

A photograph of onion plants in a field showing signs of stemphylium leaf blight. The leaves are severely damaged, appearing wilted, yellowed, and necrotic. The onion bulbs are visible at the base of the plants, some appearing healthy and others showing signs of decay. The background is dark soil.

Stemphylium Leaf Blight of Onion: Biology & Control

Lindsey du Toit, Washington State University

2023 Annual Convention & Trade Show of the
Pacific Northwest Vegetable Association
Kennewick, WA, 15-16 November 2023

Onion Downy Mildew





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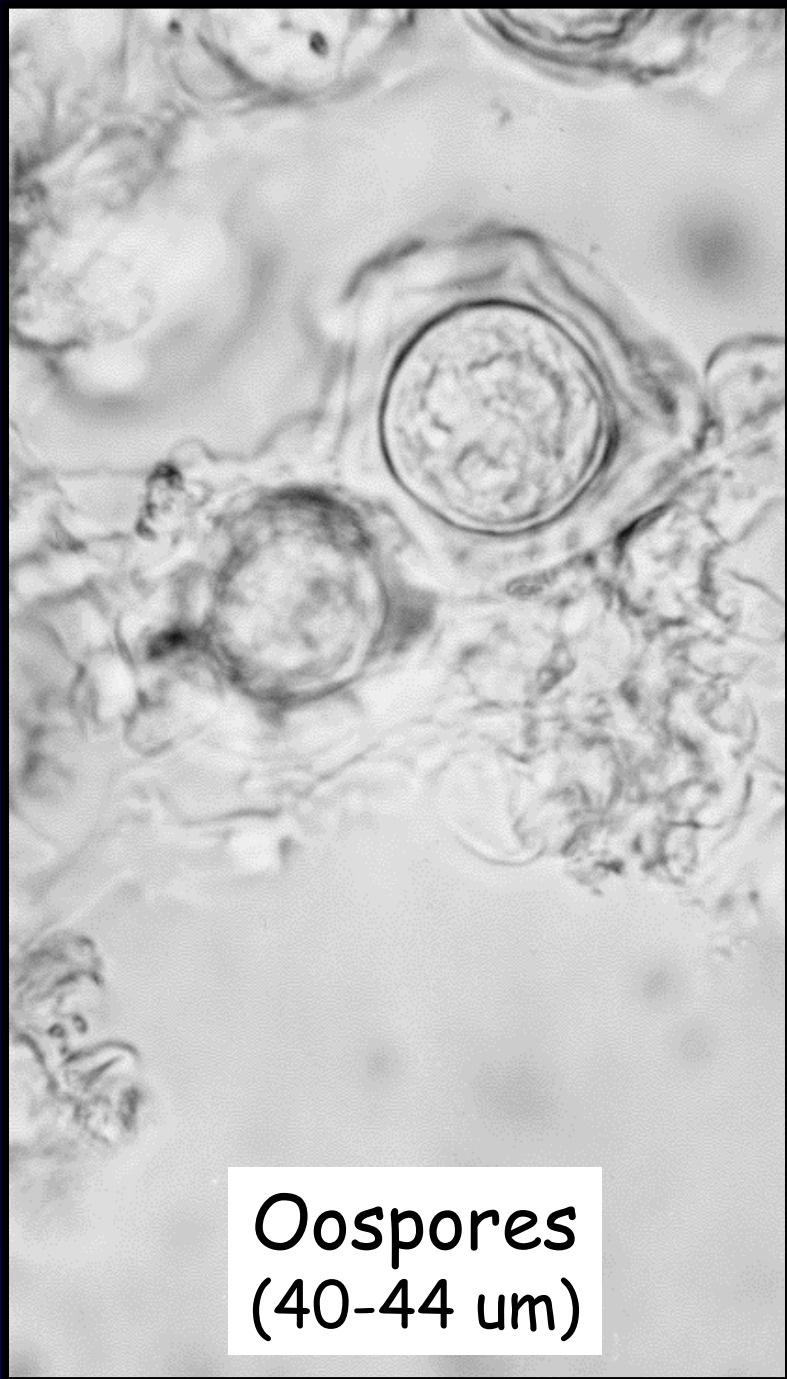




Onion Downy Mildew

- *Peronospora destructor* = oomycete
- Wild & cultivated *Allium* spp.
- Obligate biotroph = only infects living tissue
- 2 spore types:
 1. **Sporangia** = asexual, wind- & splash-dispersed
 2. **Oospores** = sexual, soilborne, seedborne, crop residues, infected bulbs, wind- & splash-dispersed from soil
- Survival: volunteers, bulbs, seed, soil, infested crop residues
- Spread: soil, water, wind, transplants, bulbs

