



**COST Action 19116**  
**Trace metal metabolism in plants -**  
**PLANTMETALS**

Training school: **Transition metals and antioxidative metabolism in serpentinoophytes**

Location: Faculty of Natural Sciences and Mathematics, University of Banja Luka, Mladena Stojanovića 2, 78000 Banja Luka, Republic of Srpska, B&H (<https://pmf.unibl.org/kontakt/>)

Date of event: **29<sup>th</sup>-31<sup>st</sup> March 2023**

**Agenda:**

**Day I (29<sup>th</sup> March 2023) - Amphitheater**

10:00-10:15 h

Opening – Welcome (prof. Biljana Kukavica)

10:15-11:00 h (theory, all together)

Prof.dr Miloš Mojović, Faculty of Physical Chemistry, University of Belgrade

“EPR-Spectroscopy: Principles and applications for exposing oxidative stress in biosystems.”

11:00-11:30 h (theory, all together)

Prof. dr Siniša Škondrić Faculty of Natural Sciences and Mathematics, University of Banja Luka

“Diversity of serpentinoophytes of Bosnia and Herzegovina”

11:30-12:00 h

Coffee break

12:00-12:45h (theory, all together)

Dr Filis Morina, Czech Academy of Sciences, Biology Centre, Institute of Plant Molecular Biology, Department of Plant Biophysics & Biochemistry

“Metal (hyper)accumulation in plant defense response”

12:45-13:15 h (theory, all together)

Prof. dr Dijana Mihajlović, Faculty of Agriculture, University of Banja Luka

“Transition metals in soil-origin, chemical species, bioavailability and methods of chemical analysis”

13:15-13:35 h (theory, all together)

MSc Ivana Pucar, Faculty of Natural Sciences and Mathematics, University of Banja Luka

“Morphological and biochemical variability of an obligate serpentinoophyte *Halacsya sendtneri* (Boiss.) Dörf. (Boraginaceae)”

13:35- 14:10 h (theory, all together)

Dr Đura Nakarada, Faculty of Physical Chemistry, University of Belgrade

Assessing the antioxidative activity of water insoluble compounds towards biologically relevant free radicals

## **Day II (30<sup>th</sup> March 2023)**

9:00-10:00 h – Classroom 24

Group 1: Quantification of transition metals in the plants and accompanying soils using atomic absorption spectrophotometry –1<sup>st</sup> part /Sampling, sample preparation for analyses and extraction of metals by acid digestion (prof. Dijana Mihajlović)

10:15-11:30 h - Classroom 24

Group 1: Laboratory work: Plant identification methods (plant parts, morphological characteristics of plants, basic principles of determination-dichotomous key; Ivana Pucar)

9:00-11:30 h – Biochemistry Laboratory

Group 2: Laboratory work: Sample preparation for protein electrophoresis (prof. Biljana Kukavica)

11:30-12:30 h

Coffee break

12:30-13:30 h - Classroom 24

Group 2: Quantification of transition metals in the plants and accompanying soils by method of atomic absorption spectrophotometry –1<sup>st</sup> part /Sampling, sample preparation for analyses and extraction of metals by acid digestion (prof. Dijana Mihajlović)

13:45-15:00 h - Classroom 24

Group 2: Laboratory work: Plant identification methods (plant parts, morphological characteristics of plants, basic principles of determination-dichotomous key; prof. Siniša Škondrić)

12:30-15:00 h – Biochemistry Laboratory

Group 1: Laboratory work: Sample preparation for protein electrophoresis (prof. Biljana Kukavica)

## **Day III (31<sup>st</sup> March 2023)**

9:00-10:00 h - Classroom 24

Group 1: Quantification of transition metals in the plants and accompanying soils using atomic absorption spectrophotometry –2<sup>nd</sup> part/Measurement of the metal contents in the extracts obtained after acid digestion (prof. Dijana Mihajlović)

