

# *BMP Potato Seed Management*

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# The basics of good seed

- These basic best management practices should be followed whether you use a seed treatment or not, and whether you use a dust or a liquid
- Start with good seed
- Seed treatments cannot turn poor seed into good seed (perform miracles) or rescue poor seed

# Many factors affect seed performance

- Variety – number and distribution of eyes, dormancy
- How it was grown - planting date, rainfall, location
- Diseases
- Storage – temperature, humidity, duration
- Transport – temperature, air, time
- Handling – in and out of harvest
- Chemical treatment **ONLY ONE FACTOR**
- Cutting – cutter, blades, size
- Planting – soil moisture, temperature, soil type, depth
- Weather

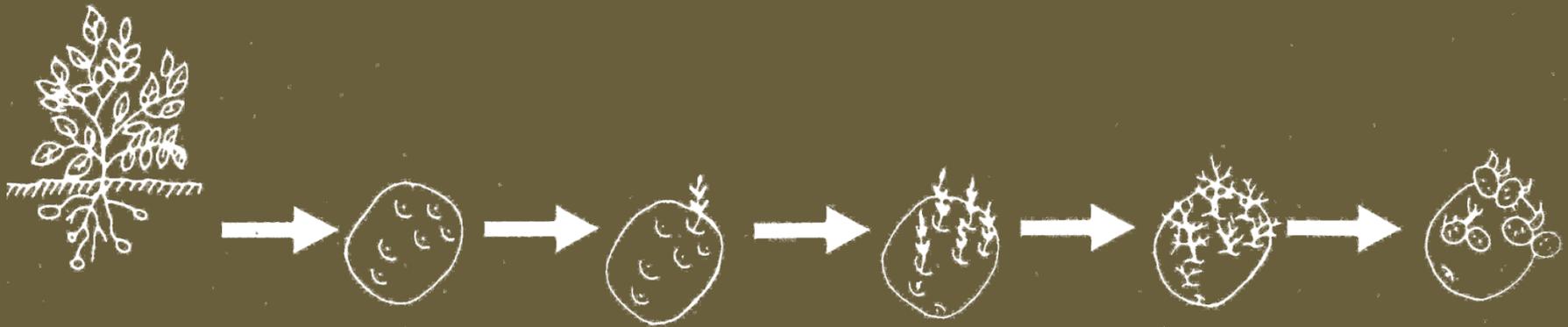
# Ideal Seed

- Ideal seed has been grown in a good field free of disease in an area with northern grown vigor
  - Long days, cool nights, plenty of food (fertilizer) and water (irrigation) and
  - Passed certification –mosaic, BRR
  - Free of diseases: late blight, mosaic, bacterial ring rot, Rhizoc, powdery scab, others
  - Vine killed
  - Handled gently during harvest
  - Stored cold 2-4°C (34-38°F)
  - Physiologically the right age

# Physiological Age

- Physiological age is a measure of stress, health and metabolism, not time
- Influenced by the growing environment and handling of the seed
- Storage conditions:
  - Temperature
  - Moisture
  - Maturity
- More heat, handling and stress increase physiological age of the seed
- Implications of physiological age:

# Physiologic Age and Stages of Sprouting



**Tuber  
Initiation**

**Dormant  
Tuber**

**Apical  
Sprouting**

**Multiple  
Sprouting**

**Hairy  
Sprout**

**Little  
Tuber**

**No Plant**

**Single Stem  
Plant**

**Multi-Stem  
Plant**

**Weak, Bushy  
Plant**

**No Plant**

**Produces  
A Few  
Large Tubers**

**Large Set  
of Smaller  
Tubers**

**Low Yield**

# Buy The Right Seed

- The seed lot has been selected that is the
  - Right variety for the right market
  - Physiologically young
  - Free of disease
  - Stored properly

# Examining Seed for Disease

- Viruses; field readings, can't see mosaic in storage
  - Some necrotic viruses visible: necrotic PVY strains, leaf roll, TRV, mop top
- Rhizoctonia - less than 5% of tuber surface
- Fusarium 2%
- Bacterial Ring Rot 0%
- Soft Rot 1% or less
- Verticillium or Fusarium; minimal
- Powdery scab; none but an emerging issue
- Scab; soil inoculum more important than seed
- Silver Scurf; seed borne inoculum most important
- Late blight zero, 1% tolerance in US

