“The SnRK2 kinases as key proteins in seeds biology- unraveling new molecular mechanisms determining seed germination abilities and the entrance into secondary dormancy state”

In nature all living organisms must continuously sense their surrounding and react for occurring changes. In cells information about these changes are transmitted to all cellular compartments including the nucleus by multiple phosphorylation cascades maintained by protein kinases. Sucrose Non-Fermenting 1 Related Protein Kinases (SnRK2s) are plant specific enzymes devoted to control responses to water deprivation. SnRK2s signaling pathways are highly conserved across plant species and play key role in plant functioning at multiple developmental stages. Although, our knowledge about SnRK2s role in seeds is still very incomplete. Why seeds are so important? In the world of sexually reproducing plants production of high quality seeds is an essential feature for survival of the species. To ensure optimal and proper development of the embryo and future seedling seeds must strictly control the complex process of dormancy and germination in time and space.

The aim of the project is to explain the role of SnRK2s kinases in seed biology and control of two critical processes: germination, when environmental conditions are optimal and prevention of germination when conditions are suboptimal, known as dormancy state. We will also study the impact of SnRK2 kinases on seed viability over time, which is also known as seed longevity. Finally, we will unravel new control mechanisms and networking between SnRK2s and their selected regulators in seeds, among others the Delay of Germination 1 (DOG1) protein.

Realization of our project will bring new important features for understanding seed physiology and biochemistry under changing environmental conditions. Obtained data, besides their cognitive relevance, should also have application value. The knowledge about mechanisms and components strictly controlling timing of seeds germination has the capital meaning for agriculture. Dormancy prevents preharvest sprouting of seeds, allows storage, preservation (e.g. in seedbanks) and long distance transport of seeds. Further, proper maturation, grain filling with storage compounds and preservation of seed viability over time stay under the highest interest and importance of farmers, scientists and consumers. For this reason we assume that results of our study may stay under the interest of a wide range of recipients and help to develop new strategies in plant modification or variety selection for improving yield quality. Given that SnRK2 kinases and mechanisms regulating seed germination and dormancy are well conserved in plant kingdom, our research takes on a new global meaning.