



Great Lakes Fruit, Vegetable & Farm Market EXPO Michigan Greenhouse Growers EXPO

December 10-12, 2019

DeVos Place Convention Center, Grand Rapids, MI



Pickling Cucumber

Moderator: Ben Phillips, Michigan State University Extension

- 9:00 am Downy Mildew Management in Pickling Cucumbers (OH 2B, 0.5 hrs)
- Mary Hausbeck, Michigan State University
- 9:30 am Worker Protection Standards for Pickling Cucumber Growers (OH CORE, 0.5 hrs)
- Ben Phillips, Michigan State University Extension
- 10:00 am Creating a Culture of Food Safety in Pickling Cucumbers
- Phil Tocco, Michigan State University Extension
- 10:30 am Perspectives on Parthenocarpic Cucumber Production and Use
- Andreas Herr, BASF

Downy Mildew Management in Pickling Cucumbers

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Downy mildew has been a yearly problem for Michigan pickle growers since 2005. The disease causes leaf blighting (Figure 1) and death of the foliage on cucumbers. Downy mildew is favored by foggy, cloudy, humid, wet weather and moderate temperatures. Melon, squash, and pumpkin are other susceptible cucurbit crops. The microorganism responsible for downy mildew is *Pseudoperonospora cubensis*. This pathogen cannot overwinter in Michigan fields but can overwinter in greenhouses or production regions that do not experience a frost. The spores move via air currents and must blow into our growing regions. Some years Michigan has had cucumber downy mildew in the state as early as mid-June. In many years, the first cucumber downy mildew symptoms were detected the week of July 4 or later.

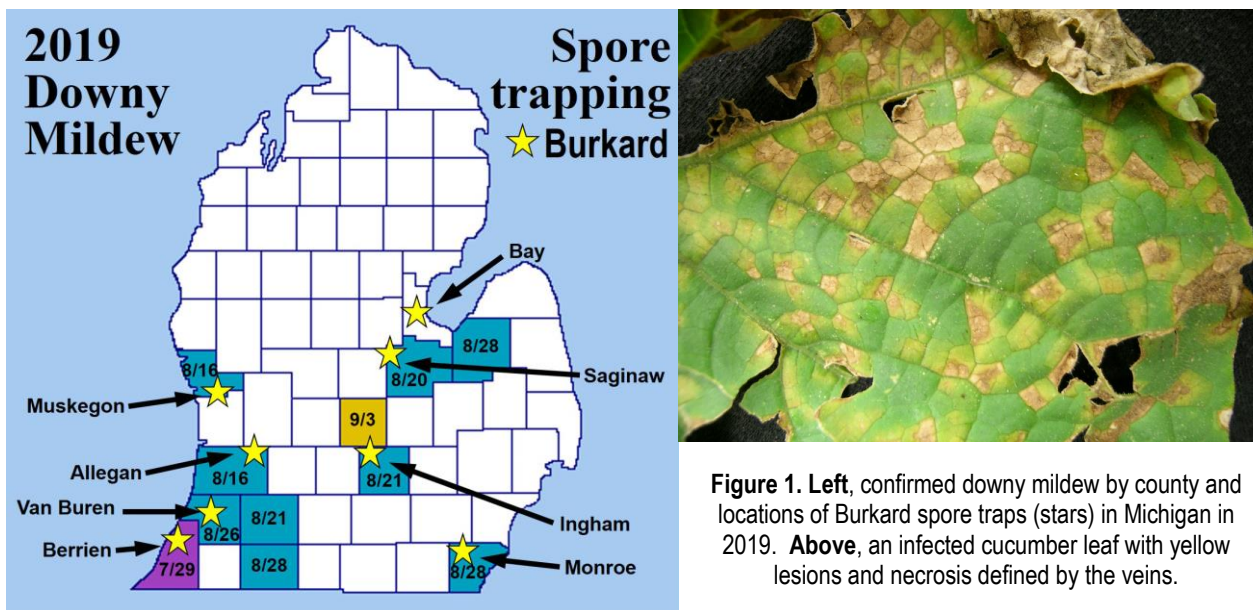


Figure 1. Left, confirmed downy mildew by county and locations of Burkard spore traps (stars) in Michigan in 2019. Above, an infected cucumber leaf with yellow lesions and necrosis defined by the veins.

