

Topic/Title (Norwegian)

Undersøkelse av fenotypisk stabilitet i genredigert potet

Topic/Title (English)

Investigating phenotypic stability in gene edited potato

Picture



Figure 1: Change in phenotype due to CRISPR/Cas editing of *F3H* in potato. Left and centre: Observed change in flower and tuber colour in the first year of greenhouse growth. Right: Unwanted phenotype with elongated tuber and additional bulbous growth observed after two generations in the greenhouse.

Summary (Describe the topic/thesis, type of thesis work: field work, laboratory work, literature study)

GENEinnovate is a project at NMBU aiming to increase our knowledge and expertise on gene editing in plants, fish, cattle and pig. In the plant part of the project, we have focused on CRISPR gene editing in potato (*Solanum tuberosum*).

We hypothesized that a CRISPR mediated knockout of *F3H* would result in lack of red pigmentation in the potato plant. This has been successfully demonstrated in two potato cultivars, 'Nansen' and 'Desiree', where tuber colour was changed from red to yellow (Figure 1). To further our understanding, we want to observe the phenotypic stability of the edited plants through several generations in the greenhouse. We want to compare the phenotypes from one generation to the next, and between different gene edited lines. In the second year of greenhouse growth, we observed unusual phenotypes in some potato tubers. This could be due to several reasons, such as somaclonal variation in regenerated plants, starch content or suboptimal growth conditions during the summer (e.g. temperatures reaching 40°C in the greenhouse or irrigation).

We want to investigate this further, by comparing plants grown directly from *in vitro* plants (first generation) with second and third generation plants in the greenhouse.

The thesis work will include greenhouse growth and harvest of gene edited potato lines, phenotypic screening, analysis of starch content, and possibly molecular screening (PCR, sanger sequencing) of



Bachelor or Master thesis BIOVIT 2022/23

the harvested tubers. Edited plants made using different delivery methods will be compared, and a successful candidate is expected to acquire knowledge on both CRISPR and different plant transformation systems.

Multiple generations in the greenhouse might be possible, depending on the starting date of the candidate.

Subject area (keywords)

Plant science, plant biotechnology, gene technology, gene editing, CRISPR

Language thesis (Norwegian and/or English)

Master thesis

Credits

30 or 60, scope of the thesis can be adjusted as needed

Project/company

GENEinnovate, NMBU

Please contact

Trine Hvoslef-Eide trine.hvoslef-eide@nmbu.no

Anders Wulff-Vester anders.wulff-vester@nmbu.no