

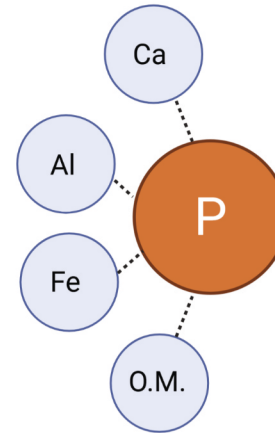
# Phosphorous fertilization in southern highbush blueberry

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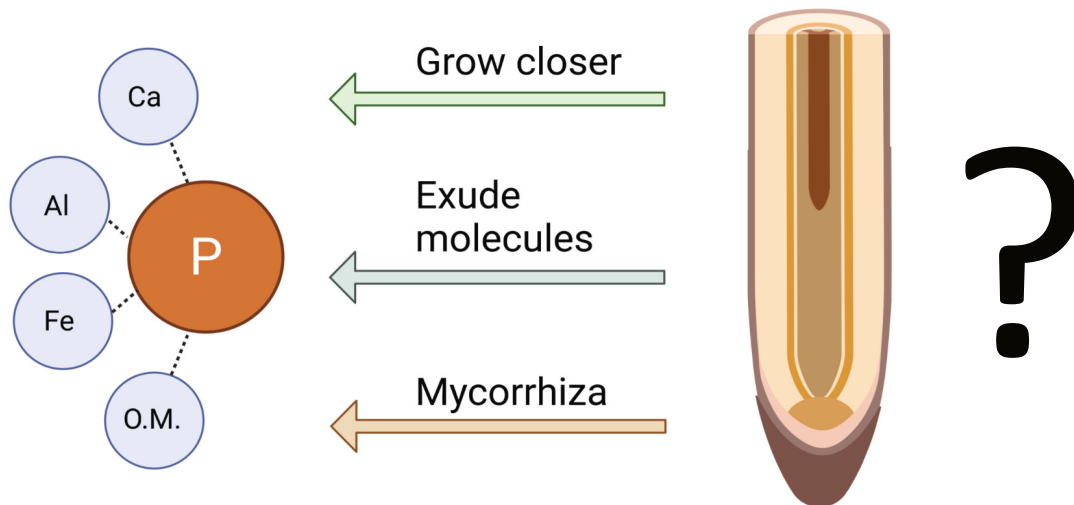


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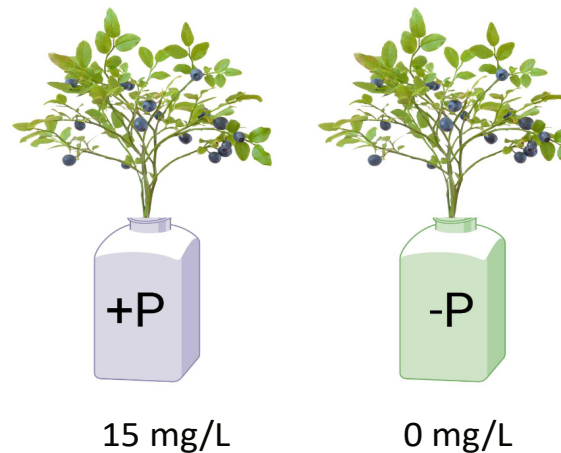
Phosphorus (P) is highly immobile in the soil



