

E-NEWSLETTER

SUE
JANUARY 2022



Dr. Veselin Petrov

Head of Department "Funding" at CPSBB:

**"We Are Proud that NatGenCrop is Among the First
Bulgarian Scientific Projects, Approved for Funding
Under the ERA Chairs Program of the
European Commission"**

The NatGenCrop team will study the natural genetic variation of hundreds of tomato and pepper lines with diverse characteristics. This makes the NatGenCrop project truly large-scale - both in terms of scope and potential for agricultural development.

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“Our Scientific Team Planted, Cultivated and Sampled Hundreds of Tomato and Pepper varieties. We Did It Parallely - Both in Greenhouses and on Experimental Fields”

Dr. Alicja Wieteska-Georgieva
Agronomist, CPSBB:

My main responsibility is to take care of the proper cultivation of plants for research at CPSBB.

Regarding the NatGenCrop project, I am responsible for the entire cultivation process - seedling production, plant protection, proper treatment and application of drought stress, seed production, as well as phenotypic analysis and collection of leaf and fruit samples for later laboratory research and analysis.

Dr. Emil Vatov
Molecular Biologist, CPSBB:

I assist in the statistical data analysis and the preparation of the experimental designs within the project, as precise randomization and replications are needed in order to obtain optimal statistical information. I also participate in the entire process of plant growing both in the greenhouses of CPSBB and in the experimental field on the territory of the MVCRI ("Maritsa Vegetable Crops Research Institute") in Plovdiv, which is a long-term partner of CPSBB.



How many vegetable varieties are included in the project?

Dr. Alicja Wieteska-Georgieva:

The project explores two of the most popular plant crops for our latitudes. - tomatoes and peppers.

During the past year we grew over 500 lines - tomato from 21 countries worldwide, and pepper lines from six Balkan countries.

We believe that the research results of this project will have the potential to be applied in future studies on other crop species.



What has been done so far since the project started in January 2023?

First of all, the scientific team was built and the experimental procedures were established. We also planted and cultivated parallelly in greenhouses and experimental fields hundreds of tomato and pepper varieties.

For the panel of lines, intended for genome-wide association studies (GWAS) in the project, we worked with 180 pepper lines and 152 tomato lines. In addition, we grew 2 BILs populations (backcrossed inbred lines) in the greenhouse, including 56 tomato lines and 110 pepper lines.



What has been done so far since the project started in January 2023?

Dr. Alicja Wieteska-Georgieva:

During the whole cultivation process, a detailed phenotypic analysis of the plants was carried out in terms of height, diameter, stem thickness, flowering time, weight, yield and fruit size. Interesting traits, such as top rot and other diseases, were also analyzed.

Leaves were sampled at the flowering and fruiting stages, fruit samples for metabolic and elemental analysis were collected as well. In this context, when we repeat the experiment next year, we will have a good statistical base to sift out interesting lines for our study and thus obtain even more precise data for analysis.



Dr. Saleh Alseekh



Dr. Alicja Wieteska-Georgieva



What lies ahead by the end of the project?

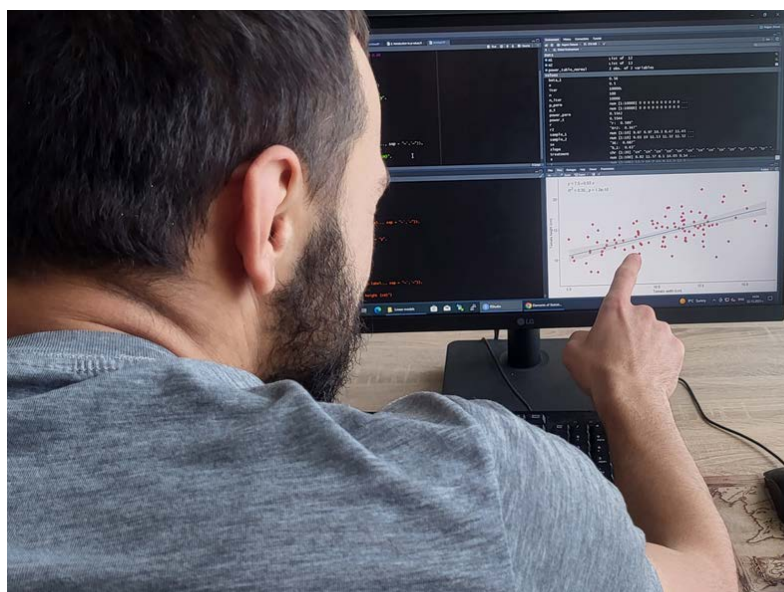
Dr. Emil Vatov:

All the samples collected from the fruits and leaves of the plants during flowering and fruiting will be analyzed for mineral and nutrient composition. The gene expression of the samples will be examined too. Also, the greenhouse and field experiment will be repeated for optimal statistical data and analysis.

