

## MASTER THESIS PROPOSAL

MSc/Master project on Potato Late Blight resistance genetics

### Identification of molecular markers for late blight foliar resistance in potato.

#### Background:

Potato late blight is caused by *Phytophthora infestans*, is the most destructive fungal disease of potato worldwide. The disease attacks both foliage and tubers, and spreads quickly in the fields, and if not controlled by fungicide spraying, crops can be severely damaged. In Norway, Graminor plant breeding are aiming to develop potato cultivars with improved genetic resistance to late blight, that would require fewer pesticide applications, for a more sustainable potato production. To breed specifically for desired economical important traits and disease resistance Graminor utilizes molecular tools (eg. GS and MAS) in the plant breeding programs. Several markers linked to important traits in the potato breeding material have been identified and are in the process of being validated and tested for their usefulness in marker assisted selection in tetraploid potato.

#### Aims and Objectives:

This study aims to identify and validate molecular markers linked to the genes involved in the response to *Pi* infection of the leaves (foliage) in Graminor potato breeding material. The student will develop/improve a method for efficient screening of *Pi* resistance by studying the response in inoculated leaflets and perform phenotypic scoring of the disease severity. Besides the phenotypic data, the genomic information from the 22K SNP will be used to perform genome wide association studies (GWAS).

*Evaluate the correlation between the observed resistance reaction in the greenhouse-grown plants, compared to the field resistance and/or tuber resistance, based on historical data. Study the association between early foliage maturity and tuber susceptibility to blight.*

#### Plant materials:

Graminor potato "core collection", a panel of 276 *Solanum tuberosum* varieties, representing the Norwegian potato germplasm, grown in greenhouse at Bjørke research station, Ridabu. This collection of tetraploid clones has previously been genotyped with the 22K GGP v3.0 Illumina array.

#### Methods:

The student will screen a panel of 276 potato cultivars for foliar response to late blight infection, according to the the "Detached leaf test for foliage blight resistance", -method developed in the framework of the EUCABLIGHT concerted action (2003-2006). Inoculum, a mix of *Pi*-races present in Norway, will be prepared to perform inoculation of leaf material, before incubation in climate chambers. Phenotyping (severity of sporulation/necrosis) will be done in collaboration with the breeders. Genome wide association studies (GWAS) will be performed, based on the phenotypes and the genomic information from the 22K chip, to identify molecular markers linked to late blight foliage resistance. PCR primer assays for candidate SNP markers will be designed and tested in SNPLine-instruments (LGC Genomics), located in the laboratories in Bjørke.

This can be 30 or 60 credit master themes

Location: NMBU/NIBIO and Graminor

Supervisor NMBU: May Bente Brurberg

Supervisor Graminor: Muath Alsheikh (also NMBU), Sidsel Emilsen

Project will be funded by Graminor AS

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For more information contact; Muath Alsheikh, Graminor AS, [muath.alsheikh@graminor.no](mailto:muath.alsheikh@graminor.no)