

Seed Certification: What It Is and What Certification Means

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Seed potato certification in the United States and Canada got its start in five states and two provinces from 1913 to 1914. Certification was officially proposed by USDA scientists at the first meeting of the Potato Association of America in 1914. Seed potato field inspections were based on visual observations, and the seed stock were increased by the use of stem cuts – a method of cutting the potato stem from a “mother plant” so that each section contained a portion of the stem and an axillary bud. This section was placed in a pot filled with a mix of sand, peat, and vermiculite and allowed to root and produce a new plant. Tubers harvested from these pots were then multiplied the next year in the field by seed growers using the tuber unit method. Each tuber would be cut and planted as a “unit” so that all of the seed pieces from that tuber were planted next to each other. This allowed for easier visualization of disease symptoms when the grower would go through to rogue (or remove) diseased plants. If one seed piece from a tuber cut into four pieces had a virus and expressed mosaic symptoms then the other pieces would express similar symptoms and all four plants could be removed, making for cleaner seed lots. Much later, with the advent of tissue culture methods, plantlets that were free of virus and bacteria, such as *Pectobacterium* (which is responsible for soft rot and blackleg), could be rapidly multiplied to produce minitubers. This allowed planting in bulk because the early generation seed was virtually disease free. However, because potatoes are vegetatively propagated, any disease that a tuber picks up during the growing season can be easily multiplied the next year when that tuber gets cut into four more seed pieces. Therefore seed growers today still inspect and rogue diseased plants from seed fields in order to produce seed that will produce a healthy commercial crop the following year. There are many lab-based tests now that allow the seed grower and the certification agency to identify and remove any virus, bacterial, or fungal caused diseases.

The certification agencies set up to monitor and regulate seed production exist mostly in the northern United States and in Canada, where insect pressure is lower and the growing season shorter resulting in less virus pressure. In the U.S., individual states have the authority to conduct certification, and it is handled under the supervision of a land-grant university, a state department of agriculture, or a grower association. The USDA-APHIS (Animal Plant Health Inspection Service), has a memorandum of understanding with each certifying agency that provides a standard set of guidelines for certification. In Canada, the certification is administered at the federal level. Tolerances are set at the federal level, but there are provincial exceptions for tighter tolerances so that they can meet certain foreign market demands. Private disease diagnostic labs are accredited by a national standards lab. The amount of seed grown in each state or province is demonstrated by a “wordle,” or a graphic word chart (Figure 1). Seed acreages produced in 2011 are shown with the larger the size of the lettering, the larger acreage produced in each province or state.

In every certification program there are basic principles that have been established over the years that serve vital functions for producing healthy seed crops. The first part of establishing a certified seed lot requires making sure the seed stocks are eligible to enter into the program – this is the start of the certification “pipeline”. On the application for certification, a grower provides the source of the seed stock he is using along with tags or documentation that the seed used is already certified. If the seed stock is coming out of a minituber producing greenhouse, it is first year material and a certification number is established. These certification numbers are provided with the application so that the agency can verify the information. The application for certification becomes the paper trail. During the summer, each seed lot is visually inspected two different times for disease. After harvest, a storage inspection takes place. It is usually done with a storage map supplied by the grower and the inspector makes sure that each lot is labeled and that there are adequate barriers between lots with no evidence of mixing in storage. Seed lots of the same generation and variety can be mixed in storage and then the map and resulting tags would list all of the certification numbers for that combination. Storage inspections are for the purpose of maintaining lot identification. During the winter a sample from each lot, that was collected at harvest, is tested in a post-harvest or winter grow-out plot. These are usually planted in November and inspected for virus and other diseases in January-February. Currently these grow-outs are done in California, Arizona, and Hawaii for the seed producing states of Idaho, Colorado, and Montana, respectively. Oregon’s seed lots are grown-out in greenhouses in Oregon. Mid-western and Eastern states conduct their grow-outs in Florida. The purpose of these grow-outs is to detect virus that was spread during the season. When a seed lot has passed all of these inspections and it is ready to be shipped to the commercial grower, a shipping point inspection is done. Again, samples of the seed are taken as it is being loaded onto the outbound truck and they are inspected for external and internal defects such as soft rot, dry rot, and bacterial ring rot. At this time they are also given a tag, which is associated with the size and condition of the seed. Once this final inspection is passed the seed is officially certified.

