

Maine Seed Potato IPM Protocol for *Dickeya* Management

Steven B. Johnson, Ph.D.
University of Maine
Cooperative Extension

At a Maine Potato Board meeting on June 22, 2016, the following information was presented:

In voluntary dormant tuber testing from the 2015 crop, 55 of the 347 samples (16%) tested positive for *Dickeya*.

Additionally, the following levels for *Dickeya*-positive samples by field year from the 2015 crop were presented:

Field Year	Number of samples tested	% <i>Dickeya</i> Positive
FY1	76	0.0
FY2	86	9.3
FY3	74	24.3
FY4	38	15.7
FY5	3	0.0

Dickeya is a recent and potentially “devastating bacterial disease in Maine seed potatoes.” In 2015, 24% of the FY3 lots **voluntarily submitted** tested positive for *Dickeya*. It is likely that some of these seed lots were planted and the resultant crop sold as seed or replanted, harvested, and sold as seed a year later. The 9% of FY2 crop (only one field year away from a crop from planted minitubers) that tested positive for *Dickeya* were also likely planted and the resultant crop replanted at least one more year before being sold as seed. Rouging diseased plants and tubers

is not a solution to eliminate the disease as all infected plants may not develop symptoms, especially in the cool growing temperatures typical of seed production areas. Following this protocol will help mitigate risks associated with *Dickeya* in seed potato production. The protocol will also be effective for *Clavibacter michiganense* pv. *sepedonicum*, the causal agent of Bacterial Ring Rot; *Pectobacterium* spp., the causal agent of Blackleg, and other bacterial pathogens that can be seed borne or affect potato seed.

The crux of the protocol is the need for a zero tolerance policy for *Dickeya*. Importantly, a zero tolerance for **any** seed replanted for multiplication is a must. If not, *Dickeya* in FY2 and FY3 seed will continue to increase and have the potential to cause the catastrophic losses some seed recipients have experienced. The goal should be to adopt a zero tolerance policy for *Dickeya* in Maine potato seed.

Introduction

All potato seed produced must be entered into the Maine Seed Potato Certification Program and be in conformity with the requirements of 01-001 DEPARTMENT OF AGRICULTURE, CONSERVATION AND FORESTRY Chapter 252: RULES GOVERNING CERTIFICATION OF SEED POTATOES IN THE STATE OF Maine (<https://www1.maine.gov/sos/cec/rules/01/chaps01.htm>). This site lists the legal requirements for nuclear, foundation, and certified potato seed. Listed also are the legal requirements for the facilities that produce these classifications of potato seed including the sanitation and field requirements.

Nuclear Seed (Field Year 0, 1, 2 and 3 Seed)

Facility

All seed for increase should originate from a nuclear seed facility that follows this protocol. Production records tracing each seed lot back to the nuclear seed facility should be kept for a minimum of 5 years. Potato tubers not produced using this protocol (e.g. from outside sources) should not enter the nuclear seed facility. If a seed lot from a source not following this protocol enters the facility, the integrity of

the protocol is lost and cannot be regained and the seed lot must be flushed off the nuclear farm.

Equipment

All field and potato handling and harvesting machinery used at the nuclear seed facility must be for the exclusive use at that facility. If machinery that has been in potato fields not following this *Dickeya* IPM protocol enters potato fields of this nuclear seed facility following this protocol, the integrity of the protocol is lost and cannot be regained and the seed lot must be flushed off the nuclear farm.

Vine Kill

All seed must be chemically vine killed. Do not roll plants or use other mechanical methods for vine kill prior to harvest as these may generate aerosols of soft rot-causing bacteria.

Harvest

Field equipment used for harvest must be disinfested with 400 ppm or greater concentration of a commercially acceptable quaternary ammonium solution between seed lots. Handling equipment, e.g., conveyers, must be disinfested with 400 ppm or greater concentration of a commercially acceptable quaternary ammonium solution between seed lots.

Storage containers

Totes, bins, boxes or similar containers from a production facility that does not adhere to this protocol must not be used. All buildings, totes, bins, boxes or similar, must be pressure washed to remove any soil or potato residue and then disinfested with 400 ppm or greater concentration of a commercially acceptable quaternary ammonium solution.

If seed is loaded into containers originating from a facility not following this *Dickeya* IPM protocol, the integrity of the protocol is lost and cannot be regained without flushing the seed lot. These containers and seed tubers cannot be returned to the nuclear seed facility.

Seed Tubers

If seed tubers leave a facility following this *Dickeya* IPM protocol and enter a different facility using this *Dickeya* IPM protocol, the integrity of the protocol is intact.

Should seed tubers leave a facility following this *Dickeya* IPM protocol and enter a different facility that does not use this protocol, the integrity of the protocol is lost and cannot be regained.

