

Serbian Plant Physiology Society

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Institute for Biological Research „Siniša Stanković”, University of Belgrade

# 2<sup>nd</sup> International Conference on Plant Biology

## 21<sup>th</sup> Symposium of the Serbian Plant Physiology Society

### COST ACTION FA1106 QUALITYFRUIT Workshop



Petnica Science Center, June 17-20, 2015

**2<sup>st</sup> International Conference on Plant Biology • 21<sup>th</sup> Symposium of the Serbian Plant Physiology Society • COST ACTION FA1106 QUALITYFRUIT Workshop**  
PETNICA SCIENCE CENTER 17-20 JUNE, 2015

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## PROGRAMME

### 2<sup>st</sup> International Conference on Plant Biology • 21<sup>th</sup> Symposium of the Serbian Plant Physiology Society • COST ACTION FA1106 QUALITYFRUIT Workshop PETNICA SCIENCE CENTER 17-20 JUNE, 2015

#### Wednesday 17<sup>th</sup> June, 2015

09:00-14:00 *Registration*

14:00-15:00 *Lunch*

#### Section I: **Plant Biotechnology**

15:00-15:30 *Opening Ceremony*

15:30-16:00 (Invited talk) **Alain Tissier** Systems biology of a plant cell factory, the tomato glandular trichomes

16:00-16:20 (Invited talk) **Jules Beekwilder** Biotechnological production of plant compounds

16:20-16:40 (Invited talk) **Milen Georgiev** Metabolomics, lead, discovery and plant biotechnology: perfect holistic match?

16:40-17:00 (Invited talk) **Dragana Božić** Exploring the secondary metabolism in trichomes of *Salvia fruticosa* and *Rosmarinus officinalis*: the case of carnosic acid

17:00-17:30 *Coffee break*

17:30-17:45 (Selected talk) **Milica Bogdanović** Problems in detecting activity of fluorescent reporter genes – case of DsRED and GFP

17:45-18:00 (Selected talk) **Stevan Jeknić** Alteration of flower color in *Solanum lycopersicum* through ectopic expression of a gene for capsanthin-capsorubin synthase from *Lilium lancifolium*

18:00-18:15 (Selected talk) **Miloš Prokopijević** Characterization of soybean hull peroxidase immobilized on glycidyl methacrylate copolymers

18:30-19:30 *Poster session: Plant Biotechnology*

20:00-21:00 *Dinner*

21:00- *Wine tasting*

#### Wednesday 17<sup>th</sup> June, 2015

08:00-09:00 *Breakfast*

#### Section II: **Plant Growth, Development, Metabolism and Nutrition**

09:00-09:30 (Invited talk) **James Giovannoni** Harnessing genetic diversity to better understand regulation of tomato fruit ripening and nutritional quality

09:30-09:50 (Invited talk) **Christian Fankhauser** Photosensory receptor-mediated growth responses in Arabidopsis

09:50-10:10 (Invited talk) **David Honys** Male germline development: lesson from the -omics

10:10-10:30 (Invited talk) **Dragan Vinterhalter** Acid growth theory, auxin and potato phototropism

10:30-10:50 (Invited talk) **Bojana Banović** How to avoid self-fertilization in plants- a buckwheat story

10:50-11:20 *Coffee break*

11:20-11:50	(Invited talk) <b>Hrvoje Fulgosi</b>	Revisiting alternative electron partitioning pathways in photosynthesis
11:50-12:10	(Invited talk) <b>Miroslav Nikolić</b>	The rhizosphere: perspective and challenges for plant nutrition
12:10-12:30	(Invited talk) <b>Jelena Samardžić</b>	Silicon alleviates oxidative stress in cucumber plants grown under copper excess
12:30-12:45	(Selected talk) <b>Lidija Begović</b>	Lignin deposition and synthesis in the internodes during barley ( <i>Hordeum vulgare</i> L.) development
12:45-13:00	(Selected talk) <b>Milan Dragičević</b>	DUF1070 is a conserved signature domain of some arabinogalactan peptides
13:00-13:15	(Selected talk) <b>Jan Fíla</b>	Phosphoproteomics profiling of tobacco mature pollen and pollen activated <i>in vitro</i>
13:15-13:30	(Selected talk) <b>Václav Motyka</b>	New findings about the role of <i>cis</i> -zeatin-type cytokinins in plant physiology and evolution
14:00-15:00	<i>Lunch</i>	

