



**Institute of Environmental Sciences
Annual Graduate Symposium
Wednesday, June 3rd 2015**



ABSTRACT BOOK

Organization Committee:

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Annual Graduate Symposium
Wednesday, June 3rd 2015

PROGRAM

8:30 - 9:00 Registration

9:00 - 9:15 Welcome Speech by Prof. Dr. Orhan Yenigün, Director

9:15 - 10:00 Keynote Talk by Prof. Dr. Barış Çallı, Marmara University - *"Me, myself and my academic career in environmental engineering"*

10:00 - 11:00 Oral Session I

B. Aylin Alagöz - *Biogas production from the anaerobic co-digestion of agro-wastes and pre-treated wastewater sludges*

Ayşe Gül Geyik - *Effect of organic carbon sources on the production of extracellular polymeric substances (EPS) in activated sludges*

Başak Daylan - *Evaluation of feedstock characteristics and the effect of the dilute sulfuric acid/steam pretreatment on structural properties of corn stover and wheat straw*

11:00 - 11:20 Coffee Break

11:20 - 12:20 Oral Session II

Asu Ziyilan Yavaş - *Synthesis and use of metal supported TiO₂ nanocomposites in photo- and sonophoto-catalytic oxidation of paracetamol*

Derya Aydın Sarıkurt - *Cosolvent flushing for remediation of groundwater contaminated with DNAPL*

Gökçin Gül - *Resistance to benzalkonium chlorides favors antibiotic resistance*

12:20 - 13:30 Lunch Break

13:30 - 15:00 Poster Session

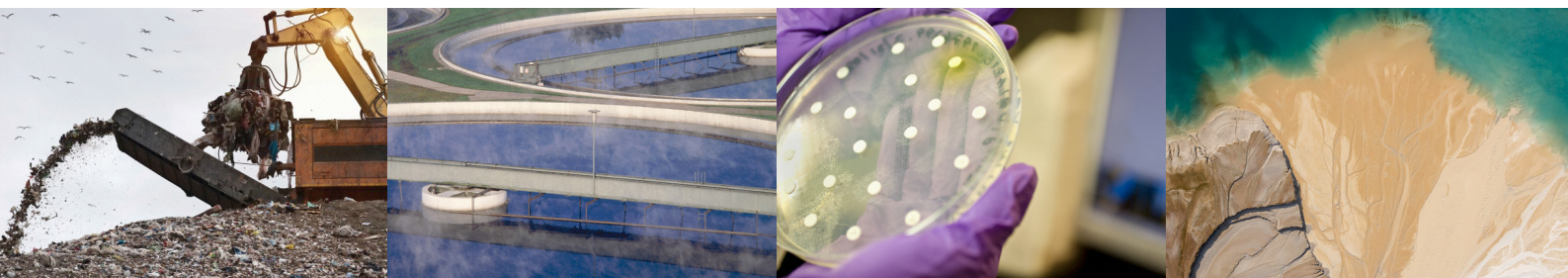
15:00 - 16:00 Oral Session III

Aydın Mammadov - *Life cycle assessment of selected laundry products*

Elif İçağasıoğlu - *Transcriptomic responses of *Mytilus Galloprovincialis* to temperature and salinity stress*

Leyla Kabasakal Güzeloğlu - *Sustainability in dairy processing in Turkey: A social multi-criteria assessment*

