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Growing larger berries: water influx and cell division

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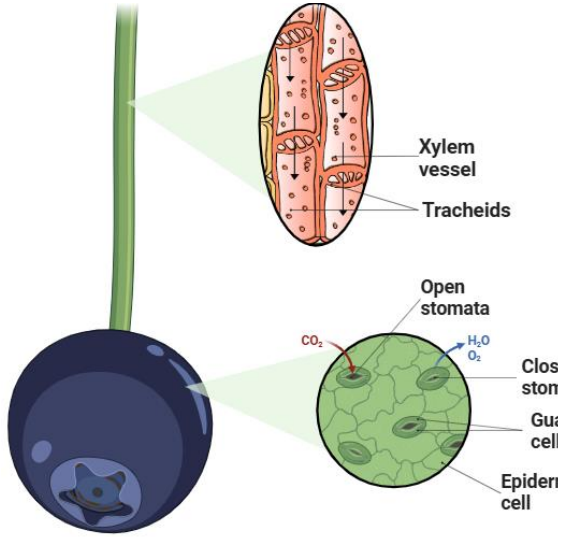
Fruit quality is the key for consumer satisfaction

- Firmness
- Size and shape
- Sugar and acidity ratios
- Texture
- Others

The water balance of fruits is influenced by two main processes:

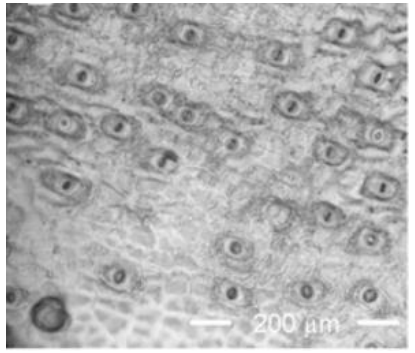
Transpiration:
- water loss through the epidermis and stomata