### Section III: Plant and Fungal Natural Products in Human Nutrition and Medicine

15:00-15:30	(Invited talk) <b>Autar Mattoo</b>	Functional Foods & Nutrition: Facts, Fiction, and Needs
15:30-15:50	(Invited talk) <b>Nataša Simin</b>	Wild-growing <i>Allium</i> species (sect. <i>Codonoprasum</i> ) as promising sources of novel herbal drugs
15:50-16:10	(Invited talk) <b>Marina Soković</b>	Alternative sources of natural products: mystery of mushrooms and beyond
16:10-16:25	(Selected talk) <b>Miloš Đorđević</b>	<i>Centaurium erythraea</i> extract improves redox-status and antioxidant enzyme activity of STZ-treated pancreatic $\beta$ -cells and diabetic rat liver and kidney
16:25-16:40	(Selected talk) <b>Bojan Jevtić</b>	Effects of cucumber extracts on cytokine production in encephalitogenic cells
16:40-16:55	(Selected talk) <b>Filis Morina</b>	Quercetin 7-O-glucoside inhibits the formation of dinitrosocatechins and their quinones in catechin/nitrite systems under stomach simulating conditions
16:55-17:10	(Selected talk) <b>Milica Pešić</b>	Development of natural product drugs in a sustainable manner
17:10-17:30	<i>Coffee break</i>	

### Section IV: Phytochemistry

17:30-18:00	(Invited talk) <b>Roque Bru Martínez</b>	Early and late molecular mechanisms involved in the biosynthesis and accumulation of stilbenoids in elicited grapevine cell cultures established from berries
18:00-18:20	(Invited talk) <b>Sokol Abazi</b>	Chemical analysis of secondary metabolites isolated from endemic Albanian plants with subcritical CO <sub>2</sub>
18:20-18:40	(Invited talk) <b>Vuk Maksimović</b>	Composition and therapeutic values of berry wines - bitter truth about sweet product
18:40-19:00	(Invited talk) <b>Maja Natić</b>	Phenolic profiles of wild fruits grown in Serbia
19:00-19:15	(Selected talk) <b>Dorisa Cela</b>	NMR structure elucidation of a new alkaloid isolated from <i>Gymnospermium maloi</i>
19:15-19:30	(Selected talk) <b>Đura Nakarada</b>	Thapsic acid, a rarely found natural product among bryophyte species
19:30-20:30	Poster sessions: <i>Plant Growth, Development, Metabolism and Nutrition; Plant and Fungal Natural Products in Human Nutrition and Medicine; Phytochemistry</i>	

20:30-21:00	<i>Dinner</i>
21:00-21:30	<i>Presentation of Petnica Science Center</i>
21:30-22:30	<i>Tour around Petnica Science Center</i>

### Friday 19<sup>th</sup> June, 2015

08:00-09:00 *Breakfast*

#### Section V: Biodiversity and Conservation

09:00-09:30	(Invited talk) <b>Goran Anačkov</b>	Phenotypic plasticity or new taxa?
09:30-09:50	(Invited talk) <b>Jelena Aleksić</b>	What does Balkan Peninsula has to offer to conservation biologists?
09:50-10:10	(Invited talk) <b>Maja Lazarević</b>	Plant diversity drivers in the Balkans: ploidization, hybridization and cryptic speciation
10:10-10:25	(Selected talk) <b>Zora Dajić Stevanović</b>	Conservation of floristic and vegetation diversity in Southeast Europe: sustainable use and ecosystem services approach
10:25-10:40	(Selected talk) <b>Mihailo Jelić</b>	Assessment of genetic integrity and diversity of <i>Populus nigra</i> in protected areas along the Danube River
10:40-10:55	(Selected talk) <b>Marko Sabovljević</b>	Conservation biology of European bryophytes
11:10-11:30	<i>Coffee break</i>	

#### Section VI: Evolutionary Plant Biology

11:30-12:00	(Invited talk) <b>Petr Smýkal</b>	Past legume crop domestication and agriculture of tomorrow
12:00-12:20	(Invited talk) <b>Stevan Avramov</b>	Comparative approach in evolutionary ecology of plants
12:20-12:40	(Invited talk) <b>Yuval Sapir</b>	Population divergence and speciation within a species: ecology and the Royal Irises
12:40-12:55	(Selected talk) <b>Aleksej Tarasjev</b>	Population scale multi-year monitoring of <i>Iris pumila</i> in Deliblato Sand: flowering phenology
12:55-13:10	(Selected talk) <b>Vukica Vujić</b>	Light induces variation in size and shape of <i>Iris pumila</i> flower parts in two natural habitats
13:10-13:25	(Selected talk) <b>Sanja Manitašević Jovanović</b>	How do <i>Iris pumila</i> plants respond to photo-oxidative stress in the wild: the variation of leaf functional traits?
13:30-13:45	<i>Group photo</i>	
14:00-15:00	<i>Lunch</i>	

