The aim of the proposed project is explanation of the HvGAMYB role in flowering regulation in conjunction with the photoperiod/gibberellin association in response to drought. The proposal is based on an assumption that the overexpression of the transcription factor HvGAMYB accelerates the flowering timing but, simultaneously, causes disruptions in anther (or pollen) development. It is well know that the differentiation in plants can be regulated by phytohormones (e.g. gibberellic acid), but how GA controls flowering in abiotic stress conditions remains elusive. Moreover, the flowering timing in many plant species is regulated by an elaborate network of genetic pathways. The results of the proposed Procjet will shed some light on the association observed between photoperiod/gibberellic pathways in drought condition and allow us to verify the hypothesis about the HvGAMYB gene activity in flowering acceleration.

A comprehensive study will be conducted in order to assess the effects of GA pathway componens on anther development. The analysis will include phenotyping a set of quantitative traits, the anther morfology and pollen viability evaluation. In addition, the dates of flowering and heading will be observed. These studies will be integrated with the analysed gene expression (HvGAMYB). Our previous studies on recombinant inbred lines of barley (*Hordeum vulgare* L.) showed that the early maturing plants (included in the plant material due to their abillity to „escape" from drought) did not develop many kernels per spikes. This may be associated with certain factors responsible for early flowering. To verify the hypothesis about the negative impact of HvGAMYB overexpression on the male reproductive organs in barley grown in drought conditions we will applied gibberellic acid and TRinexapac-etyl sprays during the greenhouse experiments. The proposed treatments allow us to observed the intensification or inhibition of GA signals in the plant tissues. In addition, we will introducted the dark conditions as a experimental variant aimed to characterize the links between photoperiod and GA pathways in drought. The result of the study will be concerned in relation to the „escape strategy" theory.

In the lifetime of a plant, flowering is not only an essential part of the reproductive process but also a critical developmental stage that can be vulnerable to environmental stresses. Exposure to stress during this important period can cause yied losses in seed-producing plants like barley. If flowering occurs prematurely under stress condition, seed-set and grain filling may be compromised. If flowering is delayed, the plant risks succumbing to unfavorable conditions before producing seeds. To ensure survival during drought, plants accelerate the flowering process, and this response is known as „drought escape". Currently, relatively little is known about the relationships between flowering and drought stress. In this reason, the proposed project is reasonable and it will considerably extend the current knowledge in this field. Drought causes yield loss and leads to sterility. It should be pointed that there is little information available concerning the source of the flowers damage. The supposition about the HvGAMYB role in anther development is in accordance with the general knowledge about the flowering process. But the relationships between an elaborate network of genetic pathways regulated early flowering in drought has not be fully explained. Therefore, enhanced understanding of the links between these processes is essential for engineering of stress tolerance in crops.