

Alternatives for turfgrass disease control without synthetic pesticides

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Major turfgrass diseases in Canada

- Cool Weather
 - Grey Snow Mould & Pink Snow Mould
 - Fusarium Patch / Microdochium Patch
 - Leaf Spots & Red Thread
- Warm Weather
 - Dollar Spot
 - Brown Patch & Anthracnose & Pythium Blight
 - Root diseases (Necrotic Ring Spot, Take-All Patch, Summer Patch)

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Fusarium Patch Disease Management



Disease Management



Fusarium Patch on bent, spring or fall



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Fusarium Patch on bent, spring or fall



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Fusarium Patch on bent, spring or fall



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Fusarium Patch on bent, spring or fall



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Fusarium patch (http://plant-pest-advisory.rutgers.edu/wp-content/uploads/2013/02/DSC_0790-e1360786182169.jpg)



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Fusarium patch (http://www.turf.uconn.edu/images/gallery/Featured%20Images/5_Anthracynin.jpg)



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Fusarium Patch on bent, Nov

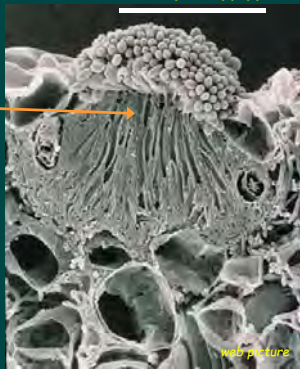


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Fusarium Patch - sporodochia

- pink spore-producing bodies

0.2 mm



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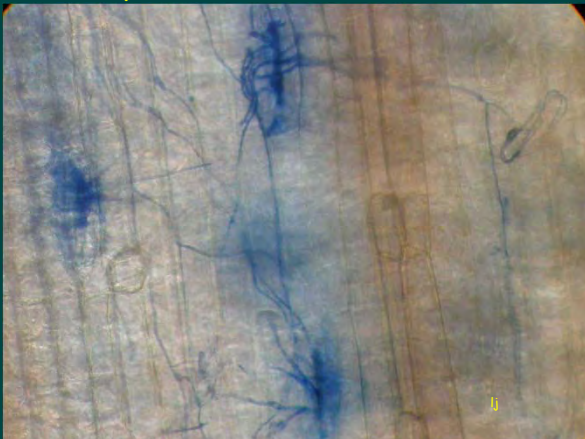
Fusarium Patch - sporodochia



spores (called conidia) being released from sporodochia (spore-producing bodies)

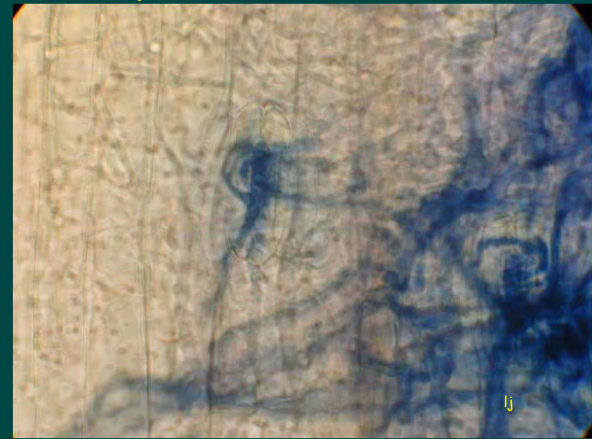
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M. nivale penetration into bent stomates



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M. nivale penetration into bent stomates



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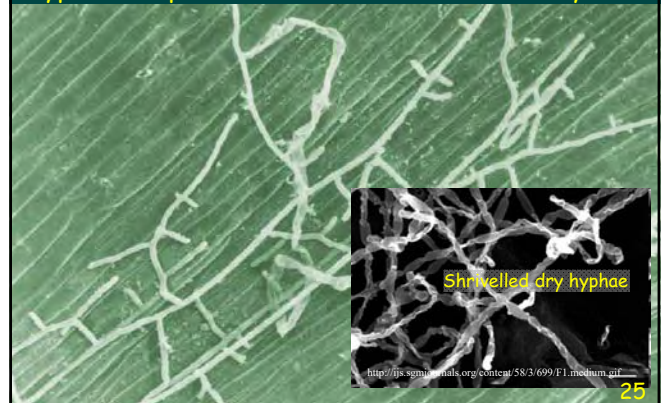
Fusarium Patch: Control

- 1) Leaf Wetness
 - reduce shade/less pm watering/drainage
- 2) Plant Health
 - less thatch / increase mowing heights+rolling / reduce compaction / less soft growth in early spring & late fall (careful with nitrogen)
- 3) Turf Covered
 - rake leaves / not heavy topdressing
- 4) Cultivars & Species
 - some cultivars more susceptible
- 5) Fungicides & Activators....