Water influx:
- Through the xylem in the pedicel

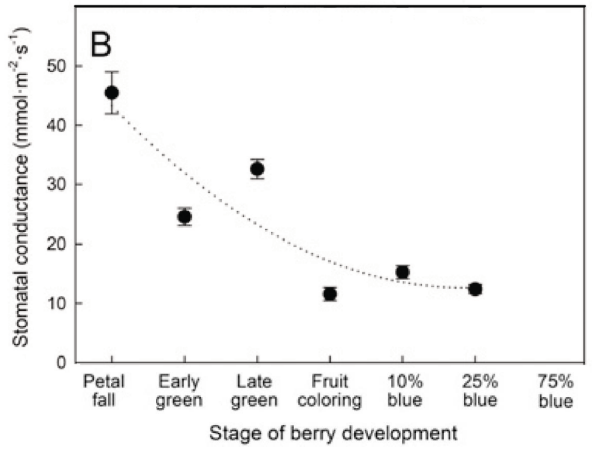


Stomata regulate gas exchange and transpiration

•**Stomatal density**: Number of stomata per unit area



Research has been conducted in NHB blueberries

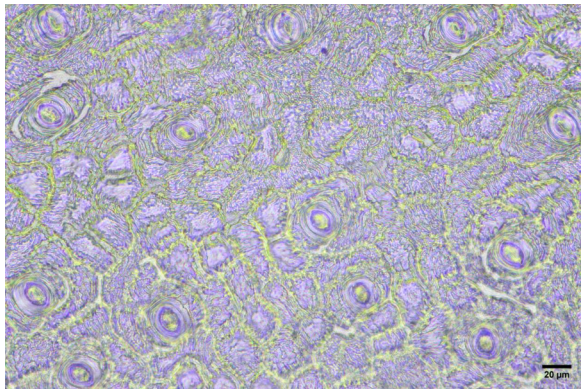


Yang, et al 2020

We measured stomatal density using microscopy and artificial intelligence

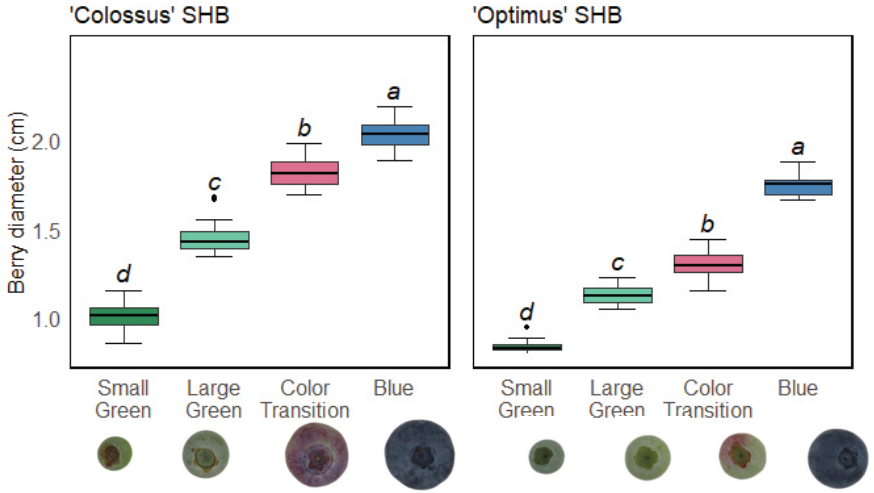
Microscopy

StoManager

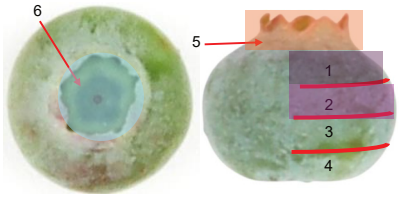


Wang, et al 2024

We studied two cultivars at four developmental stages

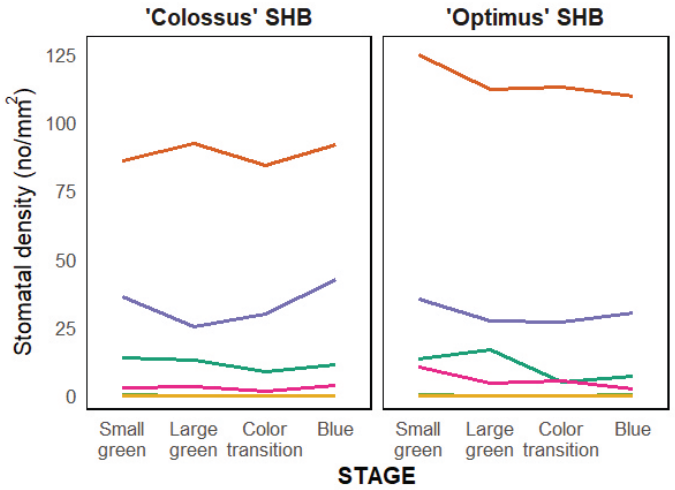


Most stomata are found in the fruit calyx

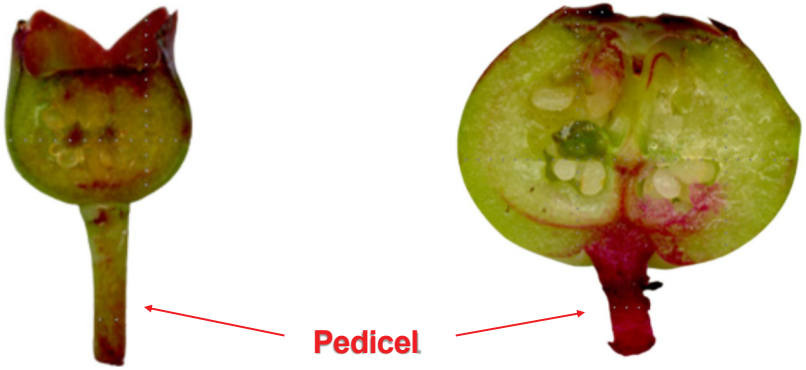


Fruit Part

- Distal (calyx) end 1
- Distal middle 2
- Proximal middle 3
- Proximal (pedicel) end 4
- Calyx 5
- Calyx basin 6



Water moves towards the calyx where the highest stomatal density was found



Small green (<10 mm)

Large green (>20 mm)