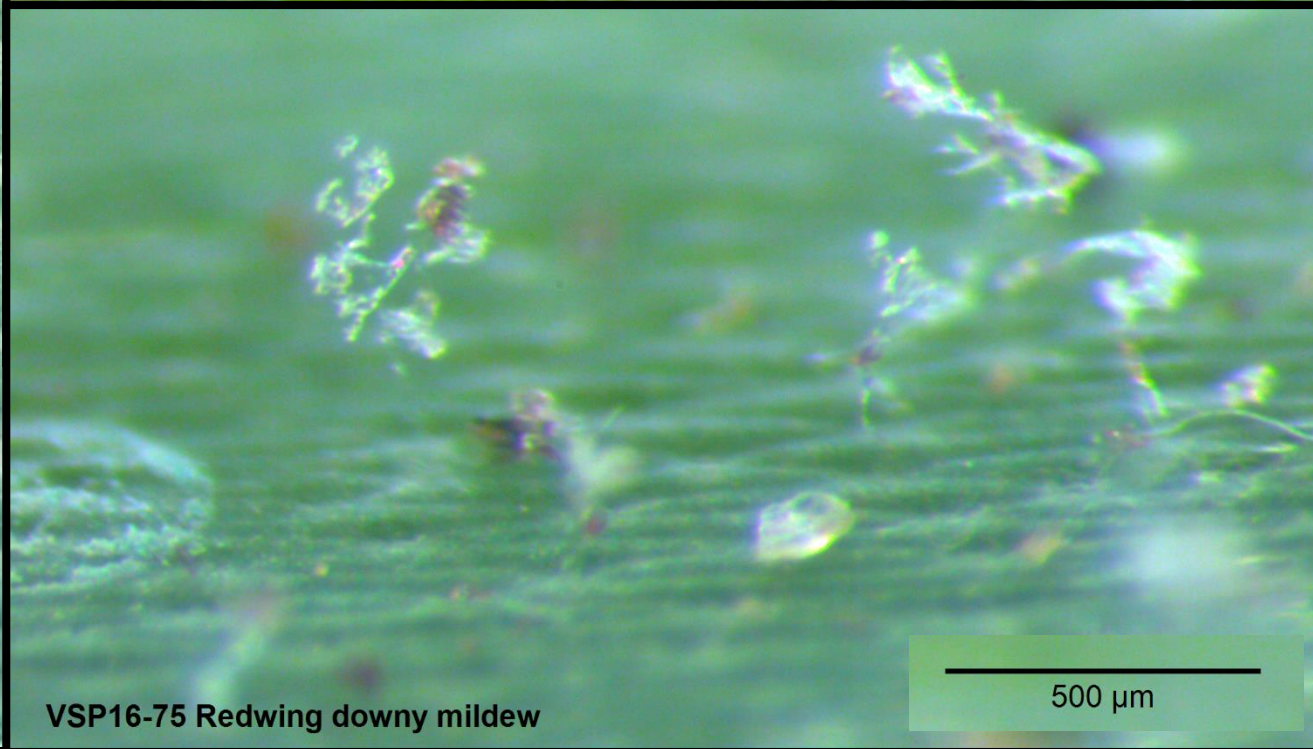




Oospores
(40-44 um)



Sporangia
(18-29 x 40-72 um)



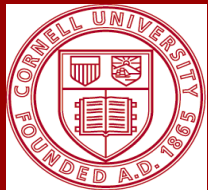
VSP16-75 Redwing downy mildew



Favorable conditions

- Cool & wet: $<72^{\circ}\text{F}$, wet leaves or $>95\%$ RH
- Sporulation at $43\text{-}80^{\circ}\text{F}$ (optimum $52\text{-}55^{\circ}\text{F}$)
- Dense canopy - seed vs. bulb crops
- No sporulation if $>75^{\circ}\text{F}$ & dry
- Dry, sunny weather impedes development
- Long latent period - 9-16 days
- Sporangia form by night, disperse by day
- Sporangia survive 1-3 days on foliage





