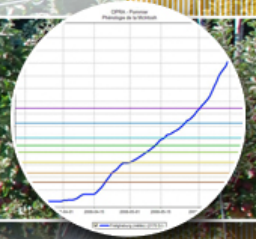




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# Weather Conditions during Specific Apple Phenological Stages Influence Fruit Quality at Harvest and in Storage

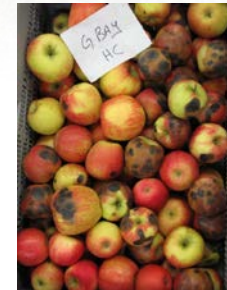
**Dominique Plouffe, Gaétan Bourgeois**

Agriculture and Agri-Food Canada, Saint-Jean-sur-Richelieu, QC

**Jennifer DeElI**, Ontario Ministry of Agriculture, Food and Rural Affairs

With the collaboration of:

Maude Lachapelle, Marie-Pier Ricard and Virginie Grégoire



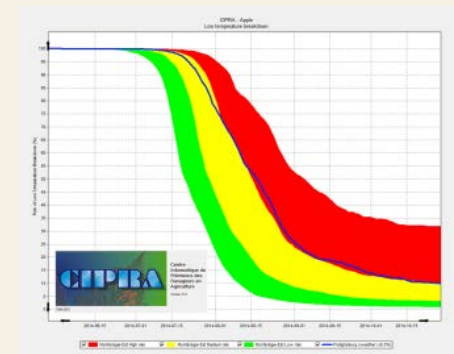
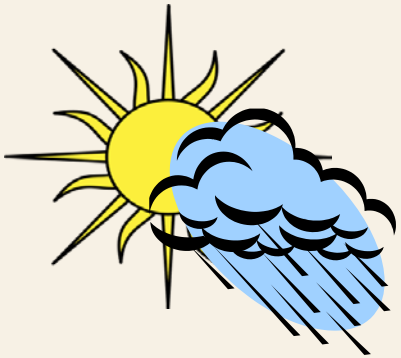
Canada

# Introduction

Weather conditions during specific phenological stages

Inter annual variability

Apple fruit quality at harvest and in storage



# Post harvest quality

<b>Models</b>	<b>Cultivars used</b>
Firmness	McIntosh
Vascular browning	McIntosh
Superficial scald	Cortland
Soft scald	Honeycrisp
Soggy breakdown	Honeycrisp
Bitter pit (in development)	Honeycrisp

