## DESCRIPTION FOR THE GENERAL PUBLIC

Plants as sessile organisms are not able to escape from surrounding stresses. In the process of photosynthesis, they absorb light energy which is converted into chemical bonds in light - dependent reactions and then in the light-independent phase this energy is used for the synthesis of organic compounds. From our point of view the most important is a by-product of photosynthesis, the oxygen that determines the life of aerobic organisms on our planet. Only a portion of absorbed energy is used for $CO_2$ assimilation. The remaining portion could be harmful, thus need to be dissipated as a heat or chlorophyll fluorescence. Light is one of the most variable factors determining the development of plants, because of its intensity and spectral composition changes during the day, but also throughout the seasons. This requires the system of rapid responses to such changes in the environment. Acclimation to the constantly fluctuating stress factors is possible only through complex communication between neighboring plant cells, but also between its leaves and roots. Excess light energy, which is absorbed by the chlorophyll molecules, results in a number of changes in chloroplasts, from where information is transferred to the nucleus in a process called retrograde signaling. Recent evidence suggests that these signals are critically important to the stressed plant response and can influence the regulation of gene expression through a process termed splicing. Another mechanism that can regulate gene expression is the mechanism of RNA interference. The key players of RNA interference are small non-coding RNA molecules and proteins which form special complexes with ability to silence the complementary mRNA sequences by cleaving them or blocking their translation. The number of evidences for the involvement of small RNAs in plant response to various stresses is increasing but still very little is known about how light stress and retrograde signals modulate their population.

**Therefore, the aim of our project is to identify small RNAs involved in plant response to light stress in leaves and roots. We would also like to know how the retroactive signals from chloroplasts affect the expression of these small RNAs and their target genes.**

We will prepare the libraries which are collections of small RNA molecules from leaves exposed to light stress and roots of model plant *Arabidopsis thaliana* grown in hydroponic conditions. We also plan to confirm cleavage sites of selected target sequences. To assess how small RNA populations and their targets are affected by known retrograde signals generated inside the plastid we will use inhibitors blocking photosynthetic electron transport and mutants impaired in retrograde signaling from chloroplast to nucleus.

This project is focused on identification of light stress-regulated small RNAs. It should elucidate their significance in plant adaptation to stress in light fluctuating conditions. The project aims to analyze various retrograde signals regulating small RNAs in leaves where the stress is applied and in dark-grown roots in order to understand small RNA-guided acclimatory networks. This will allow us to extend our knowledge about plant functioning in variable environment, ensuring its optimal growth, development and yield performance.