Information for research project

Call: Competition for financial support for projects of junior basic researchers and postdocs – 2020
Main scientific area: Agricultural sciences
Contract No: KP-06 M 46/3
Initial date and duration of the project: 27.11.2020, 24 M
Project title: "Impact of drought on the photosynthesis of maize and sorghum"
Research organization: Institute of Biophysics and Biomedical Engineering, BAS
Partner organizations:
Principle investigator: Sen. Assist. Prof. Dr. Martin Angelov Stefanov

Abstract of the research project

Due to their sessile lifestyle, plants are constantly exposed to dynamically changing environmental conditions. In this context, the study of the effects of abiotic stressors on plants through biophysical and biochemical methods gives a great impetus to the knowledge of the mechanisms of survival and recovery generated in them. Despite researches by more and more science teams, mainly from Southern Europe, North Africa, Central and Southeast Asia, on the effects of drought on plant photosynthesis, the mechanisms for plant tolerance to water deficiency have not been fully established yet.

The choice in the use of sorghum (*Sorghum* ssp.) and maize (*Zea mays* L.) as experimental models in the search for biomarkers for drought resistance is based on the great industrial and agricultural importance of these crops worldwide, as well as due to the increasing areas sown with maize and sorghum in Bulgaria against the background of declining rainfall activity and high temperatures, which determines the accelerated demand for methods for screening drought-resistant genotypes of these cereals in recent years. With climate change (global warming and the resulting dry years), maize and sorghum will be increasingly sought by Bulgarian consumers and Bulgarian businesses to meet the needs of beverages and food. Their yield will be both crucial for the financial capital of individual farmers and will be a potential macro indicator for agricultural development in the country.

This project aims to expand knowledge about the impact of drought on the process of photosynthesis as well as the molecular mechanisms of plant protection in water-deficient conditions. In addition, research will answer the question - at what threshold of drought on fertile land cultivated sorghum and maize will be able to survive and give the necessary yield.

The subject of the study will be: (i) adaptation to water deficiency and metabolic changes caused by this stress in sorghum (*Sorghum* ssp.) and maize (*Zea mays* L.), (ii) changes in the functional activity (biochemical and biophysical studies) of the photosynthetic apparatus during drought, (iii) using different concentrations of polyethylene glycol, simulating low, medium and strong stress, as well as the degree of recovery after applied stress. The research in the proposed project will be useful to establish new knowledge about the impact of drought on plant photosynthesis, as well as in the search for biomarkers of plant tolerance to water deficit.

Relevant techniques and knowledge (see CVs of the project participants) in the field of plant biophysics and biochemistry will be used in the development of this youth project and for the training of young researchers in the field of photosynthesis. The establishment of biomarkers (sensitive parameters) will be useful in the selection of species and varieties suitable for cultivation in areas with arid soils, as well as for selection and screening, in the creation of new, more drought-resistant cereal species and varieties.