



Institute of Environmental Sciences
2nd Annual Graduate Symposium
June 9-10th 2016



ABSTRACT BOOK

Organisation Committee:

**Merve Tunalı
Ayşe Hazal Pekcan
Fahri Koray Sakarya**

Special Thanks to:

**Asu Ziyilan Yavaş
Aygün Karaçay
Başak Savun
Çağrı Akyol
Derya Aydın Sarıkurt
Dışeps Apiş
Ece Özön
Elifcan Çalışkan
Emine Ertekin
Mehmet Meriç Tunalı
Muhammed Fatih Sert
Nazmiye Cemre Birben
Zeynep Akdoğan**

You can download this abstract book from the following link:

<http://www.iesc.boun.edu.tr>

**Annual Graduate Symposium
Thursday-Friday, June 9-10th 2016**

PROGRAM

Thursday, June 9th

12.00 - 17.00 Registration - Coffee Service

15.00 - 19.00 Poster Session

Friday, June 10th

9.30 - 10.00 Registration - coffee service

10.00 - 10.10 Welcome Speech by Prof. Dr. Orhan Yenigün, Director of the Institute of Environmental Sciences

10.10 - 10.40 Keynote Talk by Kordal Köseoğlu - “Çevre Sektörünün 30 Yılı”

10.40 - 10.55 Coffee Break

10.55 - 11.45 Oral Session I - Moderator: Başak Savun

Cahit Teoman - SDSN Youth and Sustainable Development Goals (SDGs)

Natalia Ciobanu - Building Resilience to Climate Change Impacts in the Ikel Watershed in Moldova: a System Dynamics Approach

11.45 - 13.00 Lunch Break

13.00 - 13.50 Oral Session II - Moderator: Dışeşp Apış

İlknur Temizel - The Fate and Behavior of Nano ZnO during Waste Stabilization in Landfills

Emine Ertekin - A Rieske Oxygenase Detoxifies Disinfectants in the Environment

13.50 - 14.50 Coffee Break - Poster Evaluations

14.50 - 15.40 Oral Session III - Moderator: F. Koray Sakarya

Ayşe Mergenci - Estimation of Population Size, Site Occupancy Modelling, and Phylogeographic Relationships of Brown Bears Distributed along Yenice Forests

İbrahim Halil Miraloğlu - Classification of Zooplankton Species in the Black Sea Using DNA Barcoding Combined with Morphological Methods

15.40 - 16.00 Closing Remarks

Poster Presentations

ID 07 Zeynep Akdoğan - Assessing the Parametric Sensitivity in Hydrological Modelling: A Case Study for Istanbul

ID 08 Çağlar Akay - Biotransformation of Acetaminophen by Soil Microbial Community

ID 09 Serap Karaca - Effective Primary Composting of Dairy Manure Blended with Poultry Waste

ID 10 Şıla Temizel - Environment & Sustainability and Health & Well-Being in the 2030 Agenda

ID 11 Şıla Temizel - Education & Skills & Jobs and Poverty & Development in the 2030 Agenda

ID 12 Bilgesu Tural - Effects of operational parameters on methane production in anaerobic digesters fed with cow manure and barley

ID 13 Gökçin Gül - The Role of Biotransformation on Biocide Resistance in a Co-Culture of *Pseudomonas Sp.* BIOMIG1 and *E. coli*

ID 14 Nazmiye Cemre Birben - Photocatalytic Degradation of Humic Acid Using a Novel Photocatalyst: Ce Doped ZnO

ID 15 Feresteh Karami - Modeling Calcium Carbonate Precipitation in The Acıgöl Lake Using Aquatox Model

ID 16 Ece Özön - Influence of Antibiotic Existence on the Biochemical Methane Production Potential of the Wastewater Sludge

ID 17 Merve Tunah - Investigation of Biosorption Potential of Silver by Green Microalgae

ID 18 Mehmet Meriç Tunalı - Microbial Association in Plant Rhizosphere Supporting Phytoremediation of Copper Contaminated Soils

ID 19 Mehmet Meriç Tunalı - The Generation of Glomalin-related Soil Protein (GRSP) and Its Contribution to Copper Sequestration in Contaminated Soils

ID 20 Zeynep Akdoğan - Modeling Chlorophyll-a Concentrations and Algal Distributions in Selected Streams of the Omerli Reservoir

