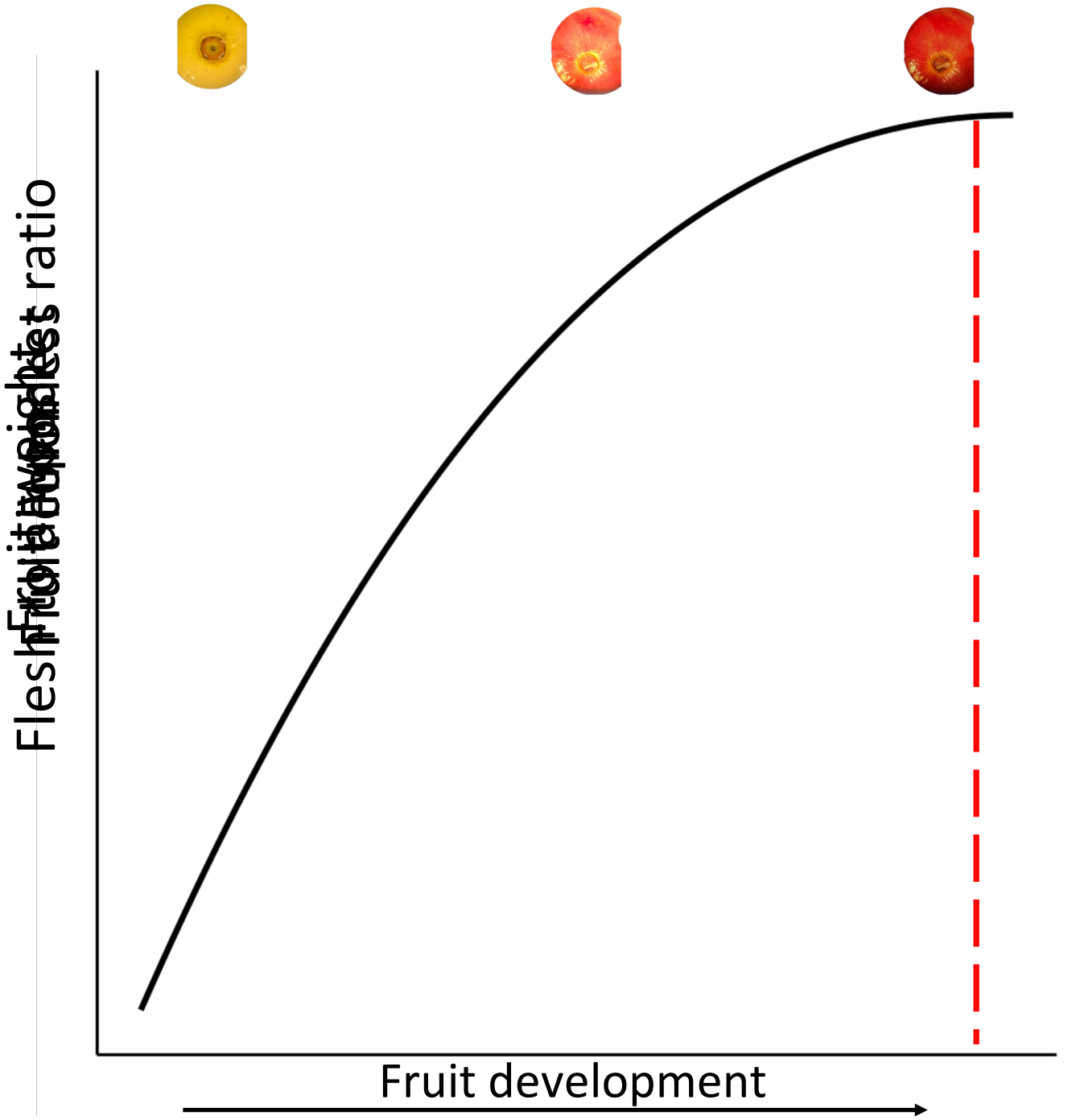
Department of Horticulture
UNIVERSITY OF WISCONSIN–MADISON

What makes a cranberry firm? Understanding fruit ripening and its role in fruit firmness

Amaya Atucha, Pedro Rojas-Barros, and Beth Ann Workmaster
Department of Horticulture
University of Wisconsin-Madison

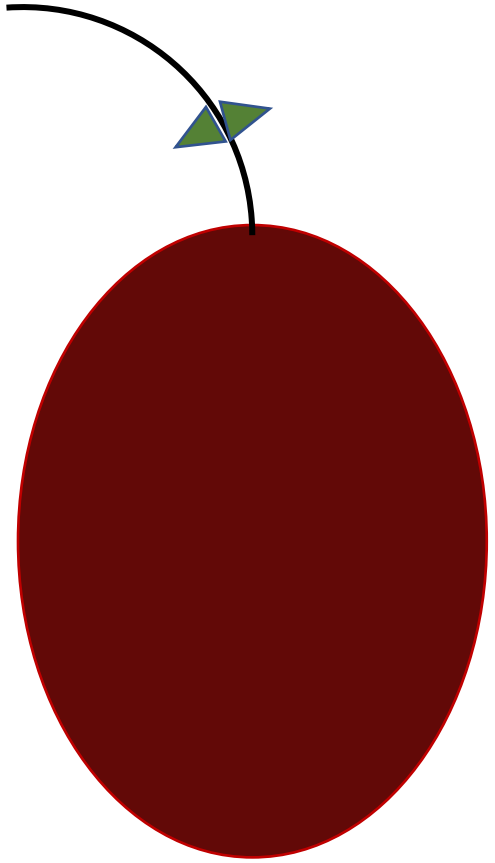
Introduction

- What are the fruit quality traits associated with ripening and maturity?
  - Color
  - Fruit weight/size
  - Firmness
- However, it is well known that many other changes in the fruit happen during this time.
- Investigating cranberry fruit changes during ripening, will allow us to determine optimal harvest time for SDC production.

