Vegetable Crop Update

A newsletter for commercial potato and vegetable growers prepared by the University of Wisconsin-Madison vegetable research and extension specialists

No. 3 – May 7, 2017

In This Issue

Calendar of Events

July 20, 2017 – UW-Hancock ARS Field Day, Hancock, WI
July 27, 2017 – UWEX Langlade County Airport Research Station Field Day, Antigo, WI
January 21-23, 2018 – Wisconsin Fresh Fruit & Vegetable Conference, Wisconsin Dells, WI
February 6-8, 2018 – UWEX & WPVGA Grower Education Conference, Stevens Point, WI

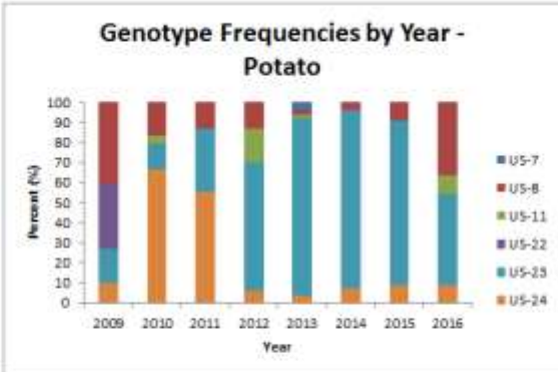
Amanda J. Gevens, Associate Professor & Extension Vegetable Plant Pathologist, Interim Co-Director of Wisconsin Seed Potato Certification Program, UW-Madison, Dept. of Plant Pathology, 608-890-3072 (office), Email: gevens@wisc.edu. Webpage: www.plantpath.wisc.edu/wivegdis/

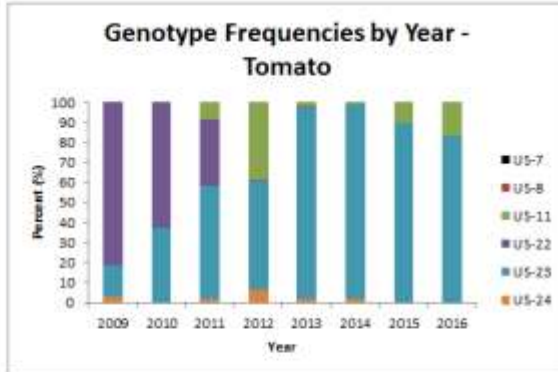
Special Local Need Registrations (Section 24c) and Emergency Exemptions (Section 18) Authorized for Use in Wisconsin – Updated by DATCP on 5/3/2017. The table below is available online with hotlink for each label at: **https://datcp.wi.gov/Documents/SpecialUses.pdf**

Product name	Active ingredient(s)	FIFRA Section	Company	Site(s) of application	Pest problem(s)	Start Date	Expiration Date
Aim EC	carfentrazone-ethyl	24(c)	FMC Corp	Hops	Hop sucker, broadleaf weeds	2/17/2015	12/31/2019
Avipel (Dry & Liquid)	9,10-anthraquinone	24(c)	Arkion Life Sciences	Field and sweet corn seed	Sandhill crane	11/20/2015	7/01/18
Bravo Ultrex	chlorothalonil	24(c)	Syngenta	Long season potatoes	Late blight, early blight, Botrytis vine rot, Black dot	5/31/2013	12/31/2017
Bravo WeatherStik	chlorothalonil	24(c)	Syngenta	Ginseng	Alternaria, Gray mold	6/27/2013	12/31/2017
Bravo WeatherStik	chlorothalonil	24(c)	Syngenta	Long season potatoes	Late blight, early blight, Botrytis vine rot, Black dot	5/31/2013	12/31/2017
Bravo ZN	chlorothalonil	24(c)	Syngenta	Long season potatoes	Late blight, early blight, Botrytis vine rot, Black dot	5/31/2013	12/31/2017
Dual Magnum	S-metolachlor	24(c)	Syngenta	Various vegetable crops	Annual grasses, broadleaf weeds	4/15/2013	12/31/2017
Echo ZN	chlorothalonil	24(c)	Sipcam Agro USA	Long season potatoes	Late blight, early blight, Botrytis vine rot, Black dot	8/15/2017	12/31/2020

