Guidelines for Seed Potato Selection, Handling and Plantin

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A major limiting factor in profitable potato production is disease, which can be seed-borne, soil-borne, or both. Vegetative pro transmission of many yield-limiting diseases caused by fungi, bacteria, viruses and nematodes. Total control of many of these necessary.

The seed potato industry and associated certification system with visible disease tolerances was formed as one strategy to mi verify varietal purity, the process also minimizes disease in seed potatoes by establishing disease tolerances. Planting certifie example, the bacteria that cause ring rot and blackleg can often be present but in a latent condition (that is, not causing outw *Helminthosporium solani* may also be on or in the seed tuber. Viruses are invisible to us and may be present but undetected. impact on the performance of the seed lot, including the spread and expression of disease in the crop and the resultant quali in selection, handling and planting of seed lots for the buyer of seed potatoes to help maximize production of a healthy and h

Selecting Seed

Purchase certified seed. You can be assured that such seed conforms to guidelines of varietal purity, field inspections, and d year-out-seed, culls, oversize or seconds may lead to problems. Ask about the pedigree of the seed; where did it originate, h reports, storage inspections and results of winter grow-out tests in Florida, California, or other southern grow-out areas. Pay p on field inspection reports.

If possible, make a personal visit to seed growers you are considering purchasing seed potatoes from. Note the general appe well-ventilated storage with high humidity but no free moisture, free from visual disease, and not excessively sprouted. Ask if protect from Fusarium dry rot. Ask if seed has been treated with Ridomil in the field to protect it from pink rot and leak (water be aware this disease could be present. Call or write the state certification agency for seed lot records from the past season; Lab at NDSU, offer testing services of seed lots for diseases and pathogens for a fee.

Examine Seed for Disease

There are several diseases to watch for and some simple tests to help evaluate seed lots for disease.

Virus Diseases

Certification readings are the best gauges of virus content. Virus symptoms are generally not visible in tubers, except fo
Some varieties, notably Shepody and Russet Norkotah, do not readily express visible mosaic symptoms, and virus can b
for PVY mosaic in these varieties, either in the production or winter grow-out fields. Such tests are routinely used for PV

Rhizoctonia

The black scurf stage on the tubers should not exceed 5% of the tuber surface (Figure 1 – 47KB color photo). Coverage
disease is most active in cool soil and causes damage by pinching off the developing sprouts, which must regrow. This

Fusarium Dry Rot

The seed should not have many tubers with symptoms of Fusarium dry rot (Figure 2 – 86KB color photo). A 1 to 2% lev
regulations allow 1% dry rot at shipping. *Fusarium* inoculum on tubers without dry rot can be determined by cutting 20-3
Read dry rot after 10-14 days incubation at 50-60°F in high humidity. This will indicate the potential for Fusarium seed
years, many isolates of *Fusarium sambucinum* (synonym = *F. sulphureum*), the agent responsible for dry rot, from throu
active ingredient in Mertect, resulting in reduced disease control. A modification of this test to determine resistance is to
boxes.

Bacterial Ring Rot

Look for external symptoms of cracks in the skin (Figure 3 – 59KB color photo); cut the stem end of suspect tubers for i
stem end of 100 or more tubers selected at random and look for characteristic ring rot discoloration in the vascular ring
disorders (freeze injury) may resemble ring rot, squeeze suspect tubers and look for cloudy bacterial ooze from the vasc
confirmation of ring rot. Do not use seed lots known to be infected with ring rot; seed lots with ring rot are not eligible fo
without causing symptoms for up to two years, and may be at such a low incidence as to avoid detection during visual i
ring rot bacteria. This testing can be done at the Seed Health Testing Lab at NDSU for a fee.

Soft Rot/Blackleg

If more than 1% of the tubers show symptoms of soft rot or tuber blackleg (Figure 4 – 61KB color photo), seed may hav
rot and wet seedpiece decay and can be latent. Because *Erwinia* can reside in the lenticels of the tuber, the number of
potential for seed decay. This can be determined by wrapping 40-50 tubers in wet paper towels, and plastic wrap over th
per tuber with a toothpick prior to wrapping. Soft rot should be odor free, mushy and wet but not sticky and stringy. A st
not be scored. These tests will indicate the potential for soft rot seed piece decay if conditions are favorable for decay. F
than 50% tuber soft rot. If handled properly (see seed handling and planting recommendations), acceptable stands and
most important consideration for reducing soft rot in the seed.