#### Section VII: Molecular mechanisms underlying health compounds biosynthesis in fruits (COST ACTION FA1106)

11:50-15:40	(Invited talk) <b>Angelos Kanellis</b>	Introduction to Session Genetic improvement of fruits and vegetables for health
15:40-16:10	(Invited talk) <b>Mondher Bouzayen</b>	Cross-talk between multiple hormone signaling pathways associated with the ripening of tomato fruit
16:10-16:40	(Invited talk) <b>Julia T Vrebalov</b>	The role of transcription factors in regulation of tomato fruit ripening and quality

16:40-17:10	(Invited talk) <b>Cathie Martin</b>	Engineering the production of health-promoting metabolites in tomato for studies of comparative nutrition
17:10-17:40	(Invited talk) <b>Giovanni Giuliano</b>	Tomato fruit carotenoid biosynthesis: regulation and evolutionary aspects
17:40-18:10	(Invited talk) <b>Panagiotis Kalaitzis</b>	Suppression of a tomato prollyl 4 hydroxylase results in multiple alterations on fruit development, ripening and health components
18:10-18:30	<i>Coffee break</i>	
18:30-19:30	Poster sessions: <i>Biodiversity and Conservation; Evolutionary Plant Biology</i>	
21:00-	<i>Gala dinner</i>	

### Saturday 20<sup>th</sup> June

08:00-09:00 *Breakfast*

#### Section VIII: Abiotic and Biotic Stress and Ecophysiology

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09:00-09:30	(Invited talk) <b>Harro Bouwmeester</b>	Strigolactones. Key players in the adaptation of plants to the abiotic environment
09:30-09:50	(Invited talk) <b>Miroslav Lisjak</b>	H <sub>2</sub> S and NO signalling in plants
09:50-10:10	(Invited talk) <b>Jelena Savić</b>	Essential oils elicit defense genes in potato: Can volatiles released from damaged plants prime defense in their undamaged neighbours?
10:10-10:30	(Invited talk) <b>Živko Jovanović</b>	<i>Alyssum markgrafii</i> as a model organism to study metal hyperaccumulation
10:30-10:45	<i>Coffee break</i>	
10:45-11:00	(Selected talk) <b>Dejana Panković</b>	The influence of <i>Trichoderma</i> spp. treatment on water regime, ABA content and gene expression in leaves and roots of tomato in drought conditions
11:00-11:15	(Selected talk) <b>Zorana Katanić</b>	Effect of dynamic changes of vegetative compatibility types in <i>Cryphonectria parasitica</i> populations on biological control of chestnut blight in Croatia
11:15-11:30	(Selected talk) <b>Nevena Nagl</b>	Effect of <i>in vitro</i> induced water deficit on lipid peroxidation intensity and antioxidant capacity of sugar beet
11:30-11:45	(Selected talk) <b>Marija Vidović</b>	High PAR and UV-B radiation-induced differential responses in green and white leaf sectors of <i>Pelargonium zonale</i> in relation to sugar, antioxidative and phenolic metabolism
12:00-13:00	Poster session: <i>Abiotic and Biotic Stress and Ecophysiology</i>	
13:00-13:30	<i>Closing Ceremony</i>	
13:30-14:30	<i>Meeting of the Serbian Plant Physiology Society/Cost Action FA1106</i>	
14:30-15:30	<i>Lunch</i>	
16:00-19:30	<i>Excursion (Gradac Canyon and "Čelije" Monastery)</i>	
19:30	<i>Departure</i>	
21:00	<i>Arrival in Belgrade</i>	

## Alteration of flower color in *Solanum lycopersicum* through ectopic expression of a gene for capsanthin-capsorubin synthase from *Lilium lancifolium*

OP1-2

Stevan Jeknić<sup>1</sup>, Maria Ivanchenko<sup>2</sup>, Slađana Jevremović<sup>3</sup>, Zoran Jeknić<sup>1</sup>  
(jeknics@onid.orst.edu)