ORAL PRESENTATIONS

Session I: 10:40 - 11:30
Moderator: Başak Savun

ID 01 SDSN Youth and Sustainable Development Goals (SDGs)

Presenter: Cahit Berk Teoman

SDSN Youth encourages young people around the world to prioritize the 2030 Agenda for Sustainable Development by providing a global platform for them to advocate for change, and formulate solutions and pathways for achieving the Sustainable Development Goals (SDGs). The vision of SDSN Youth | Turkey is to promote interactive, creative and entrepreneurial activities and projects by ensuring effective participation from young people. Additionally, commencing these projects will ensure the integration of young people from different societies, regions, religions, and history under the umbrella of the SDSN Youth. SDSN Youth has already prioritized four global targets. These can be listed as follows: educating young people about the SDGs and encouraging them to prioritize their implementation, integrating concerns and views of young people into pathways for achieving the SDGs, providing a platform for young people from different communities to connect and share ideas and experiences that address the challenges of sustainable development, and initiating and supporting projects that are aimed towards achieving the SDGs. This presentation will be about the 17 Sustainable Development Goals, their accompanied targets and indicators for OECD countries.

ID 02 Building Resilience to Climate Change Impacts in the Ikel Watershed in Moldova: a System Dynamics Approach

Presenter: Natalia Ciobanu

Having adopted the paradigm of long-term sustainable development, countries and communities are now facing the challenge of pursuing this goal in the face of climate change risks, most important of which have to do with securing sufficient and high quality water resources, agricultural production, public health and overall social welfare, while at the same time preserving ecosystems, biodiversity and subsequent ecosystem services. Multidisciplinary nature of climate change and incoherent interventions based on sectorial approaches, make the drafting and implementation of climate change adaptation strategies and action plans at sectorial level difficult and very costly. Researchers suggest that risks posed by climate change need to be addressed at watershed scale. Resilience assessment practitioners have so far only made use of causal loop diagrams and descriptive approaches for policy recommendations on how to make socio-ecological systems more resilient. Current challenge in the field of social-ecological systems research is to proceed from causal maps to computer simulation models comprehensible by the decision makers. In my research I will try to develop a simulation model based on system dynamics methodology and Group Model Building (GMB) involving stakeholders in the watershed. The aim of the research is to help the assessment of a watershed's resilience to climate change risks and to assist the policy development for building resilience. The research, which is being conducted in Ikel watershed in the Republic of Moldova, also intends to contribute to the existing modeling work in resilience assessment and socio-ecological systems framework, and to explore synergies between these and system dynamics modeling.

Session II: 11:45 - 12:35
Moderator: Dışeş Apış

ID 03 The Fate and Behavior of Nano ZnO during Waste Stabilization in Landfills

Presenter: İlknur Temizel

As a result of rapid development in nanotechnology in recent years, the number of commercially available nanotechnology products has exceeded one thousand. The extensive use of NMs and their eventual release to the environment through various pathways have recently raised concern about the potential impacts of these materials on the environment and human health. The fate and behavior of NMs during waste stabilization in landfills is still unknown. It is important to investigate the fate of nanoparticles in landfills to understand and control the environmental impacts that may occur in advance. Therefore, the main objective of this study is to provide greatly needed fundamental information and insight into the fate and impact of nano ZnO during waste stabilization in landfills. For this purpose, 70 liter lab-scale simulated conventional and bioreactor landfill lysimeters were loaded with fresh municipal solid waste obtained from a real landfill site and the reactors were uniformly mixed with pre-known amounts of nano ZnO. Samples were regularly taken from leachate and gas phases, to assess the impact of nano ZnO on different phases of waste stabilization. Daily and cumulative biogas and methane production values of each reactor were monitored to determine the impact of nano ZnO on gas production. This paper will discuss the experimental results obtained from both types of landfills.

