Seeds are responsible for evolutionary success of the flowering plants as they maintain the genetic information necessary for the next generation of plants and influence the distribution and abundance of plant species across different environmental conditions. Successful seed development depends on proper interactions between embryo, endosperm, cotyledon/s and seed coat.

The evolution of all living organism is a pivotal process leading to their development and adaptation to changeable environmental conditions. Charles Darwin noted that domesticated species are excellent models for studying evolution. Domestication is the process of adapting wild crops and animals to human imposed agro-ecosystems and to human needs. In parallel, it reduces their adaptation to wild environments such that some crops are fully dependent on humans for reproduction.

The aim of the project is to provide a model of molecular genetic mechanisms that have forced the creation and development larger seeds in legumes. Moreover, key questions will be addressed: why seed sizes are so variable? What is the impact of genetic (DNA/RNA sequences) and conformation of chromatin on ‘currently’ living plants? Does domestication make a chance of success for plant survival in changing environmental conditions? We hypothesise that seed phenotypes of mature plants can be predicted based on early seed stage development from gene expression and regulatory network and metabolite profiles.

In presented project the multidisciplinary studies using various research tools of molecular biology, genetics, advanced microscopy, bioinformatics and biotechnology will be carried out. To track evolutionary changes in plant genome the analysis on the basis on genomes, transcriptomes, metabolites will be used. To study the role evolutionary mechanism shaping seed size variations the white lupin and ‘better’ known common bean system will be explored.

We will provide a better understanding of biology processes underlying successful evolutionary mechanism shaping seed size variation in crop plants. The results should shed light on understanding these evolutionary mechanism in other legumes, including important for human food and animal feed.