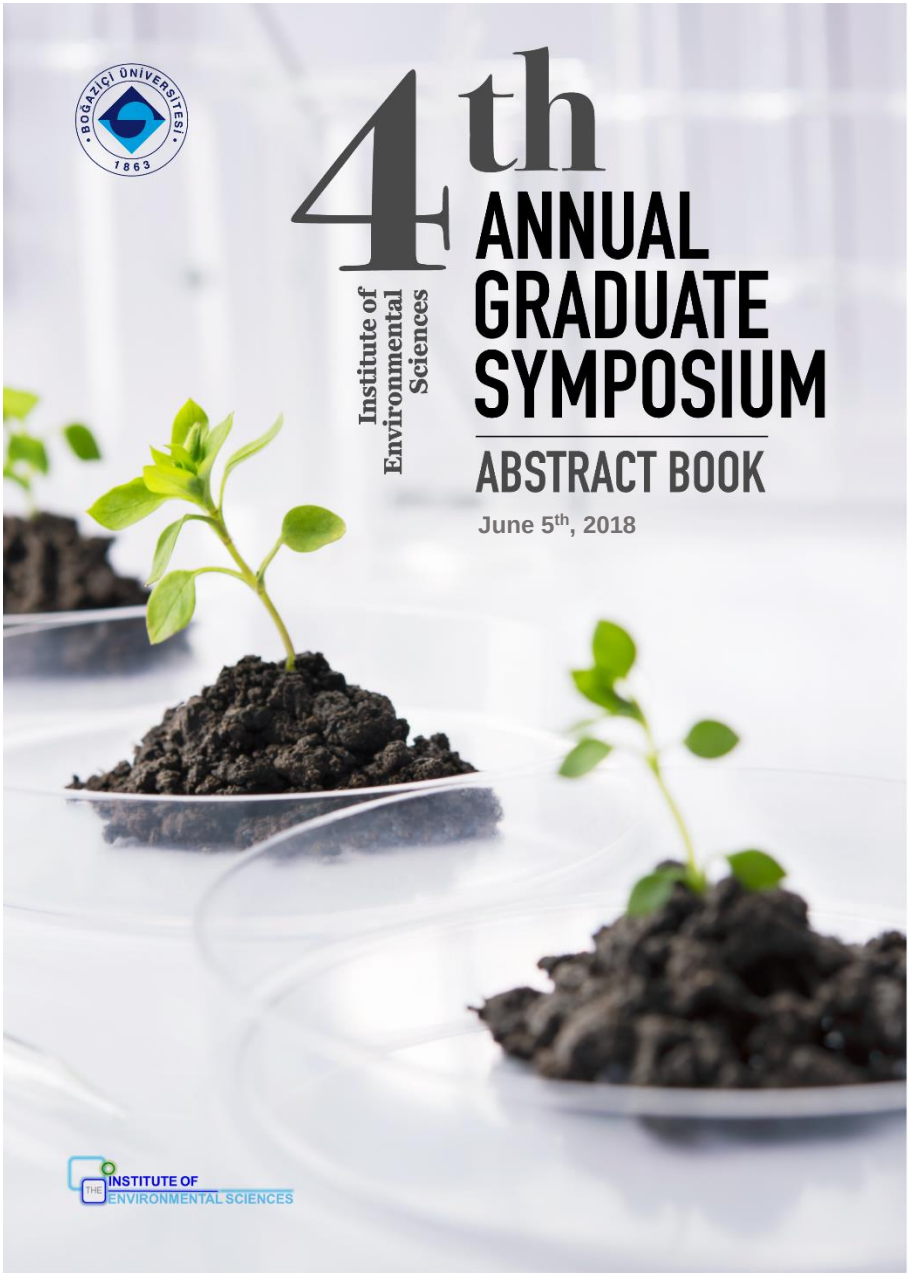

4th ANNUAL GRADUATE SYMPOSIUM

Institute of Environmental Sciences

ABSTRACT BOOK

June 5th, 2018

THE INSTITUTE OF ENVIRONMENTAL SCIENCES

Social and Scientific Committee

Prof. Dr. Işıl Balcıoğlu

Assoc. Prof. Dr. Başak Güven

Asst. Prof. Dr. Berat Z. Haznedaroğlu

Organization Committee

Ece Özön

Feride Öykü Sefiloğlu

Thanks to:

Elifcan Çalışkan

Koray Sakarya

Binnur Aylin Alagöz

Çağrı Akyol

Buse Yetişti

Ayşe Defne Şahin

Arca Yılmaz

Gökçin Gül

Zeynep Akdoğan

Jury Members

Prof Dr. Burak Demirel

Prof. Dr. Andrzej Furman

Asst. Prof. Dr. İrem Daloğlu

Koray Sakarya

Cemre Birben

Derya Gelgör

4th Annual Graduate Symposium

Tuesday, June 5th 2018

PROGRAM

09:00 - 09:30 Registration - Coffee Service

09:30 - 09:50 Welcome Speech by Prof: Dr: Orhan Yenigün: Director of the Institute of Environmental Sciences