# Handling Seed

- Temperature
  - Protect from low temperature (freezing) exposure
- Sanitation
  - Clean and disinfect all trucks and handling equipment.
- Handling
  - Manage loading to prevent cuts and bruising
    - Seed bruise/damage #1 cause of seed decay due to bacterial soft rot
    - No bruise 5% rot, bruised seed 65% rot
  - Increased handling increases aging

# Transporting Seed

- Load seed gently
  - Seed is cold and bruises easily
  - Bruises are entry sites for disease –soft rot, Fusarium in transit
  - Do everything to prevent damage, ie, sawdust on truck floor
  - During transport
    - Continue to warm gradually
    - Provide fresh air
    - Educate the driver

# Unloading seed

- Gently, avoid injuring seed –same reasons
- Most seed is stored, even for a short time prior to cutting
- After unloading, the most important consideration is to provide conditions favorable for wound healing to heal wounds that occurred during loading, transport and unloading

- Wound healing
  - Prevents desiccation
  - Prevents pathogen entry
    - Bacteria and Fusarium need wounds to enter
  
- Conditions for wound healing
  - High humidity
  - Temperatures 50-55°F (10-12°C)
  - Plenty of O<sub>2</sub> (air)
  
- Time
  - 3 days enough to stop Erwinia soft rot
  - 14 days needed to stop Fusarium
  - 21 days needed for new periderm
  
- Pile newly arrived seed out of direct sun and weather, no more than head high (about 6 ft) , provide humidity and oxygen and continue to warm the seed gradually to 10°C/50°F

# Seed Diseases and Seed Treatments

- Emergence and stand problems can be caused by diseases and these are seed treatment targets
  - Pectobacterium (Erwinia) carotovora soft rot
  - Fusarium dry rot
  - Rhizoctonia sprout girdling
  - Silver Scurf
  - Late Blight
- However seed treatments do not control/manage/reduce/suppress Verticillium, common scab, powdery scab, or ring rot
- If, then

# If, thens

- If you have seed free of disease, or don't care about seed disease, then you may not need a seed treatment
  - Can just cut and plant or use a bark seed dressing to manage cutting juice, dry the seed, favor wound healing, and facilitate good seed flow
    - Do not contain a fungicide
  - Could also pre-cut; cut and store cut seed for some days before planting
    - Allows wound healing, begins sprouting, helps foster even emergence of varieties that have strong apical dominance
    - Don't pile too high, provide plenty of air for wound healing
  - Some seed is not cut

# What do you do if you have to Pre-cut seed?

- Ensure that all wound healing requirements are met
- Make sure you apply a suitable seed treatments, including liquids
- **DO NOT USE MANCOZEB SEED TREATMENTS**  
**if you plan to pre cut and store seed**



# More if, thens

- If disease control on seed is important/necessary, then you may want to consider a seed treatment with a fungicide
- However, the most common cause of poor stands and emergence is bacterial soft rot
  - Caused by *Erwinia* (now *Pectobacterium*) *carotovora*
- Seed treatments, whether dust or liquid do not directly control bacterial seed decay but indirectly can increase bacterial seed decay if not used correctly

# Soft rot seed decay



- Seed borne in lenticels or wounds
- Bacteria in all surface waters
- Enter through lenticels or wounds
- Decay during wet conditions
- Worse under warm conditions
- Blackleg can follow
- No chemical control

# Bacterial seed decay

- If air is cut off from the seed by a film of water preventing it from breathing, soft rot decay from the lenticel-borne bacteria will begin and develop quickly; the warmer the faster
  - Both liquid and dust treatments can exacerbate soft rot seed decay if applied improperly
- If cut seed is too wet from a liquid seed treatment, and is planted in wet soil, soft rot decay can result
- If cut seed is treated with a dust containing a hydroscopic substance such as MZ or talc is planted in wet soil, the dust may absorb water, cutting off air and soft rot seed decay can result