Plants use three strategies to take up P



We used a hydroponic experiment to investigate P uptake strategies



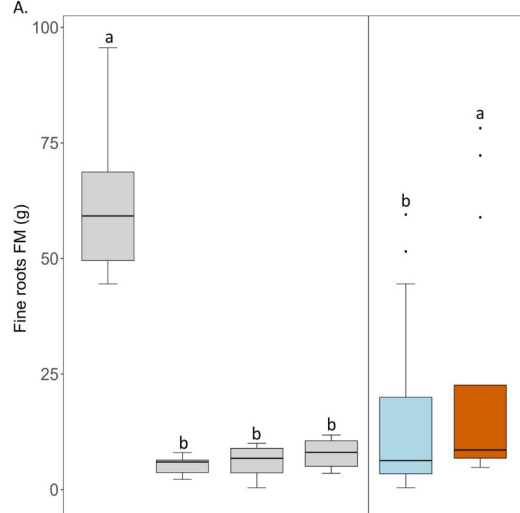
### Plant material

- 'Colossus' SHB
- 'Farthing' SHB
- 'Keecrisp' SHB
- 'Sentinel' SHB

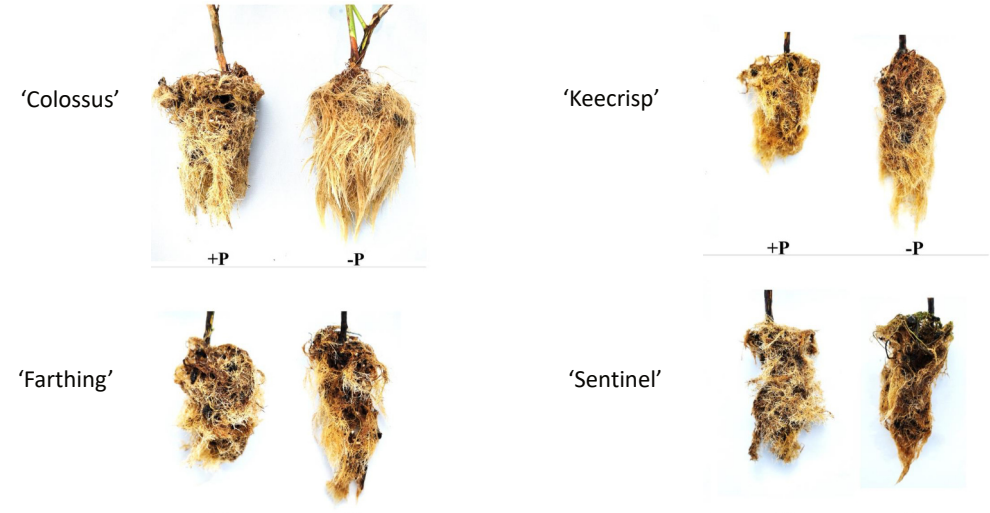
### Data collection

- Root growth and exudation
- Leaf symptoms

All varieties responded to P deficiency by growing more fine roots

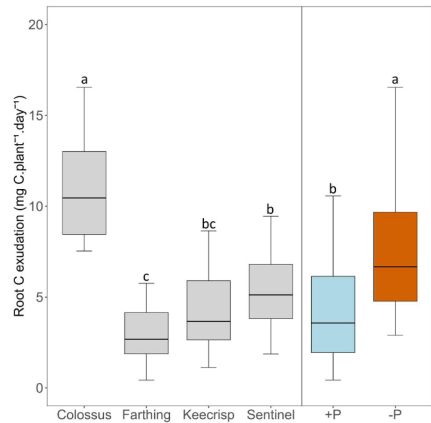


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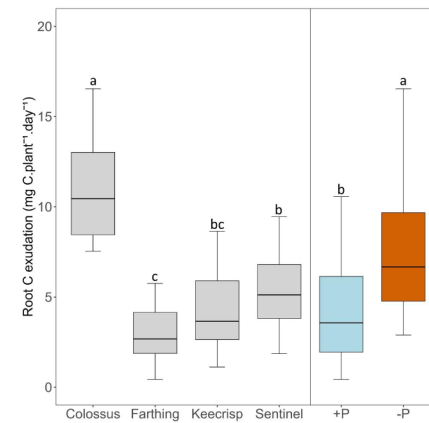
Plants responded to P deficiency by exuding enzymes and other organic molecules