ID 04 A Rieske Oxygenase Detoxifies Disinfectants in the Environment

Presenter: Emine Ertekin

Benzalkonium chlorides (BACs) are disinfectants from the quaternary ammonium compounds (QACs) group, classified as emerging pollutants in the environment. Several microorganisms capable of degrading BACs have been isolated, and the degradation pathway has been characterized. Conversion of BAC to BDMA is the key dealkylation step in BAC degradation, which reduces its toxicity. Identification of the genes and enzymes related to this reaction is crucial for developing feasible wastewater treatment strategies. In this study, four microbial communities originating from natural environments such as sewage and activated sludge units of a wastewater treatment plant, a soil sample and a sea sediment sample were enriched with BACs. A microorganism capable of mineralizing BACs, denoted as *Pseudomonas* sp. BIOMIG1 was isolated from each community. Whole genome comparison of BIOMIG1 with non-degrader phenotypes revealed that a gene cluster was responsible for BAC degradation, and this gene cluster was highly abundant also in the enrichment cultures. We further hypothesized that a catabolic gene in this gene cluster, encoding a Rieske non heme iron oxygenase (oxy-BAC), was involved in dealkylating BACs, and confirmed our hypothesis by heterologous expression in *E.coli*. A phylogenetic analysis revealed that oxy-BAC was relatively distant (25% amino acid identity) from its biochemically characterized homologues and clustered within Rieske oxygenases that can dealkylate naturally occurring QACs. *E.coli* overexpressing Oxy-BAC could convert BAC to BDMA with a rate of 14 $\mu\text{M}\cdot\text{hr}^{-1}$ and up to 90% efficiency. Our results suggest that Oxy-BAC is an important enzyme for BAC degradation, thus can be used for removal of BACs from wastewater.

Session III: 13:45 - 14:35
Moderator: F. Koray Sakarya

ID 05 Estimation of Population Size, Site Occupancy Modelling, and Phylogeographic Relationships of Brown Bears Distributed along Yenice Forests

Presenter: Ayşe Mergenci

Yenice Forest is one of the largest intact forests in Turkey. It has been listed by WWF as one of the 100 hot spots that needs urgent protection. 26.000 hectares of this forest which actually ranges over 75.000 hectares, has been designated as a wildlife enhancement area. However, in management plans of Yenice Wildlife Enhancement Area there are no species-specific information or action plans on the brown bear, which is a keystone species with their ecosystem functions. The brown bear is also an umbrella species that helps maintain many other plant and animal species by their existence. In this study, we aim to understand habitat use, activity patterns of the brown bear population in this forest, and provide an estimate of population size based on genetic methods. We will also test whether wildlife enhancement area status has any influence on occupancy of brown bears in this forest. Ecological data was collected using camera traps placed in a 2x2 km grid system and scat for genetic analysis was collected using systematic random sampling both in protected and unprotected forestland. Camera trap data analysis will include occupancy modelling, activity analysis for brown bears and species richness analysis. Scat data analysis will include mtDNA phylogeny analysis and capture-mark-recapture modelling based on individual estimations using microsatellite data. The evaluation of the results will help us to understand the ecology and genetic make-up of this species in the region, and will be used for determining conservation strategies of the species, and consequently many other inhabitant species.

ID 06 Classification of Zooplankton Species in the Black Sea Using DNA Barcoding Combined with Morphological Methods

Presenter: İbrahim Halil Miraloğlu

Although the importance of biodiversity decline has gained a much better understanding in recent years as a consequence of the increase in anthropogenic activities, this global problem is still extremely difficult to solve. The first steps in order to overcome problems related to biodiversity involve the straightforward monitoring of existing species and the rapid detection and observation of new species. In particular, the identification of zooplankton species is a milestone which is a challenging task requiring advanced expertise, effort, and time. In this context, because of the inadequacy of classical morphology-based species identification methods, DNA barcoding technique has gained importance due to its practical benefits. By identifying the types of zooplankton species in the Black Sea using both morphological and DNA barcoding methods, this study aims to compare these two techniques and to determine whether molecular methods can be used to rapidly identify zooplankton species. In this study it was observed that some species of Black Sea zooplankton can be identified using the DNA barcoding method. Although morphological methods are still considered to be more reliable, an increase in DNA barcoding analysis and the identification of which groups of organisms are suitable will become widespread since DNA barcoding will provide information for identification of almost every species type in the near future. This method (optimized method for the identification of groups of organisms, including mitochondrial DNA isolation and qPCR for organisms of different zooplankton groups) can be completed in a total time of 4 hours.