10:00 – 10:45 Keynote Talk by Dilek Bolcan- "Şişecam'da Sürdürülebilirlik Yaklaşımı"

10:45 – 11:00 Coffee Break

11:00 – 12.20 Oral Session I - Moderator: B. Aylin Alagöz

Çağrı Akyol - Biological Pretreatment with *Trametes versicolor* to Enhance Methane Production from Lignocellulosic Biomass: A Metagenomic Approach

Özgücan Eken - Evaluation of Micropollutant Toxicity in Ergene River during a Dry Season

Ece Özön - Biogas Production Potential of the Microwave, H_2O_2/MW and H_2O_2/Heat Pretreated Wastewater Sludges

Gizem Kıyak - Evaluation of Mechanisms of Increasing Soil Quality via Plant-Microorganism Interactions

12:20 - 13:30 Lunch Break

13:30 – 14:30 Oral Session II - Moderator: Elifcan Çalışkan

Derya Aydın Sarıkurt - Cosolvent Enhanced Remediation of DNAPL in Saturated Porous Media: Experimental Investigation and Numerical Modelling

Semra Ocak - Political Ecology of Pollution Control Failure in Ergene Basin of Thrace, Turkey

Mahir Bozan - Biomethane Potential of Pre-Treated Macroalgae and Corn Stover by *Trametes versicolor* Entrapped in Ca-Alginate Beads

14:30 – 16:00 Coffee Break – Poster Evaluations

16:00 – 16:45 Keynote Talk by Sibel Sezer Eralp – "Bir Sosyal Bilimcinin Çevre Korumadaki Maceraları"

16:45 – 17:15 Award Ceremony

Poster Presentations

ID 01 - Zeynep Akdoğan - Microplastics in the Environment: A Critical Review of Current Understanding and Identification of Future Research Needs

ID 02 - Elif Babayiğit - Direct Liquid-Liquid Lipid Extraction Method for Biodiesel Production from Petrochemical Industry and Municipal Wastewater Sludges: Ultrasonication Enhancement

ID 03 - Burcu Calda - Contributions of Soil Microbe Interactions to Enhance Drought Resistance against Forest Fires

ID 04 - Aslınur Çalışıyor - Effects of Different Types of Microbial Communities for Anaerobic Biodegradation of Petroleum Contaminated Soil

ID 05 - Göksu Çelik - Multistage Recovery Process of Biophenolic Antioxidants with Focus on Hydroxytyrosol from Olive Mill Waste

ID 06 - Seyedmehdi Emadian - Occurrence and Distribution of Contaminants of Emerging Concern along the Ergene River during Dry Seasons

ID 07 - Hatice Aygün Karaçay - Molecular and Morphological Identification of AMF in Kutahya Mine Tailings: Bio-Phytoremediating at Mine Site

ID 08 - Emre Karakaya - Aerobic Biodegradation of Dominant Micropollutants in the Ergene River by a Native Mixed Culture of Microorganisms

ID 09 - Dilara Selin Kubilay - Modeling Evolution and Dissemination of Resistance under Temporally Changing Antimicrobial Concentration

ID 10 - Feride Öykü Sefiloğlu - Contaminant Traffic in Ergene Watershed: Paddy soil serves as source and sink for emerging contaminants in Ergene River

ID 11 - Ayşe Defne Şahin - Understanding the Toxic Potencies of Xenobiotics Inducing TCDD/TCDF-like Effects

ID 12 - Begüm Şepitci - Biodegradation Potential of Pollutants of Emerging Concern in Ergene River during Dry Season

ID 13 - Berivan Ülger - Evaluation of Biodegradation of Bioplastics under Landfill Conditions

ID 14 - Buse Yetişti - Common Pool Resources: Groundwater Appropriation Game

ORAL PRESENTATIONS

Session I: 11:00 - 12:20
Moderator: B. Aylin Alagöz

Biological Pretreatment with *Trametes versicolor* to Enhance Methane Production from Lignocellulosic Biomass: A Metagenomic Approach