Elijah Ohaegbulam

Summary

What we know:

- Stomatal density varies depending on cultivar and fruit part

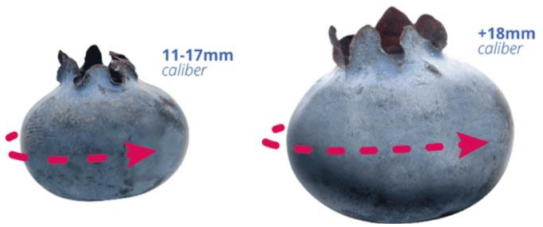
Next steps:

- Stomatal density of soft and firm cultivars
- Measure fruit transpiration
- Evaluate stomata and xylem function

Blueberry industry is challenged by evolving consumer preferences

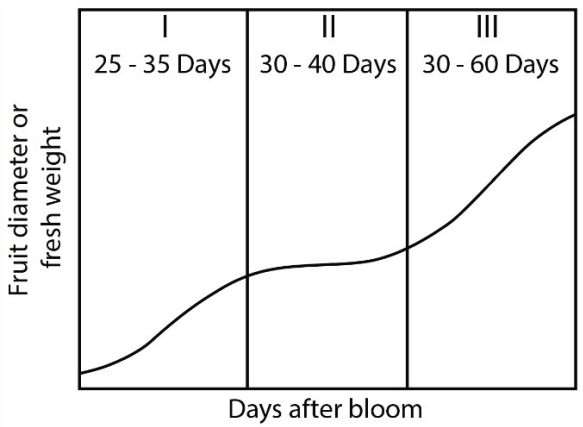
Consumers prefer larger berries

They are willing to pay higher prices for superior attributes



https://www.pacin.ca/jumbo-blueberries

Blueberry fruits have two stages of rapid growth



- Stage I
  Rapid cell division, dry weight accumulation
- Stage II
  Rapid resource accumulation, seed development
- Stage III
  Cell enlargement, maturation and ripening

Zilfina Rubio Ames (2024)

Some plant growth regulators (PGRs) can promote cell division

Cytokinin promotes cell division, growth, and differentiation

CPPU- Forchlorfenuron is a synthetic cytokinin with high activity

Wan, et al. 2024

There is a need to update the research of CPPU in modern cultivars

HortScience 42(7):1612–1615. 2007.

Effects of CPPU Applications on Southern Highbush Blueberries

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Fruit size approach

Application date

February 22, 2024 (week 8) ~80% petal fall

March 20, 2024 (week 12). Fruit on small-green stage

Concentration

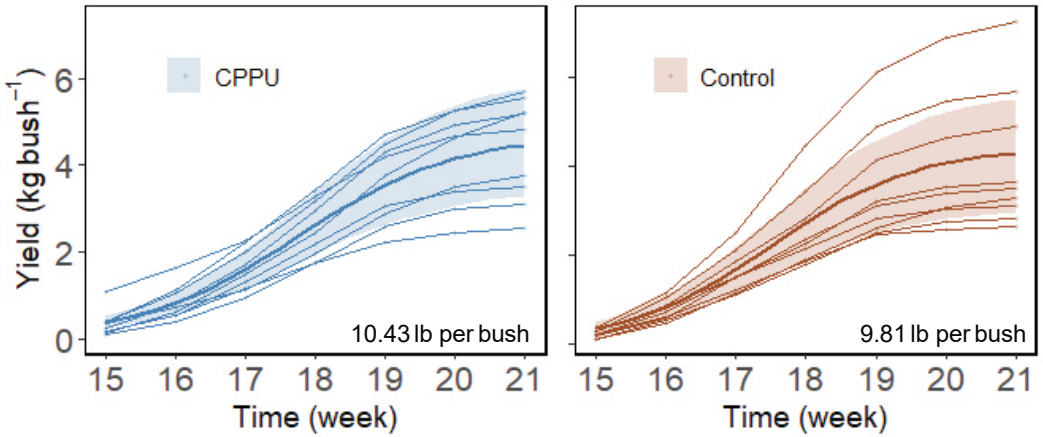
12 Oz / 150 gl (~ 5 ppm)