POSTER PRESENTATIONS

ID 07 Assessing the Parametric Sensitivity in Hydrological Modelling: A Case Study for Istanbul

Presenter: Zeynep Akdoğan

Overland flow is highly affected by increasing urbanization, and variations in land use and climatic variables, especially in the last few decades. This necessitates the development of modeling approaches for planning and management of catchments that play a significant role on water supply. The main objective of this study is to determine the effects of major hydrological and hydraulic parameters on runoff production in the Alibeyköy Reservoir catchment area in Istanbul. Storm Water Management Model (SWMM) is chosen to develop the catchment hydrological model and the model's sensitivity is assessed based on the variations in eight major parameters of the model affecting runoff production. 55 years of time series precipitation data are used for model simulations. GIS-based maps including land use and land cover information are used to determine the imperviousness values required for SWMM. A one-at-a-time parametric sensitivity analysis is carried out to determine the most significant parameters affecting the model outcomes. Analysis results reveal that area of subcatchments, precipitation and conduit depth are the most significant parameters in SWMM affecting runoff production. Percent imperviousness and percent slope are the least significant parameters amongst other parameters influencing the output.

ID 08 Biotransformation of Acetaminophen by Soil Microbial Community

Presenter: Çağlar Akay

Acetaminophen, also known as paracetamol, IUPAC name N-(4-hydroxyphenyl) ethanamide, which is an active ingredient of widely used antipyretic and analgesic drugs worldwide, has been frequently detected in domestic and industrial wastewater, surface water and soil. Since the conventional wastewater treatment systems are not adequate for the elimination of acetaminophen, a better understanding on the biotransformation of this compound is crucial to upgrade treatment systems or design advanced treatment technologies to control the release of acetaminophen into the environment and eliminate its potential hazardous impacts. In this study, four bacterial species capable of acetaminophen biotransformation were isolated from soil microbial community and identified as *Pseudomonas nitroreducens* BIOMIG-P2, *Rhodococcus erythropolis* BIOMIG-P19, *Flavobacterium sp.* BIOMIG-P32, and *Sphingobium sp.* BIOMIG-P36 via phylogenetic analysis based on 16S rDNA sequences. Among them only *Pseudomonas nitroreducens* BIOMIG-P2 is closely related to the bacteria previously isolated as acetaminophen degrader. BIOMIG-P19, which is a gram positive and belongs to Actinobacteria, BIOMIG-P32 which belongs to Bacteroidetes and BIOMIG-P36 which belongs to Proteobacteria family are novel isolates that can degrade acetaminophen. Kinetics of biotransformation of acetaminophen by four isolates were determined in a batch experiment in order to acquire knowledge about the biotransformation mechanism of acetaminophen for further application systems.

ID 09 Effective Primary Composting of Dairy Manure Blended with Poultry Waste

Presenter: Serap Karaca

Recycling of nutrient rich organic solid fraction of dairy slurry is performed followed by composting process which needs to be improved and fastened to handle huge amounts of solid waste generated from intensive animal farming. However, as well as chemical characteristics high moisture content of this waste can limit the efficiency of composting process. Although the addition of dry bulking agent to wet waste is a usual application to reduce the moisture content and reach the adequate C/N ratio (25-35) this composting approach increases the total volume of waste that has to be handled. Considering these facts, this study was aimed to enhance the composting efficiency of the solid fraction of dairy (D) slurry by blending it with broiler litter (B) and layer (L) manure to meet the necessary requirements for composting. Besides total amounts of nutrients in manure mixtures their water extractable portions were evaluated in order to explained peak temperature which attained within a short time period during composting. While the only 3% organic carbon (OC) reduction and relatively constant water extractable OC (WEOC) were observed with D+B within 7 d of composting process, 13% OC reduction and concomitant WEOC/OC and NH₄⁺ increases were the characteristics of D+L indicating the higher stability potential of this mixture. The relatively poor efficiency obtained for D+B could be attributed to resistance of bedding material (≈40% rice husk) mixed with excreta to biochemical reactions.

ID 10 Environment & Sustainability and Health & Well-Being in the 2030 Agenda

Presenter: Şila Temizel

In September, world leaders came together in New York City and adopted the Sustainable Development Goals. The goals revolve around three themes: empowering people, eradicating poverty and protecting human dignity; shared prosperity and decent, fair jobs for all; protecting the planet and tackling climate change. These 15-year goals will help guide the public's understanding of complex sustainable development challenges, inspire public and private action, promote integrated thinking, and foster accountability. In this poster presentation Environment & Sustainability and Health & Well-Being issues will be examined.

