

— Potato seed management: Seed certification and selection

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Selection of high-quality seed is essential for the production of a profitable potato crop. Your best assurance of avoiding seed-related problems is to use only certified seed. This publication details the certification process and describes the aspects of seed selection that you should consider before purchasing seed for commercial potato production.

Potato seed certification

Certified seed

Certified seed potatoes must meet the legal requirements of a certification agency. In Idaho, certification is performed by the Idaho Crop Improvement Association (ICIA). Certification does not constitute a warranty or a guarantee that the seed potatoes are disease free; rather, certification means that the seed potatoes have met the standards of the certification agency. This means the seed was produced, inspected, graded, and handled according to the regulations of the agency.

Certification process

Before the crop is planted for seed, the ICIA reviews an application, submitted by the grower, that covers cropping and disease



Fig. 1. Tuber with severe Fusarium dry rot. The decayed tissue has assumed a dry, punky appearance and contains pink areas.



Fig. 2. Severe soft rot. Rotted tissues are cream to dark tan with a distinct, dark border between healthy and infected tissues.



Fig. 3. Silver scurf infection causes raised, silvery patches on the tuber skin.

history. Seed stock planted by the seed grower must be approved by the ICIA.

During the growing season, the ICIA twice inspects seed fields for diseases and varietal purity. The ICIA determines percentages of disease and varietal mixture by inspecting a specific number of plants for a given acreage and uses the percentages to determine if the potatoes meet certification tolerances. Potato fields not meeting these tolerances are rejected from certification (Table 1).

Storage facilities are inspected by the ICIA before harvest, and the size, location, and cleanliness of each facility are noted. Movement of seed potatoes from the original storage facility requires prior approval from the ICIA.

During harvest, random samples of 400 single-drop seed tubers are collected from each seed lot to be certified. The number of samples depends on the generation number and field size of the seed lot. These tubers are planted in Oceanside, California, in late November for the winter grow-out test to check for diseases that may have developed since the last field inspection and other problems such as herbicide carryover. Potato leafroll virus and potato virus Y (mosaic) are two diseases that may spread via aphids after the last field inspection.

A seed lot that passes all the inspections

described earlier is then eligible for shipping point inspection and tagging as certified seed. The shipping point inspection is performed by a federal-state inspector who verifies that the seed lot meets United States standards for grades of seed potatoes.

The inspector also looks for the presence of zero-tolerance diseases such as bacterial ring rot, corky ring spot, and root-knot nematode. If any of these diseases are found, the seed lot will be rejected for certification. In addition, Fusarium dry rot, Rhizoctonia canker, and soft rot must be below tolerances established by the ICIA (Table 1). Depending on the grade (blue, green, or yellow tag), levels of other defects such as hollow heart and growth cracks may need to be considered. At the same time, the inspector verifies the seed lot identity, tags the seed lot, and seals the transportation vehicle.

Limited-generation certified seed potatoes

Seed potatoes are assigned a generation number that allows the prospective buyer to determine how many field generations the seed lot is removed from laboratory-grown, disease-tested parental stock. In Idaho, this parental stock is designated prenuclear seed. Production from the planting of prenuclear seed stock, when harvested, is designated nuclear seed.

Production from nuclear seed, in turn, produces seed designated generation 1 (G1). G1 seed produces generation 2 (G2) seed, and so forth until generation 6 (G6) seed is produced. At this point, the process ends because G6 seed can no longer be recertified. This system limits the number of times a seed grower may replant seed to produce certified seed, hence the name “limited generation seed.” Commercial growers most commonly purchase G3 to G6 seed.

Designations for the number of generations that seed has grown in the

field differ among states (Table 2). Note that Alaska, Colorado, Maine, New York, Utah, and Wisconsin do not designate the first harvest year from field conditions as nuclear. Check this table when purchasing seed to be sure you are getting the generation you want. Generation designations may change from year to year. For the latest information refer to the current seed directory from each state or province.

Table 1. Idaho Crop Improvement Association (ICIA) field inspection tolerances for various factors affecting seed potatoes.