# 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<sub>2</sub> concentration in storage, limited ventilation.



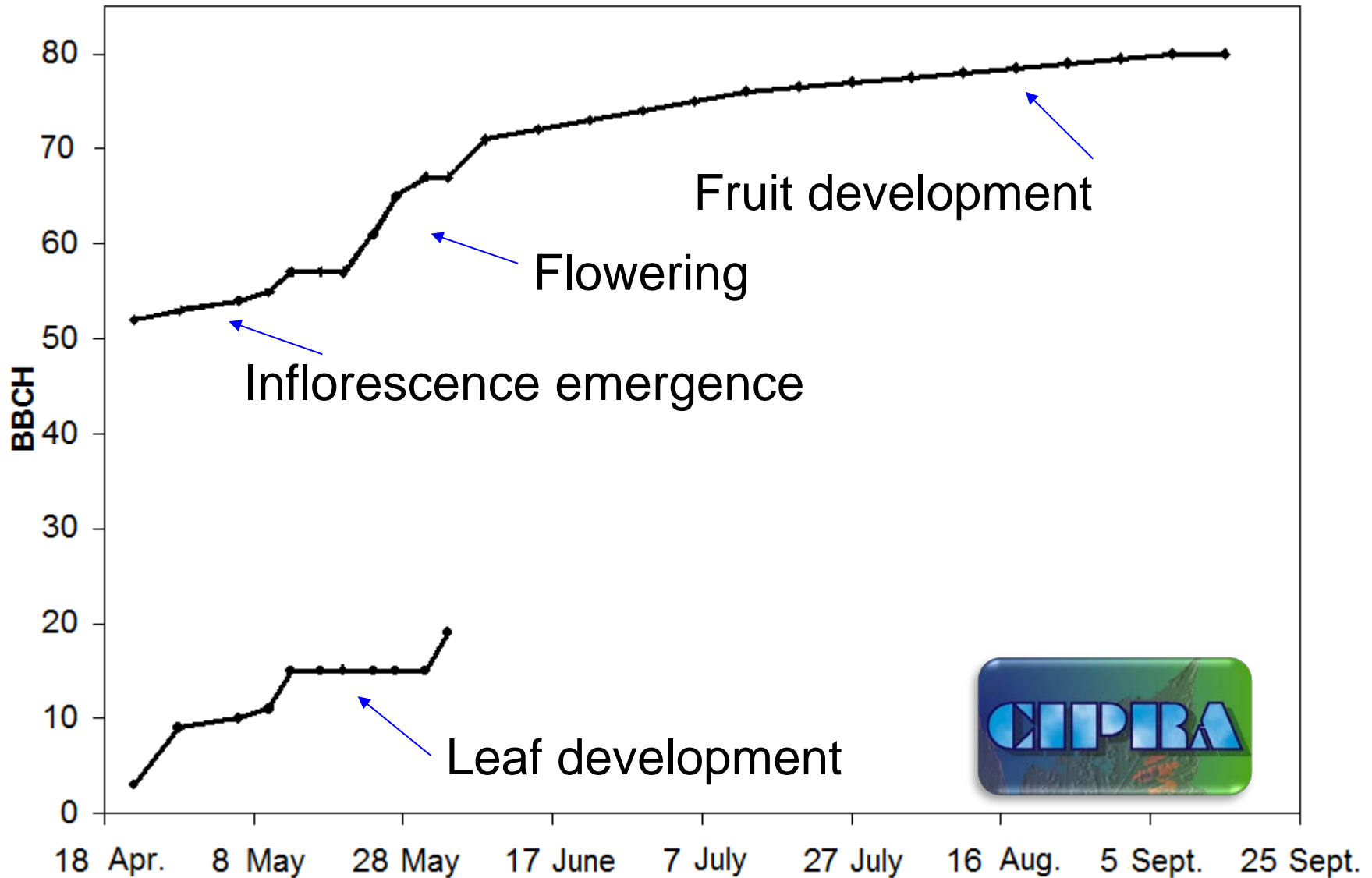
# Post harvest Disorders

## 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



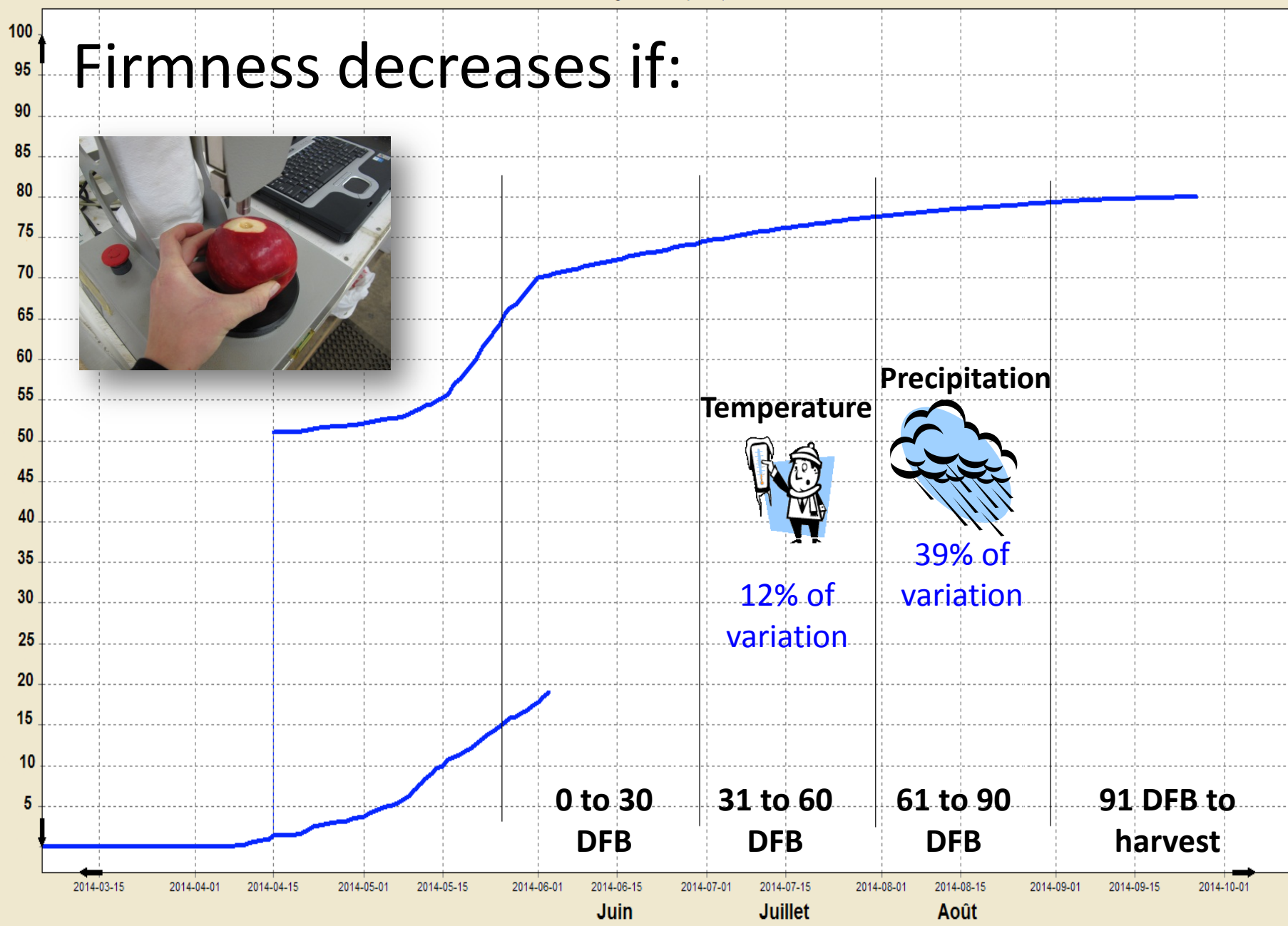
# Model: Phenology of apple



# Firmness decreases if:



Stade BBCH