2014 Downy Mildew Outbreak in NY

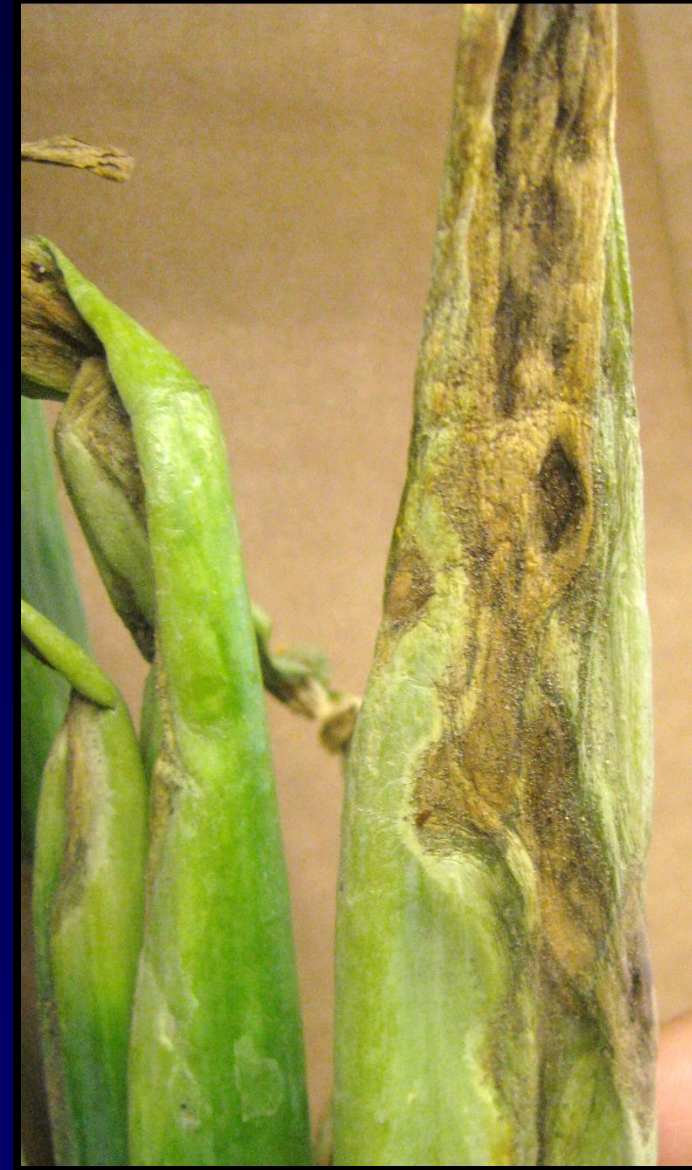


13 August 2014



27 August 2014

Opportunistic (secondary) infection of downy mildew lesions



Opportunistic infections: *Stemphylium vesicarium*



Stemphylium vesicarium & downy mildew

Stemphylium vesicarium & thrips damage (also with IYSV)



