

# Symposium on Genetics and Plant Breeding in Cereals: 100th Birth Anniversary of Academician Slavko Borojević (1919-2019)



## BOOK OF ABSTRACTS

Novi Sad, Serbia, 13-15th November 2019, organized by the Serbian Academy of Sciences and Arts – Branch in Novi Sad, Faculty of Agriculture of the University of Novi Sad, and Institute of Field and Vegetable Crops in Novi Sad



Symposium on Genetics and Plant Breeding in Cereals: 100th Birth Anniversary of  
Academician Slavko Borojević (1919-2019)

Held in Novi Sad, Serbia, on 13-15th November 2019

Organized by the Serbian Academy of Sciences and Arts – Branch in Novi Sad,  
Faculty of Agriculture of the University of Novi Sad, and Institute of Field and  
Vegetable Crops in Novi Sad

Published by:  
Institute of Field and Vegetable Crops, Novi Sad

Editor-in-chief:  
Dr. Ana Marjanović Jeromela

Editors:  
academician Dragan Škorić, Serbian Academy of Sciences  
and Arts, Branch in Novi Sad

Prof. Dr. Miodrag Dimitrijević,  
Faculty of Agriculture of the University of Novi Sad

Dr. Radivoje Jevtić,  
Institute of Field and Vegetable Crops in Novi Sad

Technical editor:  
Tanja Vunjak

ISBN 978-86-80417-83-7  
Novi Sad, 2019

This Symposium was financially supported by Provincial Secretariat for Higher  
Education and Scientific Research

## COMMITTEES OF THE SYMPOSIUM

### **Scientific Committee**

Prof. dr Miodrag Dimitrijević, chairman, Faculty of Agriculture, University of Novi Sad

Prof. dr Srbislav Denčić, Institute of Field and Vegetable Crops, Novi Sad

Prof. dr Novo Pržulj, Faculty of Agriculture, University of Banja Luka

Dr Milutin Bede, Osijek

Prof. dr Jan Bočanski, Faculty of Agriculture, University of Novi Sad

Prof. dr Sofija Petrović, Faculty of Agriculture, University of Novi Sad

Dr Ankica Kondić Špika, Institute of Field and Vegetable Crops, Novi Sad

Dr Milan Miroslavić, Institute of Field and Vegetable Crops, Novi Sad

### **Organizing Committee**

Academician Dragan Škorić, chairman, SANU, Beograd

Dr Radivoje Jevtić, vice chairman, Institute of Field and Vegetable Crops, Novi Sad

Dr Ana Marjanović Jeromela, Institute of Field and Vegetable Crops, Novi Sad

Dr Sanja Mikić, Institute of Field and Vegetable Crops, Novi Sad

Doc. dr Borislav Banjac, Faculty of Agriculture, University of Novi Sad

Doc. dr Velimir Mladenov, Faculty of Agriculture, University of Novi Sad

Dr Bojan Jocković, Institute of Field and Vegetable Crops, Novi Sad

### **Honorary Committee**

Academician Stevan Pilipović, chairman, SANU, Belgrade

Emeritus prof. Marija Kraljević Balalić, vice chairman, Faculty of Agriculture, University of Novi Sad

Prof. dr Nedeljko Tica, Dean of the Faculty of Agriculture, University of Novi Sad

Dr Svetlana Balešević Tubić, Director of the Institute of Field and Vegetable Crops, Novi Sad

Prof. dr Dejan Jakšić, Rector of the University of Novi Sad

Mladen Šarčević, Minister of Education, Science and Technological Development of the Republic of Serbia

Prof. dr Zoran Milošević, Provincial Secretary for Higher Education and Research

Dr Vuk Radojević, Provincial Secretary for Agriculture, Forestry and Water Management

Dr Novica Mladenov, Institute of Field and Vegetable Crops, Novi Sad

Prof. dr Miroslav Malešević, Institute of Field and Vegetable Crops, Novi Sad

Dr Đorđe Jocković, Institute of Field and Vegetable Crops, Novi Sad

Prof. dr Jelena Bošković, University Business Academy in Novi Sad, Faculty of Economics and Engineering Management (FIMEK), Novi Sad

Dr Ksenija Borojević, University of Massachusetts Boston, Boston

## PROGRAM

### Wednesday, November 13

17.00-18.00	Registration and Welcome Reception (The Serbian Academy of Sciences and Arts, Branch in Novi Sad, address Nikole Pašića 6)
from 18.00	Tour of Sremski Karlovci, Wine Tasting and Dinner