Presenter: Çağrı Akyol

The presence of poorly biodegradable components in lignocellulosic biomass limits the methane recovery in anaerobic digestion (AD). The main reason to go for pretreatment prior to AD is that lignin cannot be degraded anaerobically and requires oxygen for enzymatic cleavage of the aromatic rings. Thus, anaerobic microbes must be assisted in lignin degradation by novel strategies so that cellulose and hemicellulose can be accessed to hydrolyze lignocellulosic biomass. In this study, we took the advantage of highly-cellulolytic white-rot fungus *Trametes versicolor* by aerobic pretreatment prior to anaerobic co-digestion of cow manure and selected cereal crop materials (wheat, rye, barley, triticale) harvested in different rotations. The highest methane yield was obtained during the anaerobic co-digestion of cow manure and early-harvested barley in both non-treated and pretreated trials. Aerobic pretreatment boosted the methane yield by 10-18% and cellulose removal up to 80%. 16S rRNA gene amplicon sequencing revealed that microbial communities clustered with respect to the application of pretreatment and crop material (whole crop vs. crop resides) in terms of similarity. Porphyromonadaceae (Phylum: Bacteroidetes), Caldicoprobacteraceae (Phylum: Firmicutes) and Clostridiaceae (Phylum: Firmicutes) were the most abundant bacterial families in anaerobic digesters; meanwhile Anaerobaculaceae (Phylum: Synergistetes) was only detected in pretreated digesters at a high abundance. Methanomicrobiaceae and Methanosarcinaceae were the predominant methanogenic archaeal communities in pretreated anaerobic digesters; however, non-treated control digesters were only dominated by Methanosarcinaceae. Overall, aerobic pretreatment of lignocellulosic feedstock with T. versicolor contributed a higher cellulose degradation and a more diverse microbiome which in return ensured higher methane yield.

Evaluation of Micropollutant Toxicity in Ergene River during a Dry Season

Presenter: Özgücan Eken

In this study, micropollutant analyses were carried out on water samples taken at 75 different points from Ergene River during a dry month in August 2017. In addition, acute toxicity values of each water sample were determined by using Microtox toxicity test and the relationship between the chemicals detected in the samples and toxicity was investigated. About 250 micropollutants analysed in samples, 131 micropollutants were detected in at least one sample. Among these pollutants are priority pollutants, antibiotics, brominated flame retardants, nonylphenols, disinfectants, pesticides, plasticizers, fragrances and even cyanotoxins. 73 of these 131 micropollutants were identified in ten and more samples, while 21 of these micropollutants were determined in only one sample. Benzyldimethyldodecylammonium, Benzyldimethyltetradecylammonium, N,N-Diethyl-m-toluamide, Ofloxacin and Polychlorinated biphenyls (PCBs) were detected in all 75 sample points. Most chemicals (61 micropollutants) were found in sample that was taken from one of the tributaries of Ergene River (Çorlu Stream) while, least chemicals (15 micropollutants) were detected in sample that was taken from one of the sources that feeds Ergene River. The highest toxicity value was reported in sample that was taken from near to Ergene-1 Organized Industrial Zone and at this sample 15 heavy metals and 33 micropollutants were detected. Especially, Hexa(methoxymethyl)melamine, Damascone, PCBs, Aluminium, Nickel, Boron and Zinc were found in high concentrations. Correlation of each pollutant with toxicity showed that Benzyldimethyltetradecylammonium, Benzylamine, Nonylphenol diethoxylate, PCBs, Benzyldimethyldodecylammonium, Dicyclohexylamine, ADBI (Celestolide) are most probably contributes to toxicity.

Biogas Production Potential of the Microwave, H_2O_2/MW and H_2O_2/Heat Pretreated Wastewater Sludges

Presenter: Ece Özön

Anaerobic digestion has been used to stabilize wastewater sludges by providing a reduction in organic content and mass of input sludge while producing energy in form of biogas. Efficiency of digestion and biogas/methane production can be enhanced by pretreating the sludge prior to anaerobic digestion. This study comparatively investigates the effects of combined hydrogen peroxide-microwave (H_2O_2/MW), combined hydrogen peroxide-heat (H_2O_2/heat) and microwave (MW) sludge pre-treatment methods on the anaerobic digestion efficiency and the methane yield. In the study, microwave irradiation was applied to sludge samples at 160ºC for 15 minutes in a MW oven. The H_2O_2/MW pretreatment was applied to sludge samples by mixing them with 1 g H_2O_2/g TS and then microwaving them. In the H_2O_2/heat pretreatment, 1 g H_2O_2/g TS was added to sludge samples and they heated in water bath at 75ºC for 90 minutes. The pretreated sludge samples and the inoculum were mixed in 120 mL serum bottles with a food to microorganism (F/M) ratio of 1:1. The reactors were sealed and flushed with nitrogen gas. All reactors were incubated at 37°C for 40 days. Total gas productions were measured daily and gas compositions were analyzed weekly during the digestion period of the batch reactors. The pre-treatments applied to sludge samples prior to anaerobic digestion speeded up the hydrolysis step and improved the biodegradability of the organics by increasing their solubility. MW, combined H_2O_2/MW and H_2O_2/heat pre-treatments increased the methane yields by 65%, 40% and 20%.