Increase solubility of P-containing minerals

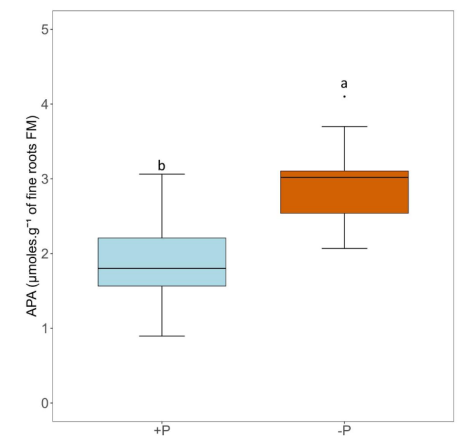


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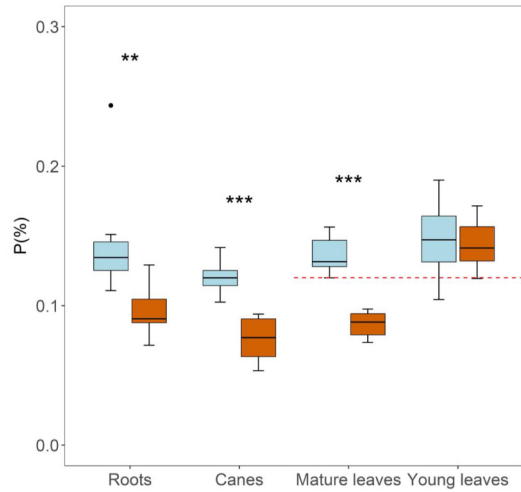
Increase solubility of P-containing minerals



Breaks P-containing minerals



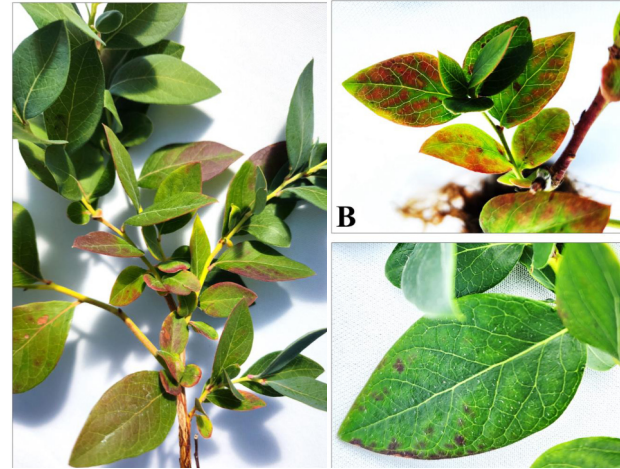
# P deficiency can have quiet symptoms



Mature leaves develop symptoms first

P is remobilized to young leaves to maintain growth

# P deficiency can have quiet symptoms

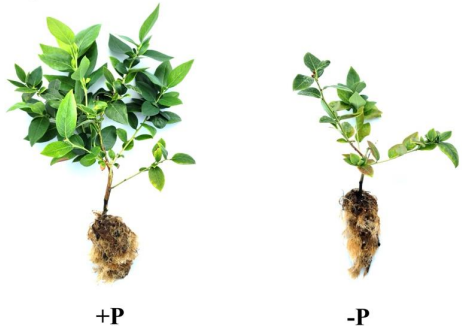


Mature leaves develop symptoms first

P is remobilized to young leaves to maintain growth

# P deficiency affects growth only in some varieties

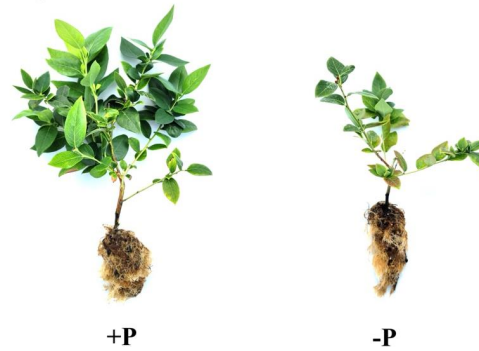
'Farthing' SHB



Less growth. Higher root:shoot ratio

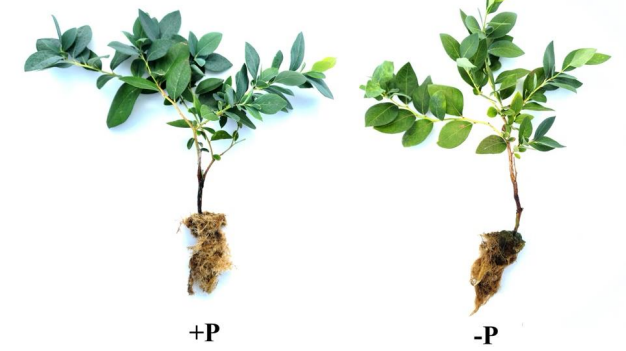
# P deficiency affects growth only in some varieties