M. Trent

Purple blotch & Stemphylium leaf blight



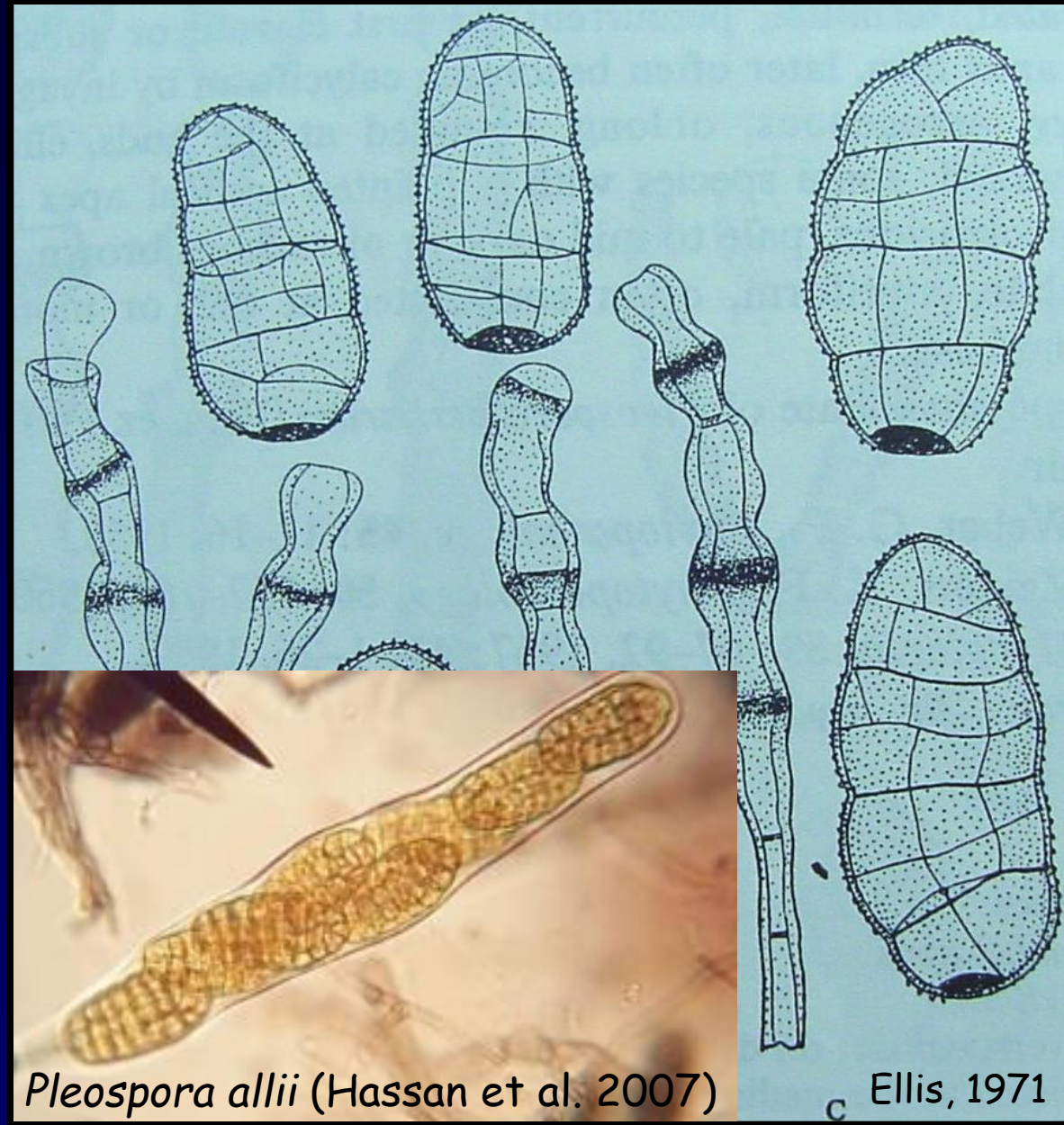
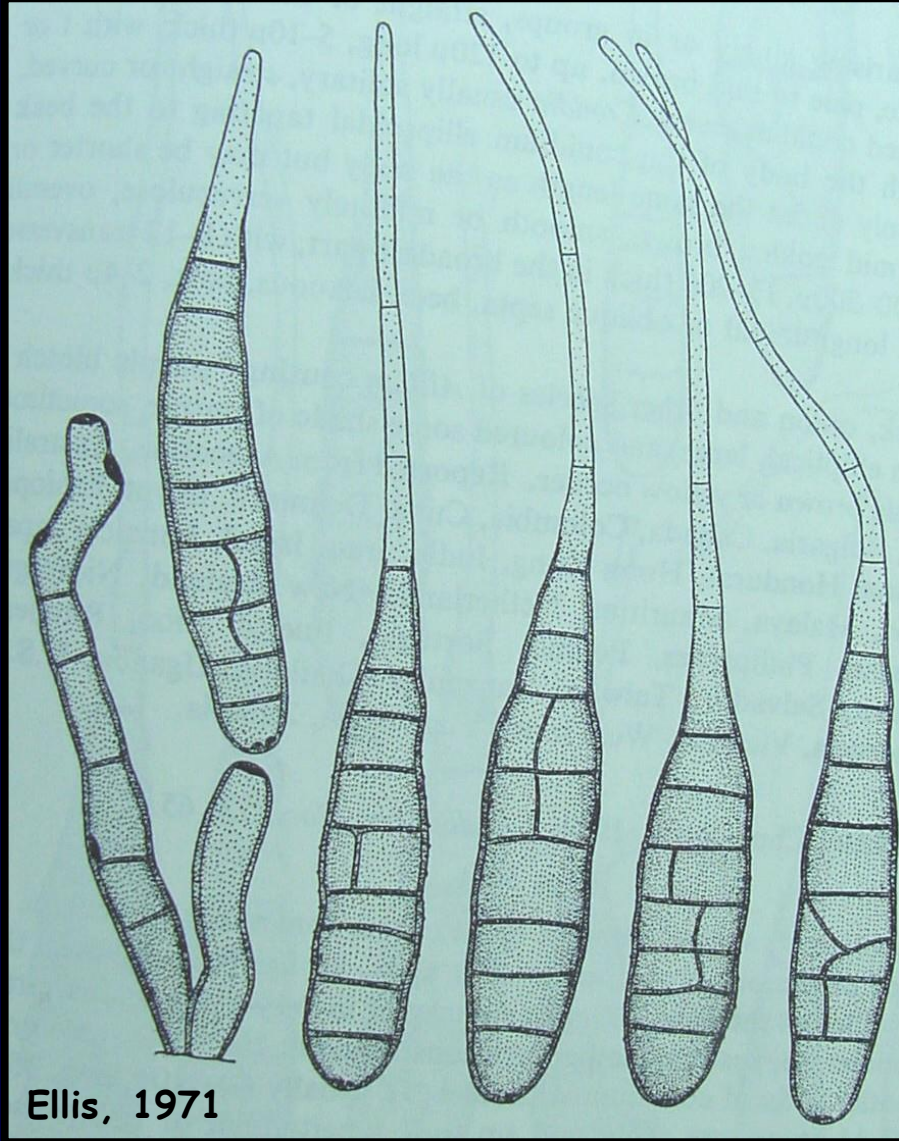
H.F. Schwartz