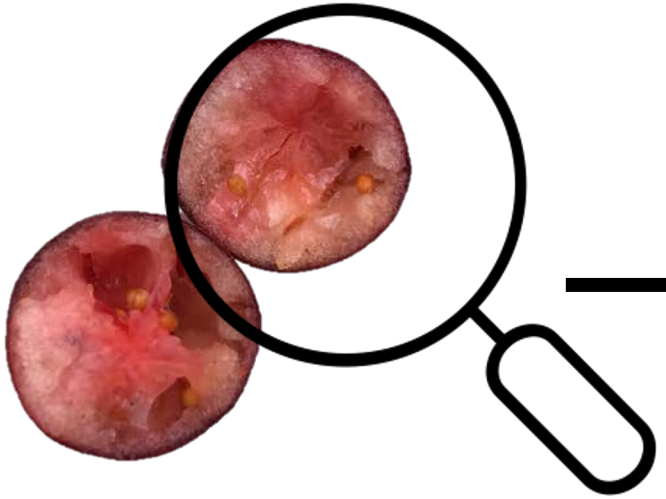

Fruit development

What makes a good SDC?

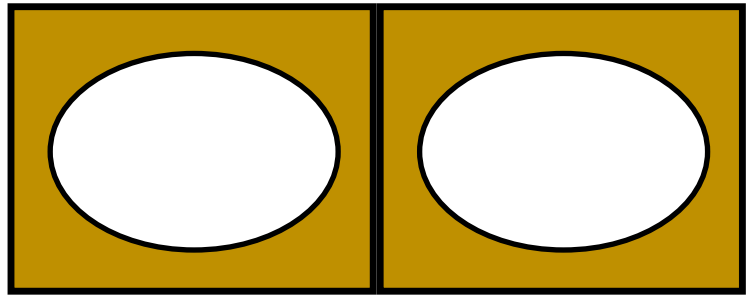
- What are the characteristics in the fruit that will result in higher efficiency of SDC production?
- External fruit factors: size, shape, color
- Internal fruit traits: Pulp thickness and structure.
- What are the pulp components and how can we relate this with SDC production?

