



PROCEEDING BOOK

5TH WORLD CONFERENCE ON SUSTAINABLE LIFE SCIENCES

WOCOLS 2023

07-10 DECEMBER 2023

CAPPADOCIA, TURKEY

Web: <http://wocols.com>





PROCEEDING BOOK

5TH WORLD CONFERENCE ON SUSTAINABLE LIFE SCIENCES

WOCOLS 2023

07-10 DECEMBER 2023

CAPPADOCIA, TURKEY

Editor-In-Chief

Asst. Prof. Dr. Aziz Satana

Editors

Asst. Prof. Dr. Arife Şimşek

Asst. Prof. Dr. M. Begüm Özen

Dr. Sevda Esmâ Darama

ISBN: 978-975-6478-98-1

COMMITTEES

Conference Chair

Asst. Prof. Dr. Aziz Satana, Erciyes University, Turkey

Conference Secretary

Asst. Prof. Dr. Merve Göre Akyüz, Ege University, Turkey

Asst. Prof. Dr. Arife Şimşek, Tokat Gaziosmanpaşa University, Turkey

Asst. Prof. Dr. M. Begüm Özen, Nevşehir Hacı Bektaş Veli University, Turkey

Organizing Committee

Prof. Dr. Fulya Dilek Gökalp, Trakya University, Turkey

Prof. Dr. Aslıhan Uzun, Nevşehir Hacı Bektaş Veli University, Turkey

Prof. Dr. Reza Amirnia, Urmia University, Iran

Assoc. Prof. Dr. Jurgita Kulaitiene, Vytautas Magnus University, Lithuania

Assoc. Prof. Dr. Nijole Vaitkeviciene, Vytautas Magnus University, Lithuania

Assoc. Prof. Dr. Mehmet Fırat Baran, Siirt University, Turkey

Assoc. Prof. Dr. Sahane Funda Arslanoglu, Ondokuz Mayıs University, Turkey

Dr. Rodolfo Gentili, Milano-Bicocca University, Italy

Dr. Dovile Levickiene, Vytautas Magnus University, Lithuania

Dr. Monika Stojanova, Belgrade University, Serbia

Ayşe Pehlivan, Erciyes University, Turkey

Onur Okumuş, Erciyes University, Turkey

Selin Ateş, Erciyes University, Turkey

Scientific Committee

Prof. Dr. Marisol Berti, North Dakota State University, USA

Prof. Dr. Elias M. Elias, North Dakota State University, USA

Prof. Dr. Ted C. Helms, North Dakota State University, USA

Prof. Dr. Burton L. Johnson, North Dakota State University, USA

Prof. Dr. Fatih Duman, Erciyes University, Turkey

Prof. Dr. Murat Deveci, Tekirdağ Namık Kemal University, Turkey

Prof. Dr. Hakan Ulukan, Ankara University, Turkey

Prof. Dr. Gökçen Yuvalı Çelik, Erciyes University, Turkey

Prof. Dr. Halil Kırnak, Adnan Menderes University, Turkey

Prof. Dr. Munis DüNDAR, Erciyes University, Turkey

Prof. Dr. Peter Pepo, University of Debrecen, Turkey

Prof. Dr. Chiwon Lee, North Dakota State University, USA

**Prof. Dr. Jose Villareal Quintanilla, Universidad Autonoma Agraria
Antonio Narro, Mexico**

**Prof. Dr. Juan A. Encina Dominguez, Universidad Autonoma Agraria
Antonio Narro, Mexico**

Prof. Dr. Radka Ivanova, Agricultural University-Plovdiv, Bulgaria

Prof. Dr. Talat Özpozan, Erciyes University, Turkey

Prof. Dr. Rüya Yılmaz, Tekirdağ Namık Kemal University, Turkey

Prof. Dr. Cengiz Toker, Akdeniz University, Turkey

Prof. Dr. Adnan Orak, Tekirdağ Namık Kemal University, Turkey

Prof. Dr. İbrahim Demir, Ankara University, Turkey

Prof. Dr. Abdul Wahid, University of Agriculture Faisalabad, Pakistan

**Prof. Dr. Shahzad Maqsood Ahmad Basra, University of Agriculture
Faisalabad, Pakistan**

Prof. Dr. Nusret Zencirci, Bolu Abant İzzet Baysal University, Turkey

Prof. Dr. Emel Uslu, Bolu Abant İzzet Baysal University, Turkey

Prof. Dr. Aziz Karakaya, Ankara University, Turkey

Prof. Dr. Didem Arpalı, Van Yüzüncü Yıl University, Turkey

Prof. Dr. Cem Özkan, Ankara University, Turkey

**Prof. Dr. Mehmet Emin Çalışkan, Niğde Ömer Halisdemir University,
Turkey**

Prof. Dr. Nazan Dağüstü, Uludağ University, Turkey

Prof. Dr. Mohamed Mergoum, University of Georgia, USA

Prof. Dr. Adnan Akyüz, North Dakota State University, USA