ID 11 Education & Skills & Jobs and Poverty & Development in the 2030 Agenda

Presenter: Şila Temizel

In September, world leaders came together in New York City and adopted the Sustainable Development Goals. The goals revolve around three themes: empowering people, eradicating poverty and protecting human dignity; shared prosperity and decent, fair jobs for all; protecting the planet and tackling climate change. These 15-year goals will help guide the public's understanding of complex sustainable development challenges, inspire public and private action, promote integrated thinking, and foster accountability. In this poster presentation Education & Skills & Jobs and Poverty & Development issues will be examined.

ID 12 Effects of operational parameters on methane production in anaerobic digesters fed with cow manure and barley

Presenter: Bilgesu Tutal

Anaerobic digestion of animal manure is an effective method of both animal waste disposal and energy demand fulfillment sustainably. However recent studies revealed that biogas yield of sole manure is relatively low due to its low carbon content. Thus, anaerobic digestion with other organic waste called co-digestion has gained attention in recent years. The aim of this study was to evaluate the biochemical methane potentials of cow manure and barley with respect to four different operational parameters in order to achieve the most efficient methane yield. Effects of temperature (mesophilic vs. thermophilic), different inoculum to substrate (I:S) ratios and different types of inoculums were investigated in anaerobic batch tests. Highest specific methane yield (286 CH₄/g VS) was found in the digester containing anaerobic seed sludge and cow rumen fluid as a supportive inoculum which was operated with an I:S ratio of 1:2. The next highest specific methane yields were obtained in the digester operated at thermophilic temperature (55°C) and in the digester operated with an I:S ratio of 1:1, as 260 CH₄/g VS and 256 CH₄/g VS, respectively. As a major indicator of stability in anaerobic digesters, no volatile fatty acids accumulation was observed in the digesters during the operation period. The results show that we can increase the methane yield with the combination of different types of inoculums instead of energy input in thermophilic anaerobic digesters.

ID 13 The Role of Biotransformation on Biocide Resistance in a Co-Culture of *Pseudomonas Sp.* BIOMIG1 and *E. coli*

Presenter: Gökçin Gül

Antimicrobial resistance is the major health threat that human society is facing today. It is believed the main cause of antimicrobial resistance development is exposure of microorganisms to biocides such as quaternary ammonium compounds (QACs) at low concentrations in the environment. QAC-induced resistance mechanisms also confer cross- and co-resistance to many antibiotics. One of the most commonly used form of QACs is benzalkonium chlorides (BACs) and they are used in disinfectants. Domestos is one of the widespread used commercial disinfectant for surface cleaning. The aim of this study is to clarify the influence of BAC degrading bacteria presence in Domestos-containing medium on BAC susceptible bacteria. In this research, *E. coli*: BAC susceptible bacteria (BAC MIC: 16 mg/L), and *Pseudomonas sp.* BIOMIG1: BAC resistant and BAC degrading bacteria, used in co-culture. According to our results *E. coli* can live up to 125 mg/L BAC concentration in the presence of *Pseudomonas sp.* BIOMIG1 while it can survive only 2 mg/L BAC concentration without *Pseudomonas sp.* BIOMIG1. These findings suggest that *Pseudomonas sp.* BIOMIG1 protects BACs-susceptible *E. coli* from disinfectant.

ID 14 Photocatalytic Degradation of Humic Acid Using a Novel Photocatalyst: Ce Doped ZnO

Presenter: Nazmiye Cemre Birben

This study aims to investigate photocatalytic degradation of humic acid (HA) as a representative of natural organic matter (NOM) by using Ce doped ZnO as a novel material. Working HA solution (UV_{254} : 0.313 /cm, DOC: 3.32 mg/L) was prepared by appropriate dilution of the stock solution (1000 mg/L). The Ce doped ZnO sample (Ce molar concentration 1%) was prepared by adding the stoichiometric amount of $CeCl_3 \cdot 7H_2O$ into the solution of $Zn(NO_3)_2 \cdot 6H_2O$. Then the solution was transferred into a 100 mL PTFE lined stainless steel vessel, autoclaved and treated at 175°C overnight. An Atlas Suntest CPS+ solar simulator was used as the photoreactor (λ : 300-800 nm, I_0 : 250 W/m). Prior to and following photocatalysis, HA degradation was characterized by specified UV-vis and fluorescence spectroscopic parameters. Advanced techniques as Excitation-Emission Matrix (EEM) fluorescence features were evaluated. Photocatalytic mineralization extend was followed by dissolved organic carbon (DOC) content. Kinetic modeling of the humic degradation in terms of UV-vis parameters as well as DOC was also employed. Photocatalytic removal rates expressed promising results (50% of DOC removal was attained following an irradiation period of <10 minutes) indicating that Ce doped ZnO could serve as an efficient catalyst for the degradation of NOM.