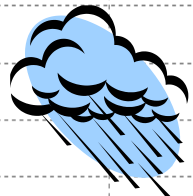


Temperature



12% of variation

Precipitation



39% of variation

0 to 30 DFB

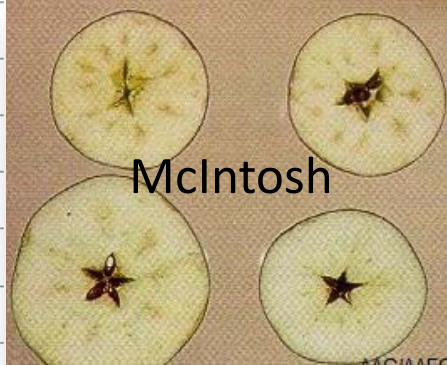
31 to 60 DFB

61 to 90 DFB

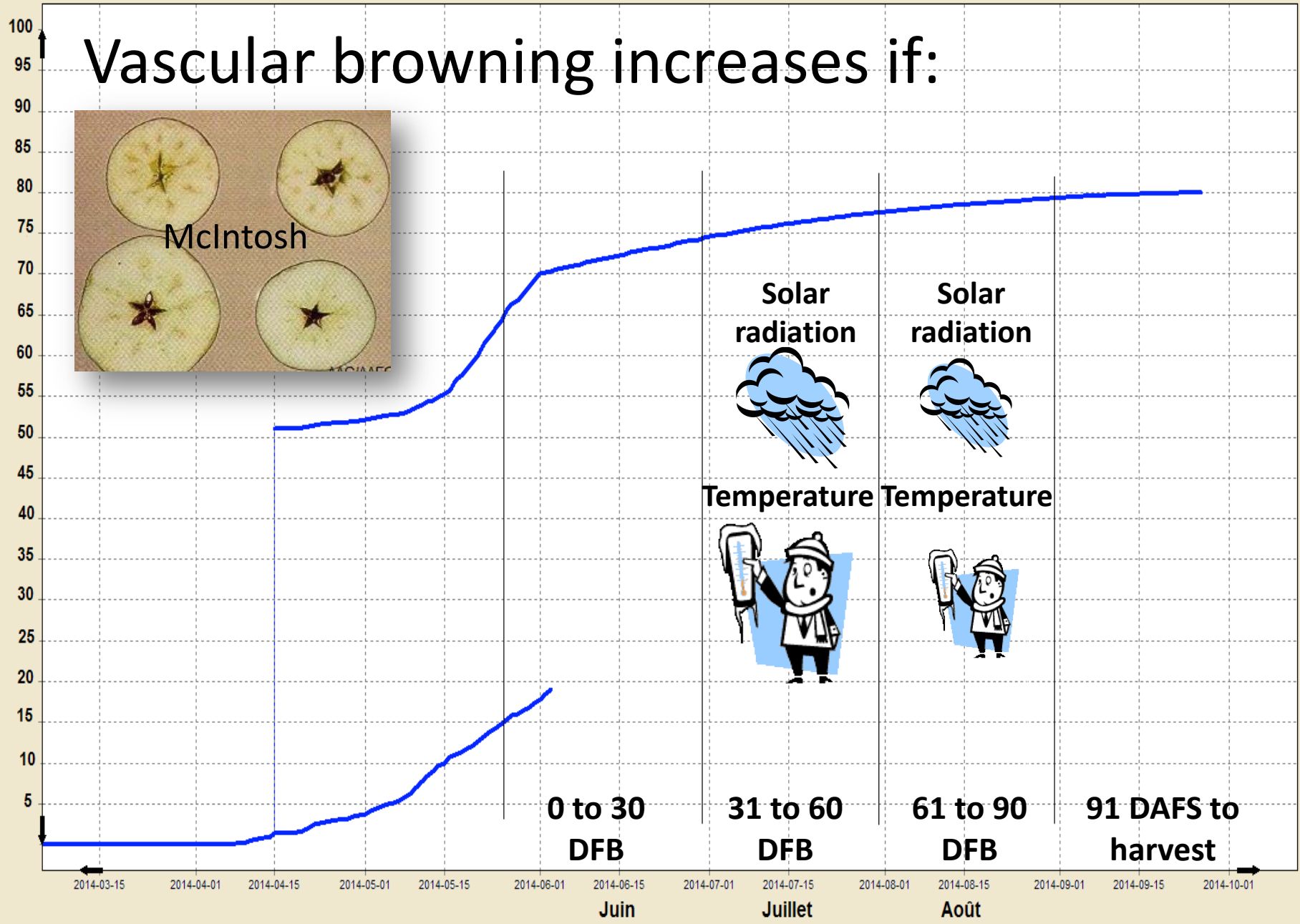
91 DFB to harvest



# Vascular browning increases if:



Stade BBCH



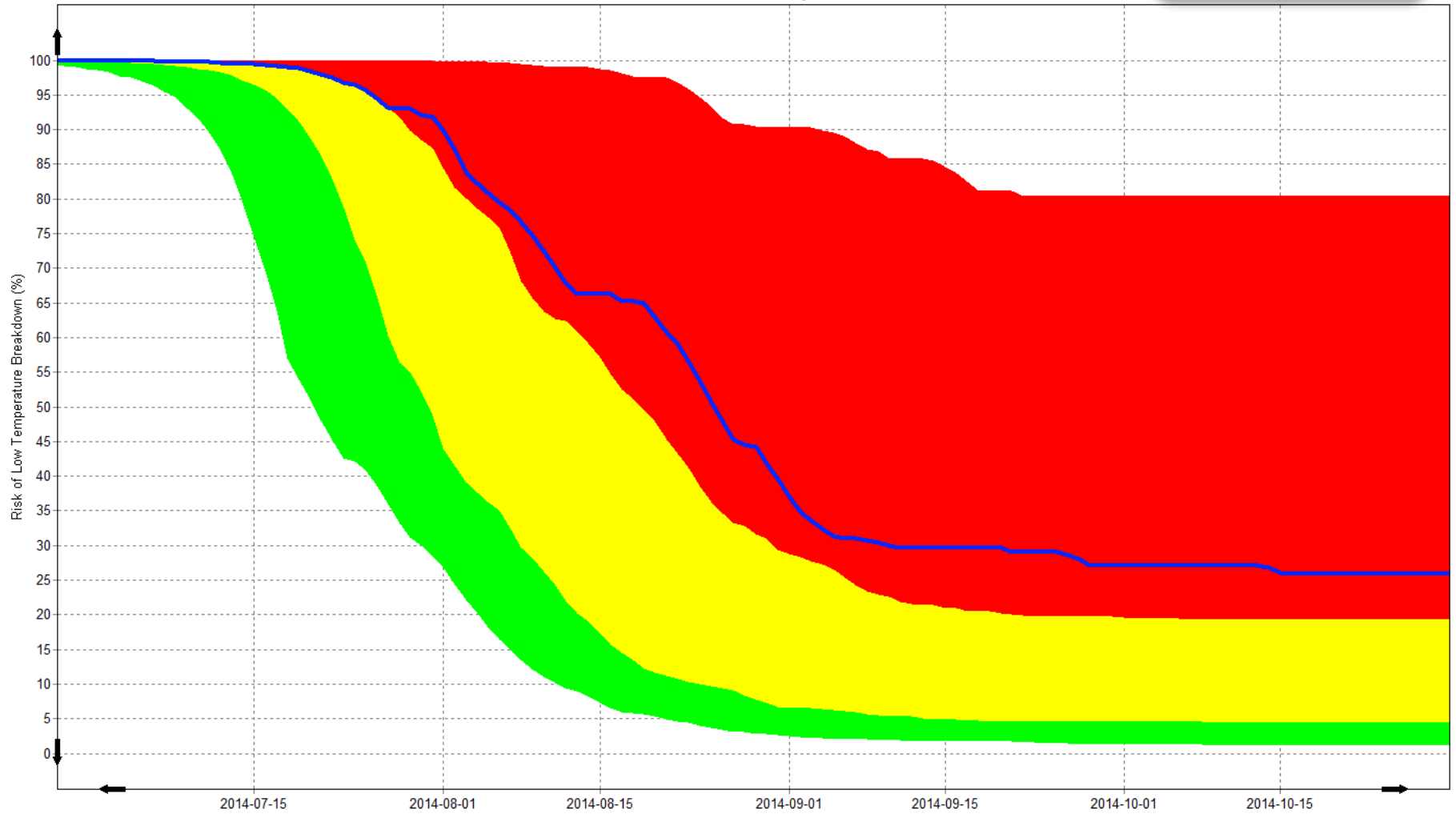
**Solar radiation**  
**Solar radiation**