Treatments

1. Control
2. CPPU

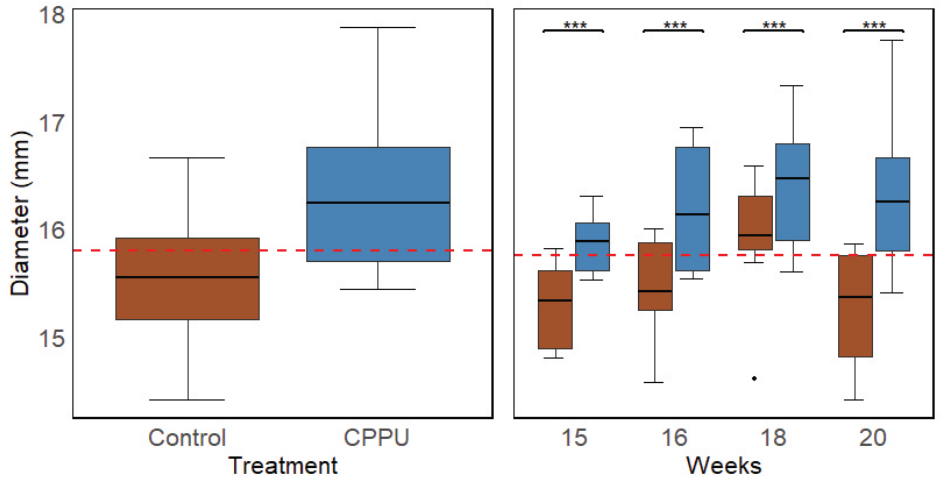
'Optimus' SHB

CPPU application did not have a significant effect in yield



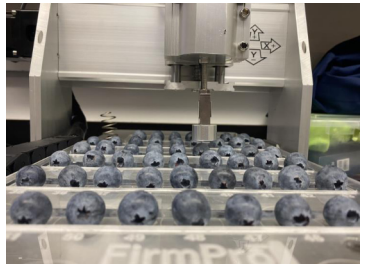
Individual bushes (n = 9).

CPPU increased fruit diameter across all weeks evaluated

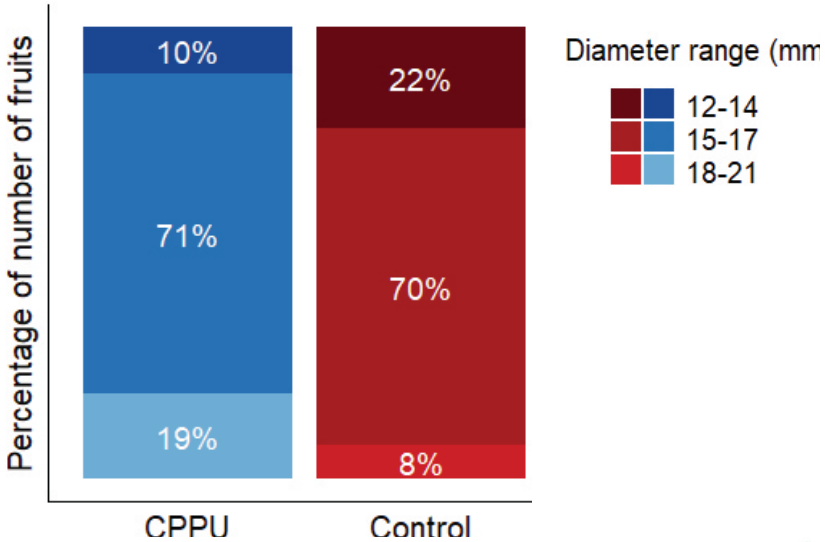


Red dashed lines represent average 15.8 mm from the Blueberry breeding program

CPPUtreatment increased the size of the smallest berries



Total: 900 berries per variety



Summary

What we know:

- CPPUapplication increased fruit diameter
- CPPUapplication did not affect yield and fruit quality parameters

Next steps:

- Evaluate additional rates

Acknowledgments

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Elijah Ohaegbulam

Thank you!

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