### Thursday, November 14

9.15 - 10.00	Opening ceremony and welcome speeches by the organizers and special guests	
10.00 - 10.30	Coffee break	
	<i>Chairpersons: Prof. Dr. Miodrag Dimitrijević, academician Dragan Škorić, academician Teodor Atanacković</i>	
10.30-11.00	Opening lecture: From Cold Spring Harbour to the Novi Sad School of Genetics	Prof. Dr. Miodrag Dimitrijević, University of Novi Sad, Faculty of Agriculture
11.00-11.30	Plenary lecture: World Food Supply Present and Future - Problems and Prospects	Prof. Dr. Perry Gustafson, Adjunct Professor of Plant Sciences, College of Agriculture, Food and Natural Resources, University of Missouri, USA and retired geneticist of the Agricultural Research Service, USDA
11.30-12.00	Plenary lecture: Gene Manipulation In Wheat Improvement	
12.00-12.30	Plenary lecture: Селекция мягкой пшеницы в Национальном Центре зерна имени П. П. Лукьяненко: традиционные и биотехнологические методы	Davojan Rumik Oganessovič, Research Institute of Agriculture named after P.P. Lukyanenko, Krasnodar, Russia
12.30-12.45	Changes in Senescence Pattern Related With Breeding Progress in Winter Wheat	Dr. Milan Mirosavljević, Institute of Field and Vegetable Crops, Novi Sad
12.45-13.00	Improvement of Spike-Stem-Tillers (SST) Complex is a Challenge In Wheat Breeding	Prof. Dr. Ivan Panayotov, Agricultural Experimental Station - Dunav, Bulgaria
13.00-13.15	Polymorphisms and Flow of Gliadin Alleles in Wheat	Prof. Dr. Desimir Knežević, University of Priština, Faculty of Agriculture in Lešak
13.15-13.30	Discussion	
13.30-14.00	Poster Viewing Session	
from 14.00	Lunch and Closing Ceremony	

## INTRODUCTORY NOTE

The greatness and wealth of a nation are not in numbers, area and material resources. The size and wealth of the nation are in people, ideas, achievements and moral values that this nation has created, reached and established.

**Prof. Dr. Slavko Borojević**, a geneticist, breeder, agronomist, professor, academician, built himself and his work into the greatness and wealth of his people, the state, and much wider than that - in the heritage of humanity.

The aspiration for freedom, the primordial, eternal struggle to achieve it, marked the life and deed of Professor Borojević. Firstly, he fought this battle as a warrior on the battlefield, then as a fighter against hunger, for food security, for liberty and independence through seed and food production self-sufficiency, creating our domestic, varieties of bread grain. It is this constant struggle that has helped to build the scientific thought of genetics at the Faculty of Agriculture in Novi Sad on the right foundation and to create the "Novi Sad School of Genetics", which, by the means of wheat breeding and through thousands of young people attending this school, has been introduced to the world, recognized and respected, like its father - professor Slavko Borojević.

The symposium "100th Birth Anniversary of Academician Slavko Borojević (1919-2019)" is devoted to remembrance of our great people, their work and legacy. In order to wisely go into the future, we need to know who we are, what we are and where we come from. We who are carrying all our ancestors in our genes, we do have the obligation to remember those who have indebted the Fatherland and preserve their work. This Symposium should bring us together around the scientific results of modern genetics and breeding, which were realized on the basis of the work and science of prof. Borojević. With this gathering, we recollect the great scientific and educational work that is possible, when the right people are in the right places and when there is concern for science and education. Professor Borojević created a highly valuable environment around him, but this environment created such a great person, as well. In these times, the Symposium "100th Birth Anniversary of Academician Slavko Borojević" should remind us that we are free, great and rich nation, especially with great achievements in agronomic science. By properly genotype by environment interaction, we could be richer for many new "borojevics", which would not leave for abroad in search for happiness, but remain here and work for the wellbeing of the Fatherland, as Slavko Borojević, a university professor, world known geneticist and wheat breeder honourably did, walking high and tall.

Prof. Dr. Miodrag Dimitrijević  
University of Novi Sad  
Faculty of Agriculture

## ABSTRACTS

### Opening lecture

1. From Cold Spring Harbour to the Novi Sad School of Genetics / Miodrag Dimitrijević, Sofija Petrović, Borislav Banjac (Serbia)

### Past and Future of Cereal Improvement

2. Changes in senescence pattern related with breeding progress in winter wheat / Milan Mirosavljević, Vojislava Momčilović, Sanja Mikić, Vladimir Aćin, Verica Takač, Srblav Denčić (Serbia)
3. Improvement of spike-stem-tillers (SST) complex is a challenge in wheat breeding / Ivan Panayotov (Bulgaria)
4. Grain yield changes in historical set of Pannonian winter wheat varieties / Bojan Jocković, Velimir Mladenov, Radivoje Jevtić, Sonja Ilin, Vladimir Aćin, Milan Mirosavljević, Dragan Živančev (Serbia)
5. Utilisation of sodium dodecyl sulphate sedimentation test for quality prediction of wheat cultivars in Serbia / Dragan Živančev, Milan Mirosavljević, Bojan Jocković, Vojislava Momčilović, Radivoje Jevtić, Vladimir Aćin, Slaviša Štatkić, Sanja Mikić (Serbia)
6. Variations of ecological factors in plant production – Frames of living activities of cultivated plants / Ljubica Šarčević-Todosijević, Vera Popović, Sara Has, Ljubiša Živanović (Serbia)