10:15-11:30h - Classroom 24

Group 1: Laboratory work: Identification of serpentinophytes (plant determination process shown on serpentinophytes, Flora Europaea; Ivana Pucar)

9:00-10:30 – Biochemistry Laboratory

Group 2: Laboratory work: Electrophoresis: in gel activity determination of antioxidant enzymes (prof. Biljana Kukavica)

11:30-12:30

Coffee break

12-30 -13: 30 h - Classroom 24

Group2: Quantification of transition metals in the plants and accompanying soils using atomic absorption spectrophotometry –2<sup>nd</sup> part/ Measurement of the metal contents in the extracts obtained after acid digestion (prof. Dijana Mihajlović)

13-45-15:00 h - Classroom 24

Group 2: Laboratory work: Identification of serpentinophytes (plant determination process shown on serpentinophytes, Flora Europaea; prof. Siniša Škondrić)

12:30-15:00h – Biochemistry Laboratory

Group 2: Laboratory work: Electrophoresis: in gel activity determination of antioxidant enzymes (prof. Biljana Kukavica)

The participants will receive a certificate after the completion of the course.

*Support:*

*The Ministry of Scientific and Technological Development, Higher Education and Information Society of the Republic of Srpska*

### **Venue**

The training school will be hosted at the Faculty of Natural Sciences and Mathematics, University of Banja Luka, Republic of Srpska (B&H). The lectures will be in an Amphitheatre on the ground floor of the Faculty of Natural Sciences and Mathematics. The lab course will be in the Biochemistry Laboratory at the same building as well as Classroom 24 (first floor of the same building). For the coffee breaks we will use the hallway in front of the Amphitheatre. Coffee breaks are paid by the training school, lunches are self-paid as COST does not allow financing of lunches any more. There is Faculty's WiFi accessible during the Training school, password will be provided by the organizers.

### **International travel**

Banja Luka is a largest city (about 200 000 inhabitants) and administrative centre of the Republic of Srpska, and its de facto capital. Banja Luka is a second largest city in Bosnia and Herzegovina, and it is located in its northern part. It is situated on both banks of the beautiful river Vrbas. Banja Luka is easily reached by air and ground transportation as described in several variants below.

### **Flying**

Banja Luka International airport (BNX)

Two low-cost airlines fly to Banja Luka Wizz air and Ryanair which offer direct flights from large European cities. Also, Air Serbia offers a direct flight from Belgrade. The schedule, and the connections are changeable. The airport is located 22 km (around 30 minutes) from the city itself, and it can be reached by Bus connection (Smiljić company) or taxi.

Another option is to fly to Zagreb, Croatia (ZAG) which is around 180km (around two-and-a-half-hour drive) away from Banja Luka. From Banja Luka to Zagreb there are direct Bus connections, and it can also be reached by taxi.

Belgrade international airport (BEG) is also an option. It is around 320 km away from Banja Luka, and there is flight (45 minutes), bus (around 5 hours through Croatia) and taxi connection (three and a half hours) to Banja Luka.

Note all taxi connections need to be prearranged, while bus connection tickets need to be reserved in advance. From Belgrade and Zagreb bus connections are offered from its bus stations which are

located in its city centres, or around 30 minutes from the airport itself (both have shuttle service from the airport).

### **Private car**

When travelling with several people and not too far a distance, time- and money-wise shared car can be an interesting alternative. The roads from EU to Banja Luka are very good, and there are highways (except from the border to the highway itself around 10km). Beware of possible traffic jams at the border (usually on weekends and holidays)

### **Visa**

If you are from within the EU, no visa is needed. If you are from outside the EU, you might need a visa. Please check this with the Bosnian Embassy in your country. You have to do this early; this process normally cost time and you might need original confirmation of participation from us.

