



### Infested Onion Plants Update: *Fusarium* Detected

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Though we are still waiting on an official report from the Cornell Plant Disease Diagnostic Clinic, we have an informal update that the two bundles of plants that were submitted for pink root evaluation “appear to be very heavily colonized with *Fusarium*.” If this fungal pathogen enters damaged roots or bulbs, *Fusarium* can cause basal rot of onions. The plants are likely also infested with the pink root pathogen *Phoma terrestris*, but we are still waiting on confirmation. Here are further considerations to how to handle your onion plants from Arizona given this new information.

#### 1) Send a sample to the Cornell Plant Disease Diagnostic Clinic:

It is still advisable to send a bundle of 25-50 plants that are showing symptoms to the Diagnostic Clinic in Ithaca if you have any that have not been planted or treated. If you need assistance filling out the paperwork included on the last page of this alert, please contact me at [eg572@cornell.edu](mailto:eg572@cornell.edu). Samples should be wrapped in dry paper towels, placed in an UNSEALED Ziploc or plastic bag, then mailed in a rigid box container to the clinic along with the completed paperwork, including the check for \$30.



Advanced *Fusarium* basal rot symptoms on onion

#### 2) Understand the risk:

- a. In the long-term: Like the pathogen that causes pink root, *Fusarium* is a fungus that can survive in the soil for many years. Planting onions that are known to be infested with *Fusarium* puts you at risk of infecting that field for years to come. If the fungus becomes well established, it is recommended to rotate out of host crops for at least four years.
- b. In the short-term: There are two variables that will impact the severity of *Fusarium* impact on your onion crop this year. First, you need to make sure to limit the amount of root and bulb damage as much as possible in season. In order for *Fusarium* to cause basal rot, it has to have a way to enter the plant through root and bulb lesions. These injuries are most often caused by onion maggots, root-knot or lesion nematodes, bulb mites, or mechanical injury caused by cultivation equipment or harvest equipment. Second, the weather will largely influence how much the *Fusarium* will spread during the growing season. *Fusarium* fungal spores germinate when soil temperatures reach 77-82 degrees and prefer moist soil conditions. So, even though the plants are heavily colonized by the fungus, we do not expect to see symptoms develop or the pathogen to spread until those environmental conditions are met.



- 3) **Dip, drench, spray:** Very little research has been done on the efficacy of different fungicides and disinfectants on *Fusarium* in onions and few products are labeled for its management. Again, since the fungus has to enter the onion through damaged roots or bulbs, it is almost more important to fine-tune your onion maggot, bulb mite, and nematode management plans to limit physical damage to plants.
- a. Pre-plant dips:
    - i. Disinfectants: OxiDate 2.0 (peroxyacetic acid + hydrogen peroxide) is labeled for pre-plant dip at a 1:100 dilution against *Fusarium* as part of the damping-off suite of pathogens.
    - ii. Fungicides: Researchers in India (Yadav 2014) found that Thiram (tetramethylthiuram disulfide) provided intermediate control of *Fusarium* basal rot on onions. Thiram is not labeled as a dip, but could be used as a seed treatment for onions planted from seed for added protection. Other researchers in Ethiopia (Sintayehu 2011) studied basal rot management in shallots with several fungicide dips. Ridomil Gold (mefenoxam) showed a minor reduction in damage over the untreated control and a product marketed as Seed Plus 30 WS (carbendazim+metalaxyl+imidacloprid) reduced disease incidence by over 40%. Ridomil Gold is labeled for a pre-plant soil application in onions for control of damping off and one of the seed treatment fungicide Proceed MD contains one of the same active ingredients (metalaxyl) as Seed Plus 30. However, it is possible that some of the disease reduction with Seed Plus 30 was the result of improved insect management from the imidacloprid in the mix.
    - iii. Biopesticides: The most promising studies of *Fusarium* management in onions come from work done in India (Malathi 2015) using *Trichoderma* species. *Fusarium* basal rot of onion was reduced by 83% using straight *Trichoderma harzianum*, which is nearly the same level of control achieved by the fungicide carbendazim (88%) in the same study. Products that include *Trichoderma* species and are labeled for pre-plant dip on onions for managing *Fusarium* and *Rhizoctonia* include RootShield Plus WP and Bio-Tam. TerraGrow from BioSafe Systems includes both *Trichoderma* species and *Bacillus subtilis* strains and is labeled for pre-plant dip of onions.
  - b. Soil furrow drenches: Research from Purdue University in 2007 (Egel 2007) showed that Topsin (thiophanate methyl) was very effective at controlling a closely related species of *Fusarium* on watermelons when applied as a soil drench (Topsin is only labeled for management of white rot on onion). Studies on the muck soils in Quebec (Ouimet 1999) showed that furrow drenches of Ridomil, Rovral, and Dithane provided no significant difference in basal rot control over the untreated block. As mentioned above, Ridomil Gold (mefenoxam) showed some ability to decrease *Fusarium* severity in shallot production.