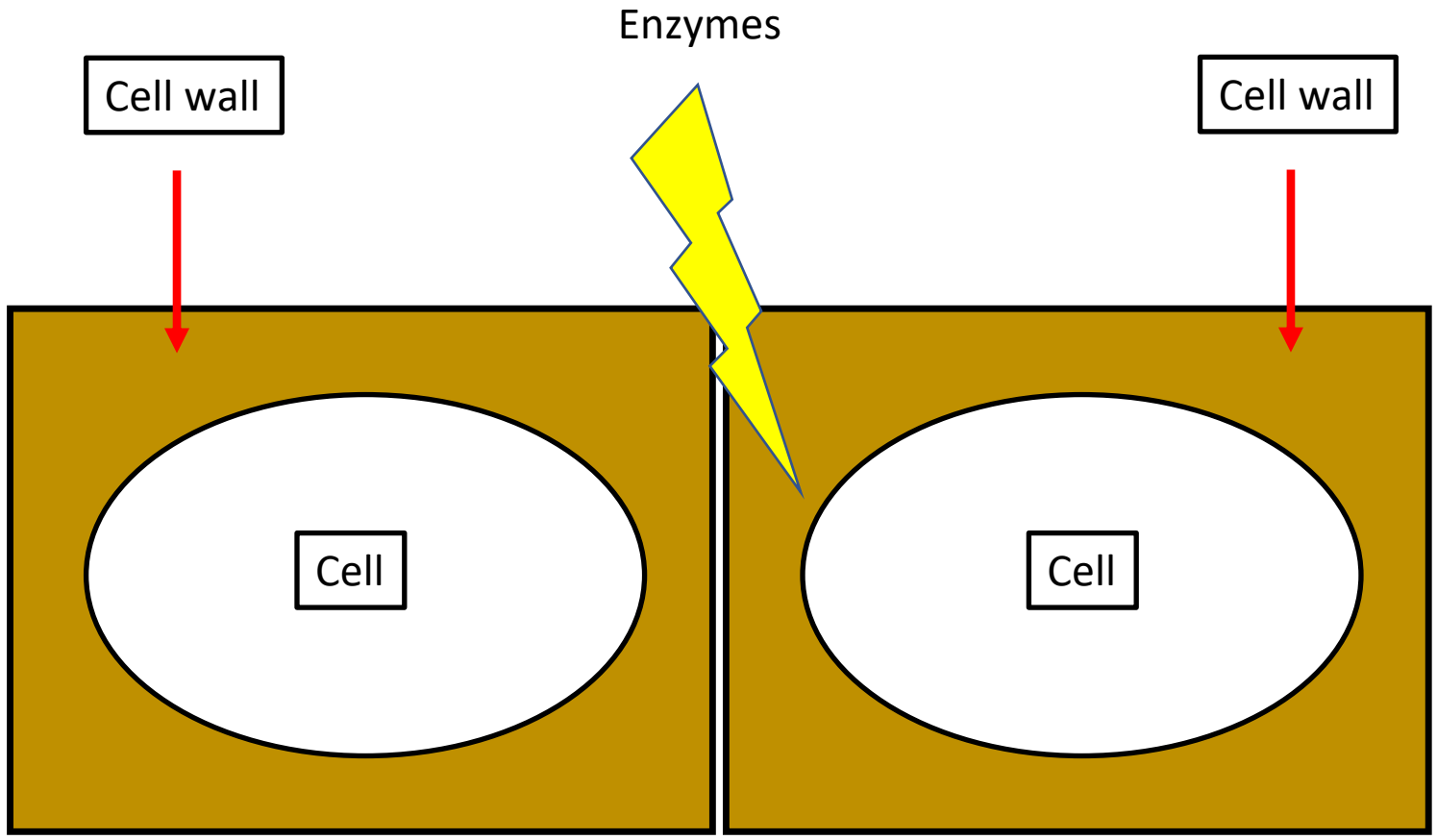


Fruit pulp



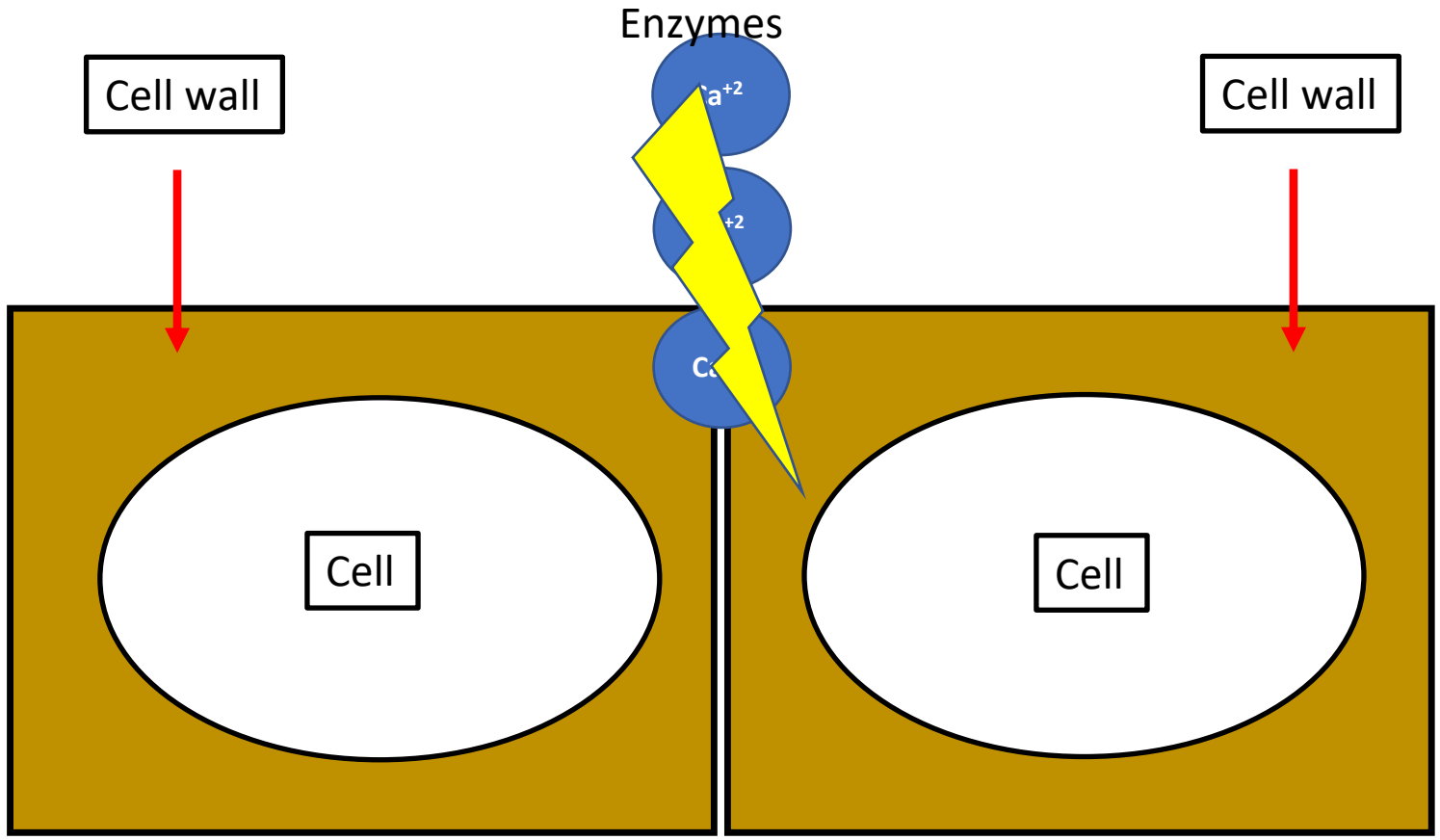
Two fruit pulp cells




Enzymes
Cell wall