ID 15 Modeling Calcium Carbonate Precipitation in The Acıgöl Lake Using Aquatox Model

Presenter: Fereshteh Karami

Calcium Carbonate (or calcite) ($CaCO_3$) is one of the most common forms of Calcium (Ca) element, which constitutes 4.9% of the Earth's crust. Due to low costs of production process many industries use $CaCO_3$ broadly as an inorganic mineral that appears in forms of chalk or limestone. The aim of this research is to model Calcium Carbonate precipitation in the Acıgöl Lake, using Water Quality Data obtained from the field measurements and Meteorological Data from Turkish State Meteorological Service (MGM) in 2011 and 2013 to produce scenarios to simulate the lake's future water quality prediction under different environmental conditions. The modeling implemented using EPA's AQUATOX water quality model. The initial step in modeling was the selection of a surrogate site, which represents best matches to the properties, and parameters of Acıgöl Lake. In order to obtain more precise results, the model is calibrated in 10 stations in the lake by applying nutrients, plant subsets, site characteristics, water volume, inflow loadings based on depth and seasonal precipitations, water temperature, wind, light, pH and etc. The model is calibrated by using data obtained in laboratory for 10°C and 30°C to cover different seasonal conditions of Acıgöl Lake and validated by field data for 2011, 2013, and 2015, respectively. It is expected that the $CaCO_3$ precipitation's mechanisms involved in the Acıgöl Lake model will provide information regarding the participating parameters in potential gain of industrial $CaCO_3$ from the lake under varying environmental conditions.

ID 16 Influence of Antibiotic Existence on the Biochemical Methane Production Potential of the Wastewater Sludge

Presenter: Ece Özön

The anaerobic wastewater sludge digestion with the application of various pretreatments can be effective both for the antibiotic removal from the sludge and for the organic content reduction of the sludge so that it can be safely disposed. This study investigates the effects of ciprofloxacin (CIP) antibiotic existence on the biochemical methane production potential of wastewater sludge. In the study, 1 mg/L CIP was spiked into the wastewater sludge and then the microwave irradiation was applied to sludge samples. The remaining sludge after the microwave pretreatment was anaerobically digested to treat waste activated sludge and produce energy from biomass in form of biogas. The waste activated sludge and the inoculum were mixed in 100 mL serum bottles at a food to microorganism (F/M) ratio of 1. All reactors were incubated at 37°C for 30 days. Total gas production and gas composition analyzed periodically during the digestion period of batch reactors. Initial and final sludge characteristics were analyzed according to Standard Method. When gas production stopped, the reactors were shut down and reactor contents analyzed to see the effect of antibiotic existence and microwave pretreatment on final sludge characteristics.

ID 17 Investigation of Biosorption Potential of Silver by Green Microalgae

Presenter: Merve Tunali

The use of electronic devices has increased drastically over the past two decades. Electronic devices and technologies are continuing to develop in many different sectors, such as; entertainment, security, health, logistics, and education. Since these devices (e.g., cell phones, computer components, electric motors, specialty glass and lenses) are accommodating many precious metals such as silver, management of the electronic devices that have completed their life cycle is emerging as a new challenge. Biosorption have become an attractive method for recovery of metals from aqueous solutions by providing several advantages such as being eco-friendly and cost effective. In this study, a type of green microalgae; *Chlorella Vulgaris* was used as biosorbent material for biosorption of silver ions. As a first step, the microalgae was cultivated in photobioreactors for 20 days under continuous illumination at an average intensity of 300 $\mu\text{E}/\text{m}^2\text{s}$ at room temperature. The microalgae was harvested and washed by deionized water and then dried at 60°C for 24 h before used. As a second step, optimum conditions (pH of the solution, temperature, biomass dosage, initial solute concentration and duration) for the biosorption tests was investigated. At the end of biosorption studies; adsorption isotherm was obtained to understand the equilibrium established between adsorbed metal ions on the algal cell and unadsorbed metal ions in the solution.