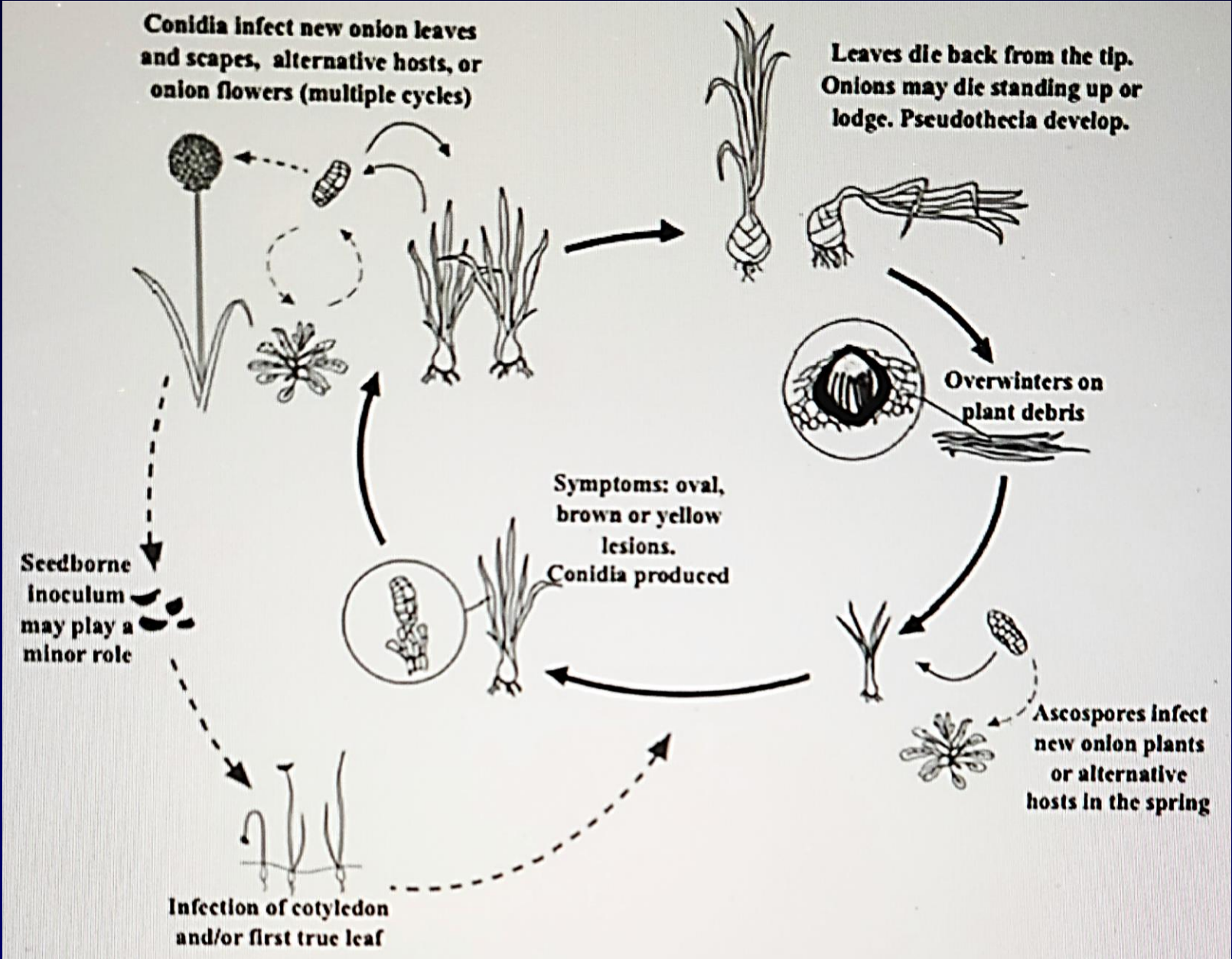
S.K. Mohan

Stemphylium vesicarium

Alternaria porri

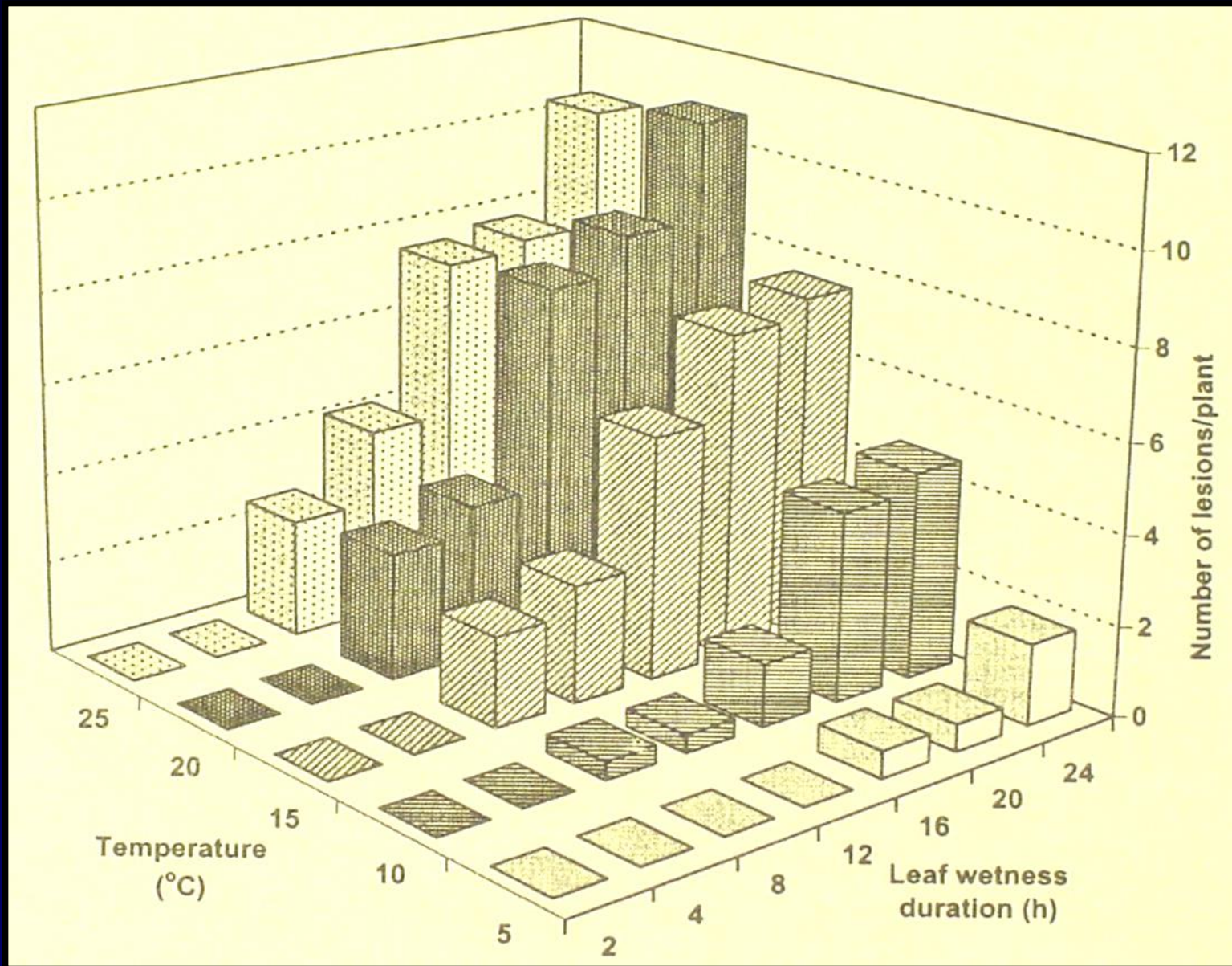


Life cycle of *Stemphylium vesicarium* on onion (S. Stricker 2021)



Spread & survival of *S. vesicarium* & *A. porri*

- Sources of inoculum
 - infested culled onions & debris: >1 year
 - infected seed - relative significance unknown?
- Dispersal of spores
 - wind
 - splashing water (rain or irrigation)
 - machinery/people moving in crop
- Optimum conditions = moist & 'warm'
 - high relative humidity (>90% for spore production)
 - extended leaf wetness (>4 h for infection by *A. porri*)
 - air temperature:
 - *A. porri*: 77-81°F = optimum (43-93°F)
 - 64-77°F = spore germination (both fungi)
 - lower temp's: longer leaf wetness needed for infection



Influence of temperature & leaf wetness duration on infection of onion leaves by *Alternaria porri*. Suheri & Price, 2000. Plant Pathology 49:375-382

Other factors affecting *Stemphylium* leaf blight

- **Crop stress - heat, moisture**
- Irrigation (furrow vs. drip vs. overhead)
- Thrips injury
- Age of leaves, maturity of crop
- Cultivar susceptibility/tolerance
- Strains of the fungus
 - more virulent strains (MI, NY, WI, & Ontario, Canada)