All certification programs require a post-harvest test for seed that will be re-certified – that is seed that will be used again by a seed grower to produce a seed lot the following year. Some states require that all seed lots, including those that are going to a commercial grower be post-harvest tested. Other states do not have this as a specific requirement, but most seed, regardless of its final purpose is usually tested. As a buyer of seed for commercial planting, a grower should always request a post-harvest test. Again, the main purpose of this test is to determine the amount of virus that can be expected when the seed is grown the following spring. Though states have different formats and information on their tags, there is a universal form that is used in the U.S. and Canada that has all the necessary information on each seed lot. The North American Plant Health Certificate (Figure 2) can be obtained either from the seed grower or the certification agency where the seed was produced. A few of the things listed on this document include; the variety, certification number, a production pedigree, the results of both the summer

and post-harvest inspections and whether or not a seed lot was ELISA tested for *Potato virus Y* (PVY).

PVY remains a problem in potato production because it can reduce yield and new strains of PVY, called necrotic strains, can cause tuber quality problems. These new strains have been detected in the U.S. since the 1990s and a bi-national survey from 2004-2006 in the U.S. and Canada showed they could be found in many areas (Gray et al. 2010). The necrotic strains can produce milder mosaic symptoms than are associated with PVY^O, the old or common strain. This reduced symptom expression in traditional varieties such as Russet Burbank and Ranger Russet, and the fact that Shepody and Russet Norkotah varieties have reduced symptom expression when infected with PVY^O, has led to increased production problems caused by PVY in the whole industry. While all seed producing programs use ELISA, a lab test that can detect all strains of PVY, Idaho and Montana are two states that use ELISA on all of the lots and varieties in their post-harvest test. This is a step forward as it eliminates the possibility of missing an infected plant, which results in a false-negative reading. More information on PVY and the new necrotic strains can be found on the website www.potatovirus.com. This website also has photos of foliar and tuber symptoms caused by PVY as well as excellent grower information and fact sheets on how to manage PVY.

With all of the information available to seed and commercial potato growers, there is no reason to buy seed without checking out its history and disease testing results. Good quality seed always has the potential to produce a high quality crop.



Gray, S., S. De Boer, J. Lorenzen, A. Karasev, J. Whitworth, P. Nolte, R. Singh, A. Boucher, and H. Xu. 2010. Potato virus Y: An Evolving Concern for Potato Crops in the United States and Canada. *Plant Disease* 94: 1384-1397.



Figure 1. Seed acreage in 2011 in Canadian provinces and U.S. states. The larger the state or province, the more seed acres produced. The largest acreage was produced in Idaho at 34,766 and the smallest number was produced in Newfoundland at 67.

NORTH AMERICAN CERTIFIED SEED POTATO HEALTH CERTIFICATE - CROP YEAR 2003

Grower Name: _____
City, State/Prov.: _____
Variety: _____ Acres: _____

Importer Name: _____
City, State/Prov.: _____
Quantity Shipped: _____
Size: _____

Lot Certification
Certification #: _____
Seed Class/Gen.: _____
Certifying State/Prov.: _____

Lot origination from tissue culture No Yes
Year micropropagated for planting: _____
by _____

Production environment pedigree: Fill 1 column per production year, use different initials in Greenhouse and Field boxes for different farms
(e.g. JSF for John Smith Farms); indicate a tuber-united lot with a "+" after farm initials; describe other footnotes in notes below.

1996	1997	1998	1999	2000	2001	2002	2003	Year of Production
								Greenhouse (insect excluding) & sterile soil
								Field (note special measures below)
								Certification No. Number of years produced
								Certifying State in field soil <input type="checkbox"/>

Summer Field Readings
Field inspections: 1st, 2nd, 3rd, Final

%LEAF ROLL
%MOSAIC
%VARIETAL MIXTURE
%BLACKLEG
%VERT + %FUSARIUM +
%EARLY BLIGHT

Post harvest readings
FINAL:

Location: _____
Sample No.: _____
Plant Count: _____

ELISA test results for latent viruses
%PVY %PVX

Other Diseases
Not known to occur in growers area: _____
No. of years since last found on this grower's farm, or NONE ON RECORD if free > 10 years: _____
Not found this year during normal certification field inspections: _____

Bacterial Ring Rot: _____
Late Blight: _____

Notes: _____

The above information is accurate to the best of our knowledge:

Program official / title: _____ Date: _____
Agency: _____ Telephone: _____
FAX: _____

Approved for use by the Certification Section of the Potato Association of America

Figure 2. North American Plant Health Certificate. This document is available from the grower or certification agency where the seed was produced and serves as a standard form for inspection results and information in the U.S. and Canada.