**Temperature** **Temperature**

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



CIPRA - Apple  
Vascular browning

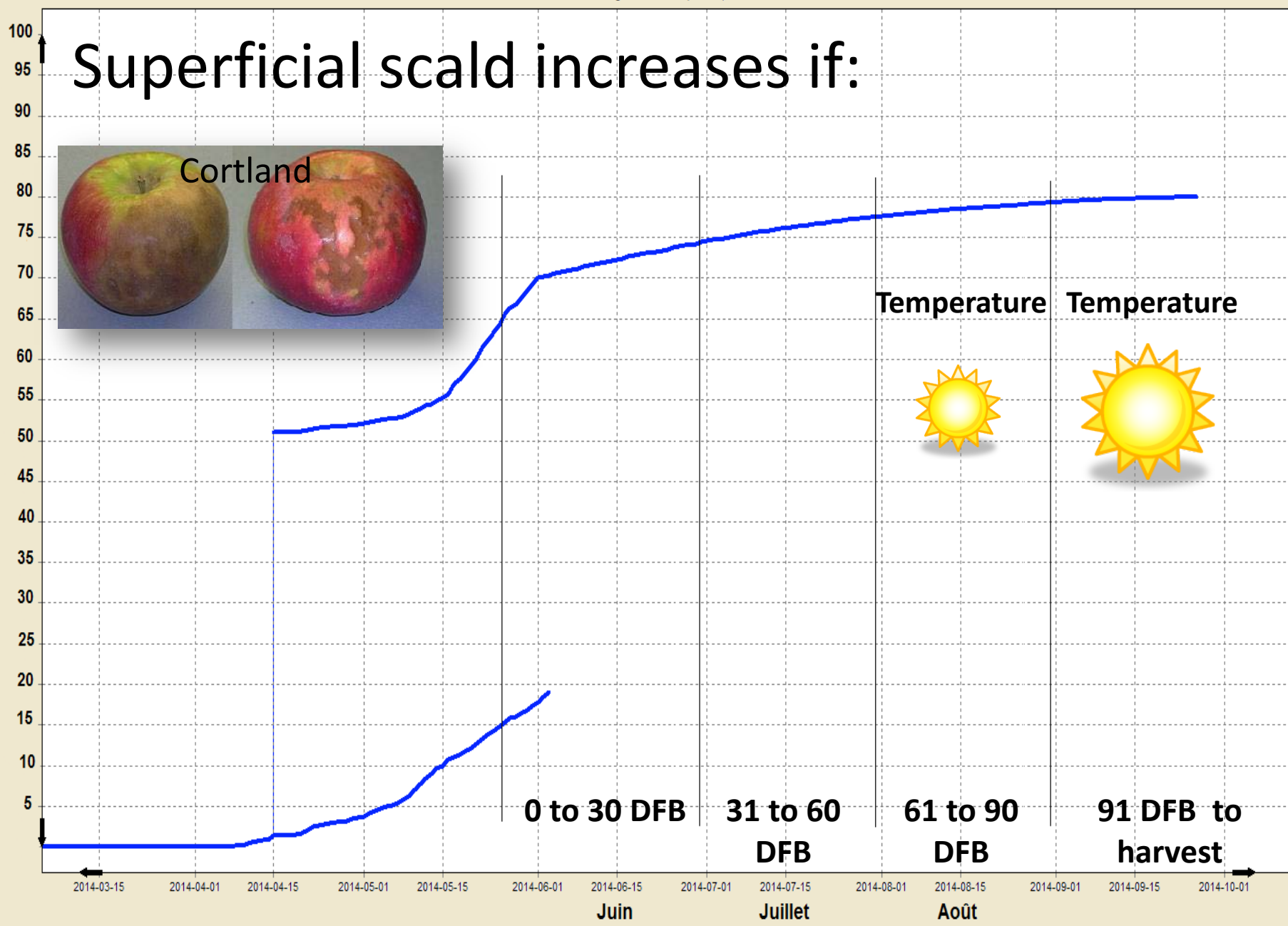


Basses-Laurentides High risk  Basses-Laurentides Medium risk  Basses-Laurentides Low risk  Oka (weather) (25.9%)