Cell wall
Cell
Cell

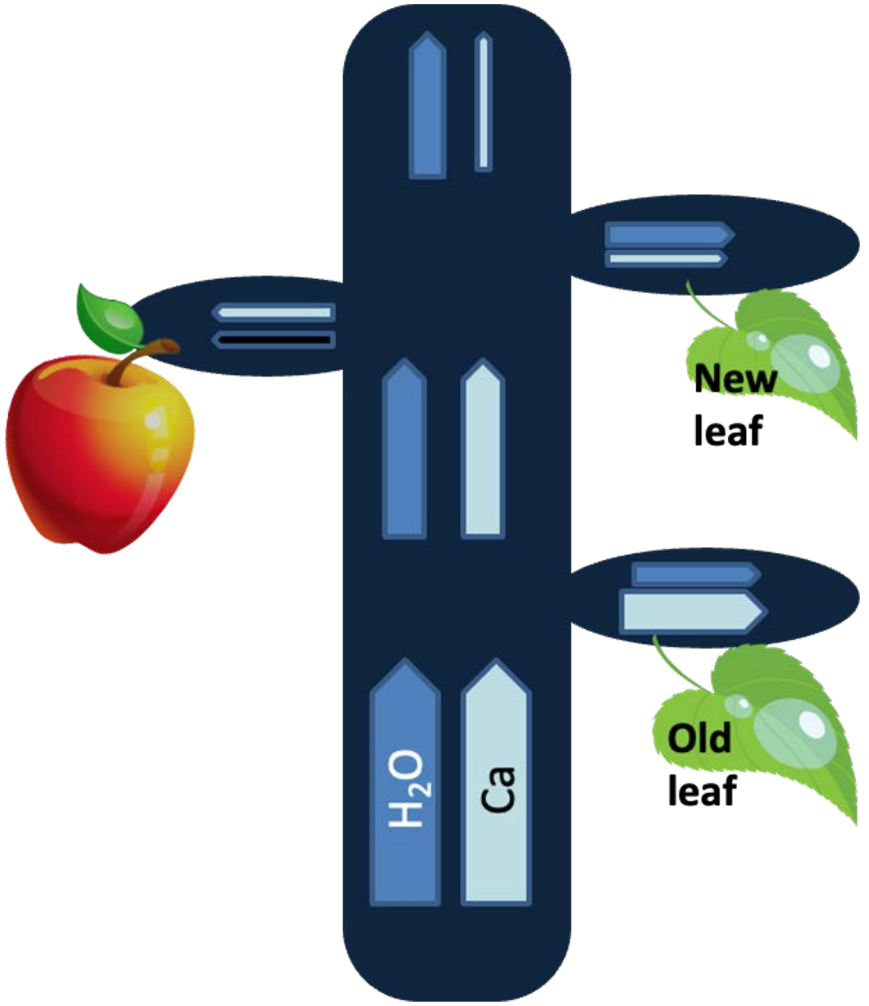
Fruit softening

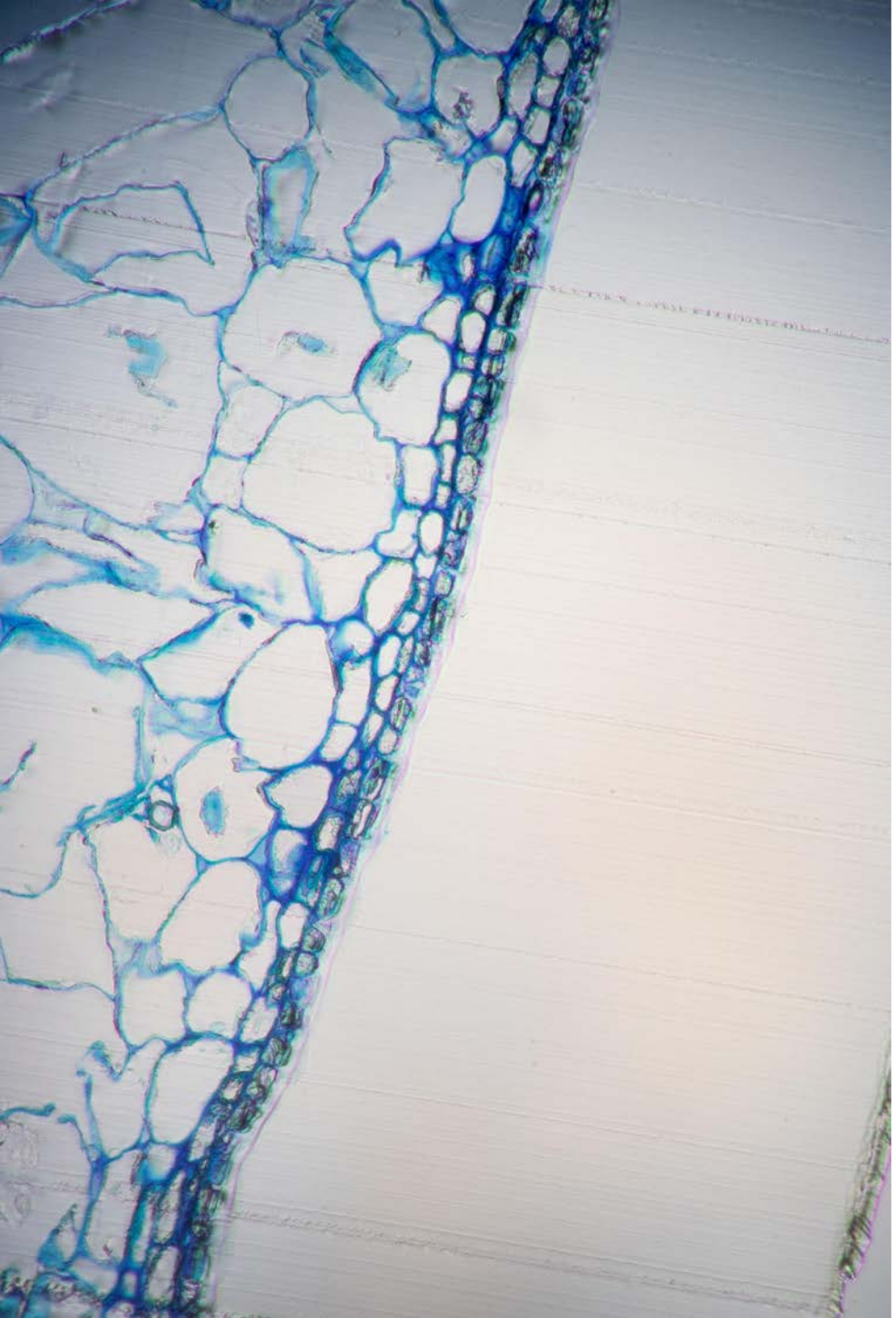
- Cell wall breakdown: pulp loses integrity.
- Enzyme activity increases.
- However, calcium plays an important role as the glue that bounds the fruit cell walls.


