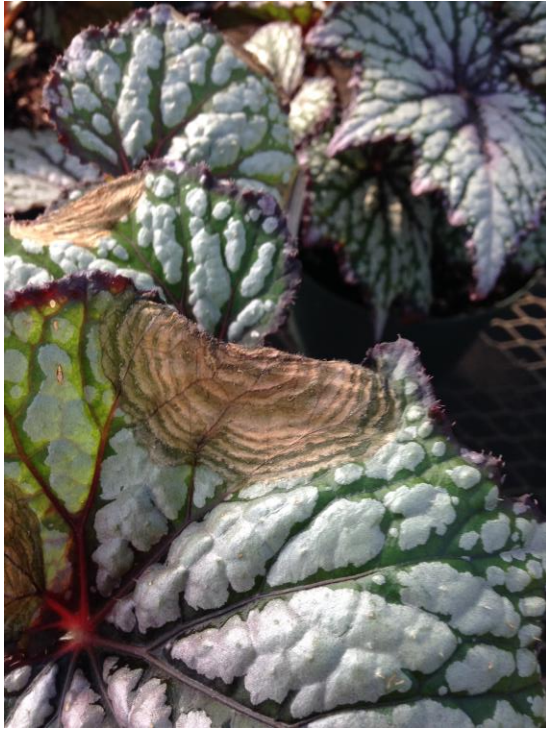
Cercospora Leaf Spot

Botrytis

begonia



Zonate lesions



Leaf Spot Fungicides

Chlorothalonil (M05)

DMIs (Group 3)

Strobilurins (Group 11)

Group 11 + 7s (above + SDHIs)

Rusts

As with leaf spots, avoid leaf wetness



Monstera with
yellow flecks on
leaves

Very happy in
my office . . .





Rust on Knockout Roses

Jerry Giordano images



Manage leaf wetness
early in growing season



Downy Mildew (Spots & Systemic)

2023: coleus, bracteantha, basil and highly resistant impatiens

Coleus DM may cause leaf spots



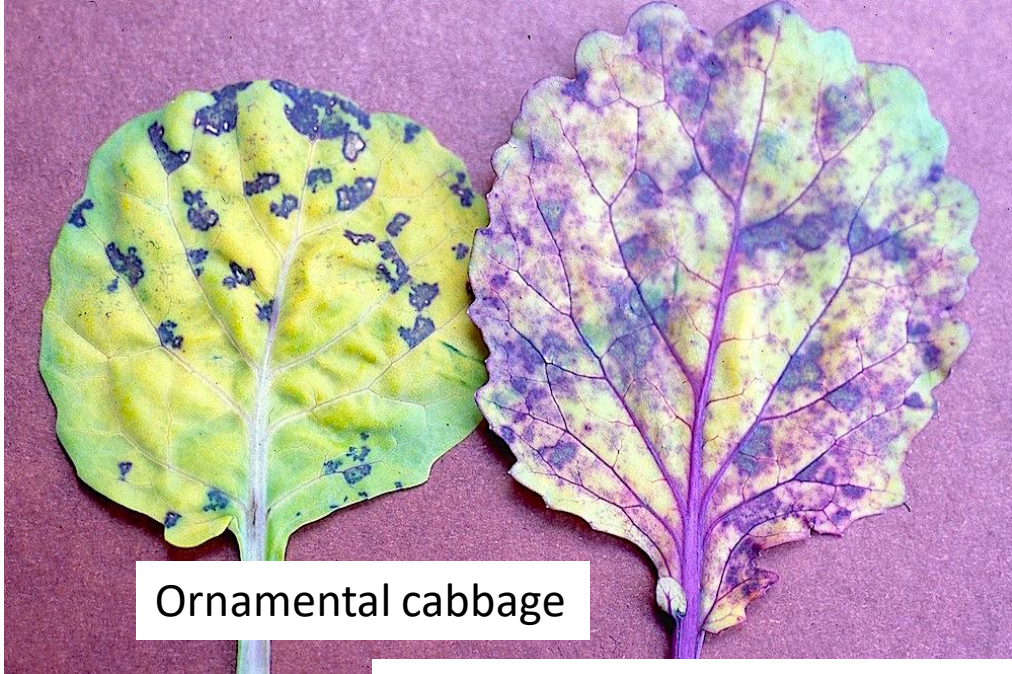
No infection at 86F
Some infection (<10%) at 77F
Plenty of infection at 68F
Lots of infection at 59F
(MSU-Harlan & Hausbeck data)