# Superficial scald increases if:

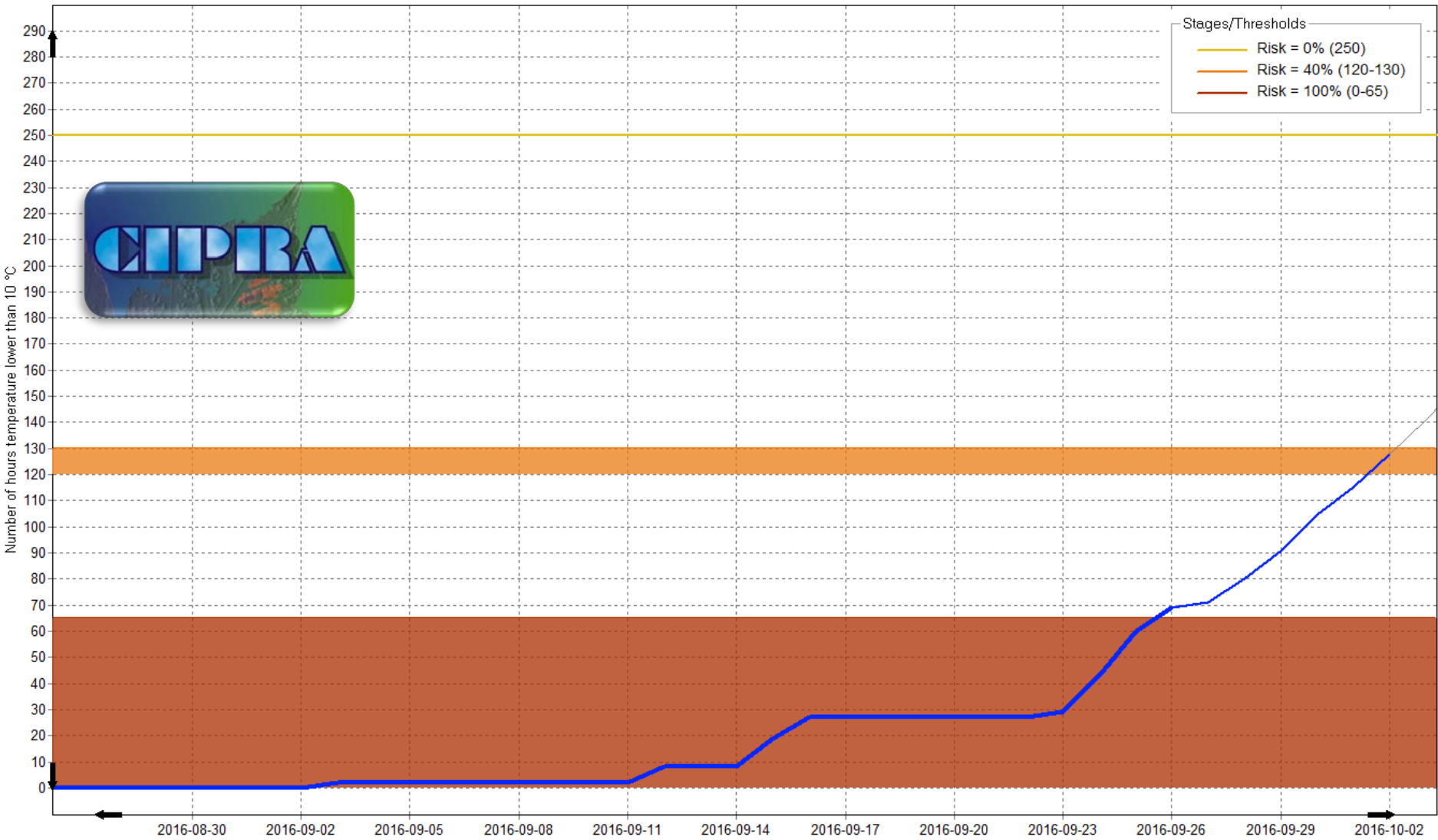


Stade BBCH



# CIPRA - Apple Superficial scald

- Stages/Thresholds
- Risk = 0% (250)
  - Risk = 40% (120-130)
  - Risk = 100% (0-65)



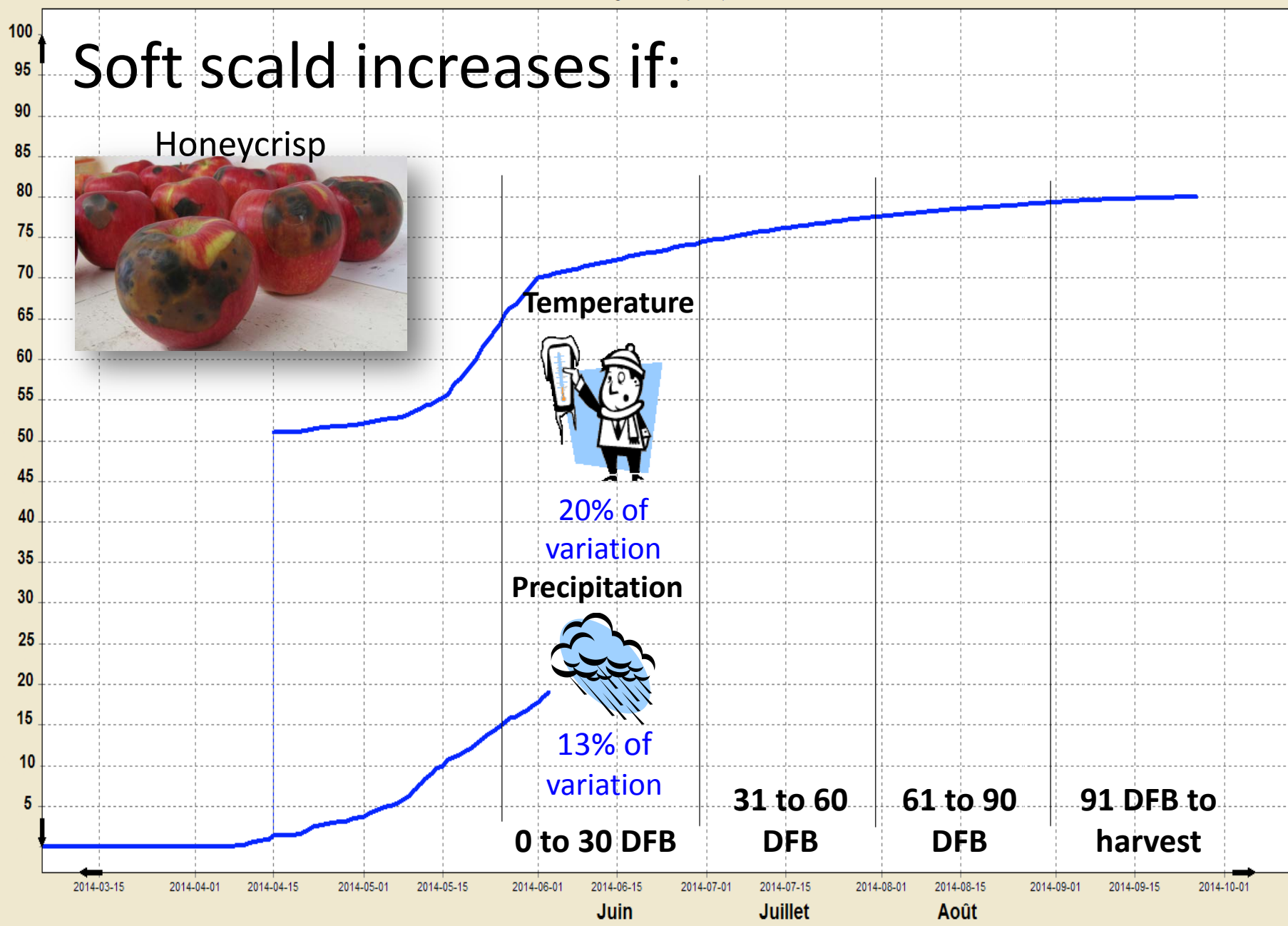
Frelighsburg (weather)  Frelighsburg (forecast)  Frelighsburg (normals)