2006 onion bulb crop, Columbia Basin, WA



Photo courtesy of Mark Trent



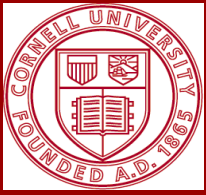
Photos courtesy of Mark Trent

Management of onion downy mildew

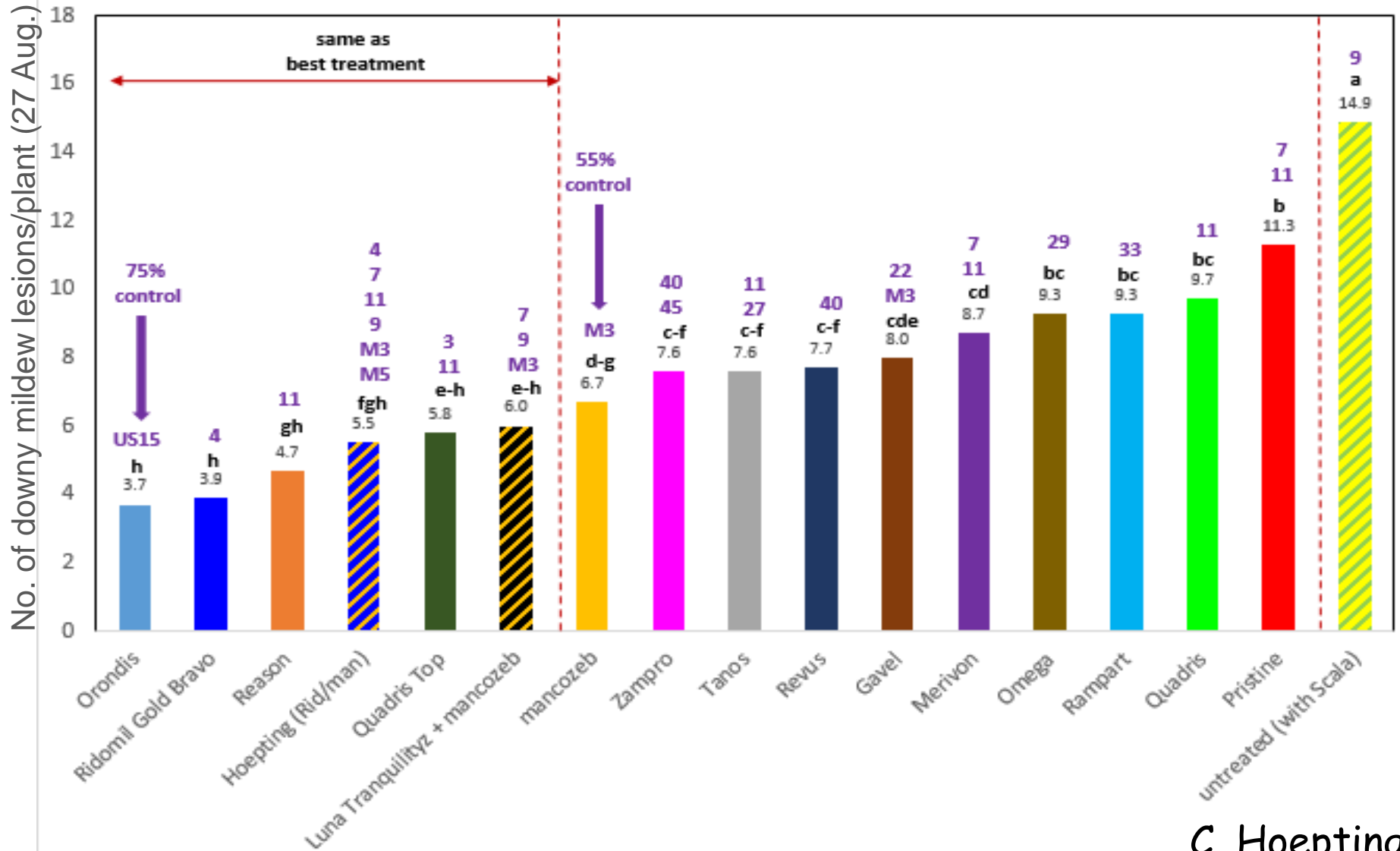
- Clean planting material - seed, bulbs, transplants, sets
- Crop rotation 3-4 years out of *Allium* spp.
- Spatial & temporal isolation
 - green bridge from annual bulb crops & biennial seed crops
- Well drained fields, rows directed into prevailing wind
- Avoid dense plantings & windbreaks
- Irrigation: surface or drip rather than overhead
- Destroy infested crop residues after harvest
- Avoid excessive N fertilization
- Partial resistance to downy mildew
 - no choice in seed crops

Management of onion downy mildew

- Fungicides:
 - seed treatments: e.g., metalaxyl, mefenoxam
 - foliar sprays: adjuvants (waxy foliage), coverage
 - scouting, accurate & early identification, preventive applications
 - fungicide resistance management
 - choice of fungicide(s)
 - Limited efficacy: coppers, dithiocarbamates (e.g., mancozeb = FRAC Group M3), chlorothalonil (FRAC Group M45), strobilurins (FRAC Group 11 - e.g., fenamidone = Reason)
 - Better effective:
 - Phenylamides (FRAC Group 4) - e.g., mefenoxam (Ridomil Gold, etc.)
 - Phosphonates (FRAC Group 33) - phosphorus acid (Aliette)
 - Carboxylic acid amides (FRAC Group 40) - dimethomorph (e.g., Forum), mandipropamid (Revus)
 - Famoxadone + cymoxanil (FRAC Groups 11 + 27) - Tanos
 - forecasting (bulb crops): e.g., DOWNCAST, INIMIL, ...

