PLANT PATHOGENS

Disease Management

Learning Objectives

- Become familiar with various types of plant pathogens or disease agents.
- Examine various methods of disease management.
- Familiarize student with common diseases for crop families in the midwest region

Plant Pathogen Overview

- A plant pathogen is any harmful infectious agent, organism, or condition that reduces a plant's overall vitality, inhibits its growth, or limits the ability of the plant to survive and reproduce.
- Pathogens can be delivered in a multitude of different ways. These include: bacteria, fungi, viruses, nematodes, oomycetes, and abiotic toxicities.
- There are several different factors that need to be present in order to create an outbreak of disease on the farm. The pathogen must be present. There must be suitable host plants around. And there must be favorable environmental conditions for the growth and development of that particular plant pathogen.

Plant Disease Agents

- *Bacteria*
- *Fungi*
- *Viruses*
- *Nematodes*
- *Abiotic*
- *Oomycetes*

Plant Disease Agents

- *Bacteria*: These single cell organisms absorb the nutrition from their host plant and thrive by killing the plant and living off of their decomposing organic matter. This is often described as a saprophytic relationship. Bacterial pa
cause blights, rots, and wilts.

Onion rot caused by bacteria can be avoided by spacing bulbs closer. See http://extension.umass.edu/vegetable/articles/stop-rot-using-cultural-practices-reduce-bacterial-bulb-decay-onions

Plant Disease Agents

- *Fungi*: Fungal pathogens are spread by many different environmental conditions such as wind, water, seeds, human and other non-human vectors. (A vector is a host capable of transferring a particular pathogen.) Fungi that are capable of regenerating spores during the growing season and re-infecting plants are known as polycyclic. Fungi that must wait for next

Apple Scab is caused by a Fungus and can be treated with organic fungicides https://www.extension.purdue.edu/extmedia/BP/BP-1-W.pdf

Plant Disease Agents

- *Viruses*: Viruses are pieces of genetic material (RNA/DNA) that disturb the plants by mimicking naturally occurring genetic abnormalities. There are more than 700 plant viruses known. Viruses can be spread by tractors or equipment, tainted seed, or by a traveling vector.

Potato Virus Y is caused by a virus which is transmitted by aphids. For more information see http://labs.russell.wisc.edu/vegento/crops-and-insects/plant-pathogens/

Plant Disease Agents

- *Nematodes*: Nematodes are both a pathogen and a vector. Nematodes are microscopic worms and are one of the most abundant phyla with over 20,000 different species. A nematode either infects a plant by injecting a needle like mouth into the plant or it actually enters the plant with its entire body. The nematodes' saliva is the infecting agent and disturbs the metabolic process of the plant causing diseas

Carrots that have been diseased by nematodes. See http://cetehama.ucanr.edu/?impact=718&a=7816

Plant Disease Agents

- *Abiotic*: This refers to deficiencies in the soil or surrounding environment that cause a debilitating illness that is harmful or fatal t

Iron deficiency in the soil.

Magnesium deficiency in soil.

http://msucares.com/crops/comhort/tomatodisease/

Plant Disease Agents

- *Oomycetes*: These organisms act much like a fungi, however they have a very different evolutionary history. They have mobile spores and can be primarily spread by both wind and water. They can also be spread by vectors. An example of an oomycetes is "downy mildew" also known as "damping off."

Oomycetes are responsible for this late blight. This is the same organism responsible for the Potato Famine and still has severe economic repercussions when it occurs today.

Common Diseases in the Midwest See the videos detailing each

- blossom end rot http://youtu.be/6uObcfRWdK0
- early and late blight http://youtu.be/nqGODg8jhsI
  http://youtu.be/9PabiuQ7wVI
- powdery mildew http://youtu.be/9ZuTUiRD3Cs
- downey mildew http://youtu.be/sz0vZ-t0gyg
- Scab http://youtu.be/tj8JCh4Why4
- peach curl http://youtu.be/9Wzu-aBVKdw

Disease Management

- Plants often have developed natural defenses against pathogens. Some plants have developed disease tolerance. Some plants have developed disease resistance. Plants that are disease resistant will exhibit characteristics that actually repel certain harmful disease known to attack that particular plant. Plants that are disease tolerant can live with a problem pathogen but survive without any substantial reduction in yield or overall health.

Disease Management Strategies

- Proper greenhouse management can be extremely helpful in the control of outbreak and spread of pathogens. Disinfecting all soil trays and propagating mediums greatly reduces the incidence of pathogens.

- See http://youtu.be/FzQyucZwj-E

Disease Management Strategies

- A solid approach to crop rotation will also limit the spread and overall effect of certain diseases. This is a result of diversity increasing overall vitality, limiting host species, and reducing environmental conditions needed for disease to flourish and spread in similar varieties or families of plants.

Disease Management Strategies

- Recognizing pre-existing factors that may contribute to pathogen outbreak is an important aspect of disease control. An example would be being vigilant and wary of downy mildew in a very wet or coastal environment.

Identifying the problem with the plant is the first step. See http://msue.anr.msu.edu/news/signs_and_symptoms_of_plant_disease_is_it_fungal_viral_or_bacterial for information on distinguishing between viral, bacterial, and fungal diseases.