16:00 - 16:30 Closing Remarks



POSTER PRESENTATIONS

- ID: 01 Kanat Gürün - *A Thorough Investigation of the Phylogeography and Evolutionary History of *Miniopterus Schreibersii* (Mammalia: Chiroptera) with New Microsatellite Data*
- ID: 02 Çağrı Akyol - *Anaerobic Co-Digestion of Cow Manure and Barley: Effect of Cow Manure to Barley Ratio on Methane Production and Digestion Stability*
- ID: 03 Emine Ertekin - *Comparative Genomics Reveals Genetic Determinants of Benzalkonium Chloride Biotransformation*
- ID: 04 Elif Irmak Erdem - *Comparison of waste degradation and microbial population profiles in yard waste, kitchen waste composting and composting of the solid fraction of digestate from anaerobic digestion of cattle manure*
- ID: 05 Zeynep Akdoğan - *Modeling Contaminant Transport at Selected Catchments in the Marmara Region*
- ID: 06 SeyedMehdi Emadian - *Effect of Quaternary Ammonium-Based Ionic Liquids on Glucose Fermentation*
- ID: 07 Fahri Koray Sakarya - *Biotransformation of Benzalkonium Chlorides by Immobilized Cells of *Pseudomonas* sp. BIOMIG1*
- ID: 08 Aslı Ş. Şalcıoğlu - *Phylogeography and Evolutionary History of Whiting (*Merlangius merlangus*) and Blotched picarel (*Spicara maena*) along the Turkish Coastal Waters*
- ID: 09 Gülşah Günel - *Improvement of Biomethane Production with Rumen Bacteria in Anaerobic Cattle Manure Digesters*
- ID: 10 Gülçin Tuğcu - *Comparative Performance of Descriptors in a Multiple Linear and Kriging Models: A Case Study on the Acute Toxicity of Organic Chemicals to Algae*
- ID: 11 Gülçin Tuğcu - *Molecular Structure-Adsorption Study on Current Textile Dyes*
- ID: 12 Gülçin Tuğcu - *Toxicity Modeling of Hazardous Air Pollutants on a Non-target Organism*
- ID: 13 Gülçin Tuğcu - *Modeling Inhibition of Monoamine Oxidase by Xanthone Derivatives using Genetic Algorithm*
- ID: 14 Hacer Yıldırım - *By-Product Utilization Opportunities from Pretreatment and Fermentation Processes of Selected Agricultural Residues*
- ID: 15 Begüm Hacıyusufoğlu - *Life Cycle Assessment of Different Cement Concrete and Their Impacts on Leed Certificated Buildings*
- ID: 16 Rana Okur - *Ecological Health Comparison for Different Personal Care Products in selected Accomodation Sector: A Case Study for Student Dormitory*
- ID: 17 Merve Tunalı - *Biotechnological Approach for Recovery of Rare Earth Elements and Precious Metals From E-Waste – (BIOREEs)*
- ID: 18 Muhammed Fatih Sert - *Assessment of occurrence and removal of steroid hormones in animal wastes*
- ID: 19 Merve Tunalı - *Life Cycle Assessment of an Anaerobic Digester Plant for Organic Wastes Generated from a University Campus in Istanbul*
- ID: 20 Nazmiye Cemre Birben - *Solar Photocatalytic Degradation of Natural Organic Matter in the Presence of Mono and Co-Doped TiO₂ Specimens*
- ID: 21 Şila Temizel - *Decision Making Tools in the Production Systems of Personal Care Products*
- ID: 22 Gülsüme Külçe - *Evaluation of Organic Farming as a Sustainability Indicator for the Selected Rural Region*
- ID: 23 Nazire Mercan - *Fate of Micropollutants During the Advanced Treatment of Sewage Sludge: Degradation of Triclosan*
- ID: 24 M.Meriç Tunalı - *Evaluation of Phyto-remediation Technology for Bioleaching and Recovery of Metals and Rare Earth Materials from Waste of Electrical and Electronic Equipment*
- ID: 25 Cansu Çetin - *Cytonuclear Discordance in the Marbled Crab, *Pachygrapsus marmoratus* (Fabricius, 1787) along the Mediterranean Coasts of Turkey*
- ID: 26 Duygu Dinçer - *Effect of Ultrasound and Microwave Pre-Treatments on EPS Structure and Dewaterability of Aerobically and Anaerobically Digested Sludges*

ORAL PRESENTATIONS

Session I: 10:00 - 11:00
Moderator: Kanat Gürün

Biogas Production from the Anaerobic Co-Digestion of Agro-Wastes and Pre-treated Wastewater Sludges