After the experiment we conducted in 2023, we already know which plants perform better in the greenhouse and which - in field conditions, which show a higher tolerance and which are susceptible to drought.

This gives us a very valuable direction for obtaining an optimal balance between the studied phenotypic characteristics (stress tolerance, nutritional and taste qualities, yield, etc.). All these markers will be linked to their respective genomic locations in both crop species and protocols will be established to characterize the identified genes and their interaction with drought.

We already have several candidate genes associated with traits of interest to our research that are yet to be studied and analyzed. We also plan to apply salinity stress in the future.



What will be the contribution of the NatGenCrop project to agriculture and science?

Dr. Emil Vatov:

In recent years, all scientific projects in our field are facing one main challenge - how to support the adaptation of economically important crops to the climate changes of the 21st century.

Moreover, Dr. Wieteska-Georgieva and I are both young scientists and a project like this gives us the unique opportunity to develop our research career and upgrade it with top-notch knowledge and experience.



We have the privilege to work with established scientists from Bulgaria and abroad, conducting our research under their guidance.

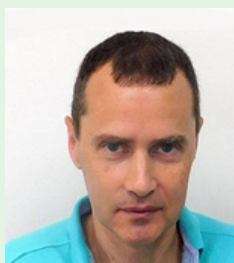
In this context, the project will contribute with highly profiled scientific expertise, as well as valuable fundamental, practical and statistical information from a large set of investigated crop lines that are economically significant for countries around the whole world.



CPSBB Established a New Research Department “Crop Quantitative Genetics”



Dr. Saleh Alseekh
ERA Chair Holder



Prof. Dr. Tsanko Gechev
Project Coordinator



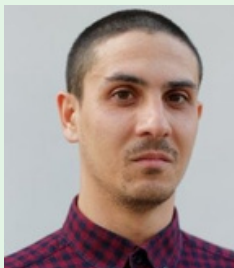
Assist. Prof. Dr. Veselin Petrov
Project Manager



Dr. Alicja Wieteska Georgieva
Agronomist



Dr. Emil Vatov
Molecular Biologist



Nikolay Anachkov
Plant Biologist/Technician



Dr. Rafe Lyall
Postdoctoral Researcher



Dr. Avanish Rai
Postdoctoral Researcher

“Crop Quantitative Genetics” is the newly established department at CPSBB. The scientific team develops an ambitious research programme as part of the ERA-Chair project NatGenCrop.

The department is headed by **Dr. Saleh Alseekh** - ERA Chair holder coming to CPSBB Bulgaria from the “Max Planck” Institute of Molecular Plant Physiology in Germany.

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The Prime Minister of the Republic of Bulgaria visited CPSBB's greenhouse facility for the NatGenCrop Project



Acad. Prof. Dr. Nikolay Denkov, Prime Minister of the Republic of Bulgaria (*front right*), visited the greenhouse facility of CPSBB where one of the NatGenCrop experiments was conducted.

Mr. Denkov was impressed by the scope of the project and the scientific activities that had been done by the researchers of the Center.

