Optimizing Pre-Planting Curing Conditions of Cut Seed Tubers

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Background

- Pre-planting practices of potato tuber involve following steps, which are effective under ideal soil and environmental conditions

After harvest, certified seed potato tubers stored in 4°C for ~6 months → Seed tubers transferred to 10°C to warm-up ~3-7 days → Seed tubers cut and treated with fungicide → Seed pieces planted in the field immediately

- Cut seed pieces can rapidly decay after planting under unfavorable conditions, leading to poor emergence and crop stand
- Formation of the suberized layer on the cut surfaces can help preserving the seed pieces against unfavorable conditions and pathogens
- Optimum curing conditions (temperature and duration) of cut tuber pieces and its impact on emergence and performance of potato crop is largely unknown
- Delayed planting due to unpredictable and unfavorable weather can further affect the quality and performance of cut seed tuber pieces in the field

Objectives

- Optimizing potato seed tuber pre-planting practices by determining the ideal temperature and duration for suberization of cut seed tuber pieces
- Investigating the impacts of different pre-planting treatments/scenarios on emergence, overall growth, and yield of agronomically relevant potato cultivars

Experimental Design

Cultivars: Bannock Russet, Dakota Russet, Russet Burbank

Pre-Planting Treatments

Fresh Cut

Treatment 1: Tubers taken from 38°F storage, cut and planted immediately

Suberized + Delayed Planting Scenario

Tubers taken from 38°F storage and warmed up to 50°F for 7 days before cutting

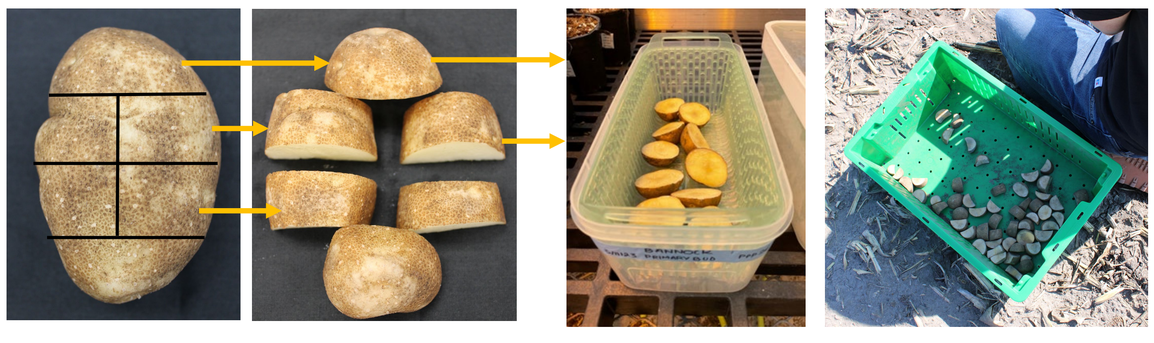
Treatment 2: Suberized at 50°F for 1 week

Treatment 3: Suberized at 50°F for 2 weeks

Treatment 4: Suberized at 50°F for 1 week + Stored at 45°F for 2 weeks

Treatment 5: Suberized at 50°F for 1 week + Stored at 45°F for 3 weeks

Treatment 6: Suberized at 50°F for 2 weeks + Stored at 45°F for 2 weeks



Whole Tuber | Cut Seed Pieces | Curing | Planting

Parameters Measured

- Suberization Rating (Microscopical)
- Emergence (percentage)
- Plant Height (Inches)
- Total Yield & Marketable Yield (hundredweight-cwt)
- Tuber Weight
- Specific Gravity

Key Findings

- Formation of suberin polyphenolics (SPP) in the first cell layer (after 1 week) and second cell layer (after 2 weeks) of cut surface of seed tuber was observed with suberization at 50°F (**Figure 1**)
- Early emergence was determined with suberization of cut seed pieces for 2 weeks at 50°F + 2 weeks storage at 45°F (Treatment 6) when compared to fresh cut pieces (Treatment 1) at 15 days after planting (DAP) (**Figure 2A)**
- Russet Burbank exhibited more uniform emergence, higher plant growth, and yield when compared to Bannock Russet and Dakota Russet (**Figure 2A & 2B, Figure 3, Figure 4A & 4B**)
- For Bannock Russet, suberization (both 1 and 2 weeks) of cut seed pieces improved emergence, growth, and overall yield when compared to fresh cut pieces (**Figure 2A & 2B, Figure 4A & 4B**)