Verticillium and Fusarium

These two fungal pathogens can cause wilt and early dying. They are easily visible as vascular discoloration in the stem
is not as important as inoculum on the surface of the tuber or in the soil. For the Red River Valley, the amount of *Vertici*
wilt that results in the field. However, tuber borne inoculum does act as a source of *Verticillium* that will contaminate the

Scab

This disease, caused by soil borne *Streptomyces*, is soil borne. Infected seed serves to introduce the scab organism int
infection comes from scab in the soil, not the seed tubers. Excessively scabby seed is unattractive (Figure 6 – 54KB col

Silver Scurf

This is primarily a seed-borne disease, although low levels of inoculum may survive in the soil from one season to the n
in reality, most seed lots have some silver scurf, and the disease may not be observed because many silver scurf lesion
patches on the skin of the potato, primarily at the stem end (Figure 7 – 48KB color photo). The fungus causing silver sc
planting and moves to progeny tubers during the growing season. Silver scurf-affected tubers are sources of inoculum i
temperatures. Selection of disease-free seed is desirable, but impractical. The use of seed treatment fungicides is a bet

Late Blight

Presence of late blight in seed can be serious and lead to epidemics later in the season. Late blight can overwinter in in
33KB color photo), and, if cut about 1/4 inch deep, as granular rust colored areas internally (Figure 9 – 36KB color phot

act as one source of blight in the field when planted. Greater than 90% of late blight affected seed tubers decay due to that grow can start an epidemic under favorable conditions. Preliminary research has shown that late blight can be spre Seed treatment fungicides have been shown to reduce this infection. Federal regulations allow 1% late blight at shippin confirmation. Late blight free seed is the best option.

Early Blight

This is a soil-borne disease caused by Alternaria *solani* and is sometimes found in seed lots. It is not considered a seed emergence problems due to secondary soft rot and dead eyes.

Nematodes

Generally not a serious problem in the Red River Valley. However, certain areas may contain nematodes and more surv nematodes should not be planted. Planting of nematode infested seed can be the initial source of field infestation which

Pink Rot and Leak

Most seed affected by these diseases, collectively called water rots, usually decays during the storage season and does removed at grading and not planted. Affected seed is watery and has a pink to charcoal black discoloration. Application excellent control of these diseases.

Prepare to Accept Seed

After you have selected the seed, agreed to a price and scheduled a delivery time, your storage should be prepared to accep your seed will perform. Do not store seed in a storage where sprout inhibitors such as CIPC have been used **unless** the entir thoroughly cleaned. The seed house must be thoroughly cleaned and disinfected to eliminate carryover of disease causing or are capable of surviving freezing temperatures. Clean out all major trash (tubers, vines, dirt, broken boxes, old bags, etc.) and in a pile (cull pile). A cull pile is a potential source of many diseases (soft rot, ring rot, late blight, viruses). Instead, burn, chop

Disinfect

After a rough cleanup, thoroughly wash the storage bins, walls and floor with hot soapy water using a high pressure washer a disinfectants must be in contact with the surface to be disinfested for a minimum of 10 minutes to kill bacteria. A foaming age as on a wall, for 10 minutes. Table 1 lists disinfectant groups commonly recommended and some of their characteristics. The disinfectants are effective when used properly at the high label rate.

In addition to the disinfectants in the table, live steam can be used to sanitize. The temperature of the steam contacting the su condensed water vapor with colorless steam. Condensed water vapor (clouds) may be at less than the required temperature. seconds for dried bacterial material. Steam must be used properly to be effective. Do not rush steam cleaning. Steam may be for high temperatures and small surface area covered with the steam appliance.

Following any of the disinfection procedures, rinse well with cold or hot water, remove excess water, replace equipment and r such as copper-8-quinolinolate, which is fungicidal and somewhat bactericidal. Do not use creosotes or coal tar since they ha

Seed Handling

A separate storage or bin(s) should be available for incoming seed. Keep lots separate if possible. When the seed arrives, ins and tags. Be sure it has not been damaged or frozen in transit. Store the seed in cool (40-42°F), well-ventilated bins at 85-9 breaks in the tuber skin may act as entry sites for disease. **Bruising of the seed during handling is the main factor causin** planting to lower the reducing sugars and give the sprouts a head start on growing. The recommended temperature is 50-55° healing process. The warming time varies depending on cultivar, but avoid excessive sprouts, which can spread disease durin

planting, but in practice this may result in excessive decay from bacterial soft rot and Fusarium dry rot. Precut seed should be for drying and wound healing. This practice is beneficial for cultivars such as Nooksack and Atlantic, which have erratic emerg

Cutting

Use a clean disinfected cutter. Seed cutters with "open cell" sponge rollers that can absorb water can also absorb ring rot ba killed by disinfection procedures. Therefore, use of cutters with water impermeable (closed-cell) sponge rollers is recommend of about 2 ounces. Clean and disinfect cutting equipment, preferably each day and definitely between seed lots. This will red seed (at least spot check) for disease - especially ring rot. If ring rot is discovered, the seed lot should not be planted. Remov facilities. Provide workers with disinfectants and wash facilities to prevent bacteria from entering the seed cutting area. Dip pa better to keep a pair of rubber boots soaking in disinfectant and change boots when entering the warehouse. Provide workers