ID 18 Microbial Association in Plant Rhizosphere Supporting Phytoremediation of Copper Contaminated Soils

Presenter: Mehmet Meriç Tunali

Certain soil microorganisms such as arbuscular mycorrhizal fungi (AMF) has a potential of enhancing the bioremediation of their host plant. The present study was carried out in order to understand the role of two mycorrhizal species for the boosting of plant growth in sorghum (*Sorghum bicolor* L.) and sunflower (*Helianthus annuus* L.) rhizosphere. These plants have some unique physiological properties, such as tolerance to abiotic stresses like drought and salinity. However, their ability to integrate with mycorrhizal fungi in order to uptake copper and metal translocation in body component were tested. In a greenhouse experiment both plants were inoculated with two AMF species; *Glomus mosseae* and *Glomus intraradices* and grown in polluted soil with various copper concentrations (100, 500 and 1000 ppm). Cu^{+2} observed in plant species, host plants' symbiosis potential with two different species of arbuscular mycorrhizal fungi exhibited strong correlation between higher pollution and AMF interaction in plants. Colonization with both AMF species significantly enhanced the transfer of Cu^{+2} to the plants; ranging between 29.34 –249.86 mg/kg (56.89% - 218.32%) for the total Cu^{+2} in sunflower and 12.06 – 73.97 mg/kg (44.97% - 96.14%.) for sorghum rhizosphere); particularly when colonized by *G. mosseae* (up to 60%).

ID 19 The Generation of Glomalin-related Soil Protein (GRSP) and Its Contribution to Copper Sequestration in Contaminated Soils

Presenter: Mehmet Meriç Tunali

In order to understand the role of two mycorrhizal species for enhancement of plant growth in sorghum (*Sorghum bicolor* L.) and sunflower (*Helianthus annuus* L.) rhizosphere, and their ability to integrate with mycorrhizal fungi in copper contaminated soils and Glomalin Related Soil Protein (GRSP) production under certain conditions in a greenhouse experiment, both sorghum and sunflower plants were inoculated with two AMF species, *Glomus mosseae* and *Glomus intraradices*, and grown in various copper Cu^{+2} concentrations. Generation of glomalin-related soil protein (GRSP) is the result of the interaction between AMF and host plants in Cu contaminated soils. Cu concentrations in this study were 100, 500 and 1000 ppm. Two commercial crops (sorghum and sunflowers) which are widely cultivated in majority of agricultural fields in Turkey were used as host plants. Results showed a strong variability in sunflower and sorghum plants colonized with both AMF species in terms of GRSP (0.6–11.2 mg/g and 0.2-10.75 mg/g, respectively). Up to 60% colonization was observed with *G. mosseae* species. Findings suggest highly efficient mechanism for AMF to mitigate stress leading to stabilization of polluted soils. Results also provide a new suggestion on the contribution of glomalin in copper sequestration in contaminated soils.

ID 20 Modeling Chlorophyll-a Concentrations and Algal Distributions in Selected Streams of the Omerli Reservoir

Presenter: Zeynep Akdoğan

Computer simulation models are useful and applicable tools in managing the eutrophication problem associated with excess growth of algae. The objective of this study is to develop a model predicting the Chlorophyll a (Chl-a) concentrations and intensity of algal blooms in selected streams of the Ömerli Reservoir. Environmental Protection Agency (EPA)'s AQUATOX model is applied to the Kömürlük and Riva Streams of the Ömerli Reservoir. Monthly data obtained from two different streams of the reservoir for one year are used as input for model application. Simulations indicate an acceptable prediction of seasonal Chl-a concentrations. While measured and simulated Dissolved Oxygen (DO) concentrations are compatible with each other for the Kömürlük Stream, simulation outcomes for measured silica vs simulated diatom have similar trends in the Riva Stream. The model outcomes for active layer thickness (sediment) vs simulated Chl-a for both streams also reveal the model reliability by representing the close relation between these two variables. The species distributions of major phytoplankton groups: greens, blue-greens, diatoms, cryptomonads, and dinoflagellates are predicted. According to the model, the greatest concentration values are observed for greens in both streams. Seasonal patterns of the algae, except blue-greens, are found compatible with the measured Chl-a values. Changing N:P ratio alters the alga concentrations however the dominance rank among the species remains the same for both streams.