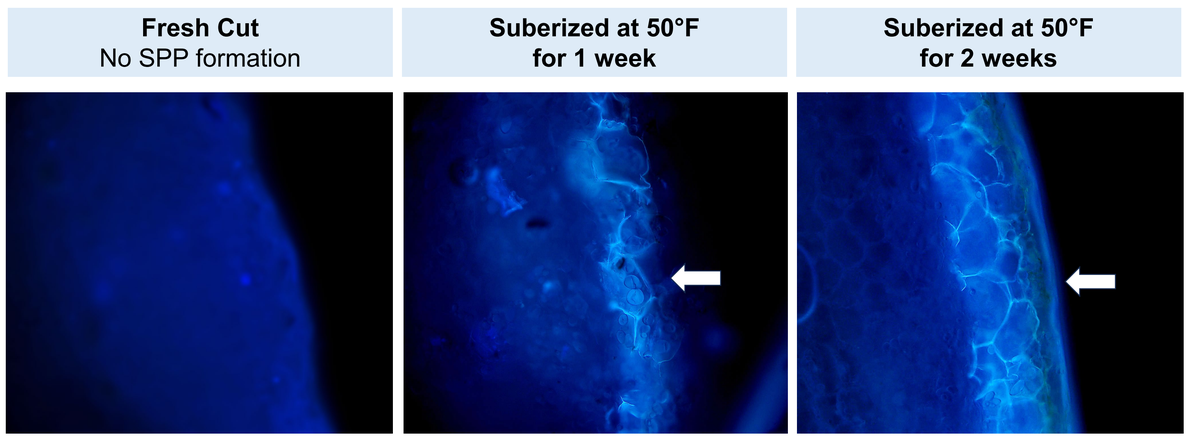


Figure 1. Formation of SPP in cut surface of seed tuber pieces

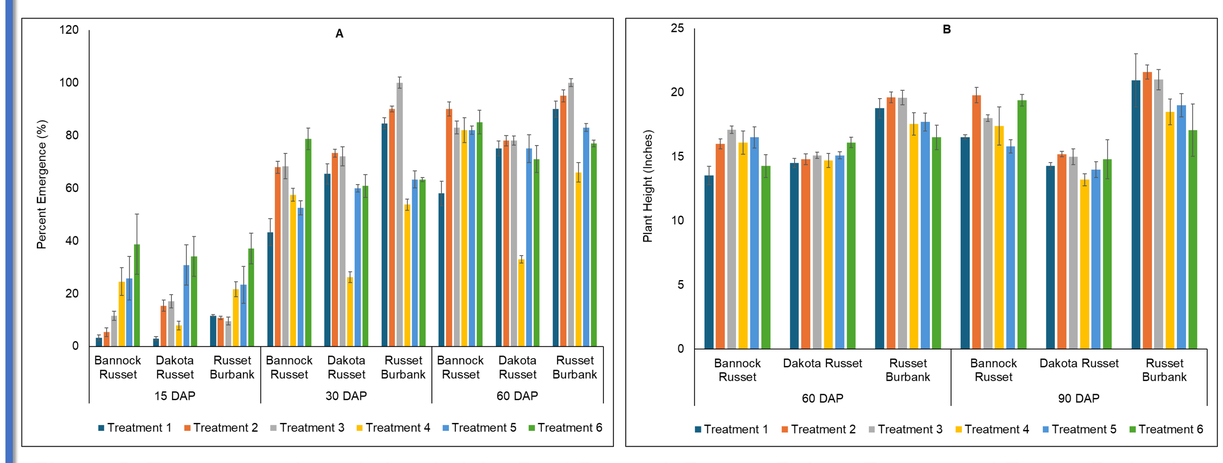


Figure 2. Emergence (A) and plant height (B) of Bannock Russet, Dakota Russet, and Russet Burbank plants grown from fresh cut (Treatment 1) and suberized (Treatment 2-6) seed tuber pieces

