OPTIMIZATION OF NUCLEAR SEED PRODUCTION:  
Seed Generations and Potato Crop Productivity

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Most seed potato certification programs in North America utilize a "limited generation" system of seed classification. In a limited generation system, planting stocks for the production of seed potatoes must be derived initially from disease-free aseptically-cultured potato tissue. Certified seed growers are not allowed to propagate this tissue-culture-derived material more than 7 or 8 times in the field. Typically, seed lots are sold off certified seed farms after only 3 to 5 total years of field propagation. The continuous influx of clean material into certified seed programs and the automatic purging of older seed lots together provide a valuable safeguard against the build up of undetected disease organisms.

Some commercial potato growers have reported that they have found "earlier generation" seed lots to be more productive than seed lots that have been propagated additional times in the field. An inference has been made that older generation seed is significantly less productive than earlier generation seed, and therefore generation is an important parameter for evaluating the quality of a seed lot. There is limited support in the scientific literature to support such a claim. The data that are available on this subject are in agreement that seed degeneration with repeated propagation occurs only after many more cycles of propagation than is typical of certified seed on the market today, and only in certain varieties, most of which are of relatively limited commercial significance. My own three-year series of studies on seed generation with seed lots propagated at the State Farm in Rhinelander conclusively demonstrates that seed quality of some varieties can be maintained at the high initial levels associated with "early generation" seed for at least 7 years in the field. Not only were Red Norland and Superior yields comparable among generations, but also quality factors such as tuber size distribution, specific gravity and chipping properties were found to be unrelated to seed generation.

Thorough evaluation of the data I have collected on yields and quality of Atlantic have recently suggested a different conclusion about the effect of advancing generations with that variety. Averaged across five studies, yields of Atlantic seed lots three and four years in the field yielded 27 cwt/A more than seed lots five and six years in the field. What makes interpretation of these data particularly difficult is that in all five studies, yields and quality factors of Atlantic seed lots seven years in the field were back up at the high levels of the earliest generations.

My experiments concur with the scattered reports in the scientific literature that seed generation probably is not a significant factor in determining yields and quality of most important commercial potato varieties. However, there may be some varieties, like Atlantic, where a grower may need to consider the number of years a seed lot has been propagated. How can this be determined? While limited generation nomenclature varies among North American seed certification programs, there are tools available to seed buyers that make comparisons between states more straight-forward. The Certification Section of the Potato Association of America has put together a document called the Limited Generation Certified Seed Potatoes Field Planting Equivalency Table that makes it easy to determine, for example, that a seed lot classed as G-3 in North Dakota has been grown actually four years in the field. A seed lot from a Wisconsin grower that we have classed as G-3 has been field grown five times, but two of those generations were performed at our State Farm.
Buying the best quality seed

Seed generation may or may not be an important consideration for evaluating seed quality, but it certainly should not overshadow those factors that clearly are significant in determining seed quality. I'd like to offer the following recommendations as time-tested means of buying the best quality seed.

1) Buy only certified seed potatoes. Certified seed regulations are now fundamentally similar between programs in North America even though terminology and details of implementation may differ. Use of the Limited Generation Certified Seed Potatoes Field Planting Equivalency Table can help you in evaluating seed from different sources.

2) High-quality seed growers have reputations for running efficient, clean, and technologically advanced operations. Determining a seed grower’s reputation requires asking a lot of questions of other growers. Extension meetings are good places to gather information, but there’s really no substitute for acquainting yourself with a seed grower’s operation and the unique quality-enhancing aspects of his production scheme such as the use of basic seed stocks from the University of Wisconsin Elite Seed Potato Farm in Rhinelander.

3) Buy seed from farms where sanitation and separation of seed lots are scrupulously maintained. It is a very good idea to visit your seed supplier to assess for yourself how much attention he pays to details like cleanliness in his operation.

4) Buy seed where potato handling equipment is designed and maintained to minimize physical damage, which should also reduce opportunities for pathogenic organisms to get established and spread. Some of these organisms may infect subsequent generations of seed and cause quality losses if they are not controlled. Ask seed suppliers about the efforts they are making to reduce bruising. If they are unable to tell you about the details of their strategy, they may not be paying enough attention to what’s happening on their farms.

5) Buy seed only from seed farms where storages are well designed to minimize the effects of physiological aging during storage. A poorly stored lot will never perform better than a well-stored lot, even if it is an earlier generation. A visit to the seed grower’s farm, again, is especially valuable for assessing the likely quality of his seed.

6) Commercial potato growers should prepare to minimize their contribution to the degeneration of seed quality by being ready to receive it when it arrives, and giving it the care necessary to maintain that quality prior to planting. Poor handling practices on their operations can negate any benefits they might receive from procuring high-quality seed. Seed shipments should be received into a sanitized storage location, and equipment that comes in contact with it should be well padded and clean. Gentle handling techniques should be used to minimize tuber wounds because these provide opportunities for the entry of potato pathogens. Ramming into a pile of seed with a Bobcat or other front-end loader to transfer it to your cutter is not an example of gentle handling.

To summarize, knowing as much as you can about your seed supplier is the best way to ensure that you will obtain the highest quality seed year to year. If you buy certified seed from a progressive seed grower with a good reputation, and you do what you can to minimize quality losses prior to planting, the generation designation of the seed you buy probably will not play a significant role in determining how well that seed will perform for you.