Spore trapping is used in Michigan to detect downy mildew sporangia in the air in cucumber production areas. Daily spore counts and confirmed cases of downy mildew by county are uploaded to www.veggies.msu.edu/downy-mildew-news, www.downymildew.msu.edu (Figure 1). A new molecular technique allows differentiation between the look-alike spores of *P. cubensis* and *P. humuli*. *P. humuli* infects hop and does not pose a threat to cucumbers. In previous years, we could not distinguish between cucumber and hop downy mildew spores as they are identical under the microscope. Hop downy mildew spores were found early in the growing season with relatively high numbers in some cases. Hop downy mildew can overwinter in Michigan, explaining the presence of these spores in early spring and summer. Keeping an eye on the spore traps totals across the state could be helpful in knowing when the cucumber downy mildew pathogen is in your production region.

Fungicides are costly and applying them before they are needed is not sustainable. However, applying fungicides when the disease is already well established in the field is not recommended because it can be too late to protect the crop and can contribute to the downy mildew pathogen developing resistance to our most important fungicides. Each year, extensive field studies are conducted at the MSU Plant Pathology Farm in Lansing, MI to compare fungicides for their ability to limit downy mildew. Recommended fungicides are listed in Table 1. Broad-spectrum fungicides applied at 10-day intervals

are recommended before downy mildew has been detected in the state. After downy mildew has been confirmed, a stronger program with fungicides that have shown good activity in our yearly research plots are recommended. Alternate among these five fungicides using a 5- to 7-day application interval; use the shorter interval when downy mildew is confirmed in your region. In some situations, a longer application interval may be acceptable.

Table 1. Recommended fungicides for control of cucumber downy mildew.

Product	Active ingredient	FRAC code*	Tank mix with
<i>Apply after downy mildew has been confirmed</i>			
Elumin	ethaboxam	22	chlorothalonil or mancozeb
Orondis Opti	oxathiapiprolin/chlorothalonil	49/M05	
Previcur Flex	propamocarb	28	chlorothalonil or mancozeb
Ranman	cyazofamid	21	chlorothalonil or mancozeb
Zampro	ametoctradin/dimethomorph	45/40	chlorothalonil or mancozeb
<i>Apply early before symptoms are observed</i>			
Gavel	mancozeb/zoxamide	M03/22	chlorothalonil
Zing!	zoxamide/chlorothalonil	22/M05	mancozeb

*The FRAC code is an alphanumeric code assigned by the Fungicide Resistance Action Committee and is based on the mode of action of the active ingredient.

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United States
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Agriculture

Does it require a respirator?

2018 Worker Protection Standard respirator requirement guide for vegetable growers

Ben Phillips, MSU Extension; Deb Chester, MSU; Craig Anderson, Farm Bureau

The Worker Protection Standard and respirators

The Worker Protection Standard (WPS) is a regulation designed to protect farm workers from dangerous exposure to pesticides. A recent update in 2015 has aligned the WPS with most of the Occupational Safety and Health Administration (OSHA) provisions for using respirators. The revised WPS includes specific requirements for the use of respirators when using pesticide products under the Agricultural Use Requirements *that requires the use of a respirator*. This revision requires all those who mix, load and apply pesticides (including self-employed handlers) to have a medical evaluation, and annual fit-tests for each type of respirator required by the pesticide product label and annual training regarding the proper use of each respirator to be used by the handler.

Remember, the WPS does not apply when the pesticide is used in a manner not directly related to the *production* of agricultural plants and *post harvest treatments* of the harvested portions of an agricultural plant under the Agricultural Use Requirements on the pesticide label. When using a pesticide for uses other than those covered in the Agricultural Use Requirements section of the label, the worker exposure is subject to the requirements of the OSHA Hazard Communication Standard, and either MIOSHA Part 700 or Part 451, including the need for respiratory protection. The Safety Data Sheet for a pesticide would indicate if you need a respirator for non-agricultural uses.

Where can I find more Worker Protection Standards (WPS) resources?

Up-to-date pesticide resources can be found on the National Pesticide Safety Education Center website (<https://npsecstore.com/>) and the Pesticide Educational Resources Collaborative website (<http://pesticideresources.org/>).