Inspection No.	Nuclear ^d		G1 ^d		G2		G3		G4		G5 and G6	
	1	2	1	2	1	2	1	2	1	2	1	2
----- (%) -----												
Diseases												
PVY	0	0	0	0	.01	TR	.50	.25	.50	.25	2.0	1.0
Leafroll	0	0	0	0	.01	.01	.03	.01	.08	.05	.20	.20
Blackleg ^a	0	0	.10	.10	.50	.50	1.0	1.0	2.0	2.0	— ^b	— ^b
Ringrot ^c	0	0	0	0	0	0	0	0	0	0	0	0
Root-knot nematode ^c	0	0	0	0	0	0	0	0	0	0	0	0
PVX		0		.50		2.00		4.00		6.00		8.00
Variety mix	0	0	0	0	0	0	.05	.01	.08	.05	.50	.20

Source: Adapted from Idaho Crop Improvement Association.

^a Tolerances based on visible symptoms.

^b Visible blackleg will not be used as a rejection factor in the G5, G6, or certified classes.

^c In the case of bacterial ringrot and root-knot nematode, 0% means none of these diseases are allowed in seed of any class.

^d With the exception of bacterial ringrot and root-knot nematode, 0% means the indicated disease or varietal mixture observed was required to be rogued in the indicated seed class.

Potato seed selection

A lot of information about the quality of a prospective seed lot can be gained by visiting the seed grower's farm. Visit during the growing season to see how the fields look. Later, after harvest, a visit to inspect equipment, storages, and the seed lot itself can be very helpful.

Inspect equipment and storage facility

Seed handling equipment should be in good repair and clean. Likewise, the storage facility should be in good repair to protect the seed potatoes from temperature fluctuations and light. The area around the storage facility should be free of cull piles and other potato debris, which are sources of disease.

Many seed producers have temperature recording charts to keep accurate records of storage conditions. These records should be reviewed to determine that storage conditions have been managed properly.

Adequate ventilation and humidity are important. Large fluctuations in storage conditions may lead to increased physiological aging and decreased seed performance.

Table 2. Limited-generation certified seed potatoes — terms^a used for seed potatoes from one to eight generations removed from laboratory-tested stock.

	1 ^b	2	3	4	5	6	7	8
Alaska	G1	G2	G3	G4	G5	G6	—	—
California	N	G1	G2	G3	F	C	—	—
Colorado	G1	G2	G3	G4	G5	G6	—	—
Idaho	N	G1	G2	G3	G4	G5	G6	—
Maine	(Maine Potato Board Farm)			G1	G2	G3	G4	G5
Michigan	N	G1	G2	G3	G4	G5	—	—
Minnesota	N	G1	G2	G3	G4	G5	—	—
Montana	N	G1	G2	G3	G4	—	—	—
Nebraska	N	G1	G2	G3	G4	G5	—	—
New York	(Uihlein Farm)		FU1	FU2	FU3	F	—	—
North Dakota	N	G1	G2	G3	G4	G5	—	—
Oregon	N	G1	G2	G3	G4	G5	—	—
Utah	G1	G2	G3	G4	G5	G6	—	—
Washington	N	G1	G2	G3	G4	—	—	—
Wisconsin	(U of W Farm)		FG1	FG2	FG3	FG4	—	—
Canada	PE	E1	E2	E3	F	C	—	—

Source: Certification Section of the Potato Association of America.

^a This table expresses equivalent terms used by various certification agencies for seed potatoes harvested from a series of successive field plantings. For specific criteria relating to disease tolerances and other requirements, the reader is referred to the certification regulations of the state in question.

^b The first field planting utilizes laboratory-tested stocks, which may be tissue cultured plantlets, greenhouse-produced minitubers, stem cuttings, or line selections. Contact agencies for details as to types of stocks planted in their programs.

C = certified; E = elite; F = foundation; N = nuclear; U = Uihlein;

PE = pre-elite; G = generation.

Check for sprouting and mechanical damage

Sprouted seed potatoes may suffer performance problems. Broken sprouts may produce excessive and weaker stems. Look for mechanical damage to the seed. Bruised or damaged seed is an indication of rough handling during harvest and transport, which can cause physiological aging and increased levels of disease.

Inspect for diseases

The presence of several important diseases can be confirmed by visual inspection or determined by a simple test. Time spent performing these inspections and tests may save a lot of trouble after planting.