Presenter: B. Aylin Alagöz

Wastewater sludges and agricultural industry residues account for a great portion of worldwide waste production. When discharged to the environment, in most cases, these wastes negatively affect surrounding environment such as surface and ground waters, soil and crops, as well as human health. This study focuses on the beneficial use of these wastes in biogas production and investigates the anaerobic co-digestion of olive and grape pomace together with the wastewater sludge as a co-substrate, for obtaining more appropriate C/N ratio to increase the biogas yield. The further enhancement of digestion efficiency and the biogas production were also investigated through the application of ultrasonication and microwave sludge pre-treatment techniques. The effects of both co-digestion and the sludge disintegration techniques were evaluated in terms of the efficiencies of organic removal, pathogen reduction and biogas production. The results demonstrated that both types of pomace were found to be appropriate energy crop residuals for the biogas production through the anaerobic degradation. The co-digestion of olive or grape pomace together with the wastewater sludge was revealed to be a much more efficient way for the biogas production compared to the single (mono) digestion of these substrates. The applied microwave pre-treatment resulted in the highest biogas and methane yield when compared with the ultrasonication. The highest biogas yield of 0.18 L/gVSremoved was obtained from the co-digestion of grape pomace with the microwave pre-treated wastewater sludge.

Effect of Organic Carbon Sources on the Production of Extracellular Polymeric Substances (EPS) in Activated Sludges

Presenter: Ayşe Gül Geyik

The study aims to clarify how the type of organic substrate in a wastewater affects the production and composition of EPS in activated sludges. For this purpose, three activated sludge reactors were operated in parallel with feeds composed of organics (i) peptone, glucose and acetate, (ii) peptone and (iii) glucose. EPS extracted from sludges were fractionated into Very Loosely Bound-, Loosely Bound- and Tightly Bound fractions and analyzed for proteins and carbohydrates. Also, molecular weight distribution of proteins was determined by using HPSEC. Regardless of the type of organic substrate, in each sludge TB-EPS prevailed. Type of organic substrate affected the relative proportion of protein and carbohydrate. HPSEC fingerprints revealed that the variety and size of proteins were dependent on the type of feed. HPSEC also pointed to a shift of high MW proteins from TB-EPS to others. Particularly, if the feed did not contain any proteins, proteins in EPS were utilized by biomass.



Evaluation of Feedstock Characteristics and the Effect of the Dilute Sulfuric Acid/Steam Pretreatment on Structural Properties of Corn Stover and Wheat Straw

Presenter: Başak Daylan

The compositional analysis of the lignocellulosic feedstock is a crucial step for the evaluation of the overall efficiency of processes designed to convert lignocellulosic polysaccharides to bioethanol. Wheat straw and corn stover — non-grain portions of the crops — are expansive, currently available sources of biomass that could potentially be used as bioethanol fuel feedstocks. The carbohydrate level of the lignocellulosic feedstocks influences the maximum theoretical biofuel yield and may affect the optimum pretreatment or saccharification conditions. The aim of this study is to determine the physical and chemical characteristics of wheat straw and corn stover to evaluate the conversion efficiency of lignocellulosic feedstock to bioethanol. The wet chemistry analysis method was used to determine the compositional variation of corn stover and wheat straw samples obtained from the Black Sea and Marmara regions of Turkey in 2012. This study also aims to propose operational conditions for the dilute sulfuric acid/steam pretreatment of selected feedstock and to explore the effect of the structural properties of the solid residues on the enzymatic hydrolysis and fermentation. Different pretreatment conditions were carried out on selected feedstocks at 160 to 200 °C temperature, 0.2-0.75 acid load %(w/w) using %72 H₂SO₄ (w/w) and 2-10 minutes residence time. Corn stover and wheat straw with high cellulose content (>55%) was obtained at 160 °C, 0.75 % acid loading and 5 minutes for corn stover and 160 °C, 0.75 % acid loading and 10 minutes for wheat straw.

Session II: 11:20 – 12:20

Moderator: Başak Savun

Synthesis and Use of Metal Supported TiO₂ Nanocomposites in Photo- and Sonophoto-Catalytic Oxidation of Paracetamol

