Weather Conditions during Specific Apple Phenological Stages Influence Fruit Quality at Harvest and in Storage

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Introduction

Weather conditions during specific phenological stages

Inter annual variability

Apple fruit quality at harvest and in storage
## Post harvest quality

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<td>Vascular browning</td>
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<td>Soggy breakdown</td>
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<td>Bitter pit (in development)</td>
<td>Honeycrisp</td>
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Post harvest Disorders

Vascular browning

• Browning of the main vascular bundles of the apple while the cortex remains normal
• Usually develops after 6 months of storage.
• Associated with cold growing season.

Soggy breakdown

• Browning of the outer cortex, moist and separated from the skin by healthy tissue.
• Aggravated by advanced maturity at harvest, light crops, large fruit size and temperature in storage too cold.
Post harvest Disorders

Soft scald
- Sharply defined, irregularly shaped brown lesion on the skin of apple.
- Worsened by temperature too cold in storage.

Superficial scald
- Diffuse browning of the skin, sometimes rough in advanced cases.
- Develops after several months of storage and becomes more extensive at room temperature.
- Worsened by: immature fruit, storage delay, high temperature and $O_2$ concentration in storage, limited ventilation.
Post harvest Disorders

Bitter pit

• Small, darkened, slightly depressed spots under the skin, usually in the calyx end of the fruit.
• Corky texture, bitter taste, does not affect skin directly.
• Calcium related
• Susceptibility is cultivar dependant
• Symptoms showing at harvest but mostly during storage
Model: Phenology of apple

- Flowering
- Fruit development
- Inflorescence emergence
- Leaf development
Firmness decreases if:

- Temperature
- Precipitation

39% of variation
12% of variation

0 to 30 DFB
31 to 60 DFB
61 to 90 DFB
91 DFB to harvest
Vascular browning increases if:

- 0 to 30 DFB
- 31 to 60 DFB
- 61 to 90 DFB
- 91 DAFS to harvest

Factors include:
- Solar radiation
- Temperature

McIntosh
Superficial scald increases if:

- Temperature

Cortland

Graph showing the increase in superficial scald over time, with different temperature phases: 0 to 30 DFB, 31 to 60 DFB, 61 to 90 DFB, and 91 DFB to harvest.
Soft scald increases if:

- Precipitation
  - 20% of variation
- Temperature
  - 13% of variation

Honeycrisp

0 to 30 DFB
31 to 60 DFB
61 to 90 DFB
91 DFB to harvest
Soggy breakdown increases if:

- Precipitation: 13% of variation
- Temperature: 36% of variation

DFB: 
- 0 to 30 DFB
- 31 to 60 DFB
- 61 to 90 DFB
- 91 DFB to harvest

Honeycrisp
Bitter pit increases if:

- 0 to 30 DFB
- 31 to 60 DFB
- 61 to 90 DFB
- 91 DAFS to harvest

Honeycrisp
## Weather conditions vs post harvest disorders

<table>
<thead>
<tr>
<th>Disorder</th>
<th>0-30 DFB</th>
<th>31-60 DFB</th>
<th>61-90 DFB</th>
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</thead>
<tbody>
<tr>
<td>Vascular browning (Mc)</td>
<td><img src="#" alt="Clouds" /></td>
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<tr>
<td>Superficial scald (Cortl.)</td>
<td><img src="#" alt="Sun" /></td>
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<tr>
<td>Soft scald (HC)</td>
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Same weather, different cultivars, different disorders
Remaining questions: First occurrence in storage
• When? (variation from year to year)
• Why? (weather parameters)
• How? (core browning vs internal browning)

More data needed (e.g. US Northeastern States)
Thank you for your attention!!!
Questions, comments, suggestions?

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