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1. Leaf wetness & infection

Hyphae on epidermal cells under 100% humidity



Shrunken dry hyphae

<http://jks.sagepub.com/content/58/3/699/F1.medium.gif>

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2. Thatch & plant vigor

(<http://www.agronomics.co.uk/img/pages/l1.jpg>)

- restricts water flow (fertilizer & pesticides too)
- non-productive tissues
- harbors pathogens (home and food)



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3. Leaves provide cover for disease



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3. Leaves provide cover (more disease)



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4. Disease Resistance

- see NTEP trials (no Bent or Poa fully resistant)

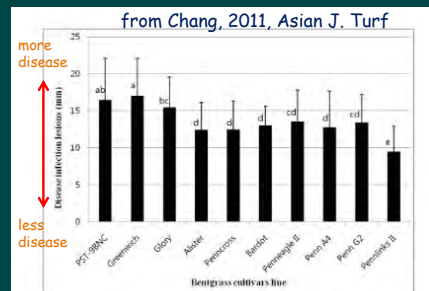


Fig. 2. Susceptibility of detached leaf assay of ten bentgrass cultivars/line inoculated with 9 isolates of *M. nivale*. Means were compared with Fisher's protected least significant differences test at $P < 0.05$.

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4. Disease Resistance (*Agrostis*)

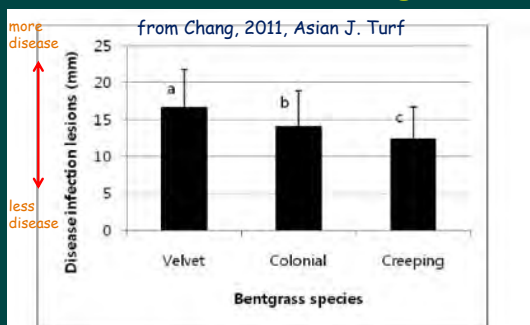


Fig. 6. Susceptibility of ten bentgrass cultivars/line inoculated with four isolates (SW5, SE90, SW8, SW65) of *M. nivale* at 10°C in the dark after cold hardening at 5°C for 15 days.

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5a. Fungicides (out of 4)

- iprodione (Rovral) 3.5
- propiconazole (Banner/QP) 3
- trifloxystrobin (Compass) 3
- triticonazole (Premis/Triton) 3
- azoxystrobin (Heritage) 2.5
- chlorothalonil (Daconil) 2.5
- mineral oil (Civitas) 1-3
- myclobutanil (Eagle) 2

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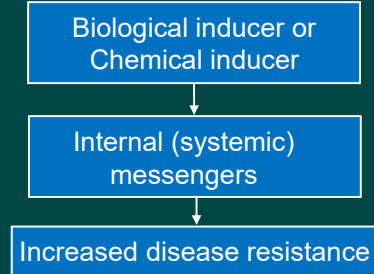
5b. Resistance Activators

- Utilize a plant's **natural** resistance responses
 - against abiotic stresses
 - against insects
 - against diseases

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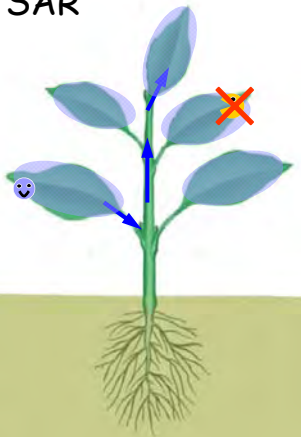
Stimulating disease resistance response

- Two main forms:
 - Systemic acquired resistance (**SAR, induction**)
 - Induced systemic resistance (**ISR, priming**)

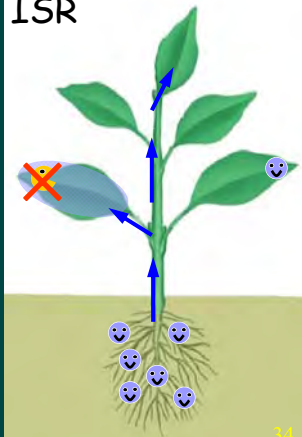


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SAR



ISR



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Resistance Activators

- Phosphites** (SAR)
 - Aliette, Apear, SwardPhite, Magallan, Alude...
- Benzothiadiazole/Acibenzolar** (SAR)
 - Actigard
 - Dac Action (Daconil + Actigard)
- Chelated metals?**
 - Chelated iron (e.g. Fiesta)
- Civitas** (mineral oil) + **Harmonizer** (chelated Cu) (ISR)
- silicon**, **butanediol**, humic acid... (ISR)

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Fusarium patch



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Fusarium patch control (4=excellent)

DMI's	Strobies	Civitas	Phosphite
Banner, Eagle, Premis, Triton, Tourney, etc	Heritage Insignia Compass		
2.3	2.8	1-3	??

Fungicide efficacy from Vincelli (2015), PPA-1, summarizing hundreds of tests

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Anthracnose



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Anthracnose control (4=excellent)

DMI's	Strobies	Civitas	Phosphite
Banner, Eagle, Premis, Triton, Tourney, etc	Heritage Insignia Compass		
2.5	3.0	3.0	2.5

Fungicide efficacy from Vincelli (2015), PPA-1, summarizing hundreds of tests

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Dollar Spot



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Dollar spot control (4=excellent)

DMI's	Strobies	Civitas	Phosphite
Banner, Eagle, Premis, Triton, Tourney, etc	Heritage Insignia Compass		
3.8	2.0	2.0	??

Fungicide efficacy from Vincelli (2015), PPA-1, summarizing hundreds of tests

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Activating defenses - consequences

- can reduce growth rates
- can slow plant development
- can lower crop yield
- stressed plants show even more negative effects
- can cause plant death (if too much)

- Think of activators like steroids

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