Respirator label language

To find whether your pesticide requires a respirator to mix, load, or apply, see the Personal Protective Equipment (PPE) requirements listed in the Precautionary Statements section of the label in the "Hazards to Humans (and Domestic Animals)" subsection.

The product formulation, toxicity, and type of application influence the type of respirator needed. Manufacturers use criteria approved by the EPA to assign PPE respirator requirements on labels. The respirator precaution statement can be very general, but some product statements can also be quite specific, with different instructions for mixers, loaders, applicators, and application type. Some may include details on half-mask or full-mask, and some may feature exemptions when using

engineered controls, such as closed or mechanical transfer mixing/loading systems, water-soluble packaging, or enclosed sprayer cabs.

Others may list multiple respirator options with National Institute of Occupational Safety and Health (NIOSH) respirator classes and filter series. Labels can be confusing because respirator terminology was changed by NIOSH. In 1995, NIOSH took over full responsibility for respirator certifications from the Mine Safety and Health Administration (MSHA). Some pesticide labels continue to use the old MSHA terms.

What is a respirator?

A respirator is a personal protective device that is worn on the face, covers at least the nose and mouth, and is used to reduce the wearer's risk of inhaling hazardous airborne particles (including dust particles and infectious agents), gases, or vapors. The many types of respirators available include (1) particulate respirators, which filter out airborne particles; (2) "gas masks," which filter out chemicals and gases; (3) airline respirators, which use compressed air from a remote source; and (4) self-contained breathing apparatus, which include their own air supply. Often, a Grade D air cylinder or an air compressor supplies the breathable air. The category of particulate respirator can be further divided into (1) disposable or filtering facepiece respirators, where the entire respirator is discarded when it becomes unsuitable for further use due to excessive resistance, sorbent exhaustion, or physical damage; (2) reusable or elastomeric respirators, where the facepiece is cleaned and reused but the filter cartridges are discarded and replaced when they become unsuitable for further use; and (3) powered air purifying respirators (PAPRs), where a battery-powered blower moves the air flow through the filters.

Filter Series

When the ambient air contains particulates (e.g. dusts, mists), air-purifying respirators use filters that are classified on the basis of oil degradation resistance and filter efficiency. To describe oil degradation resistance, NIOSH classifies a filter as N (not oil resistant), R (oil resistant), or P (oil proof). Among the N, R, and P series classes, there are also three filter trapping efficiency levels: 95, 99, and 100. A filter classified as High Efficiency (HE) can only be used on powered air-purifying respirators. Respirators that have particulate filters will not protect you against gases, vapors and the non-particulate components of fumes, mists, fogs, smoke and sprays.

Cartridges/Canisters

The terms 'cartridges' and 'canisters' are used interchangeably in air purifying respirators. They are both containers with a filter, sorbent or catalyst, or a combination of these items designed to remove specific contaminants from the air passed through the container. Often, a 'cartridge' is the term for a half or full-face respirator and a 'canister' is the term used for a gas mask. Essentially the terms are interchangeable. It is important to remember to *select the appropriate*

cartridge/canister for the contaminant in question. For example, a cartridge/canister specifically designed to remove organic vapors will not remove an acid gas or a particulate, a particulate cartridge will not remove organic vapors, and a cartridge/canister designed specifically for ammonia will not remove an organic vapor. You may require more than one cartridge to protect against multiple hazards; for example, you may need a chemical cartridge and a particulate filter in combination. Cartridges/canisters are color coded to help you select the appropriate one. You can find the color-coding requirements of labels for canisters and cartridges online from the OSHA Respiratory Protection Bulletin (https://www.osha.gov/dts/shib/respiratory_protection_bulletin_2011.html).

NIOSH TC Codes

What do NIOSH codes mean? A NIOSH TC-number is assigned to respirator masks and cartridges after they are reviewed and approved by NIOSH. There may be a filter series identifier (eg N95) as well. NIOSH approval numbers are for the entire respirator unit – you will void the approval if you use one manufacturer’s mask and another manufacturer’s cartridge/canister. You should use only NIOSH-approved respirators. The categories are as follows:

Air Purifying Respirators:

TC-84A: Non-powered dust/mist respirators with particulate filter or combination chemical cartridge with particulate filter are one the two most common styles of respirator required on pesticide labels. They are often a disposable facemask with or without a N, R or P designation, but may be a full or half-face mask with a N, R or P designated particulate-removing filter, **AND/OR** combination chemical cartridge or canister with an N filter.