Enzymes
Cell wall
Cell wall
Cell
Cell

Calcium in plant

- Essential macronutrient.
- Ca uptake occurs in the root tips of new roots.
- Calcium moves through the transpiration gradient, that is water in the plant xylem.
- Ca accumulation is higher in plant tissues with higher transpiration rates (i.e., leaves).
- Once calcium accumulates tissue, is extremely immobile.



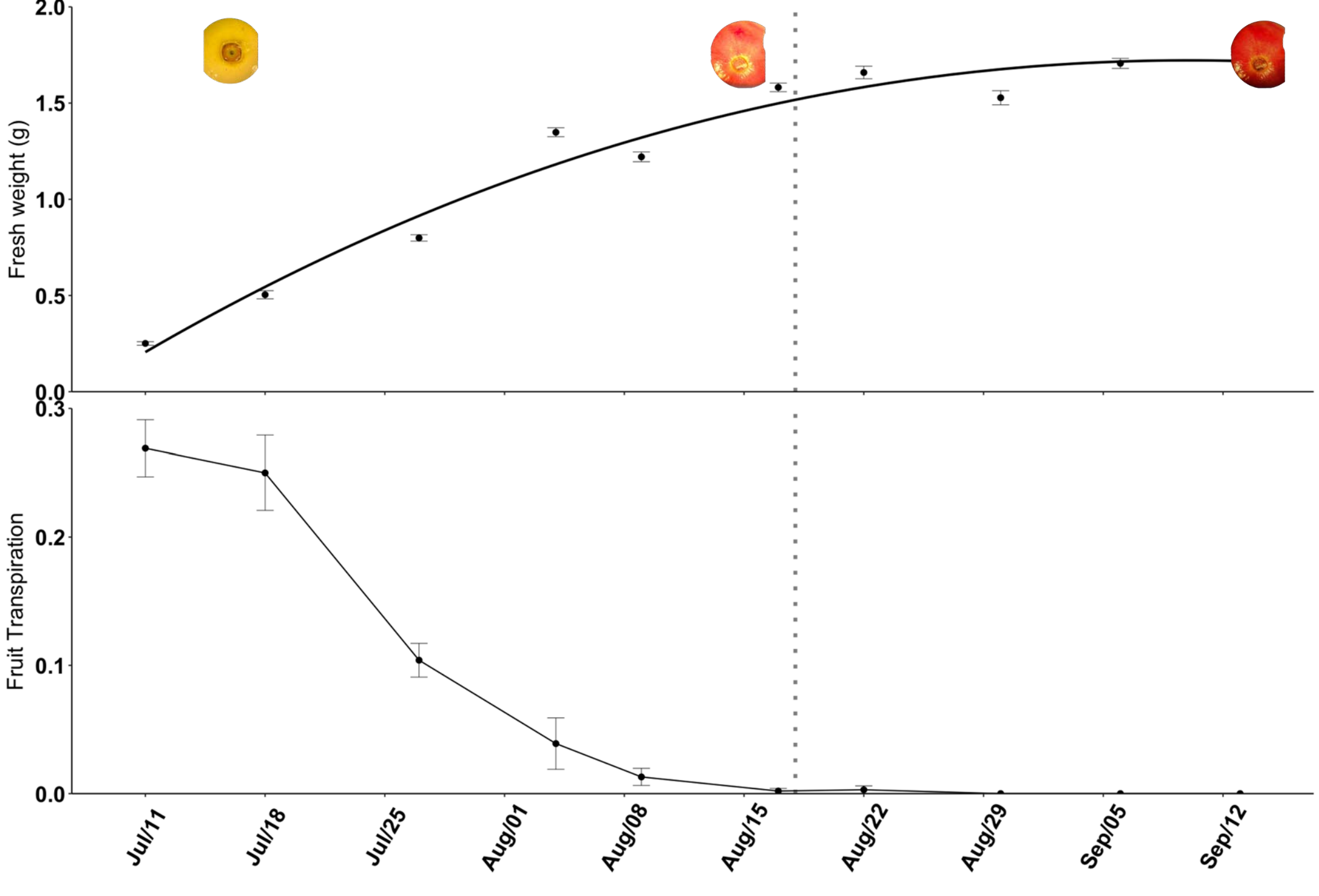


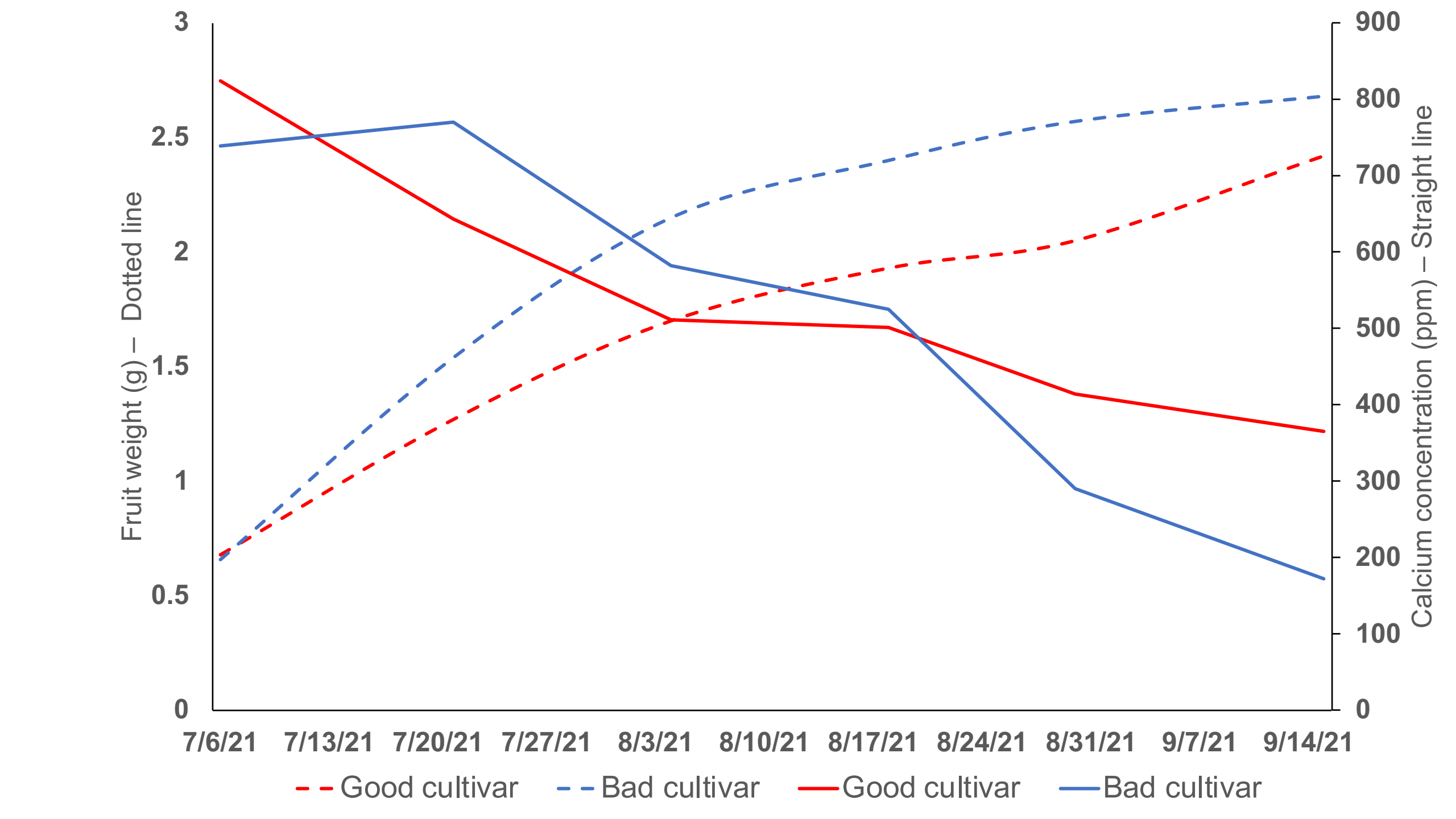
Calcium in fruit

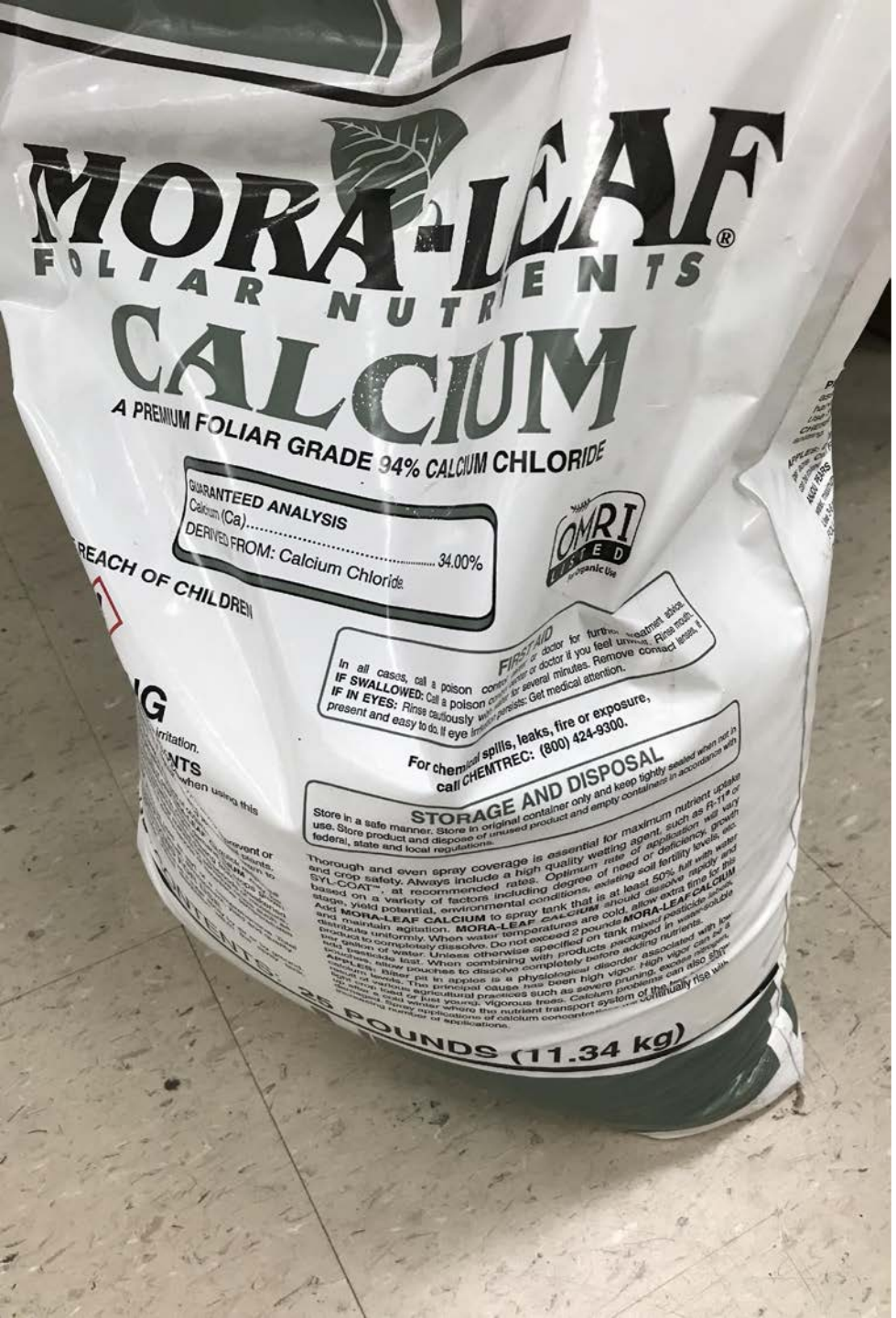
- Calcium translocation to the fruit occurs early in season before color development:
  - Cuticle thickness increases.
  - Xylem functionality decreases.
  - Fruit transpiration decreases

Fruit calcium accumulation in cranberry fruit study

- Site: Wisconsin Cranberry Research Station in Summer 2022.
- Genotype: ’Stevens’
- Weekly sampling for calcium concentration in whole fruit and in the cell wall.
- Random sample collection of the first two berries, from bottom to top.


Fresh weight (g)
2.0
1.5
1.0
0.5
0.0
Fruit Transpiration
0.3
0.2
0.1
0.0
Jul/11
Jul/18
Jul/25
Aug/01
Aug/08
Aug/15
Aug/22
Aug/29
Sep/05
Sep/12


3
2.5
2
1.5
1
0.5
0
Fruit weight (g) – Dotted line
900
800
700
600
500
400
300
200
100
0
Calcium concentration (ppm) – Straight line
7/6/21
7/13/21
7/20/21
7/27/21
8/3/21
8/10/21
8/17/21
8/24/21
8/31/21
9/7/21
9/14/21
Good cultivar
Bad cultivar
Good cultivar
Bad cultivar



Foliar calcium applications

- Calcium chloride is widely to increase Ca content in many other fruit crops.
- The objective of this study is to evaluate the effect foliar calcium application during four early phenological stages on fruit calcium content.

