Mechanical harvest of stem-on sweet cherries for brine

Jim Flore, Nikki Rothwell, Greg Lang, and Steve van Nocker

Julia Rice, Karen Powers, Lynne Sage, Doris Sullivan and Tammy Wilkinson

Cherry Bay, Send-Emeott, and Orchards
**Primary Objective:** To develop near-term strategies for improving stem-on retention on mechanically harvested fruit for the brine market.

- **Hypotheses** (based on grower observations):

  1) Can the optimal window for mechanically harvesting stem-on fruit can be predicted? **By GDH; Fruit size, FRF, Soluble solids**?

  2) Are single fruits easier to harvest than spurs with multiple fruits?

  3) Can pre-harvest application of plant growth regulators preferentially promote fruit separation at the branch-stem abscission zone?

  4) Does ethylene or pectinase activity continue to work at the stem-fruit abscission zone in brine solution, causing increased stem loss in the brine pits?
How is the fruit removed?
Two abscission zones in Sweet Cherry
Fig. 1. Changes in the site of fruit separation and in the force required to effect separation at the upper and lower abscission zones of 'Windsor' sweet cherry as related to the development of the fruit.
\[ F_{cf} = \frac{mv^2}{r} \]

- \( m \) = mass of the body in circular motion (kg) 
- \( Wt \) of Cherry \( v \) = its linear velocity (m/s) (Velocity caused by the shaker) 
- \( r \) = radius of the curve (m) (Length of the stem)

**Requirements for stem-on abscission:**
Fruit Mass X Shaker Velocity squared must be large enough to tear the pedicel from the shoot. The lower abscission zone FRF must be high enough that the fruit does not abscise from the pedicel.
Stem Abscission Zones

• Upper Zone

• Lower Zone

(‘Andersen’ stem separation was unusual)
Experiment 1: Optimal Harvest Window Prediction Factors

- Measured Growing Degree Hours, fruit size, weight, soluble solids, and FRF (fruit-stem zone) of Emperor Francis, Gold, and Ulster
'Emperor Francis' Sweet Cherry, Bahle Farm, 2009

Growing Degree Hours
Fruit Retention Force (g)

Date 2009

Growing Degree Hours
Fruit Retention Force (g)
'Gold' Sweet Cherry, Bahle Farm, 2009

Growing Degree Hours
Fruit Weight
Fruit Retention Force
% Stems-On

Fruit Retention Force (g)
Growing Degree Hours
Fruit Weight (g)
% Stems-On

Date 2009
4-Jun 11-Jun 18-Jun 25-Jun 2-Jul 9-Jul 16-Jul

3 DAYS
Stem-on Mechanical Harvest 2010

- Fruit retention force
- % Stem On
- Avg Weight per fruit (g)
- % Stem Removed

Fruit weight (g)

Fruit Retention Force (g)

% Stems removed

Date 2010

3-4 DAYS
Stem-on in relation to fruit size

- Good Relationship between Fruit diameter and Fruit Weight.
- Can begin to harvest at 4.5 to 5 grams or 18-22 mm
2011

- Early year
- Harvest was ahead of normal
- Experiments: Harvest every day at Bahle,
- Determine if time of day has an affect on % Stem-on.
TIME OF DAY
Time of Day Study (24,48,72,96 = midnight)  2011

20.85 mm

23.04 mm
The effect of temperature on % stem-on 2011

\[ y = 0.0901x + 57.31 \]

\[ R^2 = 0.0095 \]
Time of Day Study (24, 48, 72, 96 = midnight)  2011

% on

20.85 mm

23.04 mm
Early Recommendations

• 1. Be sure you have a home for the stem on fruit.
• 2. Choose the variety: Emperor Francis and Ulster were acceptable. Gold was not.
• 3. Prune the trees to stiffen them up.
• 4. Don’t use ethephon
• 5. Watch for a break in color of the fruit.
• 6. Begin harvest when fruit are 5-5.5 grams in weight.
• 7. Cool season is better than hot.