Evaluation of Mechanisms of Increasing Soil Quality via Plant-Microorganism Interactions

Presenter: Gizem Kıyak

Arbuscular mycorrhiza (AM) which belongs to the kingdom of fungi is a symbiont of the roots of the plants. It provides water, macro and micro nutrients to its host, and takes photosynthetically derived sugars from the plant in return. In this research, the role of plant-mycorrhiza interaction on the remediation of the soil from a mine tailing area in Kütahya was evaluated and the genetic mechanisms behind this remediation were highlighted. To assess the effect of mycorrhiza on plant growth, metal absorption by the plant, soil fertility and the expression of metal transporter genes, a greenhouse experiment was set up with *Sorghum bicolor* L. and *Rhizophagus irregularis*. It was found that the mycorrhiza positively affected the plant growth even at the germination stage and it increased mostly the root weight afterward. Metal absorption by the mycorrhizal roots was higher because of the increase in root growth and in the expression level of YSL-15 gene in roots. Root to shoot translocation was also higher in AM+ plants. Furthermore, the mycorrhiza induced the soil fertility to increase, however, not by the glomalin production. The expression and the production of glomalin might depend on the type and concentration of metals in the soil. Also, it was suggested to do the phytoremediation application in Kütahya between June and August since the symbiosis strongly depended on the temperature in this soil.

Session II: 13:30 - 14:30
Moderator: Elifcan Çalışkan

Cosolvent Enhanced Remediation of DNAPL in Saturated Porous Media: Experimental Investigation and Numerical Modelling

Presenter: Derya Aydın Sarıkurt

The contamination of the subsurface by the accidental release of organic contaminants in the form of non-aqueous phase liquids (NAPLs) is a widespread and challenging environmental problem. However, there is lack of cost effective technologies for the remediation of groundwater systems contaminated with NAPLs. A key process influencing the effectiveness of NAPL remediation is the interphase mass transfer which is the transfer of components across the interface separating the aqueous and NAPL phases. This study evaluates the use of cosolvent flushing for the removal of NAPLs from saturated porous media. Intermediate-scale laboratory experiments were conducted to investigate the impact of cosolvent content, flow velocity, and pumping pattern on cosolvent enhanced NAPL dissolution. Results demonstrated the importance of the flushing solution content and the flow characteristics on NAPL removal. The experimental results were also modeled using multiphase flow simulator. The model results highlighted the significance of the interphase mass transfer in NAPL remediation and the need to model this process as a non-equilibrium kinetic process. To further elucidate the factors influencing the interphase mass transfer mechanism, a series of controlled dissolution experiments from pooled NAPL were also conducted. The interpretation of the experiments was performed using a 2D pore network model in addition to a simplified 1D analytical solution. Results showed that the analytical solution which ignores lateral transport underestimates the interphase mass transfer coefficient. Based on the estimated mass transfer coefficients, improved non-lumped Sherwood correlations were developed. These correlations can be used in future modeling studies involved pooled NAPL configurations.

Political Ecology of Pollution Control Failure in Ergene Basin of Thrace, Turkey

Presenter: Semra Ocak

This thesis analyzes the pollution control failure in the Ergene Basin as a specific example of environmental conservation failure. Taking the political ecology literature as a starting point, the power and politics influencing the pollution control efforts and their failure are addressed. Rapid industrialization in Ergene has started in the 1980s to relocate industrial facilities from İstanbul to Thrace. Thus, industrial density areas were generated. The neglect on water pollution control has resulted in increasing pollution. However, there have been public response and professional efforts to control pollution levels. In response to the reactions against heavy pollution, various steps have been taken to prevent pollution, but they have been insufficient leading to pollution control failure. To understand the causes of this pollution control failure, we investigated pollution control efforts of the local professionals and the central authorities starting from the plan making process to the implementation phase. Through desktop research of environmental plans and reports, site visits to the pollution havens and in-depth interviews with experts, academics, NGOs representatives, it is observed that: The neglect of environmental problems in the context of neoliberal development, the reluctance of the state to ensure environmental conservation policies, devolution of power from local to central authorities have played a crucial role in pollution. Thus, these factors point towards an environmental governance problem arising from the lack of participation mechanisms and resulting in shifting the cost of pollution from polluters to the public and the nature through integrated treatment plants and deep sea discharge projects.

Biomethane Potential of Pre-Treated Macroalgae and Corn Stover by *Trametes versicolor* Entrapped in Ca-Alginate Beads

Presenter: Mahir Bozan

Microorganisms especially fungi are utilized in biological pre-treatment of lignocellulosic biomass. In this particular study, *Trametes versicolor* was entrapped in Ca-alginate based beads in order to use them in the pre-treatment of macroalgae (Ulva sp.) and corn stover prior to anaerobic digestion process. After pre-treatment, anaerobic co-digestion of corn stover and macroalgae was carried out. According to results, laccase activity of samples did not show any dramatic change during pre-treatment; they had stable laccase activity for 7 days. The concentration of reducing sugars was increased after 24 hours for pre-treatment samples, then tended to decrease following 6 days of incubation. Methane production of samples was increased by 26%, 24%, and 15% for macroalgae, corn, and co-digestion of both substrates, respectively. Next-generation sequencing analysis was conducted by using ION PGMTM in order to determine microbial communities in samples taken from 20th day of anaerobic digestion systems. *Methanomassiliicoccus sp.* was dominant methanogen (54%) in pre-treated samples; however, *Methanoculleus bourgensis* was dominant (42%) in non-treated digesters. In pre-treated digesters, phyla Bacteroidetes, Firmicutes, and Proteobacteria showed little increase; moreover, Synergistetes and Thermotogae decreased in percentage compared to control reactors. Overall, the results indicated that Ca-alginate entrapped *T. versicolor* can be utilized in the pre-treatment of lignocellulosic biomass in order to decrease the cost and time of the operation.