Planting

The three main points of planting are: 1) get good seed, 2) handle it carefully, and 3) use cultural practices that encourage qu seed potatoes will minimize disease and maximize emergence and stand:

- seed and soil should be the same temperature; 50°F is optimum
- avoid wet, soggy soils
- handle seed gently
- do everything possible to encourage quick emergence
- plant shallow and hill plants as they emerge

Seedpiece decay (SPD) can be a major problem in some years in all production areas. The two major causes of SPD are bac capable of causing SPD. *Fusarium* SPD tends to be dry, slow-moving decay whereas *Erwinia* SPD tends to be a wet, fast-mo the vascular system of the plant causing wilt and blackleg

Fusarium decay in the field is favored by a wide range of temperature and moisture conditions. Because this pathogen needs Seed containing *Fusarium* dry rot in storage will continue to decay when planted.

Most seedpiece decay is caused by *Erwinia* bacteria. *Erwinia* seedpiece decay (SPD) is favored by cool, wet weather. The coo which is very sensitive to drying. Excess water also inhibits resistance of the potato to disease. *Erwinia* can enter not only thro (breathing pores) of the tuber. When conditions of low oxygen occur in the field (wet soil), the bacteria become active and car from stem cutting programs, contain *Erwinia* bacteria in the lenticels. In a sense, bacterial seedpiece decay is a disease waitir

There are two important factors that affect SPD: 1) the quality of seed - how clean (disease-free) the seed is, and 2) the envir principles, the following planting recommendations have been formulated for control (or at least partial control) of SPD.

Treat the seed with a recommended seedpiece treatment chemical. There are many chemicals available - experience and the use. Do not use thiabendazole compounds (TBZ, thiophanate methyl) as a seed treatment if Mertect has been used on the s addition to prior treatment may cause abnormal sprouting disorders, such as tuber formation on the seed pieces instead of sp contain captan, thiophanate methyl, mancozeb, bleach and fludioxonil, or mixtures of these compounds. Except for bleach, a pathogens *Fusarium coeruleum* and *sambucinum*, *Helminthsporium solani* and *Rhizoctonia solani*. In recent years, many isola fungicides commonly used as seed treatments (thiabendazole and thiophanate methyl). Seed treatments containing these co disease caused by resistant strains of these fungi.

The inert ingredients, or carriers, are part of the seed treatments and may play a role in seed treatment performance. Bark ca than mineral carriers such talc, gypsum or clay. The mineral ingredients may trap water, becoming gummy and cutting off oxy seedpiece treatments are fungicides. None of the treatments will affect lenticel-borne *Erwinia*. However, because *Fusarium* in control blackleg. None of the treatments affect fungi (especially *Fusarium*) already in the seedpiece. They affect only pathoge

Seed treatments can be used going into storage, at the time seed is removed from storage, or at cutting time. Application time control. The usual application time is immediately after seed cutting; consult the product label to determine timing of the seed application of seed treatment fungicides, but more work is needed in the area of fungicide application for dust control and cor

Blackleg can be minimized in a seed lot containing up to 50% of the tubers infested with Erwinia by bruise avoidance, warmin emergence and establishment on their own roots.

If all these recommendations are followed, the seed you bought has a better chance of performing as you think it should. Rer recommendations should be combined in an integrated approach with the goal of minimizing losses to disease and maximizir

Table 1. Disinfectants commonly recommended for potato handling equipment

Disinfectant	Inactivated by organic matter	Inactivated by hard water	Corrosive to metal	Safety	Recommended concentration for use	Recommended exposure time	Shelf life	Comments
Quaternary ammonium compounds	Some	No	Slight	Use caution (see comments)	Label directions	10 min	1-2 yr	Diluted disinfectant relatively safe, concentrated form is poisonous. Stainless
Hypochlorites (5.25% bleach)	Yes	No (except iron)	Yes	Irritant, caustic	1:50 (0.1%) or 1:200 (see comments)	10 min	5.25% bleach stable 6 mo. at room temp.	Quick acting, inexpensive; caustic to skin and clothing. Use at 1:50 when mixing with water only. Is more effective at pH 7-8 than at normal pH of 10-11. For maximum effectiveness, use 1 part 5.25% bleach: 200 parts water, 0.6 parts white vinegar. Gives concentration of 256 ppm.
Iodine compounds	Some	No (except iron)	Yes	Relatively safe. Use caution.	Label directions	10 min	1-2 yr.	Do not take internally. No longer effective if it loses Yellow-brown color.Tamed iodophor compounds work best.
Phenolic Compounds	Some; not greatly	No	No	Oral poison. Use caution.	Label directions	10 min	1-2 yr	Provides residual action. These have name "phenol" on label of ingredients.
Chlorine Dioxide	No	No	No	Non-toxic	Label directions	10 min	2 wks when mixed. 1-2 yrs in separate containers.	Use potentiated form by mixing base + activator. Broad spectrum activity against viruses, fungi, and bacteria; does not produce THM.

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