

Potato Projects Resistance Biology unit (SLU Alnarp) 2021-

- **Plant resistance inducers** – the next set of questions for future sustainable agriculture, *Formas*
- **Integrated use of genetic resistance in Swedish food potato production**, *SLF/Formas* (**Late blight, Skin finish and biological control**)
- New resistance against potato blights, *Carl Trygger Foundation*
- Resistensförädling för friska grödor – fokus torrfläcksjuka i potatis (***Alternaria solani***), *SLU*
- Integrated control of **early blight** in starch potato, *SLU industry PhD programme*
- **Gene edited** potatoes for reduced pesticide usage, *Novo Nordisk Foundation*
- Protein translational control by gene editing for increased **stress resilience** especially to *Phytophthora infestans*, *Formas* – **New resistance mechanisms**
- Stress resilient plants by genome editing of potato pathogen **sensitivity genes**, *Formas*
- **Field-omics of extreme long days conditions**

Comparative proteomic analyses of potato leaves from field-grown plants grown under extremely long days

Svante Resjö^{1*}, Jakob Willforss^{2*}, Annabel Large^{1,3}, Valentina Siino², Erik Alexandersson¹, Fredrik Levander², Erik Andreasson¹

1. Department of Plant Protection Biology, Swedish University of Agricultural Sciences, PO Box 102, SE-230 53 Alnarp, Sweden

2. Department of Immunotechnology, Lund University, Sweden

Soon to be submitted

Borgeby

Umeå

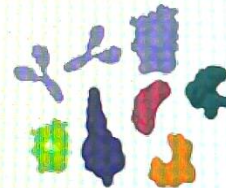
2016

2018

2019



12 potato varieties



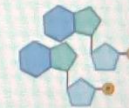
One potato variety:
Desiree



Proteomics



Transcriptomics



Metabolomics

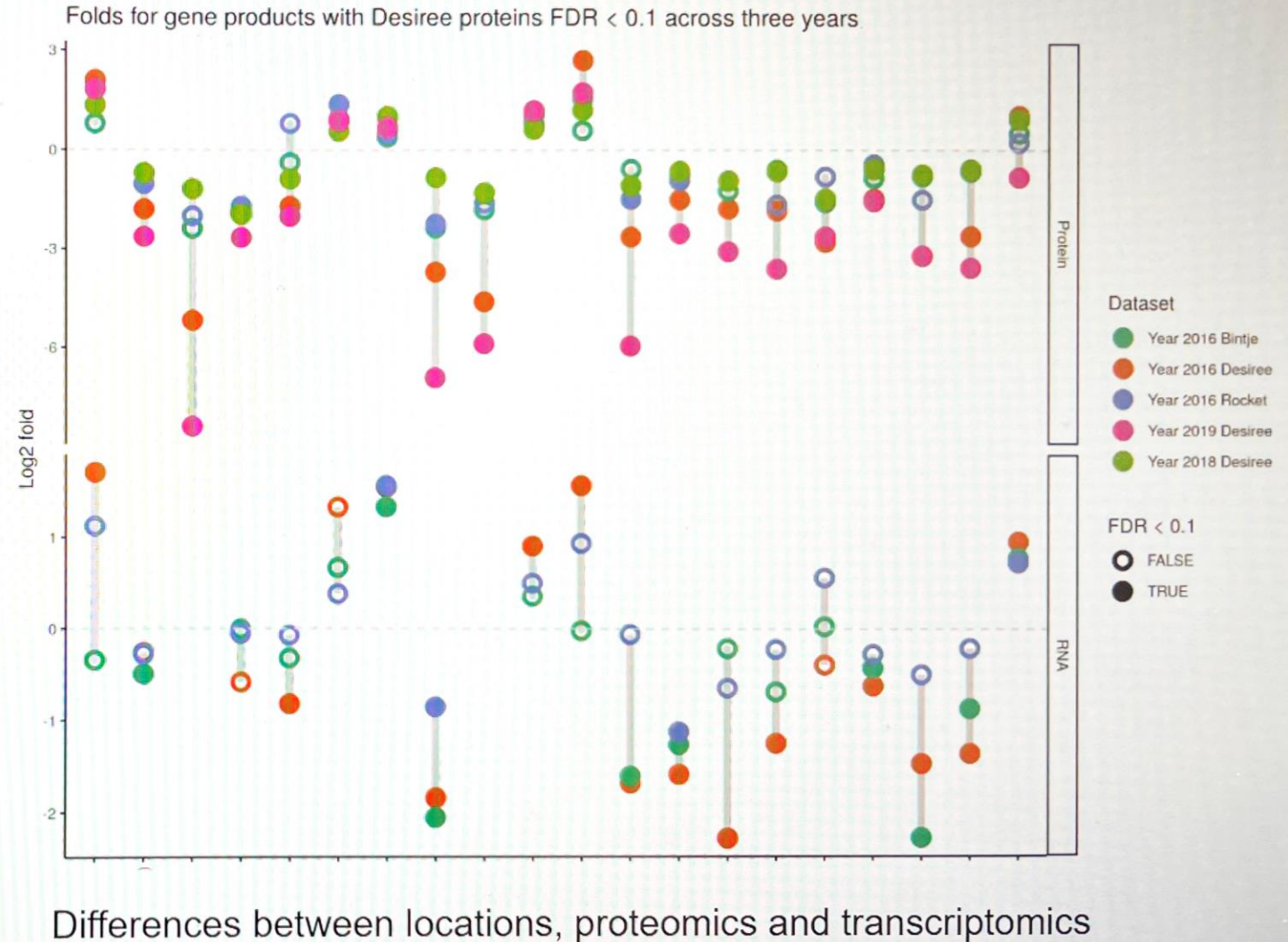
We present proteomics data from 3 years of field trials on potato, conducted in northern and southern Sweden; we analyzed over 4000 proteins every year of the study.

We observed small but consistent differences linked to the longer days in northern Sweden compared to that in southern Sweden, with a strong correlation between the mRNA and protein abundances. The majority of the proteins with differential abundances between northern and southern Sweden could be divided into three groups: metabolic enzymes (especially GABA metabolism), proteins involved in redox metabolism, and hydrolytic enzymes.

We also analyzed differences in protein abundance between potato varieties that performed relatively well in northern Sweden in terms of yield with those that performed relatively less well. This comparison might indicate a superior ability to exploit the greater number of light hours at high latitudes among the cultivars in the high-yielding group. Our results create a base of information about potato “field-omics” for improved understanding of the physiological and molecular processes in field-grown plants, and our data indicate that the potato plant is not stressed by extremely long days.

Conclusions

- Proteins consistently different between locations across three seasons identified
- Proteins different between 'yield-groups' identified
- Constitutes unique field-omics resource



Collaboration with Solynta – Umeå and Skåne

- 3x100 phenotype datapoints (over 50 new genotypes) were analysed in 2017, fewer in 2018
 - General outcome: their diploid mtr1 works well in Umeå
 - Currently in Skåne: Experiments with new late blight resistance genes, and combinations thereof (same 4 sites in Europe).
- Hybrid breeding with good parents