Prof. Dr. Sreekala Bajwa, Montana State University, USA

Prof. Dr. İsa Özaydın, Kafkas University, Turkey

Prof. Dr. Mithat Şahin, Kafkas University, Turkey

Prof. Dr. Narin Liman, Erciyes University, Turkey

Prof. Dr. Zafer Gönülalan, Erciyes University, Turkey

Prof. Dr. Erkan Gönüloğlu, Tekirdağ Namık Kemal University, Turkey

**Prof. Dr. Tinatin Doolotkeldieva, Kyrgyz-Turkish Manas University,
Kyrgyz Republic**

Prof. Dr. Hristo BELOEV, University of Ruse, Bulgaria

**Prof. Dr. Ladislav Nozdrovický, Slovak University of Agriculture in Nitra,
Slovak Republic**

Prof. Dr. Hsin Chi, Fujian Agriculture and Forestry University, China

**Prof. Dr. Mirza Barjees Baig, King Saud University, the Kingdom of Saudi
Arabia**

**Prof. Dr. Herák David, Czech University of Life Sciences Prague, Czech
Republic**

Prof. Dr. Wang Yingkuan, Jiangsu University, China

Prof. Dr. Fulya Dilek Gökalp, Trakya Univeristy, Turkey

**Assoc. Prof. Dr. Nurettin Tahsin, Agricultural University-Plovdiv,
Bulgaria**

Assoc. Prof. Dr. Murat Muştu, Erciyes University, Turkey

Assoc. Prof. Dr. Elvan Bakar, Trakya University, Turkey

Assoc. Prof. Dr. Sibel Day, Ankara University, Turkey

**Assoc. Prof. Dr. Sahane Funda Arslanoglu, Ondokuz Mayıs University,
Turkey**

Assoc. Prof. Dr. Amitava Chatterjee, North Dakota State University, USA

**Assoc. Prof. Dr. Cristian Popescu, National University of Science and
Technology POLITEHNICA Bucharest, Pitesti University Centre,
Romania**

**Assoc. Prof. Dr. Monica Popescu, National University of Science and
Technology POLITEHNICA Bucharest, Pitesti University Centre,
Romania**

Assoc. Prof. Dr. Mehmet Fırat Baran, Siirt University, Turkey

Assoc. Prof. Dr. Reza Amirnia, Urmia University, Iran

Assoc. Prof. Dr. Aleksandar Anastasovski, International Balkan University, Republic of North Macedonia

Assoc. Prof. Dr. Yuriy Kravchenko, National University of Life and Environmental Sciences of Ukraine, Ukraine

Assoc. Prof. Dr. Francesco Nocera, University of Catania, Italy

Assoc. Prof. Dr. Aliyev Zakir Huseinoglu, National Academy of Sciences, Azerbaijan

Assoc. Prof. Dr. Francesco Nocera, University of Catania, Italy

Assoc. Prof. Dr. Iduna Arduini, University of Pisa, Italy

Assoc. Prof. Dr. Charles Thomas Worley, The Ohio State University, USA

Assoc. Prof. Dr. Roswanira Abdul Wahab, University of Technology, Malaysia

Asst. Prof. Dr. Ergin Erdem, Robert Morris University, USA

Asst. Prof. Dr. Gökhan Eğılmez, University of New Haven, USA

Asst. Prof. Dr. Rebekah Oliver, North Dakota State University, USA

Asst. Prof. Dr. Mukhlesur Rahman, North Dakota State University, USA

Asst. Prof. Dr. Aziz Satana, Erciyes University, Turkey

Asst. Prof. Dr. Abbey Wick, North Dakota State University, USA

Asst. Prof. Dr. Orhan Şahin, Iowa State University, USA

Asst. Prof. Dr. Anna Yarosh, National University of Life and Environmental Sciences of Ukraine, Ukraine

Asst. Prof. Dr. Giorgos Mallinis, Democritus University of Thrace, Greece

Asst. Prof. Dr. Vrizas Z, Democritus University of Thrace, Greece

Asst. Prof. Dr. Safdar Bashir, Institute of Soil and Environmental Sciences, Pakistan

Asst. Prof. Dr. Zubair Aslam, University of Agriculture, Faisalabad, Pakistan

Asst. Prof. Dr. Zulfiqar Ahmad Saqib, Institute of Soil and Environmental Sciences, UAF, Pakistan

Asst. Prof. Dr. Nabeel Niazi, Institute of Soil and Environmental Sciences, UAF, Pakistan

Asst. Prof. Dr. Ali Dehastani, Institute for Agricultural Genetics and Biotechnology, Iran