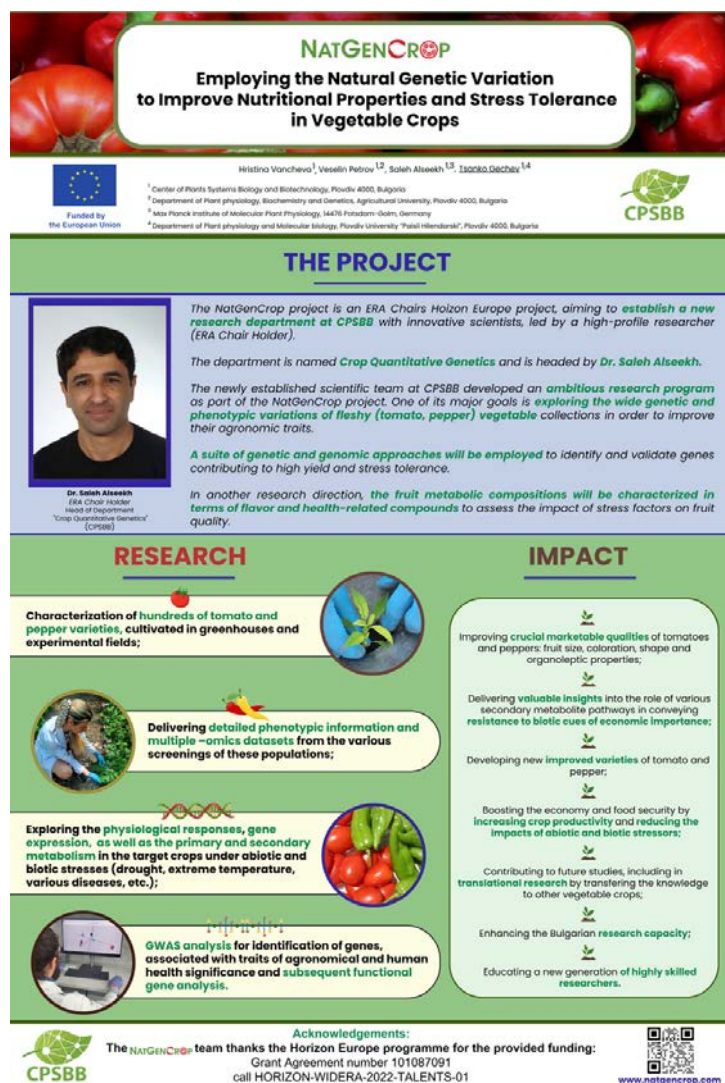
The NatGenCrop Project was Introduced to the Bulgarian Minister of Innovation and Growth



A delegation from the Bulgarian Ministry of Innovation and Growth, headed by the Minister, Mrs. Milena Stoycheva, visited CPSBB. The Minister made a tour in the greenhouses of the Center where Prof. Tsanko Gechev (*Director of CPSBB and Project Coordinator of NatGenCrop project*) presented her the conducted research, which aims at the improvement of yield and stress tolerance of economically important crops.



The NatGenCrop Project Was Presented With Posters to Scientists and Society



NATGENCROP
Employing the Natural Genetic Variation to Improve Nutritional Properties and Stress Tolerance in Vegetable Crops

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THE PROJECT

The NatGenCrop project is an ERA Chairs Horizon Europe project, aiming to **establish a new research department at CPSBB** with innovative scientists, led by a high-profile researcher (ERA Chair Holder).

The department is named **Crop Quantitative Genetics** and is headed by **Dr. Saleh Alseekh**.

The newly established scientific team at CPSBB developed an **ambitious research program** as part of the NatGenCrop project. One of its major goals is **exploring the wide genetic and phenotypic variations of fleshy (tomato, pepper) vegetable collections** in order to improve their agronomic traits.

A suite of **genetic and genomic approaches** will be employed to identify and validate genes contributing to high yield and stress tolerance.

In another research direction, **the fruit metabolic compositions will be characterized in terms of flavor and health-related compounds** to assess the impact of stress factors on fruit quality.

RESEARCH

- Characterization of hundreds of tomato and pepper varieties, cultivated in greenhouses and experimental fields;
- Delivering detailed phenotypic information and multiple -omics datasets from the various screenings of these populations;
- Exploring the physiological responses, gene expression, as well as the primary and secondary metabolism in the target crops under abiotic and biotic stresses (drought, extreme temperature, various diseases, etc.);
- GWAS analysis for identification of genes, associated with traits of agronomical and human health significance and subsequent functional gene analysis.

IMPACT

- Improving crucial marketable qualities of tomatoes and peppers: fruit size, coloration, shape and organoleptic properties;
- Delivering valuable insights into the role of various secondary metabolite pathways in conveying resistance to biotic cues of economic importance;
- Developing new improved varieties of tomato and pepper;
- Boosting the economy and food security by increasing crop productivity and reducing the impacts of abiotic and biotic stressors;
- Contributing to future studies, including in translational research by transferring the knowledge to other vegetable crops;
- Enhancing the Bulgarian research capacity;
- Educating a new generation of highly skilled researchers.

Acknowledgements:
The NATGENCROP team thanks the Horizon Europe programme for the provided funding:
Grant Agreement number 101087091
call HORIZON-WIDERA-2022-TALENTS-01

CPSBB  www.natgencrop.com

The NatGenCrop project was presented with posters during the 2nd International Conference on Plant Systems Biology and Biotechnology (ICPSBB 2023) and the international campaign "European Researchers Night 2023" in September 2023.