Disease Management Strategies

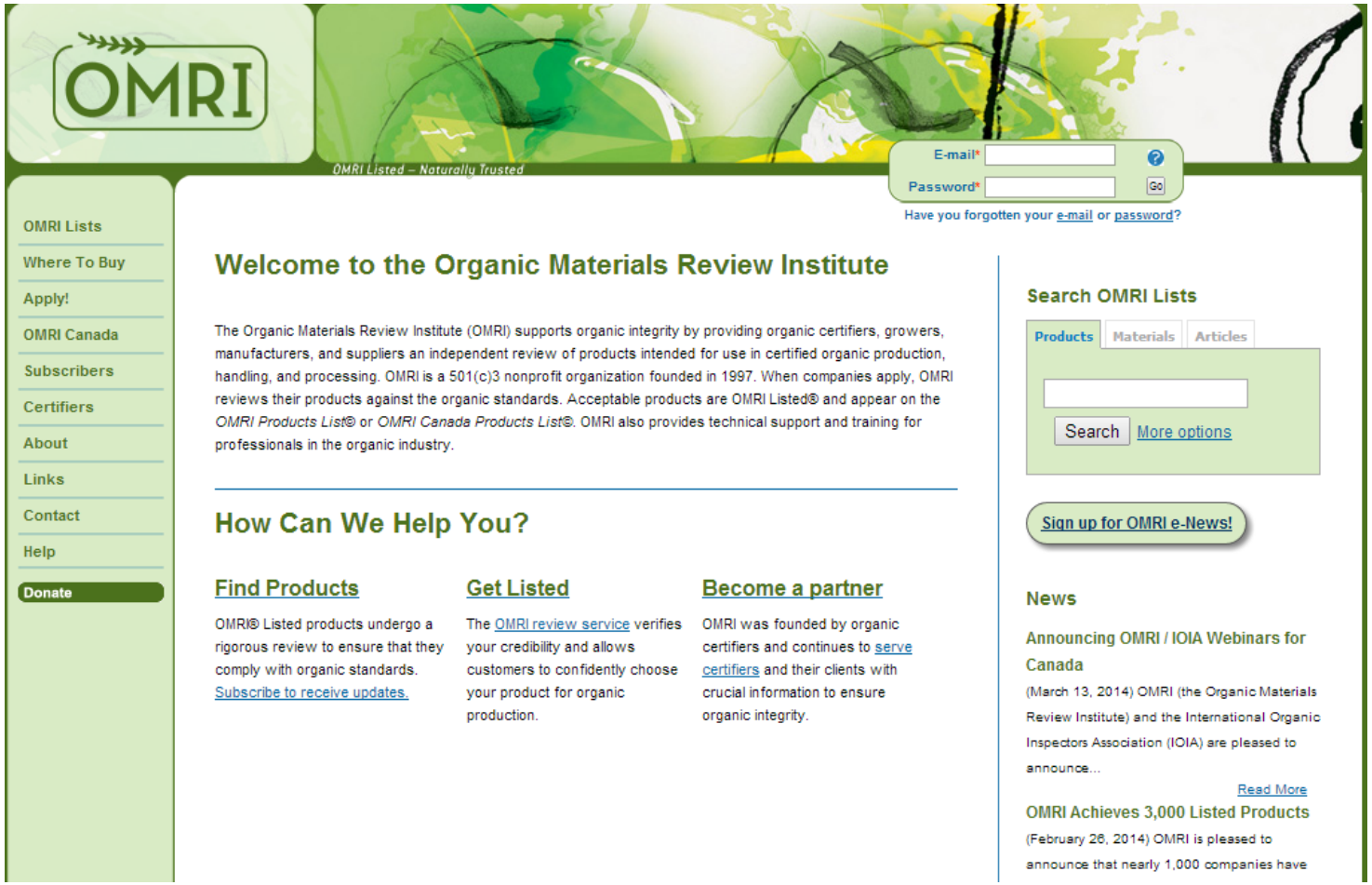
- In some organic situations, chemical control of disease is necessary and allowed by organic standards. Affected host plants can be physically removed or treated with such elements as copper, sulfur, or neem. It is always recommended that you consult with an expert before using or adding any amendment to your fields to help control disease.

Disease Management Strategies

- Overall plant vitality is probably the single most important element for fighting and combating disease in your garden or field. Pathogens have the tendency to attack weak or stressed plants in the garden. If a disease establishes itself using the weaker plants it can often jump to the stronger crops. Therefore, maintaining conditions favorable to general plant vitality can significantly reduce the occurrence of disease. Removing harvested plants quickly and composting effectively will reduce instance of pathogens as well.

OMRI
Organic Materials Review Institute

Use OMRI's website to find appropriate products for disease management.



Assessment/Review

- What is a vector?
- What are several types of pathogens and how do they affect the plant?
- What essential disease prevention methods should be used on the farm to reduce the risk of pathogens?

Resources

- https://ag.purdue.edu/btny/Pages/default.aspx
- http://msucares.com/insects/index.html
- http://msue.anr.msu.edu/news/signs_and_symptoms_of_plant_disease_is_it_fungal_viral_or_bacterial