### Biodiversity and Utilization of Genetic Resources in Cereals

7. Characterisation of small grains resources at IFVCNS with UPOV descriptors / Sanja Mikić, Verica Takač, Milan Mirosavljević, Dragana Trkulja, Vojislava Momčilović, Ankica Kondić Špika, Ljiljana Brbaklić (Serbia)
8. Estimation of genetic diversity and population structure of IFVCNS wheat collection using molecular markers and pedigrees / Ljiljana Brbaklić, Dragana Trkulja, Sanja Mikić (Serbia)
9. Analysis of chlorophyll content in a bread wheat collection and its correlations with flowering time and grain yield / Verica Takač, Sanja Mikić, Milan Mirosavljević, Vojislava Momčilović, Dragana Trkulja, Ljiljana Brbaklić, Ankica Kondić Špika (Serbia)
10. Improvement of buckwheat production / Vera Popović, Ljubiša Kolarić, Branka Žarković, Ljubiša Živanović, Ljubica Šarčević Todosijević, Jelena Golijan, Jela Ikanović (Serbia)

### Cereals Genetics and Genomics

11. Polymorphisms and flow of gliadin alleles in wheat / Desimir Knežević (Serbia)
12. Genomic technology identification of varieties and hybrids of perennial grass crops / Kondratskaya I. P., Yuknimuk A. N., Chizhik O. V., Reshetnikov V. N., Stolepchenko V. A., Vasko P. P. (Belarus)

### Cereals Breeding in a light of Climatic Changes - Biotic and Abiotic Stress Resistance

13. Obtaining of genetically changed wheat plants (*Triticum aestivum* L.) with increased resistance to drought / Mykhals'ka S.I., Komisarenko A.G., Pryadkina G.O. (Ukraine)
14. Evaluation of wheat (*Triticum aestivum* L.) response to different abiotic stresses using modern phenotyping platforms / Ankica Kondić-Špika, Sanja Mikić, Dragana Trkulja, Milan Mirosavljević, Ljiljana Brbaklić, Vesna Župunski, Imre Vass, Janos Pauk, Carl-Otto Ottosen (Serbia, Hungary, Denmark)
15. Stem store ability of winter wheat under natural drought conditions / V. V. Morgun, G. A. Pryadkina, O. V. Zborivska (Ukraine)
16. Photosynthetic traits of transgenic maize plants with dsRNA suppressor of proline dehydrogenase gene / O. O. Stasik, D. A. Kiriziy, O. G. Sokolovska-Sergiienko, G. O. Pryadkina, S. I. Mykhalska (Ukraine)

**Estimation of Genetic Diversity and Population Structure  
of IFVCNS Wheat Collection Using Molecular Markers and Pedigrees**

Ljiljana Brbaklić\*, Dragana Trkulja, Sanja Mikić

Institute of Field and Vegetable Crops, Novi Sad, Serbia  
e-mail: ljiljana.brbaklic@ifvcns.ns.ac.rs

Within its 80-year long tradition in crop improvement, the Institute of Field and Vegetable Crops has been focusing on incorporation of the latest scientific innovations and technological achievements into conventional breeding programs. The utilization of molecular markers in the Small Grains Department began two decades ago, with their routine use in screening for major genes, especially Rht, Vrn and Ppd. One of the greatest IFVCNS assets, crucial for its breeding success, is a tremendous wheat collection consisting of breeding material, and more than 3000 genotypes diligently collected for decades from all over the world, evaluated and classified by the important agronomic traits. Classification exclusively based on geographic origin has proved not to be sufficiently precise to explain all relationships among genotypes as a result of constant exchange of genetic material between breeding centres. For this reason, a subset of the IFVCNS collection, containing 283 representative wheat genotypes from 5 continents, were selected to determine its genetic diversity with 30 microsatellite markers and compare it with available pedigree data. Molecular data was analysed in the program STRUCTURE, applying algorithm model to discriminate 6 assumed clusters. A high level of molecular diversity was detected in the first cluster with genotypes originating from all continents. During the development of those cultivars in Hungary, Romania, Bulgaria, and Czechoslovakia, most of Yugoslavian and Italian cultivars were used as parent lines. Also, cultivars from the Soviet Union and Mexico were widely used for crossing in numerous world breeding centres. English, French and Italian high-yielding cultivars were dominant in the second cluster. Although the pedigrees of many genotypes from the third cluster were not available, most of them originated from America and carried Lr resistance genes. The genotypes from Croatia with specific branched spike architecture were assigned to the fourth cluster. The fifth cluster grouped the cultivars developed at IFVCNS, most of which have the Russian cultivar "Bezostaya 1" as a predominant parent, which is widely used in East and Central Europe as a donor of genes for resistance to low temperature, Rht8 and Ppd1 genes. Since pedigree data are often imprecise and incomplete, molecular markers can elucidate complex genetic relationships between genotypes caused by selection, mutation or genetic drift. Application of microsatellite markers for germplasm characterization is more efficient than pedigrees due to automatization analysis, high level of polymorphism, locus specificity and codominant nature, which could speed up the process of selection and introgression of the desirable alleles into commercial genotypes.

Key words: wheat, diversity, molecular markers, pedigree