# Soft scald increases if:

Honeycrisp



Stade BBCH

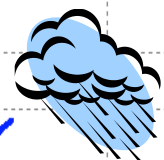


Temperature



20% of variation

Precipitation



13% of variation

0 to 30 DFB

31 to 60 DFB

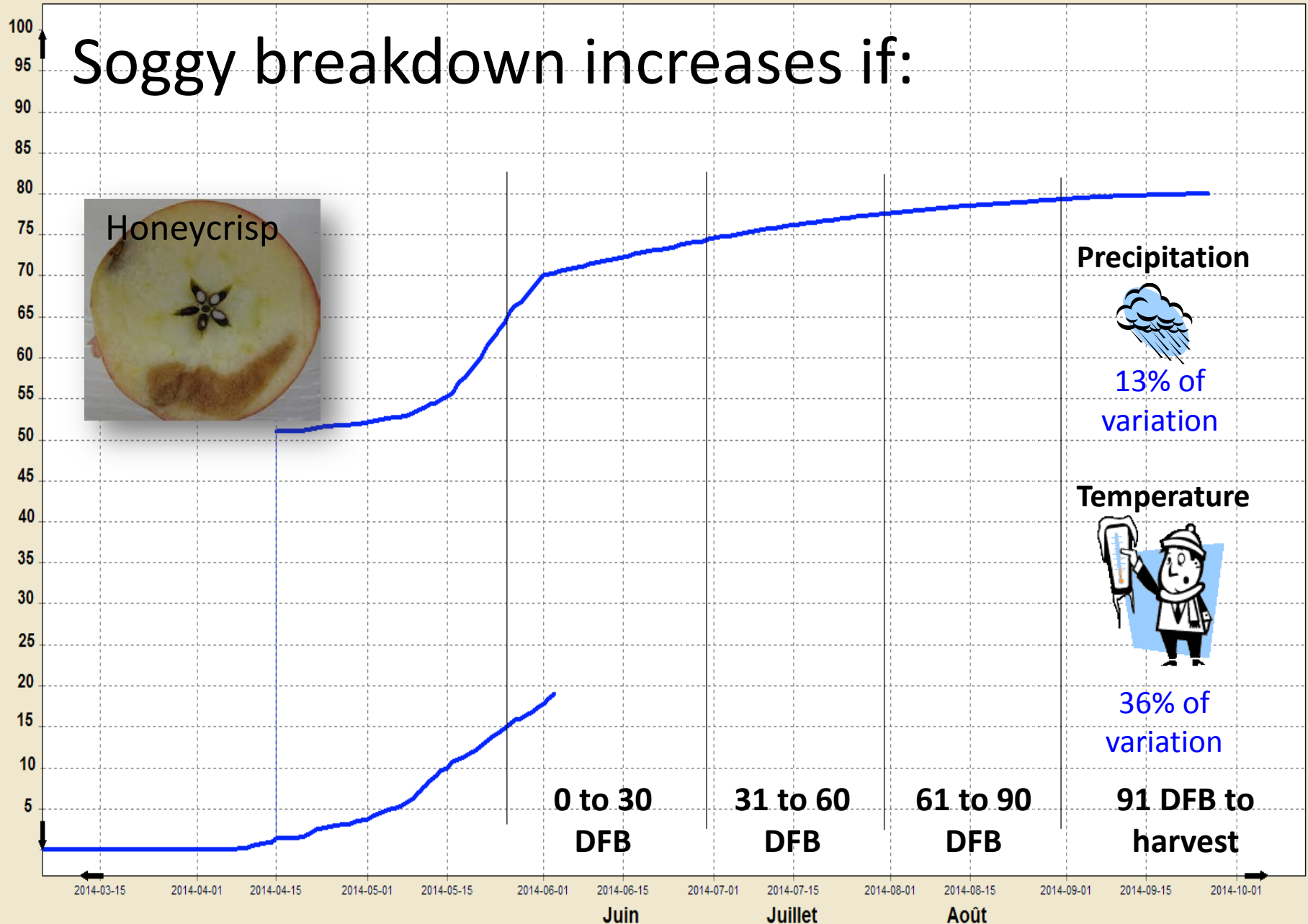
61 to 90 DFB

91 DFB to harvest

# Soggy breakdown increases if:



Stade BBCH



Precipitation



13% of variation

Temperature



36% of variation

0 to 30 DFB

31 to 60 DFB

61 to 90 DFB

91 DFB to harvest