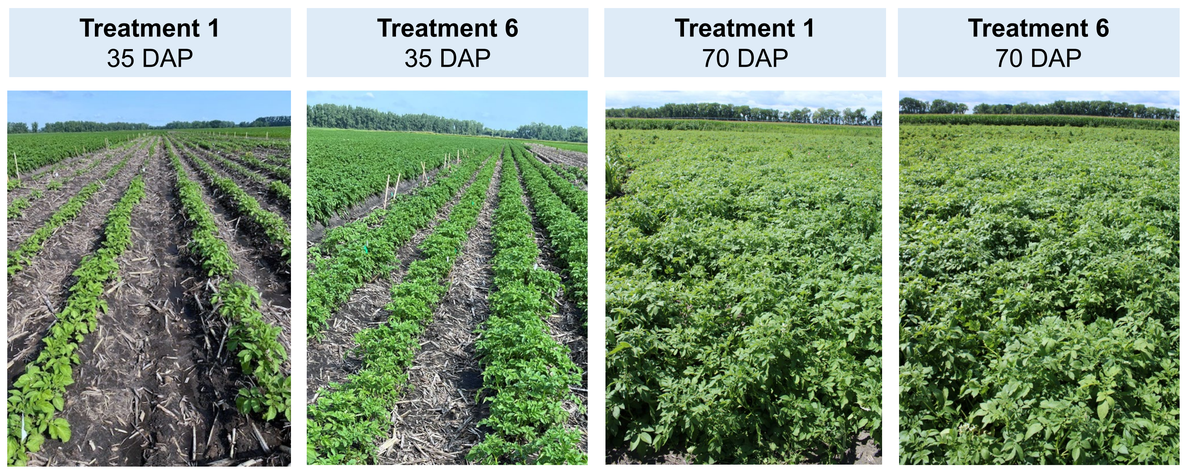


Figure 3. Emergence (35 DAP) and growth (70 DAP) of Russet Burbank from fresh cut (Treatment 1) and suberized for 2 weeks at 50°F + 2 weeks storage at 45°F (Treatment 6) seed tuber pieces

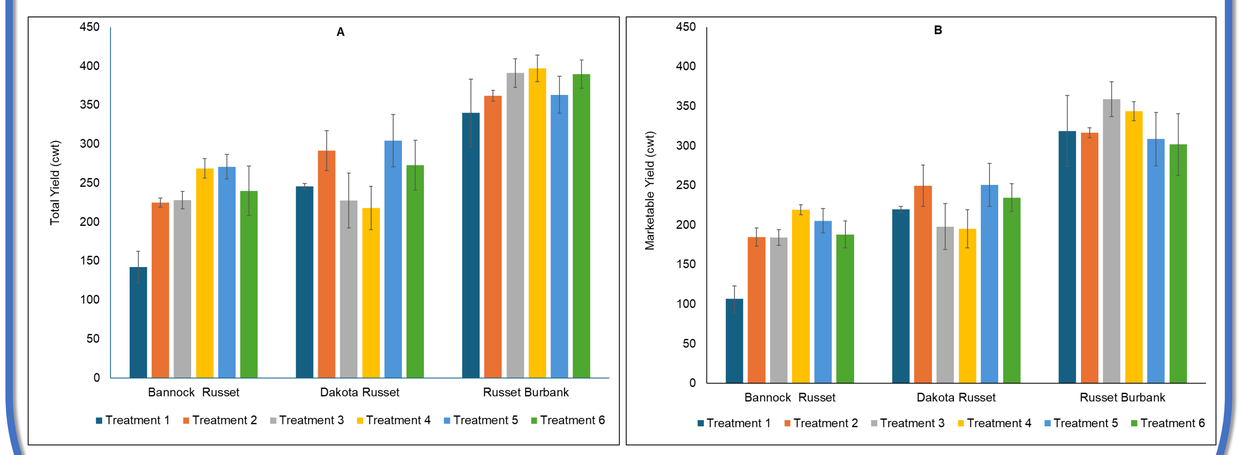
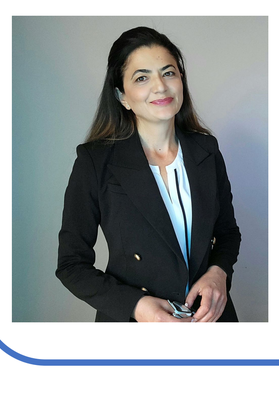


Figure 4. Total yield (A) and marketable yield (B) of potato cultivars grown from fresh cut (Treatment 1) and suberized (Treatment 2-6) seed tuber pieces



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