



HIP WP 1.5: “On Vitality of Seed Potatoes”

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The goal of this project is to gain insight into the interaction between storage conditions and genotype regarding physiological ageing of seed potatoes during storage and their subsequent performance when planted in the field. Physiological ageing is being monitored through sprouting tests and molecular analysis using metabolomics platforms is performed at different storage times to follow biochemical perturbances. The seed tubers are then planted in the field at different sites to carry out a full crop growth analysis.

Highlights:

The year 2019 was used to produce seed tubers on one site of the contrasting cultivars Agria (late, slow ager), Festien (late, fast ager), Innovator (early, fast ager) and Lady Claire (early, slow ager). Moreover, the methodologies of analysing seed tubers of potato using metabolomics platforms were optimized. Seeds were stored at 4.0, 7.5 and 10.5 °C.

During the storage season of 2019/2020, samples were taken to monitor the ageing of the seed tubers using sprouting tests and for metabolomics analysis of tubers and tuber parts (e.g. top eye, other eyes, remaining tuber parts or entire tubers). As expected, there were highly significant interactions between cultivar and storage regime for the various sprouting characteristics.

After the storage season, PhD candidate Chunmei Zou joined the team and together with the HIP partners she carried out two field experiments at different sites making use of the 12 combinations of cultivar and storage regime. During the field season regular assessments of canopy development, tuber development and physiological disorders were carried out. There were two harvests per site, one at seed tuber stage and one at table potato stage. At the final harvest, tuber size distribution was assessed making use of the phenotyping facilities of McCain. Canopy structure and yield were affected by the interaction between storage regime, cultivar and location but therefore the results were not always consistent across experimental sites. The data on the size distributions at the different harvests are still to be analysed, but with differences in number of tubers per plant and yield it is expected that there will be significant differences in size distribution as well.

Meanwhile the samples taken during the 2019/2020 storage season were analysed in the metabolomics lab and all data were processed. First analyses showed that there were very different metabolic profiles for the different combinations of cultivar and storage regime and very different changes of these profiles over time, also depending on the part of the tuber analysed. Some compounds have been identified that demonstrate very specific changes in relative abundance. At this stage it is still too early to draw conclusions on these patterns, as they need to be analysed further. However, the visualised temporal and spatial changes augur well for the successful evaluation of GxE effects and the characterisation of seed potato aging physiology.

The team is also seeking synergy with the “Ketenproject” carried out by NAK and with other HIP projects by combining observations and analyses.

Bottlenecks:

There are no bottlenecks. The research went as planned and that is a great compliment to the entire team. However, the effects of physiological age in the field experiment were smaller than expected, most likely due to the favourable growing conditions in 2020.

Planning:

In 2020, the project produced a new set of seed tubers of the same cultivars for the 2021 growing season. These seed tubers are currently being stored at the same three storage regimes as in 2019/2020. Samples are taken for sprouting tests (with a slightly modified protocol) and for metabolomics analyses. In 2021, three field experiments will be carried out with this material, again in close collaboration with the HIP partners. An MSc student will carry out a full modelling analysis of the canopy cover data set of 2020. We will also make an in-depth analysis of the 2019/2020 metabolomics data, which are very promising and hopefully validate key findings using the new samples from 2020/2021.

Products:

Presentation of Chunmei Zou during the HIP meeting of 29 October 2020 and a Video on the project.

Illustration:

Sprouting test S5 (14/05/2020)



Sprouting tests late during the storage period involving the four contrasting cultivars (Agria, Festien, Innovator and Lady Claire) and three storage temperatures (4, 7.5 and 10.5 °C).