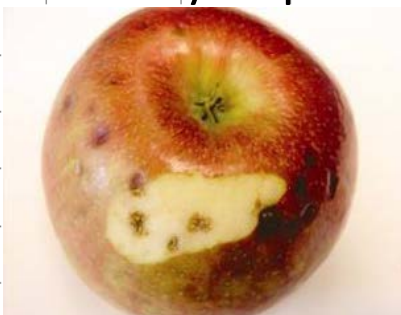
Jun

Juillet

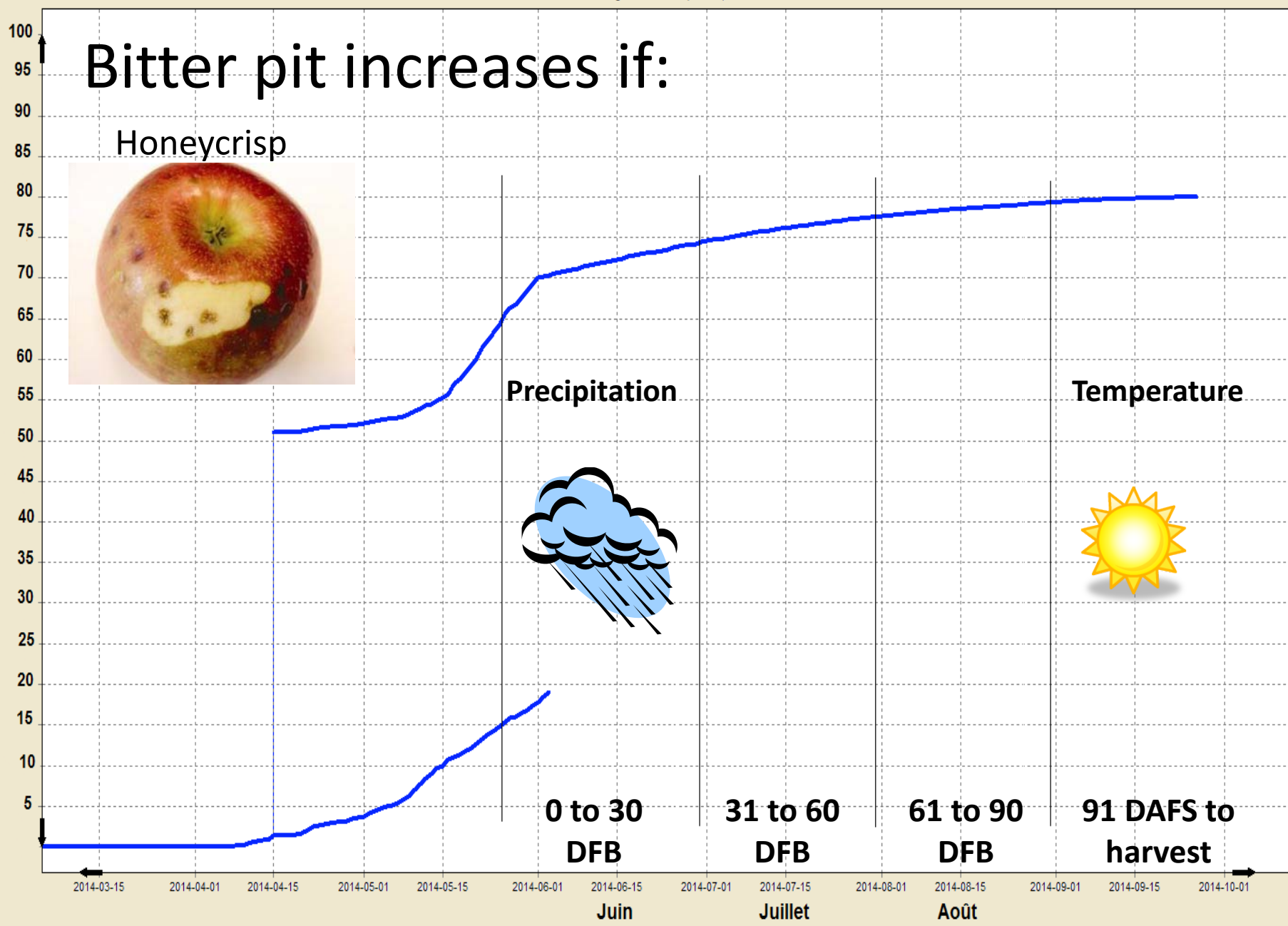
Août

# Bitter pit increases if:

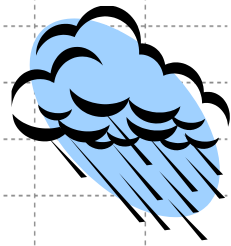
Honeycrisp



Stade BBCH



Precipitation



Temperature




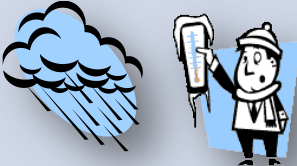



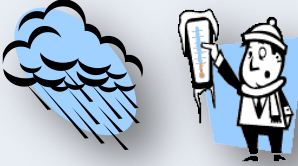


0 to 30  
DAFS

31 to 60  
DAFS

61 to 90  
DAFS

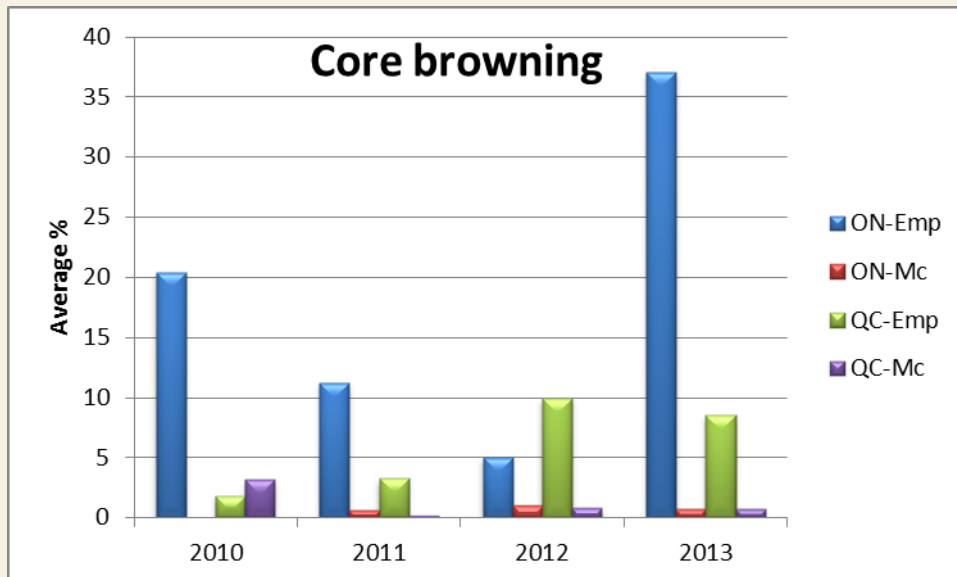
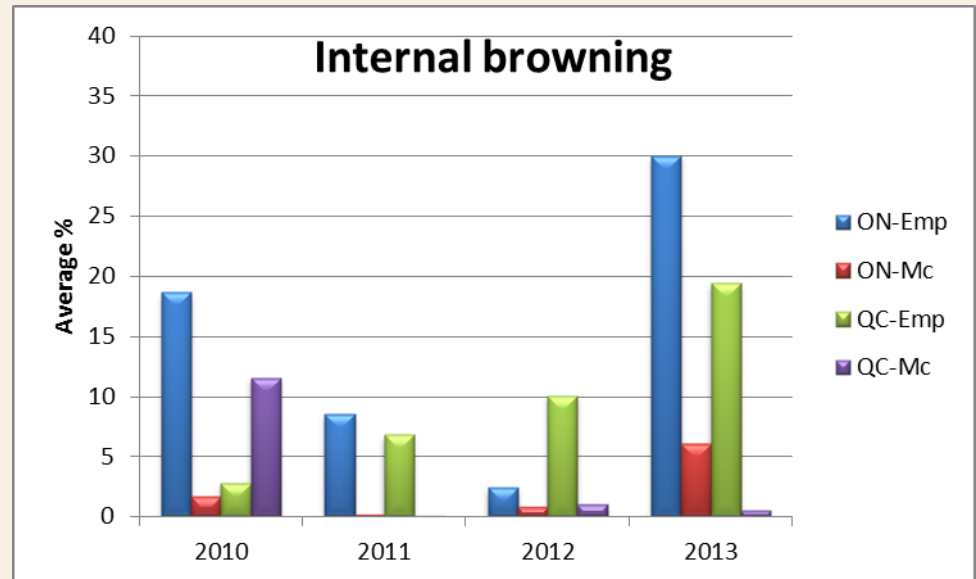
91 DAFS to  
harvest