### **Accommodation**

The best is to check with booking.com, airbnb.com or similar online booking websites. There is a variety of accommodation in Banja Luka. If you prefer Hotels our recommendation are Hotel Integra and Hotel Marriot because of its quality and location (three-to-five-minute walk to the Faculty of Science and Mathematics), but you need to be aware that those are the most expensive hotels in Banja Luka. More affordable hotels are Hotel Kamel and Hotel Bosna (located in the city centre) which are both 15-minute walk or 5 minutes by car away from Faculty of Science and Mathematics. There is a lot of private apartments which are offered in the city of Banja Luka.

### **Local travel**

#### **Walking**

Faculty of Science and Mathematics is fifteen-minute walk away from city centre where most of the tourist attractions are located. Most famous are medieval castle named Kastel, orthodox church “Hram Hrista Spasitelja”, mosque “Ferhadija”, pedestrian zone named Gentleman Street (Gospodska ulica), etc. Next to the Faculty itself on one side there is Banja Luca largest park named “Park Mladen Stojanović”, while on the other side the Republic of Srpska administration centre is located.

#### **By car**

Fifteen kilometers south of Banja Luka the Vrbas River canyon is located. This is the best place to experience river Vrbas, and is also the place where multiple World and European championships were held in rafting, canoeing and kayaking. There is a beautiful “Rafting center” located at the beginning of the canyon where you can arrange a rafting tour, and also is a recommendable place to dine.

## Editorial

### Local organizing team:

Prof. Biljana Kukavica – [biljana.kukavica@pmf.unibl.org](mailto:biljana.kukavica@pmf.unibl.org)

Prof. Siniša Škondrić – [sinisa.skondric@pmf.unibl.org](mailto:sinisa.skondric@pmf.unibl.org)

Ivana Pucar – [ivana.pucar@pmf.unibl.org](mailto:ivana.pucar@pmf.unibl.org)

### Host Organisation:

Faculty of Science and Mathematics

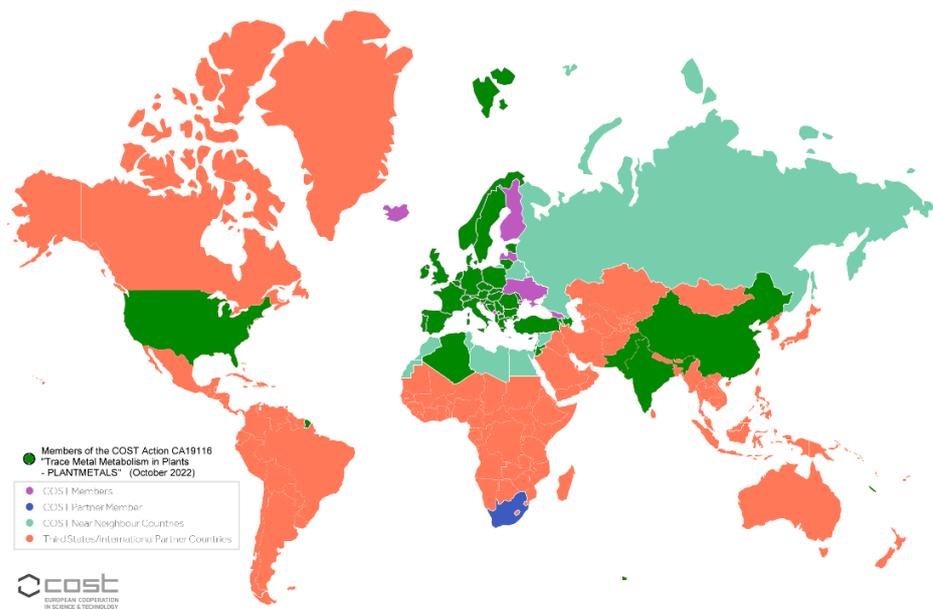
Mladena Stojanovića 2,

78 000 Banja Luka,

Republic of Srpska,

Bosnia and Herzegovina

map showing the  
participating  
countries  
in this COST  
Action



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"Trace metal metabolism in plants – PLANTMETALS"**



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