The consequence of climate change is the increase in extreme weather events such as: storms, and flooding, which are responsible for huge losses in agriculture and all its sectors: crops, animal husbandry and forestry. With the advent of the new millennium, the frequency of natural disasters has increased sharply and has occurred at a consistently high rate over the past 20 years. Floods, caused by excessive rain, reduce the oxygen concentration available to plants, leading to hypoxia. This primarily reduces ATP synthesis. Limited energy production leads to an excessive accumulation of toxins such as alcohols and aldehydes in the tissues. Then there are metabolic changes, including the transition to anaerobic respiration leading to an energy crisis of cells.

The research problem of this project concerns the molecular mechanisms of plant responses to hypoxia stress. Recently, a novel mechanism for regulating gene expression has been discovered involving chemical modifications of the nucleotides in RNA. Among the diverse modifications found on mRNAs, N6-methyladenosine (m6A) is the most prevalent modification in both plants and animals.

In response to stress, there is, inter alia, a strong reduction in the level of protein synthesis because this process consumes approximately 40% of cellular energy. One of the supposed mechanisms to control this process is the accumulation of mRNA in cytoplasmic stress granules (SGs). Specific proteins and RNAs accumulate in SGs, isolating them from ribosomes, thus providing another step gene regulation that can directly affect cell survival. Therefore, the interplay between SGs and translationally active ribosomes needs to be clarified. However, the mechanism of this phenomenon is not fully understood in plants.

In the project we will use the following methods: microscopic techniques (immunolocalization of proteins and FISH RNA using Stellaris probes), molecular biology (RNA sequencing, nanopore RNA sequencing, immunoprecipitation of SGs, ribosomes and RNP (TRAP method) to study: 1. the function of m6A in mRNA accumulation in SGs; 2. the role of m6A and SGs in the regulation of translation; 3. nuclear RNAs contribute to the biogenesis of SGs.

Understanding new mechanisms of regulating the response to hypoxia stress in the model *Arabidopsis thaliana* plant in the future will allow for the development of cultivars with desired properties, including increased tolerance to hypoxic stress and protection against crop loss.