Management of Soilborne and Foliar Diseases on Ginger

Zelalem Mersha
Phone: (804) 524-2694; E-mail: zmersha@vsu.edu
The Basics: Plant Path 101

- Susceptible host
- Conducive environment
- Virulent pathogen
The Host: Ginger plant

It all starts from the Seed rhizome!

(Reliable Source!)
The Environment: weather, soil, location, time, inputs
The pathogen: the invisible foes (symptoms and signs)
Fusarium yellow

- Creamy brown discoloration of the vascular cylinder (TruJillo E. E. 1964, Hawaii Ag. Expt. Station)

- *Fusarium oxysporum f.sp. zingiberi* (Probhakaran Nair P. K. 2013)

- Small Yellow Fusarium Root Rot caused by *Fusarium solani* in China (Liu et al. 2019)

Soft rot: e.g. Pythium

- *Pythium aphanidermatum* in China (Li et al. 2014)

- *P. myriotylum* in Taiwan (Wang 2003, Prabhakaran N. P. K. 2013)

http://www.pestnet.org/fact_sheets/ginger_soft_rot_162.htm
The invisible Foes 2018
Chesterfield country diagnostic lab result: diseased baby ginger from raised bed

1. Sample 1
   a. *Fusarium sp.*
   b. *Plectosporium*-like fungus

2. Sample 2
   a. *Fusarium sp.*

3. Sample 3
   a. Bacterial soft rot
   b. *Gloeosporium* sp. (2º)

4. Sample 4
   a. *Fusarium sp.*

5. Sample 5
   a. *Fusarium sp.*

6. Sample 6
   a. *Fusarium sp.*
   b. Picture shows vascular discoloration

7. Sample 7
   a. Bacterial soft rot

© Reza Rafie, VSU Horticulture
Major Diseases

Oomycetes: water molds
• Soft Rot (*Pythium spp.*)

Bacteria
• Bacterial wilt (*Ralstonia solanacearum*) Biovar III&IV
  *Pseudomonas solanacearum* (Pegg et al. 1974)
• Bacterial soft rot (*Erwinia caratovora pv. caratovora*)

Fungi
• Yellows (*Fusarium spp.*)
• Dry rot (*Rhizoctonia solani, R. bataticola*)
• Leaf spots
  • *Phyllosticta zingiberis*
  • *Helminthosporium maydis*
  • *Septoria zingiberis*

Nematodes
• Root knot (*Meloidogyne spp.*)
• *Pratylenchus coffeae*
Mostly it is a complex of pests and diseases!

Major Insects?
2018-2019
Pilot Projects at VSU
**In-vitro growth and dual culture studies**

**2018-2019**

**Mono-culture**

**Dual-culture**

**Incubators**

- 68 °F
- 77 °F
- 30°C
(Kyle & Mersha, unpublished)

IN VITRO RADIAL GROWTH OF THE FUNGAL PATHOGEN FUSARIUM SP. ALONE OR IN DUAL CULTURE WITH THE BENEFICIAL FUNGUS TRICHODERMA SPP.

Mycelial Growth in mm

Colony growth of Fusarium sp. isolated from Ginger and incubated at 20 or 25 °C for five days

Incubation Temperature

25 °C (77 °F)  
20 °C (68 °F)
Spatial gradient of ginger foliar biomass from front to back side as affected by soil-borne diseases and potential abiotic factors

\[ y = -0.77x + 8.77 \]
\[ R^2 = 0.79 \]

Note: Trade names used in this presentation are used solely for the purpose of providing specific information. Such use herein is not a guarantee or warranty of the products named and does not signify that they are approved to the exclusion of others. **Do not use any of the products unless registered for the given crop in the state.**
2019 Preliminary Diagnostic Results
2019 Preliminary Diagnostic Results
Diagnosis:

- Case history information,
- Signs & symptoms,
- Microscopy,
- Culturing,
- Serological,
- Molecular detection
Plant Diagnostic Skills
Diagnostics ... Seek help

Contact
Norman Dart
804.371.5086
Plant Pathology Lab, RM 229
600 North 5th St., Richmond, Virginia 23219
Norman.Dart@vdacs.virginia.gov

Agdia Testing Services
52642 County Road 1
Elkhart, Indiana 46514
Phone numbers:
800-622-4342 or 574-327-6071
Fax number:
574-264-2153
E-mail address: testing@agdia.com

Plant Disease Clinic
Department of Plant Pathology, Physiology, and Weed Science
Virginia Tech
106 Price Hall
170 Drillfield Drive
Blacksburg, VA 24061-0331

Phone: (540) 231-6758
Fax: (540) 231-7477
Email: clinic@vt.edu

Yellows, Wilts and Dry and Wet Rots

PREVENTION PREVENTION PREVENTION

• **Seed rhizome selection and treatment:**
  - Select healthy/disease free rhizomes for planting
  - Treat the seed rhizomes e.g. for soft rot with Mancozeb (0.3%) or carbendazim (0.3%), also for Fusarium yellow and Pythium soft rot
  - Rhizome hot water treatment 51 °C (124 °F) for 10 minutes

• **Proper drainage**
  - Sandy loam soil: avoid any form of water accumulation.
  - Mounding practice improves drainage.
  - Raised beds are excellent so that water percolates faster

• **Crop rotation**: depends on the host range of the pathogen and space availability (very challenging in protected systems)
Yellows, Wilts and Dry and Wet Rots

PREVENTION PREVENTION PREVENTION

- **Soil drenching:** with recommended fungicides

- **Soil solarization:** (e.g. Ravindra K. K. 2012)

<table>
<thead>
<tr>
<th>S.No</th>
<th>Days</th>
<th>Solarized soil</th>
<th>Non-solarized soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>35.42</td>
<td>36.22</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>28.64</td>
<td>38.41</td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>12.37</td>
<td>39.12</td>
</tr>
<tr>
<td>4</td>
<td>45</td>
<td>1.94</td>
<td>41.56</td>
</tr>
<tr>
<td>5</td>
<td>60</td>
<td>1.32</td>
<td>42.81</td>
</tr>
</tbody>
</table>

- **Biological control:** using beneficial fungi (**Trichoderma spp.**) and bacterial isolates (**Bacillus & Pseudomonas flourescens**)

- **Integrated Disease Management** (all compatible options that work best for the particular farm and situation)
Useful Resources


➢ Plant Village. Ginger. Available at [https://plantvillage.psu.edu/topics/ginger/infos/](https://plantvillage.psu.edu/topics/ginger/infos/).

➢ Vikaspedia. Tumeric: Diseases and Symptoms. Available at [https://plantvillage.psu.edu/topics/ginger/infos/](https://plantvillage.psu.edu/topics/ginger/infos/).


Thank you!!
zmersha@vsu.edu
(804) 524-2694