POSTER PRESENTATIONS

ID 01 - Microplastics in the Environment: A Critical Review of Current Understanding and Identification of Future Research Needs

Presenter: Zeynep Akdoğan

Microplastics (plastic particles <5 mm) are a contaminant of increasing ecotoxicological concern in aquatic environments, and for human health. Although microplastic contamination is widespread across the land, water, and air, these environments are commonly considered independently; however, in reality are closely linked. This study aims to review the background knowledge of microplastics in different environmental compartments and identify the research gaps to assess the future research priorities. Over 200 papers published between 2006 and 2017, involve microplastic contamination in the environment are identified in the Web of Science database. The research articles of "Environmental Sciences", "Marine Freshwater Biology", "Toxicology", "Multidisciplinary Sciences", "Environmental Studies", "Environmental Engineering", "Oceanography", "Limnology" and "Ecology" categories of Web of Science are taken into consideration to investigate microplastic research in rivers, lakes, estuaries, seas, and atmosphere. The papers identified for rivers, lakes and estuaries are subsequently classified according to (i) abundance and distribution (ii) fate and transport, and (iii) ecotoxicity issues. The results reveal that whilst marine microplastics have received substantial scientific research, the extent of microplastic contamination in continental environments, such as rivers, lakes and air, and environmental interactions, remains poorly understood.

ID 02 - Direct Liquid-Liquid Lipid Extraction Method for Biodiesel Production from Petrochemical Industry and Municipal Wastewater Sludges: Ultrasonication Enhancement

Presenter: Elif Babayiğit

Biodiesel production from agricultural products such as vegetable oils is currently limited due to high raw material costs and lack of agricultural lands. Municipal sludge having high lipid content is gaining traction as a lipid feedstock for biodiesel production. Petrochemical industry wastewater treatment plant (WWTP) sludge, including sludges from oil separators, primary clarifier, and the waste activated sludge from secondary clarifier, contains a high concentration of petroleum hydrocarbons, phospholipids, free fatty acids, neutral lipids and can also be used as a feedstock for biodiesel production. Standard drying method necessitates expensive sludge dewatering/drying steps to remove high water content in sludge. The aim of this study was to explore lipid extraction from municipal and petrochemical industry WWTP sludges by using the direct liquid-liquid lipid extraction method and to compare it to standard drying method. The study also investigated the effect of acid and ultrasonic pre-treatment on lipid and biodiesel yields of the sludge samples. The results of the study showed that acid pre-treatment increased the lipid yields. The highest lipid yield was obtained by application of combined acidification/ultrasonication pre-treatment to the petrochemical industry WWTP sludge and using the liquid-liquid lipid extraction method. Compared to standard drying method, direct liquid-liquid lipid extraction is found to be more efficient for petrochemical industry WWTP sludge samples. On the other hand, for municipal sludge samples lipid extraction method did not cause an important improvement in biodiesel yields. Almost same biodiesel yields were obtained by the use of both standard drying and liquid-liquid lipid extraction methods.

ID 03 - Contributions of Soil Microbe Interactions to Enhance Drought Resistance against Forest Fires

Presenter: Burcu Calda

Many studies show that the number of wildland fires increase with drought weather conditions in the Mediterranean basin. In addition, Canadian Fire Weather Index indicates strong relation between humidity changes in different layers of forest floor and potential fire behavior due to fuel moisture. Thus, in the study, Canadian Fire Weather Index will be used to estimate potential forest fire in the Mediterranean basin and MENA. The prediction will be utilized in the greenhouse experiment when deciding the temperature of experiment. To sum up, there is used AMF inoculation that provides symbiotic associations with host plants enhance ability of water uptake from soil as well as it reduces drought stress in their host plants. By this way, fuel ignition and combustion could be prevented by protecting soil humidity in this study.

ID 04 - Effects of Different Types of Microbial Communities for Anaerobic Biodegradation of Petroleum Contaminated Soil

Presenter: Aslınur Çalışıyor

Petroleum is the most common raw material that is used as energy source in a wide range of industries. As a result of the increment of petroleum utilization, the most common problem of petroleum industry is the inappropriate waste management plan that causes soil and groundwater pollution during exploration, refining, transport and storage. Since the physical and chemical methods have some disadvantages as cost and production of secondary waste generation, biological treatment methods become important environmental studies. As an effective bioremediation technique, bioaugmentation improves the biodegradability of polluted sites by introduction of single strains or mix culture of microorganisms. Besides aerobic degradation, anaerobic biodegradation is an alternative method having specific properties as mass reduction and breakdown of organic content of waste products by different reducing environment conditions, and production of biogas that can be used as renewable energy source. The aim of the study is to determine the biodegradability of petroleum contaminated soil due to sulphate reducing and methanogenic environment under different temperature conditions. Determination of degradation efficiency and the relation between the microbial community and the degradation process, chromatographic and metagenomics analyses are applied to microcosm setup that run through 12 months. Chromatographic analyses are applied on solid phase for determination of total petroleum hydrocarbons (TPHs), on gas produced and on liquid phase for determination of reduced ions during the experiment. Microbial diversity is determined by Illumina sequencing as Next Generation Sequencing (NGS).