**IRREGULAR or
VEIN-BOUNDED**



Downy Mildew on Foxglove



Ornamental cabbage

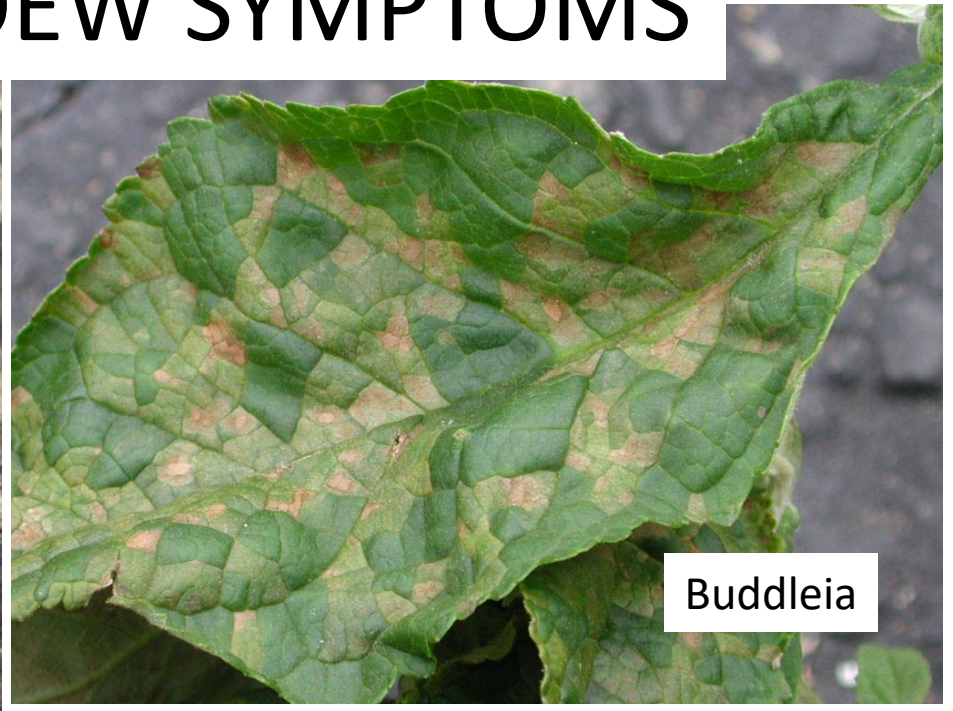


cleome

DOWNY MILDEW SYMPTOMS



Hardy geranium



Buddleia



Downy Mildew Symptoms & Signs

Snapdragon Downy Mildew



Yellowing of the new growth may signal systemic DM



Plasmopara halstedii
Sunflower downy mildew

Amazel with DM



Managing Basil Downy Mildew

**K-Phite, FosPhite, Rampart
(Phos acids) - FRAC 33
(can use at low rate with others, or
use alone at high rate)**

Revus (mandipropamid) - FRAC 40

Ranman (cyazofamid) - FRAC 21

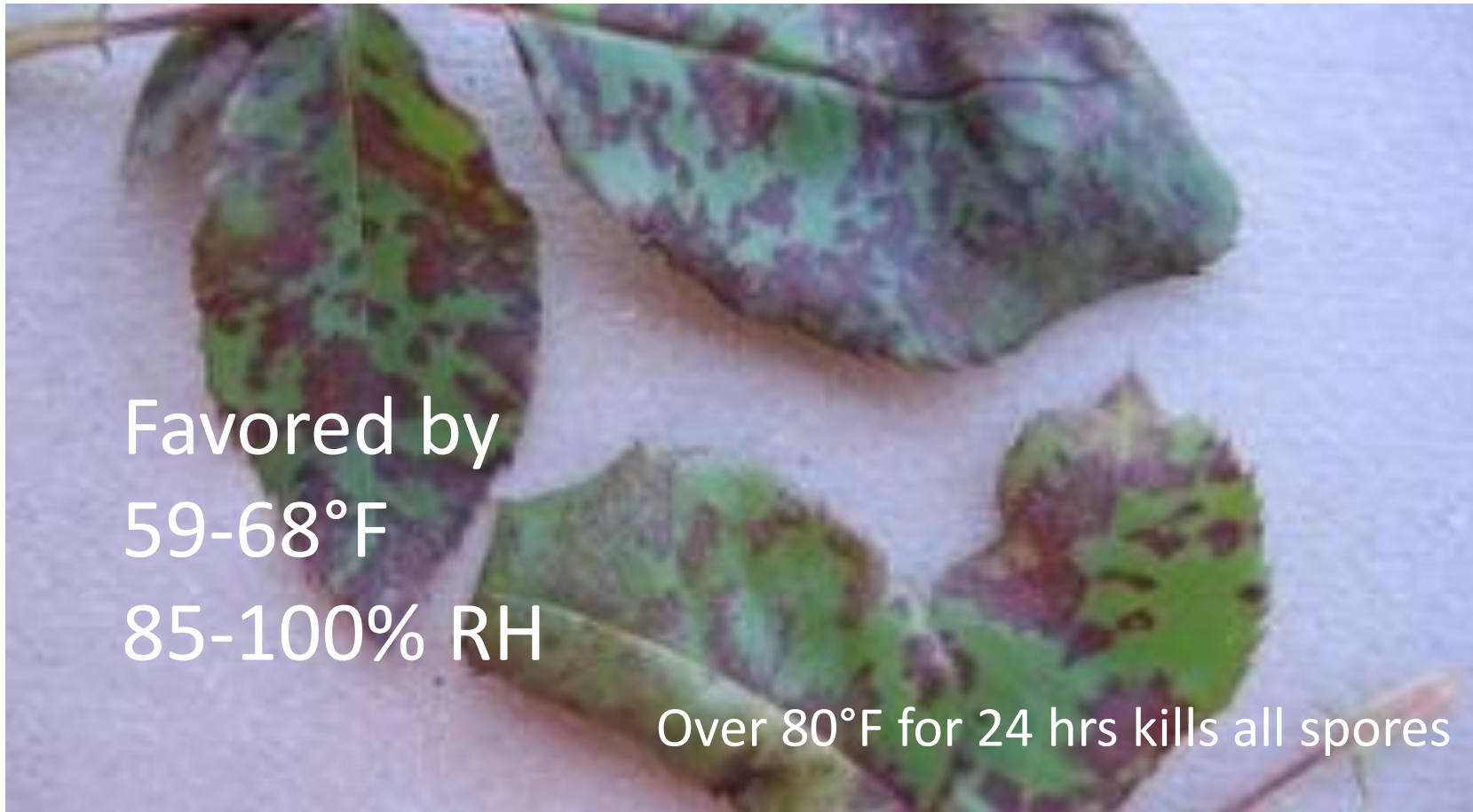
Heritage, Micora, Segovis, SubdueMAXX
Gp 11 40 49 4

Localized Infections caused by a downy mildew



Vein-bounded leaf spots

Rose Downy Mildew



Favored by
59-68°F
85-100% RH

Over 80°F for 24 hrs kills all spores

DM Trial Results on Roses

Baysal-Gurel & Simmons PDMR 11:OT011 and 012

Sprays of Subdue + Micora, alt Mural, alt Segovis worked well at 7-14 day intervals

Best effectiveness at Chase Research Gardens:

Segway, Stature DM, Micora, Aliette, Subdue-MUST TANK MIX)

MSU

Heritage, Stature, Junction, Daconil (but beware on Knockouts)

Downy mildew sporulation on undersurface of leaves – white to gray



impatiens



coleus

COLEUS DM

Long Island NY:

- Orvego 11-28 fl oz/100
- Pageant 8 fl oz/100
- Stature 6.4 oz/100 (better to use 12.8 oz)

While Heritage and Aliette NOT very effective

Michigan:

- FenStop, Orvego, Stature (SP)
- Subdue (DR)



IDM on Impatiens 2023



IDM
Found on Highly
Resistant
Impatiens
2023



Questions?
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