



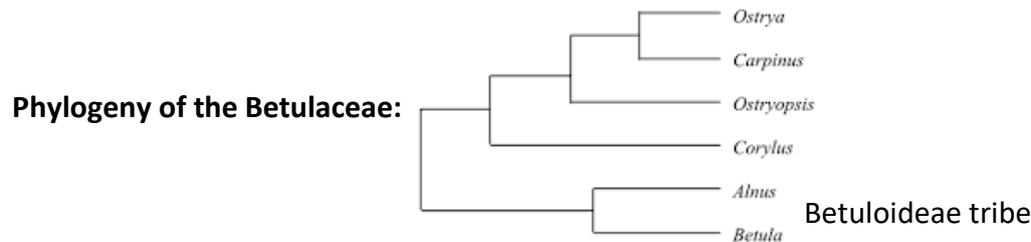
MSc thesis project (60 hp)



Reaction of alder and birch to *Frankia*:

What was lost in the non-symbiotic genus *Betula*?

Collaboration with Sara Mehrabi, Uppsala University,
Katharina Pawlowski, Stockholm University
and Jarkko Salojärvi, Helsinki University, Nanyang Technological University



Alnus spp. trees (Griesmann et al. 2018) can enter a root nodule symbiosis with nitrogen-fixing *Frankia*, while trees of their sister genus *Betula* (Salojärvi et al. 2017) cannot. A comparison between both can help us understand the gene losses in birch that are required for the establishment of the root nodule symbiosis in alder.

In the experiment, seedlings of both tree species will be grown in an axenic system and infected with *Frankia alni* ACN14a. The root hair extension zone – the area of the root where nodule induction takes place – will be harvested at days 0, 1, 4 and 10 after inoculation. Transcriptomes will be sequenced and their comparison will be carried out to identify the point where the signaling responses of alder and birch to *Frankia* diverge, and what may be the underlying cause for this divergence.

The project will require

- Plant tissue culture
- *Frankia* cultivation
- RNA isolation
- (transcriptome sequencing and mapping to the respective genomes will be performed)
- Evaluation of transcriptome comparison and confirmation of key points by RT-qPCR

The lab will be based at Stockholm University.

If interested, please contact:

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References

- Griesmann M, Chang Y, Liu X, Song Y, Haberer G, Crook MB et al. (2018) Phylogenomics reveals multiple losses of nitrogen-fixing root nodule symbiosis. *Science* 361(6398): eaat1743. doi: 10.1126/science.aat1743.
- Salojärvi J, Smolander OP, Nieminen K, Rajaraman S, Safronov O, Safdari P et al. (2017) Genome sequencing and population genomic analyses provide insights into the adaptive landscape of silver birch. *Nat Genet* 49(6): 904-912. doi: 10.1038/ng.3862.