

Managing Diseases with an Integrated Mindset

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Taking an integrated approach to managing diseases entails being proactive, planning in advance, and keeping records, as well as using cultural management practices and appropriate fungicides applied at the right time. Being proactive means having knowledge about diseases that have occurred in the past and also knowing about others that occur in the region to be prepared. This includes for each disease knowing how the pathogen survives and spreads, and thus potential sources of the pathogen, being familiar with symptoms especially initial ones, and knowing conditions favorable for infection and disease development. This information is the basis for many cultural practices, and varies a lot among pathogens. Cultural practices include seed tested and/or treated for pathogens, resistant varieties, crop rotation, plastic and organic mulch to create barrier between pathogen in soil and crop, weed management, biofumigation, and cultural practices to minimize favorable conditions, such as using drip rather than overhead irrigation to minimize leaf wetness and soil moisture. Fungicides continue to be the most important tool for managing many diseases partly because modern fungicides are highly effective due to targeted activity and mobility in plants, but single-site mode of action makes them prone to resistance developing in pathogens. Managing fungicide resistance is not only an important component of an IPM program, using an IPM program with cultural management practices to minimize need for fungicides is an important strategy for managing resistance. Keeping records about diseases that occur, including when first symptoms seen, severity and impact, can be useful for managing diseases in the future.

IPM Elements for Cucurbit Disease Management include:

1. Know about diseases that could occur.
2. Familiar with symptoms.
3. Know current recommendations in particular pertaining to fungicides and resistant varieties.
4. Plan fungicide program in advance based on current information about labeled fungicides including resistance, use restrictions, and safety to beneficials. Most effective fungicides have targeted activity requiring use of more than one with multiple diseases.
5. Calibrate sprayer to ensure correct fungicide dose applied.
6. Crop rotation.
7. Resistant varieties.
8. Seed tested and/or treated for pathogens.
9. Greenhouse sanitation for crops grown from transplants.
10. Clean equipment between fields using a high-pressure power washer spray nozzle.
11. Cultural practices to minimize favorable conditions for disease development.
12. Cultural practices for specific diseases. Ex. managing soil moisture for Phytophthora blight.
13. Scout regularly, at least once weekly. Submit sample for diagnosis when unsure.

14. Initiate fungicide applications based on threshold or forecasted risk when appropriate.
15. Record notes on diseases that occur including onset date and severity.
16. Evaluate success of management program.
17. Promptly incorporate crop after harvest (mow and disk) then plant winter cover crop.
18. Do not dump cull fruit in production field.

Resources about managing diseases of vine crops (aka cucurbits) and also other vegetables:

Principles of plant disease management are described at <https://nysipm.cornell.edu/agriculture/vegetables/vegetable-ipm-practices/chapter-2/>.

Resistant variety lists are at <https://www.vegetables.cornell.edu/pest-management/disease-factsheets/disease-resistant-vegetable-varieties/>.

Photographs of symptoms for many of the diseases occurring in New York, along with information about the causal pathogen and its management, are in Disease Factsheets at <https://www.vegetables.cornell.edu/pest-management/disease-factsheets/>.

The Management Guidelines for Vegetable Crops contain current information about fungicides registered for use in New York. Most information is organized by disease in crop chapters that also have information about the causal pathogen and its management. This book is updated yearly. Print and on-line version can be purchased at <https://cropandpestguides.cce.cornell.edu/>.

The cultural management practice information from the Management Guidelines for Vegetable Crops is available at the IPM website. The cucurbit crop chapter is at <https://nysipm.cornell.edu/agriculture/vegetables/vegetable-ipm-practices/chapter-18/>.

IPM elements for cucurbit powdery mildew:

1. Learn about the disease at <https://www.vegetables.cornell.edu/pest-management/disease-factsheets/cucurbit-powdery-mildew/>.
2. Plan fungicide program based on information at above website about fungicide efficacy, resistance, and label use restrictions.
3. Calibrate sprayer to ensure correct fungicide dose applied.
4. Select resistant varieties.
5. Do not grow verbena, an alternate host, in a greenhouse with cucurbit transplants.
6. Scout for symptoms starting at flowering. Examine both surfaces of at least 50 older leaves. Threshold for starting fungicide applications is 1 spot on 50 leaves.
7. Rate success of fungicide program and identify ways to improve if not satisfactory.
8. Promptly incorporate crop after harvest (mow and disk) to reduce inoculum for other plantings; powdery growth on affected foliage is mostly the pathogen's asexual spores capable of moving long distances in air currents. This practice is also useful for reducing over-wintering inoculum. However, while this pathogen has ability to produce a structure containing survival spores, these are not thought to play an important role in the disease cycle. First two isolates of opposite mating type need to grow together and sexually reproduce for this structure to form. Next growing season the structures need to be on the soil surface for spore release and dispersal to a nearby crop.

IPM elements for cucurbit downy mildew:

1. Learn about the disease at <https://www.vegetables.cornell.edu/pest-management/disease-factsheets/downy-mildew-of-cucurbits/>.
2. Plan fungicide program based on information at above website about fungicide efficacy, resistance, and label use restrictions.
3. Calibrate sprayer to ensure correct fungicide dose applied.
4. Select resistant cucumber varieties.
5. Sign up to receive alerts when downy mildew has been detected nearby at <https://cdm.ipmpipe.org/>.
6. Become familiar with early symptoms. See <http://blogs.cornell.edu/livepath/gallery/cucurbits/downy-mildew-o-cucurbits-early-symptoms/>
7. Scout for symptoms at least weekly.
8. Monitor <https://cdm.ipmpipe.org/> to know when downy mildew is developing in crops
9. Start applying targeted fungicides as soon as symptoms detected.
10. Report occurrence to extension specialist or post at <https://cdm.ipmpipe.org/>.
11. Rate success of management program and identify ways to improve if inadequate.
12. Promptly incorporate crop after harvest (mow and disk) to reduce inoculum for other plantings. This practice is also useful for reducing over-wintering inoculum. But note, while this pathogen has ability to produce its survival spores (oospores), which are the result of sexual reproduction, isolates of opposite mating type are being found on different cucurbit crop types reflecting host specialization. This could change.

IPM elements for Phytophthora blight:

1. Learn about the disease at <https://www.vegetables.cornell.edu/pest-management/disease-factsheets/phytophthora-blight-and-its-management-in-cucurbit-crops-and-other-vegetables/>.
2. Plan fungicide program based on information at above website about fungicide efficacy, resistance, and label use restrictions.
3. Calibrate sprayer to ensure correct fungicide dose applied.
4. Resistant varieties expected to be available in future.
5. Select field with good drainage. Plant cover crop rather than crop in low areas.
6. Mustard biofumigation before planting.
7. Reduced tillage for cucurbit or other crop in rotation (eg sweet corn).
8. Subsoil or chisel plow. Other practices to improve soil drainage.
9. Raised, dome-shaped beds with plastic mulch for non-vining cucurbit types.
10. Drip irrigation.
11. Avoid over irrigating.
12. Irrigate with water free of pathogen; ponds and streams can be contaminated if they contain water that drained from fields with Phytophthora blight, including at other farms.
13. Preventive fungicide program started before symptoms seen.
14. Clean farm equipment, shoes, etc. of soil between fields.
15. Scout for symptoms at least weekly.
16. Remove or disk in affected plants when found.
17. Do not dump cull fruit in production field.