ID 05 - Multistage Recovery Process of Biophenolic Antioxidants with Focus on Hydroxytyrosol from Olive Mill Waste

Presenter: Göksu Çelik

The number of phenolic compounds (PCs) and their environmental contamination problems as consequences of olive oil production process in the countries surrounding the Mediterranean Sea propel the need for extraction of high-added value phenolic antioxidants from olive mill wastewater (OMWW) and for the reduction in phytotoxicity of the effluent. As current treatment methods for OMWW still do not meet high efficiency for the recovery of phenolic antioxidants, new extraction and isolation methods with low solvent consumption will still be on-demand in foreseeable future. In this regard, this research utilizes concentrated decanter and lagoon OMWW treated with Mechanical Vapor Recompression (MVR) evaporator to recover natural antioxidants mainly hydroxytyrosol (HTyr). A successful multi-stage recovery process including the pretreatment by acidification, extraction with organic solvent and/or solid phase extraction using nonionic polymeric adsorbent was applied to both types of concentrate. Solvent:solid ratio, solvent concentration, extraction time and stage were the parameters used in an experimental design to optimize solvent extraction stage of the process. The results clearly revealed the requirement of ultrasonic assistance for solvent extraction of decanter concentrate. Acidification of OMWW concentrates enhanced the overall recovery of HTyr by increasing solubility of PCs and hydrolyzing oleuropein to HTyr. The efficiency of ethyl acetate and ethanol was compared in terms of partitioning of antioxidants and eliminating other constituents of concentrate such as carbohydrate, protein and oil. The necessity of further purification with Amberlite-XAD16N resin for HTyr was also evaluated.

ID 06 - Occurrence and Distribution of Contaminants of Emerging Concern along the Ergene River during Dry Seasons

Presenter: Seyedmehdi Emadian

Ergene River spans Thrace from northeast to southwest and joins to Meritsa River, then falls to Aegean Sea at Turkey-Greece border. Ergene River is the most polluted river in Turkey. The polution is mainly due to the extensive discharges from different industries, domestic discharges and runoff from agricultural fields, animal farms and solid waste disposal sites. Since the river connects to the Meritsa River which is an interboundary river, water quality of Ergene River has an international importance. In this study, we screened 250 contaminants of emerging concern (CEC) in 75 samples taken along the river in August and November 2017 using liquid chromatography tandem mass spectroscopy with multiple reaction monitoring (LC-MSn/MRM). Eighteen heavy metals and 134 organic CECs were detected at least one point. Concentration of CECs ranged from 10 ng/L to 300 mg/L. CECs detected in most of the samples include heavy metals (e.g. Ni, Pb, Cu, Al, Co, V, Cr, Ba), PCBs, antibiotics (e.g. ofloxacin, azithromycin, norfloxacin), corrosion inhibitors (e.g. 1,2,3-Benzotriazole, 5-Tolytriazole), surfactants (e.g. nonylphenol diethoxylate, benzalkonium chlorides), pesticides (e.g. Diuron, prochloraz, acetamiprid, carbendazim) and metal coating agents and resins such as hexa(methoxymethyl)melamine (HMMM). As a result, this study is the most comprehensive watershed based water quality evaluation study done in the region which may be a useful example for similar studies in progress throughout the world.

ID 07 - Molecular and Morphological Identification of AMF in Kutahya Mine Tailings: Bio-Phytoremediating at Mine Site

Presenter: Hatice Aygün Karaçay

Tavşanlı is a coal mining site located in Kütahya, Turkey. The tailings of this mine site are contaminated with heavy metals. Heavy metal contamination possesses a threat to the biota, ecosystem function and structure. Thus, remediation of mine tailing is crucial for the removal and destruction of toxic elements. Bio-phytoremediation is the use of plants, microorganisms or both to remove, detoxify, sequester contaminants or convert them into non-toxic materials. Since Tavşanlı stands for a stressed environment due to its contamination, it is hypothesized that native plants have an interaction with Arbuscular Mycorrhizal Fungi (AMF) in order to support plants to thrive in harsh conditions. This study will examine how bio-phytoremediation methods can be implemented for the Tavşanlı mine site tailings. Soil samples were obtained from the mine site and will be examined using both molecular and morphological techniques to investigate the presence of AMF-specific strains of these microorganisms which are known to bioremediate heavy metal contaminated sites. Specific primers that target the Internal Transcribed Spacer (ITS) region will be used to identify the AMF in the soil samples, and the amplified region will be sequenced and compared to the AMF database.