# Weather conditions vs post harvest disorders

Disorder	0-30 DFB	31-60 DFB	61-90 DFB	91 to harvest
Vascular browning (Mc)				
Superficial scald (Cortl.)				
Soft scald (HC)				
Soggy breakdown (HC)				
Bitter pit (HC)				



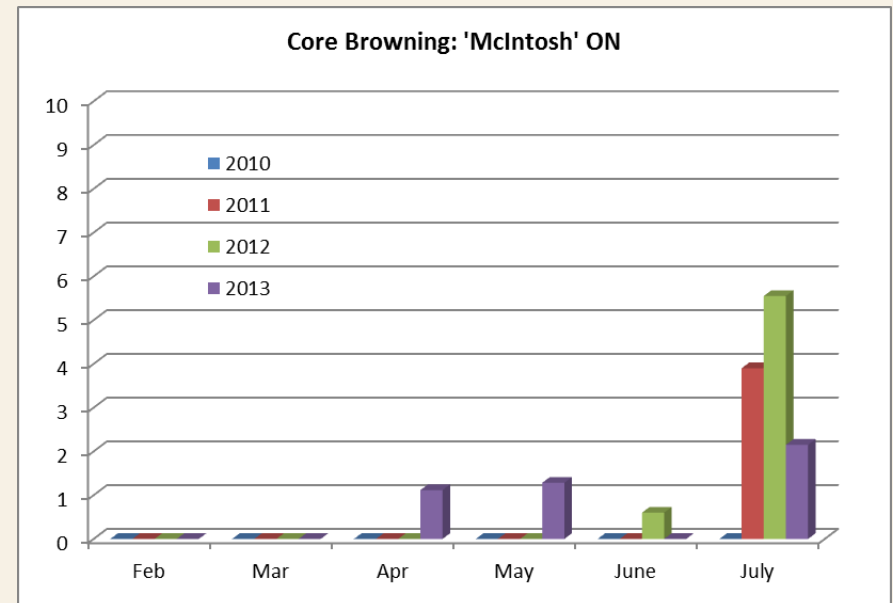
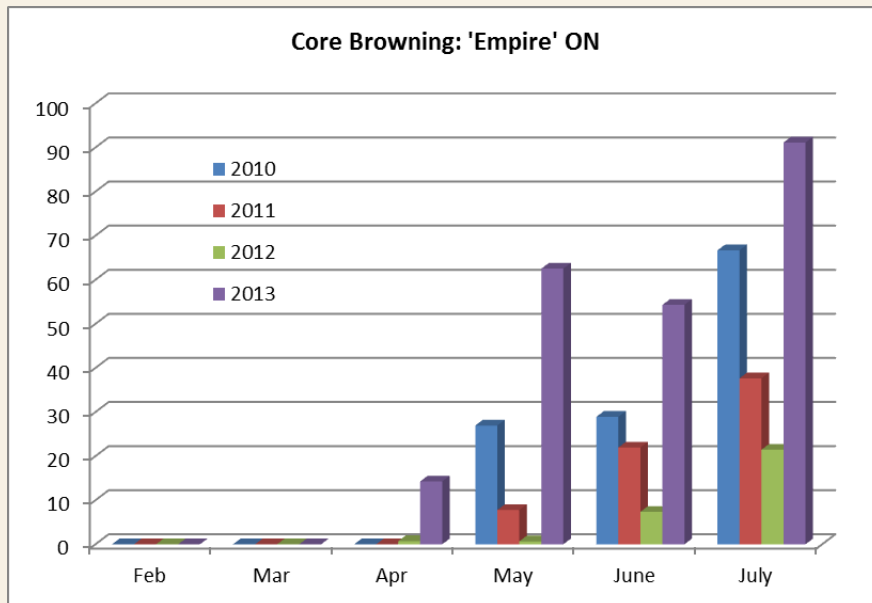
Same weather,  
different cultivars  
different disorders



# Remaining questions: First occurrence in storage

- When? (variation from year to year)
- Why? (weather parameters)
- How? (core browning vs internal browning)

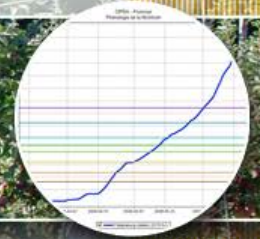
More data needed (e.g. US Northeastern States)





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Thank you for your attention!!!  
Questions, comments, suggestions?

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Canada 