'Farthing' SHB



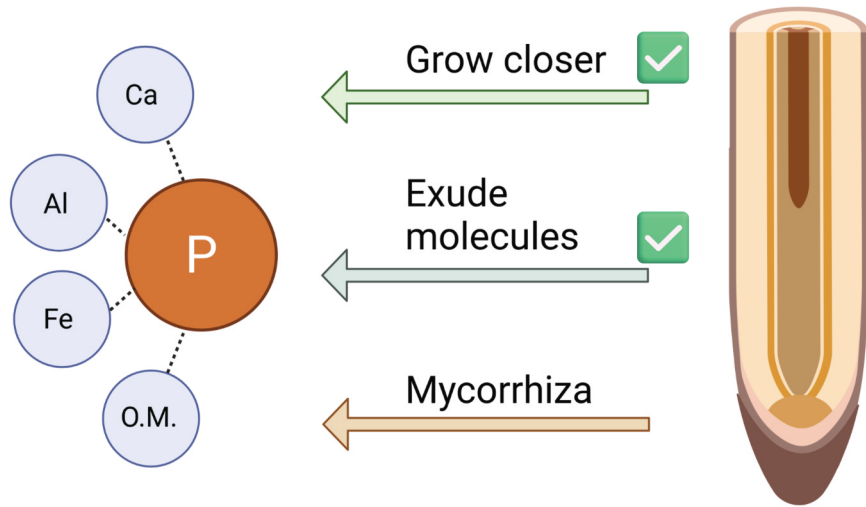
Less growth. Higher root:shoot ratio

'Sentinel' SHB



Maintain growth. Same root:shoot ratio

## SHB use two strategies to take up P



## We investigated P deficiency responses in a field experiment

- 'Sentinel' and 'Optimus' SHB
- Five P rates
  - 0 lb/A
  - 15 lb/A
  - 30 lb/A
  - 45 lb/A
  - 60 lb/A



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## We investigated P deficiency responses in a field experiment

- 'Sentinel' and 'Optimus' SHB
- Five P rates
  - 0 lb/A      0 lb  $P_2O_5$  / A
  - 15 lb/A     35 lb  $P_2O_5$  / A
  - 30 lb/A     70 lb  $P_2O_5$  / A
  - 45 lb/A     105 lb  $P_2O_5$  / A
  - 60 lb/A     140 lb  $P_2O_5$  / A



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## Field conditions at planting

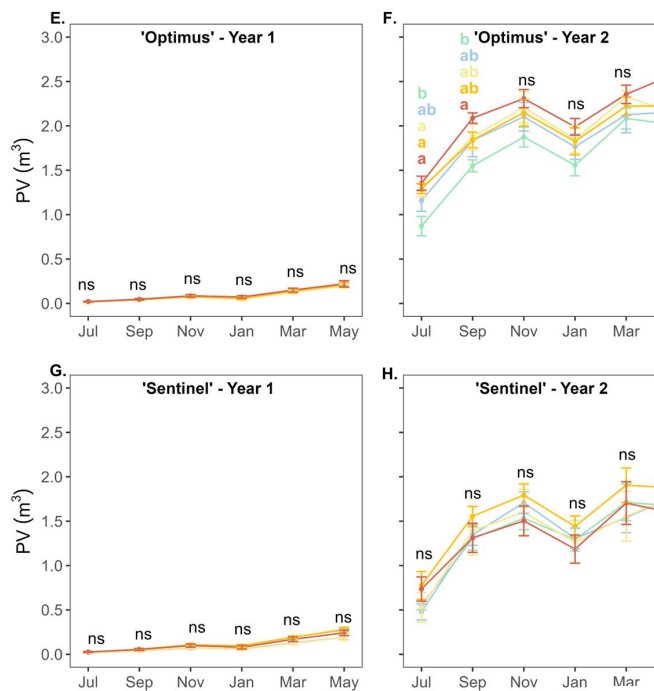
Soil properties	Average $\pm$ S.D. (n = 8)
pH	6.05 $\pm$ 0.19
Cation exchange capacity (meq/L)	5.08 $\pm$ 0.61
Organic matter (%)	0.63 $\pm$ 0.08
M3 Phosphorus (mg/Kg)	157.75 $\pm$ 21.46