Asst. Prof. Dr. S. M. Rahaman, Bihar Agricultural University, India

Asst. Prof. Dr. Neeraj KHARE, Amity University Rajasthan, India

Dr. Adnan ABBAS, China Agricultural University, College of Engineering, China

Dr. Kaveh Ostad-Ali-Askari, Islamic Azad University, Iran

Dr. Khurram YOUSAF, Nanjing Agricultural University, China

Dr. Sevim Z. Erhan, Eastren Regional Research Center, ARS, USDA, USA

Dr. Aykut Gram, Erciyes University, Turkey

Dr. Orsolya Balogh, University of Zurich, Switzerland

Dr. Giuseppe Giuliano, Studiogiuliano, Italy

Dr. Katerina Pazderu, Czech Univeristy of Life Sciences Prague, Czech Republic

Dr. Vinayak S. Shedekar, the Ohio State University, USA

Dr. Denis Magnus Ken Amara, Njala University, West Africa

Dr. Jaime Senabre, University of Alicante, Spain

Dr. Marcelo Huarte, National University of Mar del Plata, Argentina

Dr. Rafiq Islam, the Ohio State University, USA

Dr. Elham Motallebi, Garmsar Azad Eslami University, Iran

Dr. Mani Yousefi, Islamic Azad University Nour Branch, Iran

Dr. Abdelmotalab F. Kheiralla, University of Khartoum, Sudan

Dr. Tahir IGBAL, Arid Agriculture University, Rawalpindi, Pakistan

Dr. Jiban Shrestha, Nepal Agricultural Research Council, Nepal

Dr. Mohamed Faraj Edbeib, BaniWalid University, Bani Walid, Libya

Dr. Fahrul Zaman Huyopi, University of Technolgy, Malaysia

Dr. Sevda Esmâ Darama, Ondokuz Mayıs University, Turkey

Anny Roelofsen, ISTA, Vinçotte ISACert Nederland, the Netherlands

KEYNOTE SPEAKERS

Dr. Sevim Erhan, USDA, Director, USA

Prof. Dr. Manfred Wilhelm, Karlsruhe Institute of Technology, Germany

Prof. Dr. Kadircan Keskinbora, Bahçesehir University, Turkey

Prof. Dr. Hakan Yardımçı, Ankara University, Turkey

Prof. Dr. Munis Dünder, Erciyes University, Turkey

Prof. Dr. Sibel Silici, Erciyes University, Turkey

**Assoc.Prof.Dr. Cristian Popescu, National University of Science and
Technology POLITEHNICA Bucharest, Pitesti University Centre,
Romania**

Dr. Marius Lasinskas, Vytautas Magnus University, Lithuania

Asst.Prof.Dr. Chiara Montagnani, University of Milano-Bicocca, Italy

Application of Bioremediation in Reducing the Content of Hydrocarbons in Soil Polluted from Fuel Oil

Andjela B. Stanojevic¹, Miroslav Vrvic², Srdjan Miletic³

¹ Lund University, Environmental Studies and Sustainability Science, Lund, Sweden

² BREM Group LTD, Department for research and development, Belgrade, Serbia

³ Institute of Chemistry, Technology and Metallurgy, University of Belgrade, Serbia

Corresponding author: andjelastanojevic1507@gmail.com

ABSTRACT

A big percentage of soil and water pollution comes from accidental spillage during exploitation, transport, processing, storage, and extensive use of petroleum. One of the technologies that are increasingly used in the world for the remediation of polluted environments, primarily soil, is bioremediation (use of non-pathogenic microorganisms that use organic pollutants as a source of nutrients). The main objective of this investigation was to answer whether it is possible in the applied conditions of bioremediation to successfully purify the soil contaminated with hydrocarbons from fuel oil? In this study, *ex-situ* bioremediation was performed on the soil from different areas in Serbia contaminated with waste oils from petroleum products. The *ex-situ* bioremediation process was performed at the BREM plant in Dobanovci (N 44°48'52.42" E 20°13'13.08"). Bio-pile for bioremediation was made on a waterproof asphalt surface. Sampling was performed from the bio-piles before/and after bioremediation and from control bio-piles (without added microorganisms) and total petroleum hydrocarbons (TPH) were gravimetrically determined according to Beškoski et al. (2011). For the determination of petroleum hydrocarbons, gas chromatography (GC) was used. The content of TPH, obtained by the gravimetric method, for the sample before bioremediation and the control sample was around 22%, while TPH content for the soil sample after bioremediation was 1.62%. The TPH content decreased by 92.9 % in the bioremediation process, while in the control sample it decreased by only 3.02%. GC-analysis shows a significant decrease, the content of hydrocarbons with 17C and 18C atoms (pristane and phytane). The applied bioremediation procedure has significantly reduced the TPH content, which indicates that the soil contaminated with fuel oil was successfully cleaned.

This research has been financially supported by the Ministry of Science, Technological Development and Innovation of Republic of Serbia (Contract No: 451-03-47/2023-01/200026).

Keywords: Bioaugmentation, *Ex-Situ* Bioremediation, Fuel Oil, Pristane, Phytane