ID 08 - Aerobic Biodegradation of Dominant Micropollutants in the Ergene River by a Native Mixed Culture of Microorganisms

Presenter: Emre Karakaya

Ergene River is the most polluted surface water in Turkey. About 168 micropollutants belonging to different class of chemicals, whose occurrence in aquatic environments have been a rising concern worldwide for the last few decades, are identified in the Ergene River. In this study, we investigated the biodegradation potential of those chemicals in a sample taken from Ergene River at a point where most of the micropollutants are present at high concentrations. The sample was incubated in an Erlenmeyer flask at room temperature for 30 days. Concentration of each micropollutant was measured in every two days using ultra high performance liquid chromatography and tandem mass spectrometry ($UHPLC\text{-}MS^n$). We found that while N-Benzylmethylamine, Oxybenzone, Piperonylbutoxide, and 4-Aminomethyl-benzenesulfonamide were completely degraded within 5, 7, 9, and 12 days, respectively, by the native microbial community, whereas 1,2,3-Benzotriazole, N-Ethyl-p-toluenesulfonamide, Hexa(methoxymethyl)melamine, Norfloxacin, Omethoate and Diuron were not degraded in the course of incubation. Half-life of biodegradable compounds were between 0.8 and 25 days. Atrazine has the lowest biodegradation rate whereas Nonylphenol diethoxylate has the highest among the micropollutants present in that sample. The outcomes of this study will further be used to identify the novel microorganisms that can degrade the micropollutants in the Ergene River microbiome.

ID 09 - Modeling Evolution and Dissemination of Resistance under Temporally Changing Antimicrobial Concentration

Presenter: Dilara Selin Kubilay

Quaternary ammonium compounds (QACs) are one of the most extensively used cationic biocides in human and animal health care facilities. Along with their many advantages as an antimicrobial agent, one of their biggest disadvantage is that QACs may facilitate development of antimicrobial resistance in bacteria which also promote antibiotic resistance at sub-inhibitory concentrations. Since QACs are biodegradable biocides, their concentrations may decrease substantially after they are applied to surfaces in hospitals. Thus, biodegradation creates environments with QACs at sub-inhibitory concentrations which are hotspots for evolution of QAC resistance. The objective of this study is to elucidate the role of biodegradation on the development and dissemination of resistance to benzalkonium chlorides (BACs, one of the most extensively used QACs) in a microbial community composed of a BAC degrader and a BAC susceptible microorganism. A continuous reactor system composed of a 2-L glass bottle fed aseptically with a medium containing inorganic salts, maltose and BACs by a peristaltic pump. The co-culture was composed of *Pseudomonas sp.* BIOMIG1 as the BAC degrader and an *Escherichia coli* strain as the susceptible microorganism. The reactor system was operated at 10-hour retention time with 1000 mg/L maltose and 16 mg/L BAC which is above the minimum inhibitory concentration for the *E. coli*. *E. coli* reached a turbidity of 0.60 AU within a day when the reactor was operated only with *E. coli* at 1000 mg/L maltose without any BAC. On the other hand, *E. coli* was immediately washed out from the reactor and growth was not observed for 7 days when the feed contained 16 mg/L BAC but no BIOMIG1. When BIOMIG1 was present in the reactor, *E. coli* was not washed out and its turbidity reached to 0.22 AU in 3 days while the reactor was being fed with maltose and BAC. We also identified a BAC resistant *E. coli* which can grow in the co-culture reactor system operated with a feed of 16 mg/L BAC and 1000 mg/L maltose.

ID 10 - Contaminant Traffic in Ergene Watershed: Paddy soil serves as source and sink for emerging contaminants in Ergene River

Presenter: Feride Öykü Sefiloğlu

Ergene River is the most polluted surface water in Turkey. Pollution is mainly industrial at the source of the river located in the northeastern Thrace, whereas agricultural runoff transports pesticides to the river at the southwestern region, where rice cultivation is the major activity accounting for 55% of total rice production of Turkey. In this study, 170 organic emerging contaminants were searched with LC-MS/MS analysis in composite soil samples collected from 11 different paddy fields, where the surface water is consumed for the irrigated agriculture. The results were compared and associated with the analysis of water samples taken from the main river and its tributaries surrounding the agricultural area targeting the same analytes. From the analyzed micropollutants, 50 pesticides and 32 emerging contaminants were detected in soil samples. Among these, hexa(methoxymethyl)melamine, benzododecinium and tris(2-butoxyethyl) phosphate were found frequently both in river and soil samples, whereas several industrial contaminants e.g galaxolide and ethylhexylmethoxycinnamate were only detected in soil. Within the targeted pesticides, acetamiprid, azoxystrobin, carbendazim, prochloraz, molinate, oxadiazon were identified prevalently in a large concentration range of 0.01-540 µg/kg. Since soil acts both as a continuous source of agrochemicals and sink for other persistent contaminants, understanding the contaminant footprint is crucial for the risk assessment of crop health.