Echo 720	chlorothalonil	24(c)	Sipcam Agro USA	Long season potatoes	Late blight, early blight, Botrytis vine rot, Black dot	8/15/2017	12/31/2020
Echo 90DF	chlorothalonil	24(c)	Sipcam Agro USA	Long season potatoes	Late blight, early blight, Botrytis vine rot, Black dot	8/15/2017	12/31/2020
Indar 2F	fenbuconazole	24(c)	Dow AgroSciences	Cherries, peaches, nectarines	Blossom blight, fruit brown rot	3/22/2016	12/31/2020
Linex 4L	linuron	24(c)	Tessenderlo Kerley, Inc. (NovaSource)	Potatoes grown on coarse-textured, low organic matter soils	Broadleaf and grass weeds	4/26/2016	12/31/2020
Lorox DF	linuron	24(c)	Tessenderlo Kerley, Inc. (NovaSource)	Carrots grown on coarse-textured, low organic matter soils	Broadleaf and grass weeds	5/11/2015	12/31/2019
Nimitz	fluensulfone	24(c)	ADAMA	Carrots	Root knot, stubby root, and lesion nematodes	5/3/2017	12/31/2021
Omega 500F	fluazinam	24(c)	Syngenta/ISK Biosciences	Potatoes	Powdery scab	11/16/2016	12/31/2020
Reflex	sodium salt of fomesafen	24(c)	Syngenta	Lima beans	Palmer amaranth and nightshade species	4/10/2017	12/31/2021
Sandea	Halosulfuron-methyl	24(c)	Gowan Company	Cucumbers	Nutsedge, broadleaf weeds	7/8/2014	12/31/2018
Starane Ultra	fluroxypyr 1-methylheptyl ester	24(c)	Dow Agrosciences	Dry bulb onions	Broadleaf weeds including volunteer potato	3/18/2015	12/31/2019
Stinger (cranberry)	clopyralid	24(c)	Dow Agrosciences	Cranberries	Broadleaf weeds	5/17/2013	12/31/2017
Stinger (strawberry)	clopyralid	24(c)	Dow Agrosciences	Strawberries	Broadleaf weeds	3/31/2015	12/31/2019
Topsin M WSB	thiophanate-methyl	24(c)	Distributed by United Phosphorus, Inc	Ginseng	White mold, Rhizoctonia root and crown rot, and Cylindrocarpon root rot	4/23/2013	12/31/2017
Vydate L	oxamyl	24(c)	DuPont	Dry bulb onions	Onion thrips, stubby root nematodes	6/20/2014	12/31/2018

National Late Blight Updates: **http://usablight.org** is again up and running for 2017 in effort to support the detection and characterization of late blight on tomato and potato crops from the U.S. Already this year, late blight has been confirmed on potato and tomato in southwestern Florida. In all reported cases, the pathogen genotype was US-23. This has been the predominant genotype in Wisconsin, and across the U.S., in recent years. US-23 can still generally be managed well with use of phenylamide fungicides such as mefenoxam and metalaxyl (ie: Ridomil).





Frequencies of late blight pathogen genotypes in recent years (from usablight.org).

<u>Potato blackleg (contributions from Dr. Amy Charkowski, Colorado State Univ., formerly of UW-Madison, Dept. of Plant Pathology):</u> The primary bacterial pathogens that cause potato blackleg and tuber soft rot are *Pectobacterium atrosepticum*, *P. carotovorum, P. wasabia*e, and more recently in the U.S., *Dickeya* spp. Previously, all of these pathogens were grouped in the same genus *Erwinia*. *Dickeya* and *Pectobacterium* affect many host species including potato, carrot, broccoli, corn, sunflower and parsnip; legumes and small grains are not known hosts. *Dickeya dianthicola* was confirmed in the eastern U.S. in just 2015, causing significant potato losses in some areas. *Dickeya* appears to spread over long distances via seed potatoes, was first reported in the Netherlands in the 1970s, and has since been detected in many other European countries, and now the U.S. Pictures, below, show symptoms of *Dickeya*.

Stem lesions are mainly seen at the base of the stem.

Decayed stem is a dull brown.

Pith at base of stem is soft or missing.
Vascular system above lesion is brown.

Plants may show symptoms on only one of the stems.

Leaves of plants with milder symptoms are curled.

Under the right environmental conditions, infection of seed with blackleg pathogens can result in symptoms including poor emergence, chlorosis, wilting, tuber and stem rot, and darkened or black stems which are slimy, and death. These symptoms result from the cell-wall-degrading enzyme activity of the bacteria within the plant tissues on which they infect.