Fusarium dry rot — Severe infestations of *Fusarium* dry rot can be detected visually, but seed will not be certified if it contains more than 2 percent serious damage by dry- or moist-type *Fusarium* dry rot. Dry rot lesions are fawn to dark chocolate brown, and the rotted tissue remains relatively firm. As the lesions age, the tissues assume a dry, punky appearance and may contain areas that are yellow, pink, or orange (fig. 1). Seedlots without severe visual symptoms may still have the potential to develop this disease.

Dry rot potential can be determined by a simple "bag test." Randomly select 40 to 60 tubers from the seed lot in question to perform this test at home. Cut 20 to 30 tubers with a sterilized knife making seed pieces the same as those made by your seed cutter. Place the cut seed pieces in a large paper bag (like the bags from a grocery store), fold the top over, and shake vigorously for 1 minute. Place the paper bag inside a large plastic trash bag and fold the top over, but do not seal the trash bag. Some air must be able to enter the bag. Keep the bag at approximately 70°F for 3 to 4 weeks.

Cut the other 20 to 30 tubers in the same manner, but after placing them in another paper bag, add the seed piece treatment you intend to use on the seed you will plant. Once again, shake the bag vigorously for 1 minute, place the paper bag in the plastic trash bag, and store as described above.

After the incubation period, examine the seed for *Fusarium* dry rot decay. If the un-

treated seed pieces have *Fusarium* decay, check to see if the seed piece treatment prevented the growth of *Fusarium* on the treated seed pieces. Remember, a seed piece treatment **will not stop** the growth of a pre-existing *Fusarium* infection; it will only prevent the development of new infections on healthy seed pieces.

Soft rot — Soft rot is caused by the bacterium *Erwinia carotovora*. Rotted areas of infected tubers are cream to dark tan with a distinct, dark border between healthy and infected tissue (fig. 2). In the absence of secondary rotting organisms, soft rot has no odor. Rotted tissue is soft and mushy and can be easily rinsed away with water.

Some soft rot may be found in most seed lots, but the level of infestation should not exceed 1 percent. More than this amount could be an indication of potential problems for seed piece decay later. Soft rot potentials can be determined by a test performed by a qualified laboratory.

Rhizoctonia canker and black scurf — Black scurf looks like soil that cannot be washed off. This black material is the sclerotial form of the fungus *Rhizoctonia solani*. On seed potatoes, *Rhizoctonia* sclerotia should not cover more than 20 percent of the tuber surface. Sclerotia are seldom responsible for more than cosmetic damage to the infected tuber but are the source of inoculum for the more damaging canker form of *Rhizoctonia*, which has the potential to cause significant losses. *Rhizoctonia* cankers may girdle underground sprouts, stunting or killing stems, and resulting in poor stands, lower than expected stem numbers, or both. Developing stolons can also be infected, which can lead to lower tuber set.

Bacterial ring rot — Seed certification standards have a zero tolerance for bacterial ring rot caused by the organism *Clavibacter michiganense* ssp. *sepedonicus* (formerly *Corynebacterium sepedonicum*). Advanced infections are characterized by cracking of the tuber skin. Less severe symptoms may be detected by cutting the stem end of at least 100 randomly selected tubers to look for internal vascular discoloration. Tubers with internal symptoms should be sent to a laboratory to confirm presence of the disease because not all tubers with vascular ring discoloration are infected with bacterial ring rot. Other disorders, such as freezing or *Verticillium* infection, may cause vascular ring discoloration.

Silver scurf — Silver scurf is caused by the fungus *Helminthosporium solani* (fig. 3). Silver scurf does not usually cause yield losses, but its presence may result in cosmetic defects, leading to reduced quality in fresh-packed potatoes. Transmission of the disease can occur through seed. Therefore, examination for silver scurf symptoms is recommended to decrease the likelihood of this disease becoming a problem in the commercial potato crop.

Examine certification records

Before making a final decision on a seed lot purchase, examine the seed certification records. Idaho seed certification records can be obtained from the ICIA with the consent of the grower.

Examine the summer field inspection reports, the ICIA storage inspection reports (available in January), and results of the winter grow-out test conducted in California (available in early March). Be sure the seed potatoes have passed a shipping point inspection and are sealed and properly tagged by a federal-state inspector. All transport trucks must be sealed with a metal seal by a shipping point inspector. Verify the certification number before accepting shipment to be certain that the potatoes being delivered are the same ones purchased.

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