

Syngenta Seedcare

Best Management Practices

1. Know YOUR seed.

- The condition of a seed piece can have an effect on its ability to perform. It is important to have an understanding of the physiological age, condition, disease spectrum and characteristics of a specific batch of seed and variety.
- Before receiving seed, all machinery, transport and storage surfaces that the seed will contact should be cleaned and disinfected. Use labeled disinfectants.

Consider the condition of the seed:

Severely sprouted seed

All liquid potato seed treatment labels state that treatments should not be applied to severely sprouted seed. Often the sprouts break off during or after treatment, which results in an untreated area of the seed piece. When these sprouts break off, the exposed area or the stub of the broken sprout does not suberize like a cut surface of the tuber, and as a result, the wound is more susceptible to disease.

Controlling physiological age

While dormancy and physiological age are considered separate issues, growth and storage conditions that influence physiological aging can also influence dormancy.

- **Growing conditions of the seed crop** – Any condition that places the growing seed crop under stress causes physiological aging of the seed. Low moisture, high temperatures, inadequate fertility, frost damage and disease pressure may cause stress and consequently age the seed.
- **Bruising of seed tubers** – Bruising increases the respiration of the seed, which accelerates the aging process. It can also create an entry point for pathogens. It is always best to minimize any drop of seed - whether it's whole seed or cut seed. A simple drop of more than 15 cm (6 inches) is enough to create significant bruising in cut seed.
- **Seed storage temperature** – Seed held in storage at a constant 3-4°C at 90% relative humidity (RH) will age slower than seed held at higher temperatures or in fluctuating temperatures.
- **Cutting operation** – The wound healing of smooth cuts requires less energy and a lower respiration rate than cuts made with dull blades.

Disease spectrum

Research by Dr. Rick Peters, Agriculture and Agri-Food Canada, has found some *Fusarium* spp. resistance to fludioxonil and thiophanate-methyl in different potato growing areas of Canada. Careful consideration has to be made when selecting a seed piece treatment for potato seed.

Seed treatments do not affect the physiological condition of the seed.

The Syngenta logo, featuring the word "syngenta" in a lowercase, sans-serif font, with a stylized leaf icon above the letter 'i'. A registered trademark symbol (®) is located to the upper right of the word.

Any of these factors could ultimately impact the performance of the seed. Thus it is very important for growers to start each year with as much understanding and information as possible. This level of understanding will help to choose the right products and implement the best practices.

Regardless of whether a seed treatment is used or not, different seed will have inherent differences in how it heals. As part of gaining as much understanding of the seed on the farm as possible, a batch test can be performed on a sample of the seed. The aim of the batch test is to see how each seed variety and lot received on the farm responds to the seed treatment selected.

- Examine the seed prior to testing to understand physiological age, condition, any disease levels and other characteristics inherent to a grower's seed.
- Batch test using approximately 40 seed tubers in 4 replications (sample seed from different areas of the received load).
- Cut seed to 2 to 2.5 ounces (i.e. 56-70g) with a maximum of two cut surfaces per seed.
- Always treat as recommended by the manufacturer. Decide if an inert dust should be applied.
- Store in cool dry place at 10°C with plenty of air (oxygen) and high humidity (95%).
- Generally the desire is to try to replicate the same system used on a particular farm. Therefore a grower should take his own practices into consideration.

Examine the seed after two weeks in storage. If the seed is showing good signs of healing then consider proceeding with the treating of other seed following best management practices.

The following is a discussion of the best management practices once a batch test is complete.

2. Application Guidelines

For Syngenta liquid Seedcare™ products, we suggest using a recommended enclosed treater. This allows a grower to capitalize on a preferred application method and encourages thorough coverage through atomizers and seed to seed rubbing and cushioning during liquid seed treatment application. For seed treatment products of other manufacturers, look to the manufacturer's label for treatment equipment recommendations.

Volume of Slurry: Always follow labeled rates. When adding another component ensure that it's compatible and done so in accordance with the label rates. Be sure to maintain recommended slurry volumes. Also ensure that equipment is properly calibrated and that treater, knives, and any equipment touching the cut surface are disinfected from time to time and between different sources of seed received. Be sure to maintain label rates of products and ensure good coverage of the slurry on the entire amount of seed that is being treated. Potatoes should be completely covered with no excess moisture.

Dust after liquid application: Use of an inert dust is one factor which may improve conditions with suberization. Inert dust may also improve conditions for suberization in varieties that are inherently low in specific gravity or 'high water content' seed, in higher humidity treating environments, and when planting into wetter soil conditions.

3. Encourage suberization

Wound healing is a natural process that is influenced by **temperature, humidity and availability of oxygen**. When a potato tuber is cut, it undergoes a three-stage wound-healing process. First, lignin, a woody polymer, is deposited between the cells. Next, suberin, a waxy polymer, is deposited over the exposed area. Lignin and suberin act as a first line of defense against infection and protect that area of the seed piece from drying out. The third step actually creates new kinds of cells, phellem, below the suberin. As these new cells begin to form, their starch is depleted and their cell walls thicken, resulting in brick-like layers of cells. Phellem is the final stage of wound-periderm formation. It's only at the completion of this stage that the "skin" is fully restored to its original protective capacity.

