Two Cassava related projects, contact Erik Alexandersson, SLU Alnarp (erik.alexandersson@slu.se)

Cassava is one of the most important food and feed crops in the tropics and especially Africa. Because of its remarkable tolerance to drought, ability to grow in poor soils, and perennial nature which allows it to be harvested when required, this species plays a particularly important role in food security in developing countries. However, heavy dependence on cassava for food has important nutritional drawbacks. Its relatively low nutritional quality has dire implications for millions of people. In particular, the carotenoid provitamin A (β-carotene) deficiency (VAD) commonly affects people whose diets are mainly constituted by starchy staple, and across Africa, an estimates 43% of preschool children show clinical signs of VAD. Therefore, cassava varieties with high carotenoid content should be bred for.

1. MSc or research project in plant nutrition: Carotenoid content in Cassava

In this project, we want screen the β-carotene content in different cassava lines and relate them to potato, which can have high values, using HPLC. In addition, we will look at the starch quality since high-starch varieties are preferred by the farmers. We are also interested in identifying new metabolite intermediates in the carotenoid biosynthesis. Finally, the effect of storage on the β-carotene content will be tested. The results will be related to existing genetic markers and maps (QTLs) for β-carotene and dry matter traits already existing to enable future breeding efforts.

2. MSc project or research project in plant bioinformatics: Cross-transcriptome analysis of Cassava and Potato for improved nutrient content and increased stress tolerance

In this project we want to test a new exploratory approach by cross-species comparative genomics between, a well-studied starch producer, and cassava, based on transcript data to identify new candidate genes and to understand the regulation of the key genes leading to increased β-carotene levels in cassava roots. Both potato and cassava have sequenced genomes, which is essential for this approach, produce carotenoids and have large amount of starch in heterotrophic starch-storing organs, i.e. roots and tubers.

Even though many biological pathways have been studied extensively, discovering missing genes in pathways remains a fundamental challenge, not least in non-model species such as cassava. Therefore we will with the help of cassava gene expression (RNA-seq data) adapt the MORPH (MOdule-guided Ranking of candidate PatHway genes), and try similar approaches. We will also adapt cassava and potato gene expression data to the CoExpNetViz algorithms. This will be done in collaborations with our colleagues at VIB Ghent, Belgium. The goal is to refine carotenoid and starch pathways in cassava and fine new gene candidates interacting with these for further study.