Field Year 0 seed is produced in a lab or a greenhouse
Field Year 0 seed planted becomes Field Year 1 seed when harvested
Field Year 1 seed planted becomes Field Year 2 seed when harvested
Field Year 2 seed planted becomes Field Year 3 seed when harvested
Field Years beyond Field Year 3 seed are not eligible for nuclear designation

Seed Handling

Field Year 0, 1, and 2 seed is preferred to be planted whole (single drop, whole seed) rather than cut.

Planting should be done with a cup-type planter.

Testing

Dormant tuber testing

Dormant tuber testing should be done at the following rates:

Field Year 0 seed (lab or greenhouse produced): 1 tuber per hundredweight (100 pounds) up to 400 tubers per seed lot.

Field Year 1 seed: 1 tuber per 25 hundredweight up to 400 tubers per seed lot.

Field Year 2 seed: 1 tuber per 25 hundredweight up to 400 tubers per seed lot.

Field Year 3 seed: 400 tubers per seed lot.

Samples should be taken at harvest to ensure a random selection of tubers. The presence of *Dickeya* in any seed lot is cause for flushing the seed lot off the nuclear farm. A nonrandom sample will not provide any confidence level of the absence of *Dickeya* in the seed lot; it can only confirm the presence if the lot tests positive for *Dickeya*.

Field plant testing

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Field samples with blackleg or stem soft rot symptoms must be tested for *Dickeya*. The presence of *Dickeya* in any seed lot is cause for flushing the seed lot off the nuclear farm.

Foundation/Certified Seed (Field Year 3, 4 and 5 Seed)

Facility

All seed for increase should originate from a nuclear or foundation/certified seed facility that follows this protocol. Records tracing each seed lot traceable to the nuclear seed facility should be kept for a minimum of 5 years. If seed or non-seed tubers not produced in a facility using this protocol (e.g. from outside sources) enter the foundation/certified seed facility, the integrity of the protocol is lost and cannot be regained without flushing the seed lot off the foundation/certified farm.

Vine Kill

All seed must be chemically vine killed. Do not roll plants or use other mechanical methods for vine kill prior to harvest as these may generate aerosols of soft rot-causing bacteria.

Equipment

All field and potato handling and harvesting machinery used at the foundation/certification seed facility must be for the exclusive use at that facility. If machinery that has been in potato fields not following this *Dickeya* IPM protocol enters potato fields of this foundation/certification seed facility following this protocol, the integrity of the protocol is lost and cannot be regained and the seed lot must be flushed off the foundation/certified farm.

Harvest

Field equipment used for harvest must be disinfested with 400 ppm or greater concentration of a commercially acceptable quaternary ammonium solution between seed lots. Handling equipment, e.g., conveyers, must be disinfested with 400 ppm or greater concentration of a commercially acceptable quaternary ammonium solution between seed lots.

Storage containers

Totes, bins, boxes or similar that used in a production facility that does not adhere to this protocol should not be used at the facility. All buildings, totes, bins, boxes or similar, must be pressure washed to remove any soil or potato residue and then disinfested with 400 ppm or greater concentration of a commercially acceptable quaternary ammonium solution.

If seed is loaded into containers originating from a facility not following this *Dickeya* IPM protocol, the integrity of the protocol is lost and cannot be regained without flushing the seed lot. These containers and seed tubers cannot be returned to the foundation/certified seed facility.

Seed Tubers

If seed tubers leave a facility following this *Dickeya* IPM protocol and enter a different facility using this *Dickeya* IPM protocol, the integrity of the protocol is intact.

Should seed tubers leave a facility following this *Dickeya* IPM protocol and enter a different facility that does not use this protocol, the integrity of the protocol is lost and cannot be regained.

Field Year 3 seed planted becomes Field Year 4 seed when harvested
Field Year 4 seed planted becomes Field Year 5 seed when harvested
Seed beyond Field Year 5 are not eligible for seed designation

Seed Handling

Field Year 3 and 4 seed is preferred to be planted whole (single drop, whole seed) rather than cut.

Planting is preferred to be done with a cup-type planter rather than a pick-type planter.

Testing for *Dickeya*

Dormant tuber testing

Dormant tuber testing should be done at the following rates:
Field Year 4 seed: 400 tubers per seed lot.

Field Year 5 seed: 400 tubers per seed lot.

Samples for testing should be collected at harvest to ensure a random selection of tubers. The presence of *Dickeya* in any seed lot is cause for flushing the seed lot off the foundation/certified farm. A nonrandom sample will not provide any confidence level of the absence of *Dickeya* in the seed lot; it can only confirm the presence if the lot tests positive for *Dickeya*.

Field plant testing

Field samples symptomatic with *Dickeya* must be tested. The presence of *Dickeya* in any seed lot is reason for flushing the seed lot off the foundation/certified farm.