Morphological, physiological and proteomic responses of potato cultivars to nitrogen deficiency in an *in vitro* system

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Nitrogen is an essential nutrient which directly influences crop yield and quality. Potatoes require high levels of nitrogen up to 200 kg per hectare, especially in early developmental stages for canopy development. The above-ground biomass is generally related to the photosynthetic capacity and therefore contributes essentially to tuber yields. Nitrogen fertilizers have been used intensively with negative side effects on the environment, e.g. nitrate leaching to the groundwater. This is a special problem in potato production due to the shallow root system of potato and the practice of total nitrogen input in a single treatment at the beginning of growing. Identification of traits contributing to improved nitrogen uptake and utilization may help in breeding of potato cultivars with optimized nitrogen efficiency.

Previous studies on *in vitro* grown table potatoes indicated that responses to nitrogen deficiency varied considerably in a set of table potato cultivars. Especially differences in nitrogen uptake capacity and root development were observed. This suggested cultivar-depend differences in response to nitrogen deficiency and nitrogen use efficiency. In the present study the developed method was used to screen a set of starch potato cultivars for their response to nitrogen deficiency under highly controlled *in vitro* conditions. Liquid MS media with four nitrogen levels (60, 30, 15 and 7.5 mMol/l) were used and plant development and nitrogen uptake evaluated after 7, 11, 14 and 18 days of incubation.

Here we present results obtained on two table cultivars (Lambada and Topas) and seven starch cultivars. Lambada produces high biomass under high nitrogen availability and reacts with a strong decrease under nitrogen deficiency. In contrast Topas produces less biomass under high nitrogen availability, but does not react with a strong decrease under limited conditions. The nitrogen uptake and root development on Lambada is faster than on Topas. We use these differently reacting cultivars to classify the starch cultivars for their response to nitrogen deficiency. To achieve this we determine the biomass production of roots and shoots (fresh and dry matter), the chlorophyll- and crude protein content. Furthermore, differences in the nitrogen uptake during the cultivation period will be demonstrated.

In addition, the *in vitro* system is used to study early proteomic changes in the shoot proteome on the cultivars Topas and Lambada. Using 2D IEF/SDS PAGE method to separate and MALDI-TOF MS to indentify the proteins. First results obtained revealed more differently regulated proteins in Topas than in Lambada.