

Carrot is a valued and worldwide cultivated vegetable, known for its storage root health benefits that contains high amounts of β -carotene (pro-vitamin A). All mechanisms responsible for its biosynthesis and accumulation in storage root remains undiscovered. Basic factors limiting genetic research in this plant among others are its biennial nature and modifying effect of environmental factors on carotenoid content. For this reason in this project we plan to use a model system of callus tissue made of undifferentiated cells maintained in a controlled laboratory environment. In previous initial research was demonstrated that modified amount of mineral salts supplying nitrogen inhibits accumulation of carotenoids in carrot cells. Therefore the aim of this project is to analyze how availability of different mineral nitrogen forms (ammonium and nitrate) affects biosynthesis and accumulation of carotenoids.

In this project two callus tissue lines will be obtained. First one will accumulate high amounts of carotenoids, comparable with amounts found in carrot roots. Second one under effect of changed availability of nitrogen sources will have inhibited carotenoids accumulation. To compare changes in carotenoid content, their quantity will be measured in both tissues using high performance liquid chromatography (HPLC). From both tissues will be isolated total mRNA and sequenced. Based on sequencing results genes with changed expression profile will be acquired. Using histological and ultrastructural analysis we want to precisely see changes that happens in cell structure. In particular, interesting will be to find out changes in chromoplasts development, which determines also carotenoids accumulation in cells.

Results from all analyses allows one to understand the influence of availability of different nitrogen forms on metabolic processes in carrot cells, in particular connected with production of carotenoids and chromoplasts development process, where they are accumulated.