Humidity is one of the requirements for suberization; however the presence of free moisture can also impede wound healing. Ensuring that the slurry volume is accurate, avoiding treating in high humidity environments, preventing condensation, applying an inert dust after liquid application, and using auxiliary fans are all incremental steps a grower can take to contribute in removing small amounts of excess moisture.

Additionally, you can give your seed pieces better opportunity for suberization by implementing the following:

- Calibrate knives – no more than two cut surfaces
- Conduct a batch test as described earlier
- Treat seed in temperatures $>7^{\circ}\text{C}$ to avoid shatter
- Use clean water
- Disinfect equipment from time to time using labeled disinfectant and allowing it to work for at least 15 minutes

Soil conditions are also an important factor. Potato seed pieces need oxygen for healing in the soil. Hard pans in soil, or in and around the planting furrow have very poor available oxygen, and planting into such soil will slow the suberization process. This problem is exacerbated when the soil is wet, poorly drained and less than $<7^{\circ}\text{C}$. This problem may be more pronounced in heavier clay soil types. Poorly drained soil with hard pans increase the chance of seed decay due to poor wound healing. Liquid seed treatment cannot fix this problem. Therefore, make sure to prepare the soil well with ample airspace around the seed piece and ideally, with complete absences of soil hard pan anywhere near the placement of seed. Do not plant more than 8 inches deep in heavy or poorly drained soils. If planting seed shallower, for example 3-4 inches from the top of the hill, with 4 inches of non-hard pan layer below, consideration should be given to re-hilling the rows at emergence to prevent sun exposure of the developing tuber potatoes.

Another factor that plays into suberization is the decision to store treated seed or to plant it right after treating.

In a cut/ treat and plant scenario, the soil environment will have the most impact on wound healing.

- **Soil drainage** – The cut-treat-plant approach works best in sandy soils. Dry sandy soil will help in suberizing the seed piece. Applying an inert dust can also help to work with the soil environment to provide an improved overall environment for healing. Heavier soils that tend to hold water may result in seed decay and delayed suberization.
- **Timing** – The first 36-48 hours after cutting are important to wound healing. Apply a seed treatment soon after cutting to prevent the pathogens from gaining entry and help the seed to naturally heal the cut surfaces. Plant into moist, but not wet, soil. And, look at the forecast for warm weather with dry workable conditions and no immediate threat of wet weather.
- **Soil temperature** – Generally, ideal soil temperature for planting is between $10-12^{\circ}\text{C}$. In the maritime provinces of Canada, however, it is preferable to plant when the temperature is above 12°C . Different types of soil will warm differently – heavier or clay soils will warm more slowly than sandy soils. It is recommended that the seed temperature be as close to the soil temperature as possible to avoid sweating. Planting in either hot or cold soil wetter than 70-80% favours bacterial seed piece decay.
- **Planting** – In the cut/treat/plant scenario, plant the same day as you treat. Do not plant more than 8 inches deep in heavier soils or poorly drained soils. Depending on seed type, consider planting seed shallower but also consider that the grower may need to re-hill after emergence to avoid sunburn.

If all conditions are favorable it is preferable to cut/treat and plant, however it is very often that weather, equipment or operational issues may mean that growers need to cut, treat and store seed. Cutting and treating seed allows a grower to plant when conditions, such as the weather, soil condition, etc., is more optimal. Plus, pre-cutting enables cut seed to suberize prior to planting. However, it is important to ensure that the seed is stored in a manner that allows proper suberization.

- **Seed treatment** – Treat immediately after cutting. Seed can be stored for a reasonable period of time but we do not recommend storing the treated seed for more than two weeks.
- **Storage temperature** – $10-11^{\circ}\text{C}$ is ideal for storage after cutting.

- **Storage humidity** – 80-90% RH without any free moisture on the seed.
- **Storage ventilation** – Uniform air movement through every part of the pile is a must and should move at approximately 0.5 cubic ft/minute. Do not store treated seed in trucks. We do not recommend storing in boxes unless you are familiar with the requirements to maintain proper air flow and the proper storage environment for your seed while using boxes. Do not use air from a CIPC system or air from storages treated with CIPC.
- **Storage duration** – Store for long enough to initiate wound healing (usually 3-4 days after treatment). Storage for 7-10 days will allow optimum performance. Do not store treated seed longer than two weeks. In all cases, and at all times, handle seed with care, particularly while it is undergoing the suberization process.
- **Excessive sprouting** – Avoid storing pre-cut seed that is excessively sprouted (sprouts that are more than 1 inch or longer). Sprouts break off at planting and leave an entry point for infection.
- **Piling** – Pre-cut seed should not be piled over 1.8 m high.

There are a lot of factors that come into play and the best course of action is always the one that takes into consideration a grower's seed, operations and the environment.

This document combines the understanding of our chemists, biologists, field experts and local sales representatives. Please note that the information provided here are only a guideline and not a comprehensive or definitive view of all of the elements of crop establishment.