

5. Conclusions

On the basis of results obtained and presented in this Ph.D. thesis, we can answer the question setting in "Aims":

1. During ontogeny of plants grown *in vitro*, the content and function of carotenoids changed in dependence on cultivation conditions (irradiance, presence of sucrose in medium, CO₂ concentration). These cultivation conditions affected carotenoid pattern also after *ex vitro* transfer.
2. Protective function of carotenoids was positively affected by sucrose in medium under higher irradiance but not under low irradiance.
3. Higher irradiance in combination with sucrose in cultivation medium had positive effect on carotenoid contents in beginning of *ex vitro* acclimation.
4. Changes in carotenoids content and function after *ex vitro* transfer were dependent on previous *in vitro* cultivation as well as on conditions during *ex vitro* growth. Very important were irradiance and CO₂ concentration. The shift of function of carotenoids from light-harvesting to protective enabled that photoinhibition was not observed after *ex vitro* transfer.
5. The content of xanthophyll cycle pigments and their de-epoxidation state increased during water stress. Also in these experiments carotenoids protected plants against photoinhibition damage.
6. Biosynthesis of carotenoids including xanthophyll cycle pigments during water stress was stimulated by abscisic acid and benzyladenine application and thereby protect of plants against photoinhibition.
7. Higher content of cytokinins in transgenic plants influence the content and composition of carotenoids and their changes during ontogeny.