<sup>1</sup> Oregon State University, Department of Horticulture, ALS 4017, Corvallis, OR 97331, USA

<sup>2</sup> Oregon State University, Department of Botany and Plant Pathology, 2082 Cordley Hall, Corvallis, OR 97331, USA

<sup>3</sup> Institute for Biological Research “Siniša Stanković”, University of Belgrade, Bulevar despota Stefana 142, 11060 Belgrade, Serbia

Red irises flowers do not exist naturally and to produce them efforts using classical breeding have failed. Genetic engineering provides a potential avenue to create novel flower hues, but irises are difficult to transform and take a long time to reach flowering. For these reasons, we used tomato flowers (*Solanum lycopersicum*) as a model system to investigate flower color modification by alteration of the carotenoid biosynthetic pathway. *S. lycopersicum* is a useful model system due to its ease of transformation and short time from seed to flowering. We expressed a capsanthin-capsorubin synthase gene from tiger lily (*Lilium lancifolium*) under the control of a petunia chalcone synthase gene promoter fused to an enhancer sequence of the cauliflower mosaic virus 35S promoter. Capsanthin-capsorubin synthase (*Llcs*) catalyzes the conversion of antheraxanthin and violaxanthin, two yellow xanthophylls that are produced in tomato flowers, into capsanthin and capsorubin, two red  $\kappa$ -xanthophylls, respectively. All transgenic lines produced flowers with a new light orange pigmentation, as opposed to the natural yellow. UHPLC analysis confirmed that the color change coincided with the accumulation of two novel xanthophylls, capsanthin and a capsanthin-like carotenoid. A more pronounced color change likely could have been achieved using a stronger or more specific promoter; nevertheless, these results indicate that alteration of the carotenoid biosynthetic pathway is a potential approach to altering flower color in ornamental crops.

**Keywords:** genetic transformation, flower color, carotenoids

This research was sponsored by the Cooley’s Gardens Inc., Silverton, OR (Grant: ARF3711) and by the Ministry of Education, Science and Technological Development of the Republic of Serbia (TR 31019).

## Characterization of soybean hull peroxidase immobilized on glycidyl methacrylate copolymers

OP1-3

Miloš Prokopijević<sup>1</sup>, Olivera Prodanović<sup>1</sup>, Dragica Spasojević<sup>1</sup>, Mira Stanković<sup>1</sup>,  
Željko Stojanović<sup>2</sup>, Ksenija Radotić<sup>1</sup>, Radivoje Prodanović<sup>3</sup>  
(mira.mutavdzic@imsi.bg.ac.rs)

<sup>1</sup> Institute for Multidisciplinary Research, University of Belgrade, Kneza Višeslava 1, 11000, Belgrade, Serbia.

<sup>2</sup> IHTM, University of Belgrade, Njegoševa 12, 11000, Belgrade, Serbia

<sup>3</sup> Faculty of Chemistry, University of Belgrade, Studentski Trg 12-16, 11000, Belgrade, Serbia

Toxic aromatic pollutants that are found in various industrial wastewaters pose a serious environmental threat. Current methods for phenol removal have certain disadvantages, such as low efficiency, high cost or generation of even more toxic products. On the other hand enzyme-based treatments are highly selec-

tive and efficient. Soybean hull peroxidase (SHP) as well as other class III peroxidases catalyzes oxidation reaction in the presence of hydrogen peroxide, resulting in phenol polymerization and formation of less hazardous phenolic polymers. As a by-product of the food industry, soybean hulls are inexpensive and readily available source of large quantities of crude peroxidase. The aim of our research was to isolate SHP from soybean hulls and immobilize it onto a glycidyl methacrylate based carriers using glutaraldehyde method and characterize the resulting product. Immobilized SHP showed dependence upon the pore size of the carrier matrix, with the highest obtained specific activity of 22.8 U g<sup>-1</sup> of carrier. Immobilized enzyme proved as an effective phenol removal alternative method with improved thermal and organic solvent stabilities compared to the free form. It also showed greater stability and tolerance to pH fluctuations, showing higher specific activities over a wider pH range. Operational stability was tested by repeated pyrogallol oxidation cycles in a batch reactor. After three cycles, immobilized SHP retained over 60% of the initial activity.

**Keywords:** soybean hull peroxidase, immobilization, glycidyl methacrylate

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