Fruit calcium application

- Site: Wisconsin Cranberry Research Station in Summer 2022

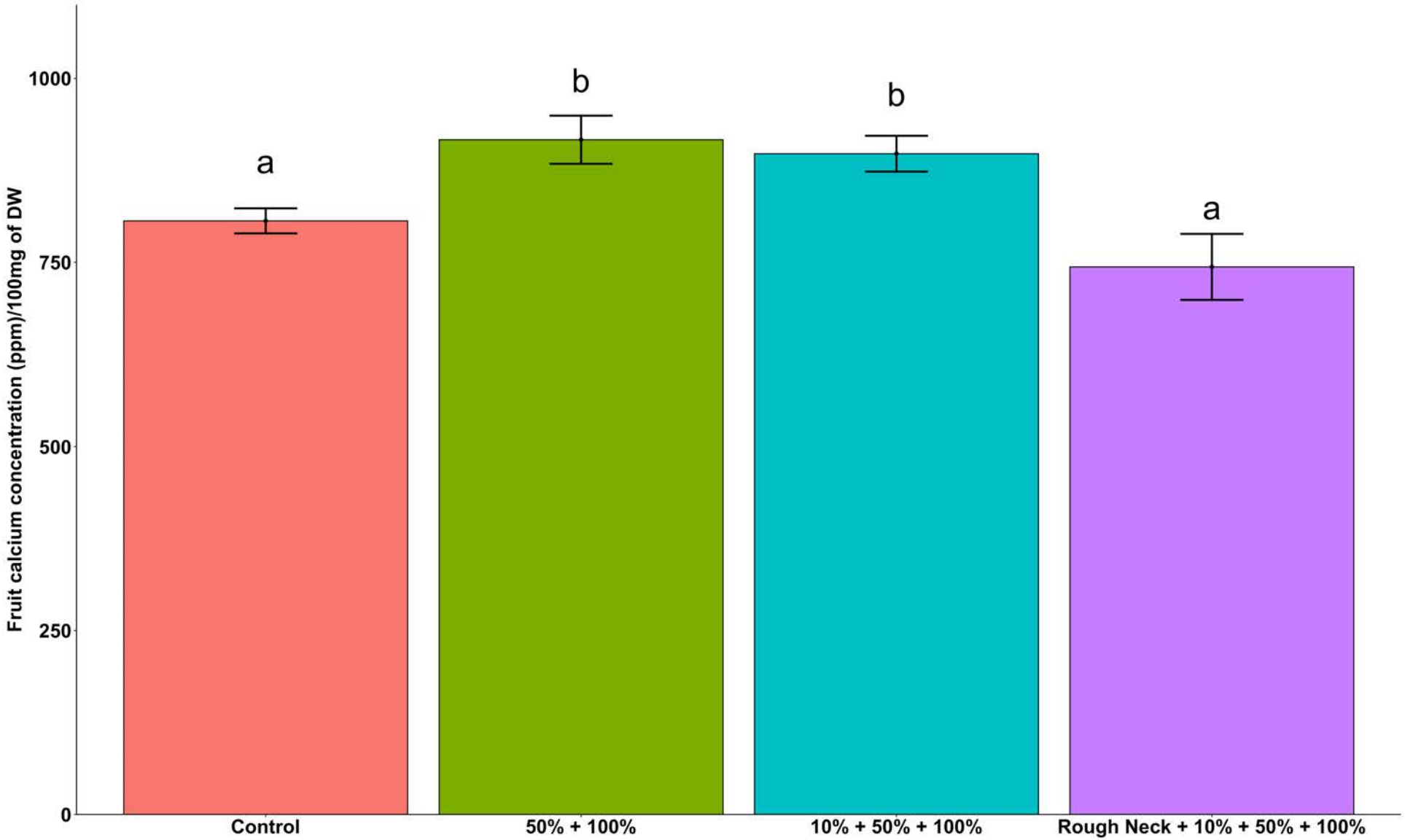
  Summer 2023 pending location

- Calcium chloride applications through four different phenological stages:
  - Rough neck
  - 10% Bloom
  - 50% Bloom
  - Full Bloom

- Calcium concentration:
  - Control
  - 750 ppm
  - 1500ppm
  - 3000ppm

Fruit calcium application

- Repeat the best treatments from 2022.
- Add cumulative applications.
- Add locations and cultivars.


Fruit calcium concentration (ppm)/100mg of DW
1000
750
500
250
0
a
b
b
a
Control
50% + 100%
10% + 50% + 100%
Rough Neck + 10% + 50% + 100%

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- Wisconsin Cranberry Research Station (Thanks again Wade!)
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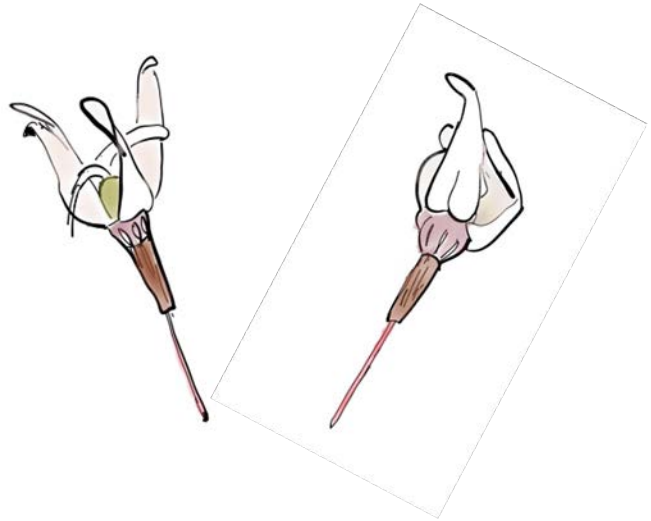
- Allison Jonjak.
- Atucha lab members



Thank you