TC-23C: Non-powered respirators with chemical cartridge or powered air-purifying respirators with chemical cartridge **OR** a particulate filter were one of the two most common styles of respirator required on pesticide labels. Older pesticide labels sometimes require an MSHA TC-23C respirator with both a chemical cartridge **AND** a particulate prefilter. *However, currently only TC-84A respirators are tested with combinations of filters and cartridges.* So, in these special cases where labels have not yet gone through the re-registration process, growers will actually be expected to use a TC-84A combo respirator, and not the TC-23C listed.

TC-21C: powered dust/mist particulate respirators (no chemical cartridge combination). These are half-face or full-face masks, hoods or helmets with a battery-powered fan that moves air through the filters and circulates it through the mask. High Efficiency filters selected for the contaminant(s) must be used with these types of respirators. These feature interchangeable cartridges for different particulate filter series and a pre-filter.

TC-14G: gas masks with canisters are sometimes listed as an option for certain soil fumigants. They are similar to full-face TC-23C respirators, but are designed

specifically for chemical gas or biological exposure. These feature interchangeable cartridges for different particulate filter series.

Atmosphere-Supplying Respirators:

TC-13F: self-contained breathing apparatus (SCBA) is an atmosphere-supplying respirator; the respirator face piece is connected to portable breathable air in cylinders carried on the back of the wearer.

TC-19C: supplied-air respirators (SAR) are an atmosphere-supplying respirator; the respirator face piece is connected to a “fixed” air source (not designed to be carried by the wearer).

EPA-approved medical evaluation forms

The Environmental Protection Agency (EPA)-approved medical evaluation forms are questionnaires that employees must fill out for a physician or other licensed health care professional (PLHCP) to review. The forms are available in English (<http://pesticideresources.org/wps/hosted/medical-eval-english.docx>) and Spanish (<http://pesticideresources.org/wps/hosted/medical-eval-spanish.docx>).

How employers must handle the forms. What do they need from you?

Sections 1 and 2 of Part A of the form are required by the law and must be completed in private by the employee during normal working hours or at a time and place that is convenient for them. While the regulation does not require all of the following information, the employer must complete the following information for the health care provider:

- The type and weight of respirator that the employee will use.
- How long and how frequently the employee will use the respirator.*
- How much physical work the employee will do while using the respirator.*
- Other PPE the employee will use.*
- The temperature and humidity extremes of the working environment.*

*Not required, but the questions can be found in Part B, Section 2 of the medical form.

The health care provider may determine that additional questions about the respirator activities are necessary and/or a physical examination. These could include the questions in Part B, Section 1, a pulmonary function test (PFT) or electrocardiogram (ECG). If an employee answers yes to questions 1-8 in Part A, Section 2, it is the employer’s decision to allow any use of a respirator—i.e., transfer to other jobs that don’t require one—before arranging for a follow-up medical exam.

How health care providers must handle the forms. What do you need from them?

The health care provider will give the employer and employee a written medical determination (medical release) of the medical evaluation results. An

employee cannot use a respirator until this written medical determination is received allowing such use. The determination will include the following information:

- Whether the employee is medically able to use a respirator.
- Any restrictions on the employee's use of the respirator.
- The need for follow-up medical evaluations.
- Verification that the health care provider has given the employee a copy of the written medical determination.

Once complete, employers must keep records of **the medical determination** listed above. It **should not include any** completed medical questionnaires or detailed notes from any additional medical examinations. That information is confidential and should not be in the possession of the employer.

Vegetable pesticides that require respirators

So, what commonly used pesticides labeled for vegetable use have respirator label language? You can view a list of 500 products, in order by trade name here: <http://bit.ly/doineedarespirator>. The chemicals on this list that do not require a respirator for agricultural production under WPS may still require a respirator for non-agricultural uses under OSHA's Hazard Communication Standard, MIOSHA Part 700 or Part 451. To find out if a non-agricultural use requires a respirator, look at the Safety Data Sheet. If the label did not require a respirator for agricultural use we indicated "no". If the label required any type of respirator for any or all processes we indicated "yes, see label". Always double-check the label and Safety Data Sheet that comes with your specific product and formulation.