- 4) **Scouting for Symptoms in Season:** Onions affected by basal rot often show signs of “dying standing up” at the peak of the summer. Leaf tips can turn yellow and plants can begin to wilt during hot and dry weather. If pulled, the roots may detach from bulbs. If the infection is severe, *Fusarium* can cause a reddish-brown discoloration of the outer wrapper. Unfortunately, affected bulbs may not show easily identifiable symptoms in the field and will often rot in storage.



Onions infected with *Fusarium* basal rot (<http://www.omafra.gov.on.ca/english/crops/hort/news/hortmatt/2016/14hrt16a1.htm>)

- 5) **Plan for next year:** As with pink root, the only truly effective strategy for reducing the level of *Fusarium* pressure is to rotate out of the production of host crops for 3-5 years. It is worth considering that basal rot is typically more severe on transplanted onions than direct seeded crops. Insecticidal seed treatments for managing onion maggot are also more effective than soil applied chemicals, which can also help reduced the degree of *Fusarium* entering bulbs through damaged roots. Finally, the Cornell Guidelines list the following onion varieties as being resistant to *Fusarium*: Eskimo, Frontier, Benchmark, Millennium, Condor, Prince, Copra, Duration, and Celtic. The full list of resistant varieties can be found at the VegMD website: <http://vegetablemdonline.ppath.cornell.edu/Tables/TableList.htm> (separated by early yellows and reds).

#### References:

- Egel, D., & Hoke, S. (2007). Managing *Fusarium* wilt of watermelon with fungicide drenches and seed treatments. *Department of Botany and Plant Pathology, Purdue University, IN, USA*.
- Malathi, S. (2015). Biological control of onion basal rot caused by *Fusarium oxysporum* f. sp. cepae. *Asian Journal of Bio Science*, 10(1), 21-26.
- Ouimet, A., Phillion, V. (1999). Evaluation of the Efficacy of Different Fungicides Against Onion Basal Rot. *Fungicide and Nematicide Tests*, 55, 185.
- Sintayehu, A., Sakhuja, P. K., Fininsa, C., & Ahmed, S. (2011). Management of fusarium basal rot (*Fusarium oxysporum* f. sp. cepae) on shallot through fungicidal bulb treatment. *Crop Protection*, 30(5), 560-565.
- Yadav, S. L., Ahir, R. R., Rathore, B. S., & Yadav, S. M. (2014). Efficacy of Different Fungicides and Organic Amendments against Basal Rot of Onion Caused by *Fusarium oxysporum* in vitro. *Plant Pathology Journal*, 13(1), 56.