Presenter: Asu Ziylan Yavaş

Analgesic and anti-inflammatory pharmaceuticals are frequently observed in the natural environment, partly because they are not biodegradable in sewage treatment facilities and partly due to their non-reactivity under ambient aqueous conditions. Despite their very low concentrations (at ngL⁻¹) however, these chemicals have the potential to impair with the human cell, thus imposing serious health risks when upon ingestion of contaminated water. Hence, significant amount of research has been lately focused on the destruction of these compounds in water. In the present work, paracetamol, which is a widely used non-steroidal, anti-inflammatory pharmaceutical, was selected as the model compound to investigate the degradability of such compounds by sonocatalytic, photocatalytic and sono-photocatalytic AOPs using immobilized TiO₂ nanoparticles, with the aim of slowing down the recombination of e⁻/h⁺ pairs to improve the sonolytic and photolytic activation of the semiconductor. The immobilization was done in the laboratory by sonolysis of TiO₂ nanoparticles in the presence of noble metal gold and palladium to produce Au-TiO₂ and Pd-TiO₂ nanocomposites. It was found that immobilization of precious metals was an effective means of enhancing the catalytic activity of TiO₂ in the presence of ultrasound and UV-irradiation, but sonication was more effective than photolysis for the activation of Pd-TiO₂ owing to their smaller particle size (than that of Au-TiO₂) that facilitated the formation of cavitation bubbles and reactive species on the catalysts. Application of sonolysis and photolysis simultaneously resulted in enhanced rate of PCT elimination and TOC decay in the presence of catalysts.



Cosolvent Flushing for Remediation of Groundwater Contaminated with DNAPL

Presenter: Derya Aydın Sarkurt

The contamination of the subsurface by non-aqueous phase liquids (NAPLs) is among the most challenging environmental problems. Field investigations have shown that due to their low solubility and high interfacial tension, many NAPLs can persist in porous media for decades. Among the more promising technologies for NAPL source zone remediation is in-situ cosolvent flushing which involves the injection of chemical agents for the enhanced solubilization and/or mobilization of the NAPL. This study investigates the significance of the cosolvent (ethanol) contact time on the DNAPL (trichloroethylene-TCE) recovery from contaminated groundwater. Batch tests were conducted to evaluate the operational parameters such as solubility, interfacial tension, and miscibility as a function of cosolvent content. Flushing experiments were performed using a two-dimensional tank. The effect of cosolvent content, flow velocity and pumping pattern (continuous and intermittent) on TCE mass recovery were investigated. Tracer tests were also conducted to estimate the dispersion coefficients and to assess the uniformity of the flow field. Experimental results show that increasing the ethanol content of the flushing solution leads to significantly higher recovery of the TCE mass. However, ethanol contents greater than 50% by mass may cause enhanced mobilization and downward migration of the TCE. Increasing the cosolvent flushing solution velocity resulted in lower remedial efficiency. Intermittent flow enhanced the TCE recovery due to the higher contact of the contamination with cosolvent flushing solution. This suggests that using intermittent flow can lead to overall enhanced system efficiency while avoiding higher cosolvent contents and the risk of DNAPL downward migration.

Resistance to Benzalkonium Chlorides Favors Antibiotic Resistance

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. The aim of this study is to clarify the relationship between QACs resistance and antibiotic susceptibility by using different microorganisms having different tolerance to benzalkonium chlorides (BACs), a most extensively used QACs. Minimum inhibitory concentration (MIC) of 18 antibiotics belonging to different antibiotic groups for *E. coli* (BAC MIC: 16 ug BAC/ml), *Serratia marcescens* (>1024 ug BAC/mL) and two *Pseudomonas sp.* (1024ug/mL, degrades BACs) were checked. The lowest MIC was reported for quinolones whereas penicillins were the least effective antibiotics on the bacteria tested. Results showed that *E.coli* which is susceptible to BACs is also the most susceptible bacteria to almost all antibiotics. *Serratia marcescens* is more resistant to antibiotics than *E.coli* but it showed less resistance than *Pseudomonas sp.* which can also degrade BACs. *Pseudomonas sp.* strains (BIOMIG1-SEW and AS), which possess highest resistance to all antibiotics are not only highly resistant to BACs but also they can biodegrade BACs. Given the fact that many antibiotics are biodegradable by certain microorganisms; these findings suggest that catabolic enzymes which involve in BAC degradation may also facilitate resistance to antibiotics. The hypothesis of Strain BIOMIG1 may subsist on antibiotics will be tested in the next steps of this study.