ID 11 - Understanding the Toxic Potencies of Xenobiotics Inducing TCDD/TCDF-like Effects

Presenter: Ayşe Defne Şahin

Toxic potencies of xenobiotics such as halogenated aromatic hydrocarbons inducing 2,3,7,8-tetrachlorodibenzo-p-dioxin/2,3,7,8-tetrachlorodibenzofuran (TCDD/TCDF)-like effects were investigated by quantitative structure-toxicity relationships (QSTR) using their aryl hydrocarbon receptor (AhR) binding affinity data. A descriptor pool was created using SPARTAN 10, DRAGON 6.0 and ADMET 8.0 software packages and the descriptors were selected using QSARINS (v.2.2.1) software. The generated QSTR models for AhR binding affinities of chemicals with TCDD/F-like effects were internally and externally validated in line with the Organization of Economic Co–operation and Development (OECD) principles. TCDD-based model had six descriptors from DRAGON 6.0 and ADMET 8.0, whereas TCDF-based model had seven descriptors from DRAGON 6.0. The predictive ability of the generated models was tested on a diverse group of chemicals including polychlorinated/brominated biphenyls, dioxins/furans, ethers, polyaromatic hydrocarbons with fused heterocyclic rings (i.e. phenoxathiins, thianthrenes and dibenzothiophenes), and polyaromatic hydrocarbons (i.e. halogenated napthalenes and phenanthrenes) with no AhR binding data. For the external set chemicals, the structural coverage of the generated models was 90% and 89% for TCDD and TCDF-like chemicals, respectively.

ID 12 - Biodegradation Potential of Pollutants of Emerging Concern in Ergene River during Dry Season

Presenter: Begüm Şepitci

In recent years, there have been an increase in production and consumption of chemicals, such as surfactants, flame retardants, pharmaceuticals and personal care products, gasoline additives, biocides and polar pesticides, which has resulted in their accumulation release and accumulation in the environment as pollutants. About 168 pollutant of emerging concern has been identified in Ergene River which is one of the most polluted surface water in Turkey. In this study, we investigated the biodegradation potential of those pollutants in the samples taken from 29 different points along the Ergene River. Experiments were performed in 250-mL Erlenmeyer flasks inoculated with 100 mL sample. Each flask was spiked with acetaminophen at 10 µg/L as a biodegradable reference substrate. All flasks were incubated at room temperature between 20-25 °C and agitated at 100 rpm. Micropollutants were monitored for 30 days in the samples taken aseptically from each flask using AB SCIEX QTrap 4500 LC-MS^n system. Some micropollutants such as; oxybenzone, N-Benzyldimethylamine were easily biodegraded along with reference compound acetaminophen whereas Ofloxacin, Hexa(methoxymethyl)melamine, 4-Methyl-1H-benzotriazole and many of them were not biodegraded.

ID 13 - Evaluation of Biodegradation of Bioplastics under Landfill Conditions

Presenter: Berivan Ülger

Plastics are utilized in numerous applications throughout the world and their use has been increasing day by day. Although their resistance and strength lead to this extensive use, their environmental impacts cannot be ignored. Bioplastics generated mostly from renewable sources have been seen as an alternative to conventional plastics especially considering packaging applications. Even though the bioplastics have drawn a lot of attention recently, their ultimate situation as a waste particularly in landfill sites is still unknown. The aim of the study is the comprehension and evaluation of the biodegradability of Polylactic Acid (PLA), which is one of the most produced bioplastics and utilized in several areas, under real landfill conditions.

ID 14 - Common Pool Resources: Groundwater Appropriation Game

Presenter: Buse Yetişti

In the context of common pool resources, it is difficult to exclude potential users from exploitation of the resource; this is why, the question at this junction is how to establish and manage coordination and cooperation for usage of these resources. This project particularly focuses on the issue of groundwater appropriation for agricultural irrigation. The main idea behind the basic system dynamics model of this work is that the more groundwater is extracted by farmers in total, the less effective are their wells. Accordingly, if there are many farmers benefiting from the same aquifer, as the power that they exert to extract groundwater increases simultaneously, the amount of groundwater they can extract ceteris paribus (at the same energy cost) decreases. The methodology used to approach the problem and construct a simplistic model is system dynamics simulation in this work. Furthermore, common pool resource gaming will be applied to understand whether the outcomes of the simulation stimulate changes in behavior of the farmers. The design of the game allows farmers to choose the power and duration that they will use to extract water on a daily basis. The experiments include a base treatment where the farmers are not allowed to communicate between decision intervals, and a communication treatment where they can communicate and arrive at a deal in terms of daily appropriation. We have not performed the treatments yet, but we expect that the communication treatment will increase the total amount of water that is extracted by all the farmers with the same level of energy requirement.

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