Blackleg and soft rot bacterial diseases are promoted by cool, wet conditions at planting and high temperatures after emergence. While the pathogens can be spread in infested seed, other sources of inoculum include soil, irrigation water, and insects. Levels of infection are dependent upon seed-handling/cutting techniques, soil moisture and temperature at planting and emergence, cultivar susceptibility, severity of infection of seed, and potentially, amount of bacteria in irrigation water, cull piles, or other external sources. Sanitation and disinfesting of potato cutting equipment and proper handling reduces spread and aids in control of the pathogen. Treating seed to prevent seed piece decay by fungi can also contribute to blackleg control. Since the pathogen does well in cool, wet soils, avoid planting in overly wet soil. Crop rotation away from potato for 2-3 years for *Pectobacterium* and less than 1-2 years for *Dickeya* species will help control this disease as the bacteria do not survive well in soil.

While seedborne or vascular blackleg cannot be reversed with applications of fungicides or bacteriacides, spread of the bacterial pathogen from infected to healthy plants and aerial stem rot may be managed in the field with fungicide tank-mixes which contain copper. Remember that the pathogen is inside of the plant (until severe symptoms develop) and copper treatments are not internalized. Most often, conditions which favor plant to plant spread include high winds and driving rains or heavy overhead irrigation.

It is likely that this pathogen was present and spreading in seed potatoes and on farms in the affected states for a few years (2013-2014) without causing significant disease damage due to cool temperatures. In 2015, however, temperatures were warmer and the presence of *Dickeya* resulted in significant disease outbreaks on commercial potato farms. Increased detection and recognition of this rapidly spread disease problem has prompted additional sampling and monitoring efforts from within numerous seed certification and regulatory agencies.

Field control of aerial stem rot is challenging. Copper containing fungicides such as Kocide can provide some control of aerial stem rot, and can aid in managing bacterial infection after the crop has suffered hail or driving rain/wind damage. However, note that results of these approaches have had varied success throughout the U.S. In work by Dr. Dennis Johnson of Washington State University, the famoxadone+cymoxanil (Tanos) plus mancozeb tank-mix alternated with mancozeb+copper hydroxide (ie: Kocide) was an effective chemical tool in reducing aerial stem rot in potato. Irrigation management to reduce excess water also greatly enhanced control of aerial stem rot. Copper hydroxide applications alone did not have as effective of control as Tanos+copper hydroxide. As Tanos is also an excellent late blight control material, its use as we approach DSVs of 18 at this time offers an appropriate program for control of both diseases.

Testing for *Dickeya* and *Pectobacterium* is available using new standard polymerase chain reaction (PCR) assays. Random sampling of 400 tubers per lot will likely identify seed lots with one per cent or greater incidence (1,200 tubers per lot will likely identify seed lots with 0.3 per cent or greater incidence).

Research is being carried in both Canada and the United States to learn more about the *Dickeya* pathogen, its presence in seed lots, how it spreads and survives, and how to properly manage it using seed certification, chemicals and cultural practices.

How *Dickeya* Spreads: The most important means of dissemination for *Dickey*a and other bacterial pathogens of potato is the movement of latently infected seed tubers. The pathogen can be carried on the tuber surface and in lenticels (as for *Pectobacterium* spp.), but is also likely to be found in the tuber vascular system, which it enters systemically via the stolon from the infected mother plant or via root infection.

Although disease symptoms are often indistinguishable from those of the more established blackleg pathogen *Pectobacterium* spp., *Dickeya* spp. can initiate disease from lower inoculum levels, have a greater ability to spread through the plant's vascular tissue, are considerably more aggressive, and have higher optimal temperatures for disease development.

However, they also appear to be less hardy than *Pectobacterium* spp. in soil and other environments outside the plant. *Dickeya* is not a good soil survivor (generally less than two years) and rotation out of potato for at least three years will greatly reduce the disease. *Dickeya* and *Pectobacterium* thrive in water and low oxygen, and therefore over-irrigation, poor drainage or excessive rain will spread *Dickeya* and *Pectobacterium.* Both pathogens can spread after severe storms.

Generally, disease caused by *Dickeya* spp under warm, wet conditions leads to stem rotting with symptoms similar to those of *P. atrosepticum*. Under conditions with lower humidity, less rotting is observed with *Dickeya* spp but symptoms such as wilting, increased leaf desiccation, stem browning and hollowing of the stem can be present. Tuber soft rot, from either pathogen, ranges from a slight vascular discoloration to complete decay. Affected tuber tissue is cream to tan and is soft and granular. Brown to black pigments often develop at the margins of decayed tissue. Lesions usually first develop in lenticels, at the site of stolon attachment or in wounds. Symptoms caused by *Dickeya* spp. tend to develop when temperatures exceed 25ºC (77ºF), while *Pectobacterium* predominate below 25ºC.Recent studies showed that *Dickeya* spp., particularly at temperatures of 27ºC (80ºF) or above, cause more severe rots than *P. atrosepticum* and are more likely to produce a creamier, cheesy rot.