**Plant Disease Diagnostic Clinic  
 Sample Submission Form**



Cornell University

**Please mail samples and payment to:** Plant Disease Diagnostic Clinic, 334 Plant Science Building, Ithaca, NY 14853

*In-state (out of state): basic \$30 (\$50); turf or nematode \$50 (\$70); or see full list of fees at: [plantclinic.cornell.edu](http://plantclinic.cornell.edu)*

Location Where Sample Was Taken	Referring Agent (i.e. CCE Agent, Consultant, Arborist...)
Home Owner <input type="checkbox"/> Commercial Grower <input type="checkbox"/> Business name (if any): _____ Person to contact: _____ Address: _____ Phone: _____ Fax: _____ Email: _____ County: _____	Business: _____ Agent: _____ Address: _____ Phone: _____ Fax: _____ Email: _____

**Describe the nature and extent of the problem:** \_\_\_\_\_  
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**Collection date:** \_\_\_\_\_

**Scientific Name:** \_\_\_\_\_ **Common Name:** \_\_\_\_\_

Disease Symptoms:	Affected Parts:	Distribution on Site:	Planting:	Additional Information:
wilting <input type="checkbox"/>	stems <input type="checkbox"/>	entire field <input type="checkbox"/> sunny <input type="checkbox"/>	garden <input type="checkbox"/>	Number of acres or plants affected?
yellowing <input type="checkbox"/>	leaves/needles <input type="checkbox"/>	field edge <input type="checkbox"/> shaded <input type="checkbox"/>	nursery <input type="checkbox"/>	Approx. date problem appeared?
galls <input type="checkbox"/>	branches/twigs <input type="checkbox"/>	random <input type="checkbox"/> wet areas <input type="checkbox"/>	orchard <input type="checkbox"/>	Did problem occur gradually?
dieback <input type="checkbox"/>	flowers <input type="checkbox"/>	high areas <input type="checkbox"/> dry areas <input type="checkbox"/>	green <input type="checkbox"/>	Getting worse or staying the same?
rot <input type="checkbox"/>	fruit/seeds <input type="checkbox"/>	low areas <input type="checkbox"/> windy <input type="checkbox"/>	fairway <input type="checkbox"/>	Approx. age of plants?
marginal burns <input type="checkbox"/>	roots/bulb/rhizome <input type="checkbox"/>	by road/drive/building/pool <input type="checkbox"/>	yard <input type="checkbox"/>	Date last transplanted?
shedding/thinning <input type="checkbox"/>	crown <input type="checkbox"/>	feet away: _____	field <input type="checkbox"/>	How often watered?
leaf spots <input type="checkbox"/>			forest <input type="checkbox"/>	
streak <input type="checkbox"/>	<b>Distribution on Plant:</b>	<b>Media Type:</b>	greenhouse <input type="checkbox"/>	
mosaic <input type="checkbox"/>	top of plant <input type="checkbox"/>	sandy <input type="checkbox"/> hydroponic <input type="checkbox"/>	interior <input type="checkbox"/>	
blight <input type="checkbox"/>	bottom of plant <input type="checkbox"/>	loamy <input type="checkbox"/> artificial mix <input type="checkbox"/>	<b>Drainage:</b>	
other: _____	current-season growth <input type="checkbox"/>	clay <input type="checkbox"/>	good <input type="checkbox"/>	
	previous-season growth <input type="checkbox"/>	<b>Aspect:</b>	fair <input type="checkbox"/>	
	one side of plant <input type="checkbox"/>	north <input type="checkbox"/> east <input type="checkbox"/>	poor <input type="checkbox"/>	
	scattered <input type="checkbox"/>	south <input type="checkbox"/> west <input type="checkbox"/>		
<b>Chemicals/Fertilizers:</b> <i>give rate and date/s of application</i>			<b>Cropping History:</b>	

Date Received at the Diagnostic Clinic: \_\_\_\_\_ By Whom: \_\_\_\_\_  
 CU-PDDC-Form-012-001 Approved by: Karen L. Snover-Clift Effective Date 01/06/15 version 1.1

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