Life Cycle Assessment of Selected Laundry Products

Presenter: Aydın Mammadov

The aim of the study was to evaluate and contrast the environmental performance of powder and liquid laundry detergent formulations. The environmental impacts of Regular, Compact, Phosphate-free and Liquid laundry detergent formulations throughout their entire life cycles were analyzed by the Life Cycle Assessment (LCA) methodology. The products were compared in terms of their global warming, acidification, eutrophication, and photochemical ozone creation potentials as well as in terms of GHG emissions, water consumption and waste generation parameters. Plastic and cardboard packaging waste management and domestic wastewater treatment practices, as well as energy production conditions specific to Turkey were collected as a part of a country-specific data required for the LCA study. Various consumer washing habit and format changes scenarios are also generated and evaluated using LCA methodology.

Transcriptomic Responses of *Mytilus galloprovincialis* to Temperature and Salinity Stress

Presenter: Elif İçağasıoğlu

Organisms adapt to acute or gradual changes in their environment by adaptation through selection or phenotypic plasticity that is the ability of a single genotype to create different phenotypes. Phenotypic plasticity includes physiological mechanisms like transcription, translation, hormonal regulation etc., and is especially important for immobile organisms in unpredictable habitats, as mobile organisms can migrate to compensate for the environmental change. In unpredictable habitats environmental factors may vary dramatically. Salinity and temperature are probably the most two important ecological factors affecting every aspect of biology of an organism. Understanding the adaptational mechanisms to changes in these variables at an organismal and cellular level could be important when projecting the distribution patterns, competition capacity and ultimate fate of the species. One of the most important marine organisms from a commercial perspective is the Mediterranean mussel *Mytilus galloprovincialis*. Genomic responses to environmental stress have been previously studied for *M. galloprovincialis* from other geographic locations yet no study exists on genomic responses of populations from the Bosphorous, Aegean and Black Seas. This project will focus on the genomic responses of *M. galloprovincialis* from these seas to chronic osmotic and thermal stress. We will investigate this by generating transcript catalogues of up- and down-regulated genes, and analyzing how such plasticity in gene expression contributes to physiological plasticity in the environment.



Sustainability in Dairy Processing in Turkey: A Social Multi-Criteria Assessment

Presenter: Leyla Kabasakal Güzeloğlu

The aim of this research is to analyze sustainability of dairy processing plants using Social Multi Criteria Analysis methodology. In Turkey, dairy processing is mainly carried by three different types of processing plants; industrial scale, small scale (Mandira) and co-operative. This study will focus on the middle of the dairy life cycle, processing. This research aims to study processing plant alternatives to reach the best option to process milk and find out which processing method has the most overall benefit to its stakeholders. The idea is to bring all stakeholders together and reach a certain degree of consensus that is relatively equitable for affected groups (Munda, 2000). Literature in environmental impact assessment (Balana, Mathijs, & Muys, 2010), (Dantsis, Douma, Giourga, Lloumou, & Polychronaki, 2010), (Andreoli M, 2000), (Rigby, 2001), (van Calker, Berentsen, Romero, Giesen, & Huirne, 2006) suggests that the optimum method for complex problems involving different stakeholders and triple bottom line (People, Planet, Profits) is Multi Criteria Method (MCM). Contrary to monetary evaluation methods, Multi-criteria Decision Making (MCDM) method uses an aggregation procedure and is not about profit maximization; rather it is about the process and allows integrated assessment of the problem at hand. It also helps to see which sacrifices can be made to ensure a democratic participatory process. The goal of this research is to perform a sustainability assessment using Multi-Criteria Analysis on discrete in Turkey to help policy makers and company owners on strategic decision making.

POSTER PRESENTATIONS

ID: 01 A Thorough Investigation of the Phylogeography and Evolutionary History of *Miniopterus schreibersii* (Mammalia: Chiroptera) with New Microsatellite Data

Presenter: Kanat Gürün

Miniopterus schreibersii is a cave-dwelling bat species that has a sub-cosmopolitan distribution and consists of lower taxa, multiples of which have been elevated to species level recently, and is therefore well suited for phylogeographic investigations at large geographic scales. In this study, 396 tissue samples, which were collected from 38 populations and 12 different geographic regions that span the entire range of *M. schreibersii* were analyzed using nuclear microsatellite markers, in order to investigate the taxonomy, evolutionary history and conservation of this species. A previous study that made use of 6 microsatellite markers was expanded with the use of 6 additional markers and eventually, the phylogeography of the species across its whole distribution area was examined in greater detail, thus increasing the body of knowledge regarding its phylogeographic history significantly and providing the necessary validation of the studies that only made use of mitochondrial markers. The examination of these nuclear loci confirmed the findings of previous studies, including the pattern of local differentiations previously detected in mitochondrial DNA, and provided a more complete picture of the genetic distribution of *M. schreibersii*. Significant differentiations of the nuclear DNA were detected between all geographical regions, namely North Africa, Lebanon, Cyprus, Anatolia, Russia, Thrace-Balkans, Slovakia, Italy, France, and Iberia, where all 38 populations were located.