# BMP for managing soft rot decay

- Apply liquid seed treatments at ULV to avoid excess water
  - Recommended volume 0.5 gal/T
- Best to use a calibrated machine to apply liquids to insure thorough coverage and right volumes
  - One of the BMP challenges is finding the right equipment to provide recommended coverage volume
  - Examples: Milestone barrel treater, MAFEX spray unit
- Allow treated seed to dry
- Don't plant into wet soil

# Post-harvest spray application volumes



Dry and 1.05ml/kg  
Dry and 0.25 gal/T



Dry and 2.1ml/kg  
Dry and 0.50 gal/T



Dry and 4.2ml/kg  
Dry and 1.0 gal/T



Dry and 8.4ml/kg  
Dry and 2.0 gal/T

# More if, thens

- If managing Rhizoc, Fusarium or silver scurf is important, then a seed treatment should be considered
- All are seed-borne, at least in part, and seed treatment is an important part of an integrated management plan

# Rhizoctonia

- Survives as sclerotia on seed and in soil
  - Seed inoculum -stem girdling
  - Soil inoculum -stolon girdling
- Seed inoculum grows with sprout and causes pre- or post-emergence stem decay
- Manage by clean seed, rapid emergence, seed treatment



# Fusarium dry rot



- Seed- and soil-borne
- Slow decay and weak plants
- Manage by clean seed, seed treatment
- Controlling FDR indirectly controls Erwinia soft rot decay

# Silver scurf



- Most important blemish disease of table stock potatoes, especially reds
- Infection occurs in the field and can spread during storage
- Seed-borne
- Requires multiple tactics to reduce disease
- Rotation, sanitation, clean seed, short time between vine-kill and harvest
- Seed treatment an important management strategy



# Liquid seed treatments

- Liquid seed treatments are active against all three of these pathogens and reduce disease caused by them
- In the US and Canada two liquid seed treatments registered
- Both are combinations of two fungicides and a systemic insecticide
  - Titan Emesto Silver (Bayer) registered only in Canada
    - Penflufen + Prothioconazole + Clothianidin
  - Emesto Silver registered in US
    - Penflufen + Prothioconazole
  - Cruiser Maxx Extreme (Syngenta)
    - Fludioxonil + Difenoconazole + Thiamethoxam

# More of the story

- The penflufen part of Emesto is an SDHI fungicide; in lab and field trials we have conducted with three SDHI compounds in 2013, none of them have good activity against Fusarium
  - The SDHI fungicides do have good activity against Rhizoc in field trials
  - The SDHI fungicides do have activity against silver scurf in lab trials
  - In field trials we conducted at Becker in 2013, none of the SDHI fungicides or any other fungicides we tested as seed treatments suppressed tuber black dot at harvest
- Resistance to the fludioxonil part of Cruiser has been reported in several Canadian provinces and MI
- Consequently, in both Emesto and Cruiser, it is the triazole fungicides prothioconazole and difenoconazole that is doing the work to suppress Fusarium
  - Remember managing Fusarium indirectly helps manage soft rot seed decay

# Even more

- Importantly, neither Emesto or Cruiser have activity against the spread of late blight during cutting,
  - Only MZ and Reason seed treatments can reduce spread of late blight
    - Reason seed treatment only registered in Canada

# Liquid ST BMP's

- Use as necessary
- Different mind set than using dusts; use at ultra low volumes
- Ernesto has a red dye, Cruiser does not have a dye--- we can debate this all day but is a matter of visibility
- Insecticide and broad spectrum fungicides in one seed application
- Apply at ULV volumes of water
  - 0.5 gal/T
  - Must avoid wet seed
  - Application technology steepest learning curve/biggest challenge
  - Dry treated seed
- Do not plant into wet soil

# Other considerations

- No dust, better worker safety – liquids are coming
- Broad spectrum efficacy
- Even application
- No activity against late blight

# Summary

- Three points of planting
  - Get good seed
  - Handle it carefully
  - Watch for Disease
- Recommendations to minimize decay and disease
  - Seed and soil same temperature
  - Handle seed gently
  - Avoid wet conditions
  - Encourage quick emergence
  - Use a seed treatment fungicide to reduce Rhizoc, Fusarium and silver scurf
  - Control of Fusarium indirectly controls Erwinia decay

