Summary

Nitrogen deficiency is one of the most severe abiotic stresses, which leads to serious developmental alterations in plants. Adjustment of their root morphology is an important adaptive response when facing limited nitrogen resources. This comprises an elongation of the primary root and changes in lateral root density in some species. Such conditions also cause *Fabaceae* family members to develop a symbiotic relationship with nitrogen-fixing bacteria that results in the formation of root nodules. Noteworthy, aforementioned root reactions are dependent not only on environmental stimuli, but also on many endogenous factors. One of them are phytohormones, their metabolism and transport, as in the case of cytokinins. The activity of this hormone is multidirectional and influences, *inter alia*, the length of primary root, number of lateral roots, as well as development and number of nodules. Moreover, cytokinins often antagonize other hormones, such as auxins.

The goal of the presented doctoral dissertation was to characterize one of the proteins from the ABC (ATP-binding cassette transporters) transporter family in *Medicago truncatula*, namely MtABCG40. Carried out experiments showed that MtABCG40 is a plasma membrane protein, which imports *trans*-zeatin, known to be an active form of cytokinin. The gene encoding the transporter was most strongly induced in roots which exhibited the lowest lateral root density caused by nitrogen deprivation and cytokinin treatment. The activity of *MtABCG40* promoter was visible in *M. truncatula* root vascular bundle, root apical meristem (RAM) and lateral root primordium. The growth of *mtabcg40* primary root was slowed down which was accompanied by its shortened root tip and an induction of cytokinin and auxin RAM cell response. There were also more lateral roots produced. Their early primordia comprised more cells compared to the wild type. Similar observations were made for nodules. *mtabcg40* plants created more of them and the nodule primordia consisted of more cells. Any changes of *MtABCG40* expression due to the systemic autoregulation of nodulation signals were not recorded.

The obtained results indicate that MtABCG40 takes part in the negative regulation of *M. truncatula* lateral root density under nitrogen deprivation. This regulation relies on its ability to reduce RAM cells' sensitivity to root cap cytokinins, which results in the acceleration of primary root growth, and the suppression of lateral roots' initiation that causes their lower number. The number of nodules is reduced by MtABCG40 in a similar manner. The latter phenomenon is local, root-specific and not dependent on systemic signals from the shoot.