

Rhizobium inoculants for Ontario bean plants

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The BENEFIT Project



BENEFIT - Bio-inoculants for the promotion of nutrient efficiency and crop resiliency in Canadian Agriculture

Research Goals

Identify Canadian microbes able to support crop nutrition (dry bean, wheat, barley, canola, peas)

Identify plant traits to guide breeding of cultivars better able to benefit from microbial interactions

The BENEFIT Team



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BENEFIT Partners and Funders



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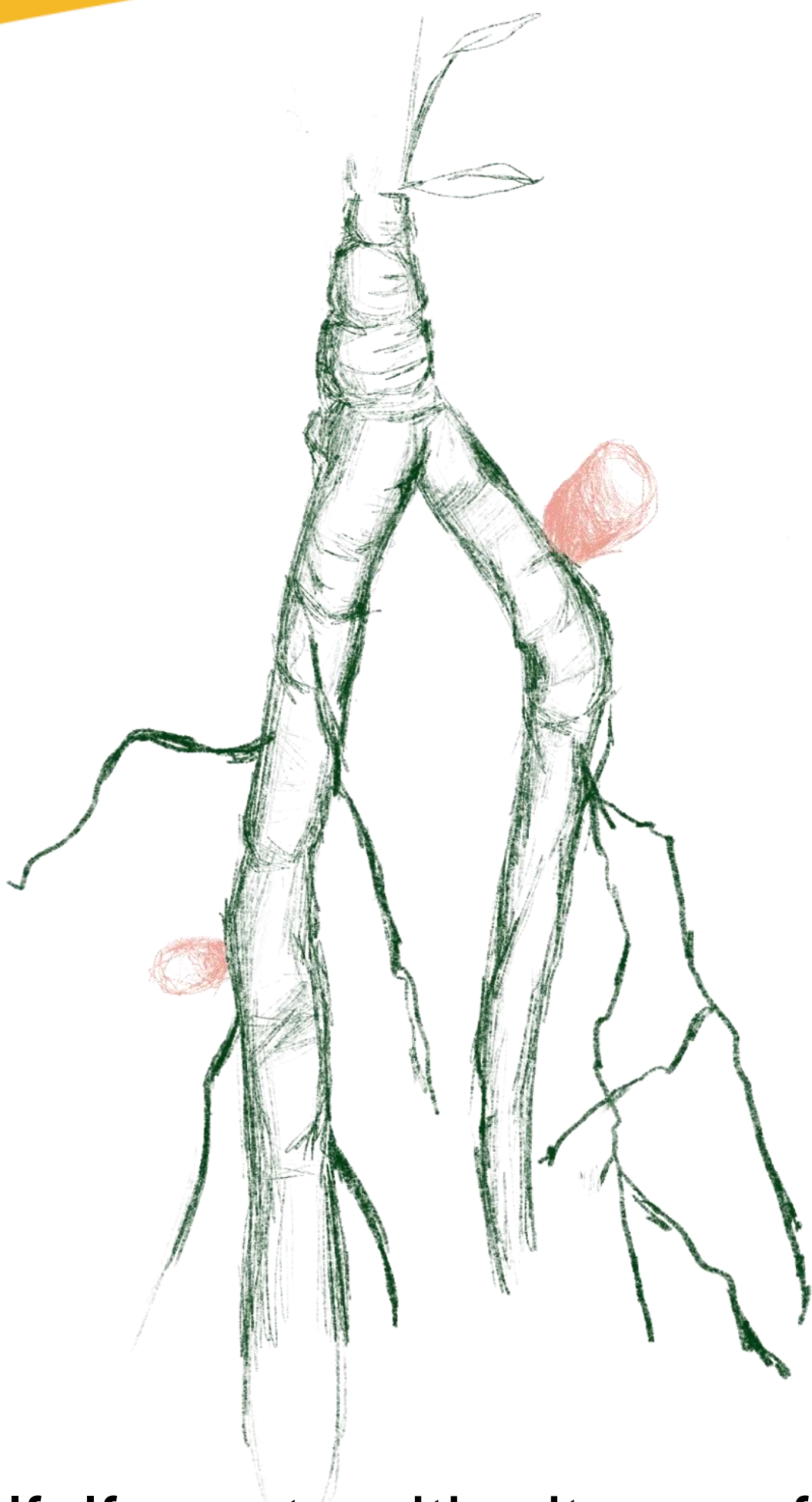


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Bean - a legume without a rhizobium inoculant



Alfalfa roots with nitrogen-fixing nodules. Hand drawn by former student Janis Cheng.