Dickeya dianthicola, the new blackleg pathogen, has the ability to remain dormant in tubers when temperatures are low (for example, at harvest time and in seed storages). Tubers infected with this form of *Dickeya* look healthy at planting, but the disease develops when soil temperature increases. Seed tubers may rot in the soil, causing poor emergence, or infected plants may emerge that eventually die but not before spreading the disease to neighboring plants.

Controlling *Dickeya:* Management challenges of both *Pectobacterium* and *Dickeya* include the lack of curative chemicals or resistant varieties, and the limited ability to predict the severity of the disease in the field. Growers are therefore advised to take precautions when acquiring seed potatoes in order to prevent the introduction and spread of *Dickeya* to their farms.

For one, it's recommended that growers purchase and plant only certified *Dickeya*-free seed potatoes. It is extremely important that they request a laboratory testing confirmation from the seller showing that seed to be purchased was tested at a certified testing facility and found to be free from *Dickeya*.

Cutting seed will spread *Pectobacterium* and *Dickeya* within a seed lot. For this reason, growers should consider planting uncut seed when possible. If cutting seed, it's important to ensure that the cut surfaces are suberized prior to planting to avoid new infections. *Dickeya* may be managed through biosecurity measures and on-farm precautions such as decontamination of farm machinery, eliminating plant debris and alternative hosts, and avoidance of mechanical harvesting during the early phases of pre-basic seed tuber multiplication.

Growers should make sure to thoroughly sanitize seed cutting equipment and planter between seed lots. Seed should be warmed prior to planting so that it is approximately the same temperature as the soil, and to reduce water condensation on tubers. Bacteria cannot enter plant tissues unless there is a port of entry (for example, un-suberized cut surfaces of the seed tuber, or bruises) and a film of water or a wet surface.

At harvest, growers should reduce the chances of inflicting damage to the skin such as cuts and bruises. If soft rot is present in a portion of the field, this part of the field should not be harvested. In addition, harvesting equipment should be sanitized between lots. Improved storage management can reduce bacterial load on tubers and tuber rotting. Both physical (especially hot water treatment) and chemical methods have been explored with limited success.

Dickeya grows slowly or not at all at seed storage temperatures, so if the crop looks good going into storage, it will likely not decay in storage due to *Dickeya*, but the bacteria will likely cause disease and spread the next year if infected potatoes are planted. Tissue culture plants are unlikely to survive if infected with *Dickeya*. However, tissue culture testing for soft rot pathogens is already a routine. *Dickeya* could spread in a greenhouse in nutrient film technique (NFT) or potting-soil based systems. Irrigation water can be tested for *Dickeya* to ensure freedom from the pathogen.

Grower Checklist for Preventing *Dickeya*

1. Plant certified, disease-free tubers, into well-drained soil with temperature under 10°C.
2. Plant whole seed tubers if possible. Suberize cut seed before planting.
3. Plant seed tubers during conditions that favor fast emergence.
4. Clean and disinfect tools and equipment used for cutting and planting seed.
5. Avoid wounding during seed cutting, planting and harvest.
6. Fungicidal seed treatment of potatoes to prevent seed piece decay can indirectly prevent seed contamination, especially during the cutting operation.
7. Utilize crop rotation of two or more years with a non-host crop.
8. Avoid over-irrigation.
9. Avoid excessive fertilization, which may impact plant and tuber maturity.
10. Consider copper fungicides, which are partially effective against disease and dry out existing lesions.
11. Delay harvest until skin set is complete (up to 21 days after top-kill).
12. Avoid wet conditions during harvest to prevent soil from sticking to tuber skins.
13. Store contaminated potato lots separately.
14. Provide adequate ventilation in storage.
15. Check storages regularly for temperature increase and odors. If problems are detected, hot-spot fans can be used to cool the pile.
16. Dry potatoes before storage or shipping.

The 2017 A3422 Commercial Vegetable Production in Wisconsin Guide is now available for 2017. As in past years, the guide can be downloaded for free (link below) or a hard copy can be purchased from UWEX Learning Store for $10.

https://learningstore.uwex.edu/Assets/pdfs/A3422.pdf