The two events attracted dozens of scientists from all over the world, as well as hundreds of schoolchildren, teachers, lecturers and students from Plovdiv.



The NatGenCrop Project Was Presented to Students as Part of Their Practical Education

Tenth graders from the Professional School of Food Technology in Plovdiv visited CPSBB as part of their practical education in Biotechnology. The researchers from CPSBB, Dr. Emil Vatov and Dr. Alicja Wieteska guided the students through the laboratories, and greenhouses.

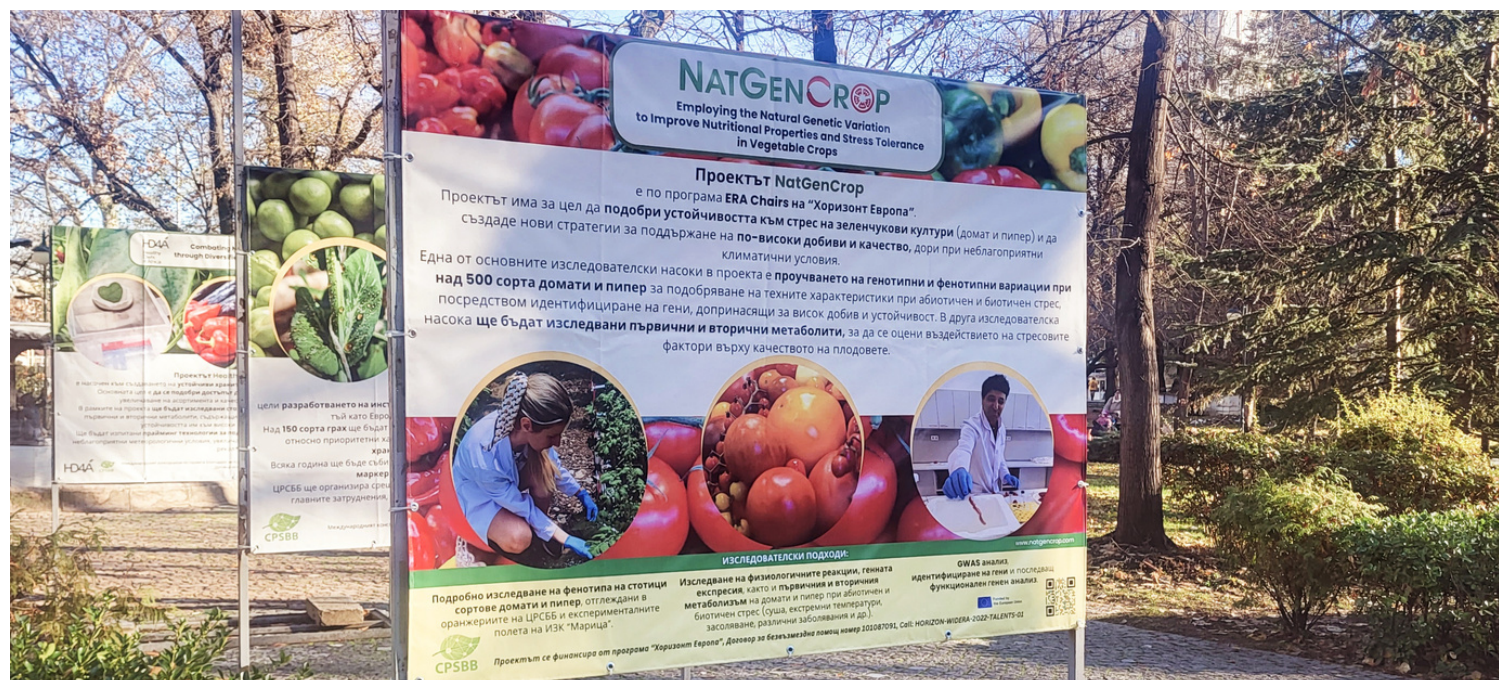
They showed the students hundreds of tomato and pepper varieties from Bulgaria and abroad that had already been planted for the project and explained in detail the further steps in the research.



A Photo Exhibition in the Center of Plovdiv Showcases the NatGenCrop Project



CPSBB presents the NatGenCrop project to the Bulgarian society with a public exhibition in Tsar Simeon's Garden in Plovdiv.



The exhibition will be available until February 2024, presenting the newly built scientific complex of CPSBB and current scientific projects, incl. NatGenCrop.