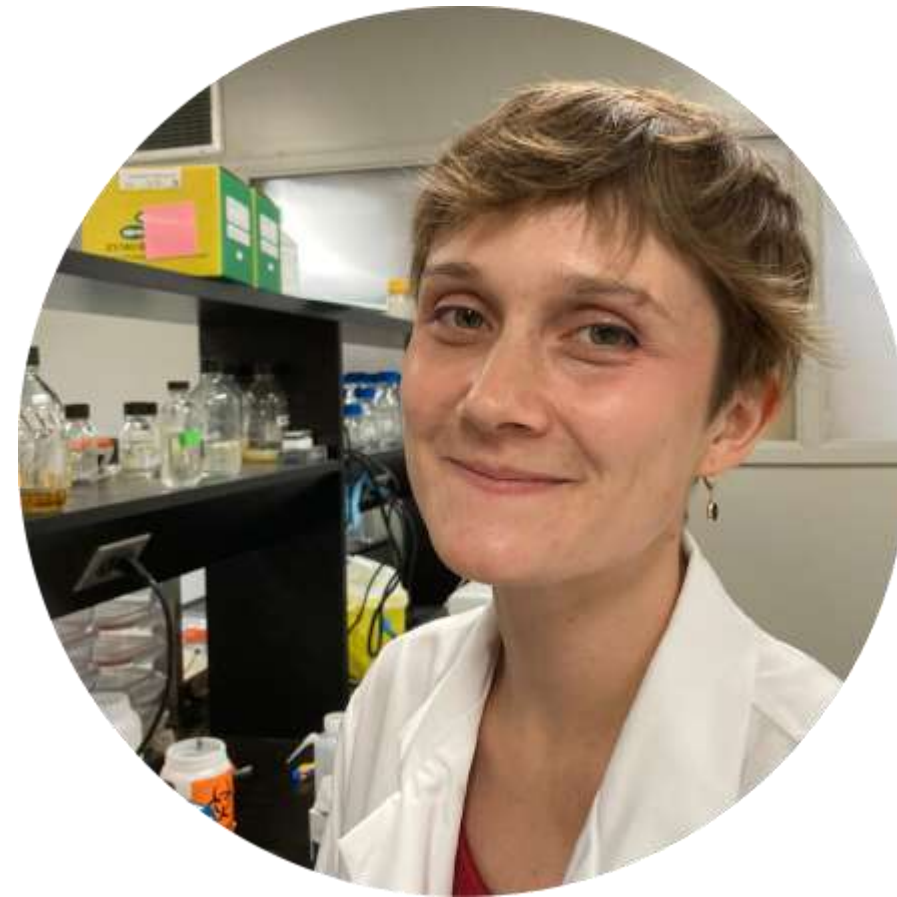
Train	Control	Rhizobium inoulcation	Nitrogen fertilizer
Yield (kg/ha)	2566	2470	3004
%Ndfa (measure of N-fixation)	45.5	42.6	20.4

Data taken from Reinprecht et al (2020) Frontiers in Plant Sciences, from Peter Pauls team.

Nodule trapping experiments



Avery Dixon
Undergraduate student



Oone Esme
Lab Technician



Tia Harrison
Postdoctoral Fellow

Nodule trapping

Inoculate plants with soil samples

“Trap” rhizobia in the nodules

Purify rhizobia from the nodules



Nodule trapping experiments - Navy bean



No soil

Soil 1

Soil 2

Soil 3

Soil 4

Soil 5

Nodule trapping experiments - Navy bean



No soil

Soil 1

Soil 2

Soil 3

Soil 4

Soil 5



Soil 2

Nodule trapping experiments - Navy bean



No soil

Soil 6

Soil 7

Soil 8

Soil 9

Nodule trapping experiments - Navy bean



No soil

Soil 6

Soil 7

Soil 8

Soil 9



Soil 7

Nodule trapping experiments - Navy bean

Initial observations

Common bean rhizobia are common in Ontario ... but most are not useful

Will these pose trouble for an inoculant?

Some sites look promising for identification of potential inoculant strains



Soil 2



Soil 7

Nodule trapping experiments - Adzuki bean



No soil Soil 1 Soil 2 Soil 3 Soil 4 Soil 5



No soil Soil 6 Soil 7 Soil 8 Soil 9

Nodule trapping experiments - Adzuki bean



No soil

Soil 1

Soil 2

Soil 3

Soil 4

Soil 5



No soil

Soil 6

Soil 7

Soil 8

Soil 9

Nodule trapping experiments - Adzuki bean

Initial observations

Adzuki bean rhizobia are uncommon, but present, in Ontario

Too early to tell if any are effective symbionts



Future Steps



Individually screen all ~300 rhizobia for nitrogen-fixation with navy bean and kidney bean, or adzuki bean

Test their competitiveness for nodule occupancy

Continue to survey more Ontario soils for bean rhizobia

Interested in helping?

If willing to provide us with
soils for surveys of rhizobia,
please reach out!

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Nodule trapping experiments - Kidney bean

Commercial
variety



Heirloom
variety