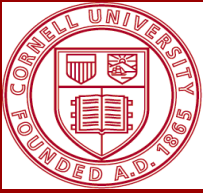


2015 Fungicide field trial in NY: Downy mildew severity



Management of Stemphylium leaf blight

- Crop rotation (at least 2 years)
- Clean seed/treated seed
- Reduce duration of leaf wetness - irrigation, plant density
- Sanitation (NOT soilborne pathogen)
 - destroy onion cull piles
 - bury onion debris
- Minimize injury & stress
- Resistant cultivars?
 - most cultivars susceptible to purple blotch
 - Sweet Spanish types more susceptible
- Fungicides



2013 Fungicide field trial in NY: Fungicide treatments for SLB

C. Hoepting 2013



Non-treated



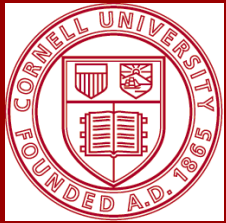
Luna Tranquility



Merivon



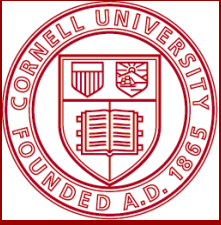
Fontelis



Cornell University recommended fungicide program for DM & SLB

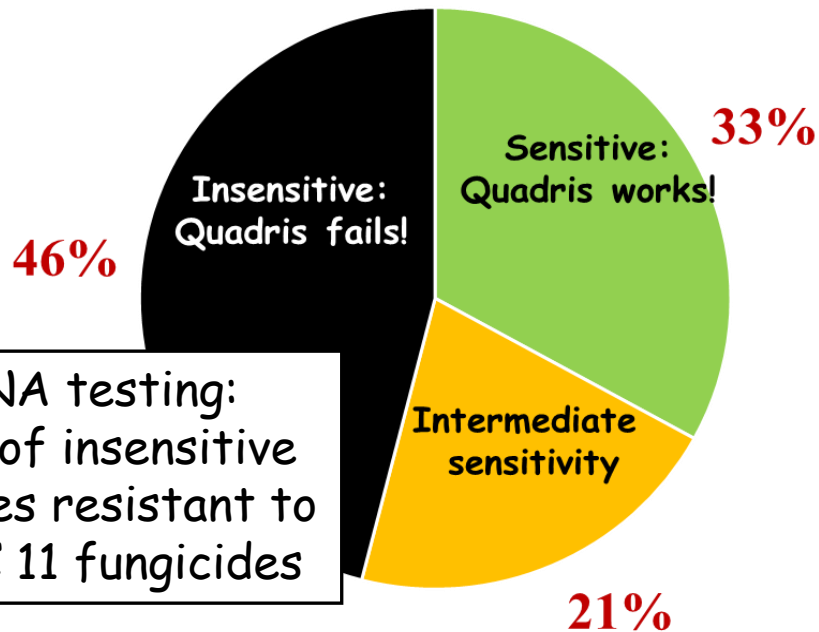
A. Initial, preventative program:

- Mancozeb or phosphorous acid
 - Tank mix when fungicides have no DM activity
 - E.g., Luna Tranquility, Inspire Super, Scala, Rovral
 - Mancozeb better than phosphorous acid
- FRAC Group 11 fungicides
 - Quadris Top (3, 11)
 - Merivon (7, 11)
 - Tanos (11, 27)



Stemphylium vesicarium resistance to Quadris (azoxystrobin) in NY

Fungicide sensitivity of *Stemphylium vesicarium* isolates to azoxystrobin (Quadris):
Conventional onion fields (n = 24)



DNA testing:
86% of insensitive isolates resistant to FRAC 11 fungicides

Hay et al. (2021) documented NY onion isolates resistant to FRAC groups:

- 2 (iprodione)
- 7 (boscalid, fluxapyroxad, fluopyram)
- 9 (cyprodinil, pyrimethanil)
- 11 (pyraclostrobin, azoxystrobin)
- ... and most recently
- 3 (difenoconazole, propiconazole)

Application of a pesticide to a crop or site that is not on the label is a violation of pesticide law and may subject the applicator to civil penalties

In addition, such an application may also result in illegal residues that could subject the crop to seizure or embargo action

It is your responsibility to check the label before using any product to ensure lawful use and to obtain all necessary permits in advance