Very high P concentration

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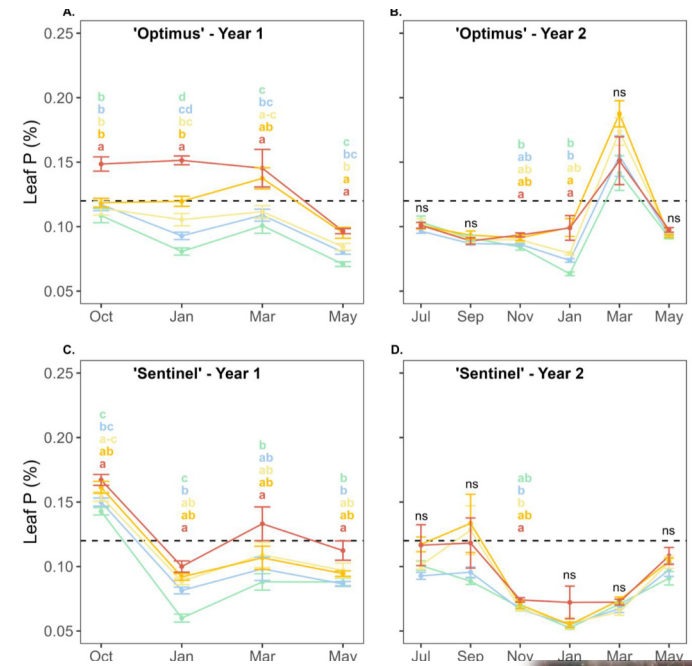
Plant growth was affected in 'Optimus' but not in 'Sentinel'



P fertilization (lb/A)

● 0 ● 15 ● 30 ● 45 ● 60

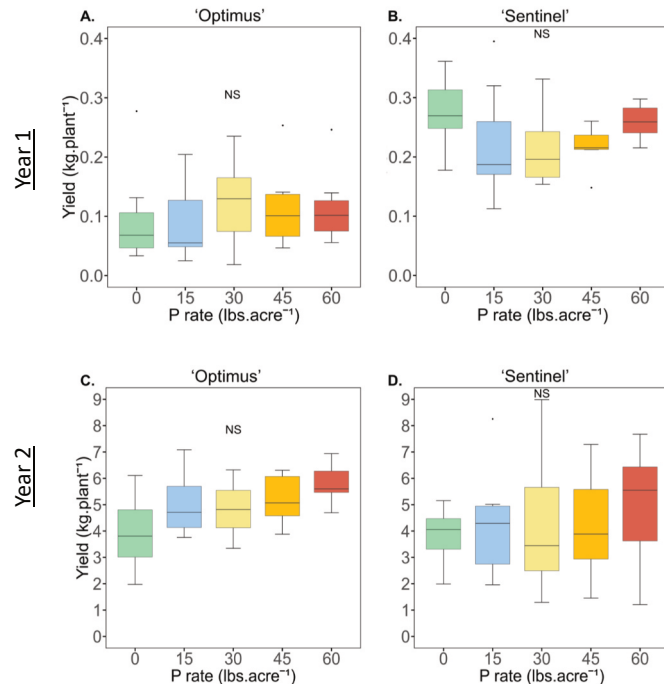
Leaf P concentrations were affected when plants were small



P fertilization (lb/A)

● 0 ● 15 ● 30 ● 45 ● 60

P fertilization did not affect yield



In summary:

- Blueberry plants forage phosphorus by:
  - Growing more fine roots
  - Releasing enzymes and other organic molecules in the soil
- There are varietal differences.



## In summary:

- Phosphorus deficiency:
  - Is easier to detect in older leaves
  - Appears as reddening in older leaves
  - Can affect plant growth, but not yield



## Ongoing work

- Field → Third year harvest scheduled for Spring 2025
- Nursery → P deficiency for faster rooting

## Collaborators



Marlon Retana-Cordero



Dylan Kovach



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#28710

## Funding

## Ongoing work

- Field → Third year harvest scheduled for Spring 2025
- Nursery → P deficiency for faster rooting

## Phosphorus fertilization in southern highbush blueberry

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