ID: 02 Anaerobic Co-Digestion of Cow Manure and Barley: Effect of Cow Manure to Barley Ratio on Methane Production and Digestion Stability

Presenter: Çağrı Akyol

Anaerobic digestion of animal manure results in relatively low biogas yields due to its low carbon content (Ziganshin et al., 2013). Therefore, anaerobic co-digestion of manure and energy crops to methane-rich biogas has been widely conducted, as methane can be converted to heat, electricity or place biofuels (Wang et al., 2010). Barley is among the most commonly cultivated cereal species and its use as an energy crop has gained attention in recent years (Sahabi et al., 2013). In this study, anaerobic co-digestion of cow manure (CM) and barley (*Hordeum vulgare*, HV) was evaluated in terms of biochemical methane potentials with respect to five different CM to HV mixing ratios of 1:0, 2:1, 1:1, 1:2 and 0:1 based on volatile solids (VS) contents. Bacterial community composition of the seed sludge was examined using 454 pyrosequencing of 16S rRNA gene sequences. Based on the taxonomic classification major bacterial phyla belonged to the Firmicutes (42%), and Bacteroidetes (22%). Co-digestion of cow manure and barley was superior at all mixing ratios to the digestion of cow manure alone. The digestion systems failed at the ratio of 0:1 and there was no methane production. The presence of barley caused high acidification but there was no volatile fatty acids accumulation at the end of the digestion. Highest specific methane productions were obtained at CM to HV mixing ratios of 2:1 and 1:1 as 216 CH₄/g VS and 230 CH₄/g VS, respectively. Due to the highest specific methane production, the optimal CM to HV mixing ratio was found to be 1:1 in this study.

ID: 03 Comparative Genomics Reveals Genetic Determinants of Benzalkonium Chloride Biotransformation

Presenter: Emine Ertekin

Benzalkonium chlorides (BACs) are disinfecting agents released into every compartment of the environment since decades. Some members of natural microbial communities are capable of biotransforming BACs. This is a major problem as biotransformation reduces BAC concentrations in target environments and creates hot spots for colonization by possibly pathogenic species. Although biotransformation pathway of BACs has been biochemically characterized and consists of subsequent conversions to benzyldimethylamine (BDMA) and dimethylamine (DMA), underlying genetic determinants remain unclear. In this study, the overall aim was to identify the genetic determinants of BAC biotransformation by using comparative genomics. Briefly, two microorganisms capable of doing (1) complete biodegradation (2) conversion of BAC to BDMA respectively, were isolated from a BAC enriched mixed culture. Isolates were 100% identical based on their 16S rRNA genes. The complete degrader strain was mutated to generate a phenotype only capable of BDMA biotransformation. BDMA accumulator strain was mutated to generate a phenotype that degrades neither BAC nor BDMA. Comparison of isolate whole genomes revealed that a rieske type dioxygenase was the candidate gene for BAC to BDMA conversion. This dioxygenase was a novel type in Rieske oxygenases and its function was further confirmed by heterologous expression in *E.coli*.



ID: 04 Comparison of Waste Degradation and Microbial Population Profiles in Yard Waste, Kitchen Waste Composting and Composting of the Solid Fraction of Digestate from Anaerobic Digestion of Cattle Manure

Presenter: Elif Irmak Erdem

In recent years the interest around composting has been significantly raised as it is an effective low-cost method of diverting organic waste including animal manures, municipal biosolids, crop residues, food processing wastes and wastes from several industries while creating a valuable resource which can be used as fertilizer and soil conditioner. Additionally, new researches have been conducted to investigate compostability and compost quality of digestates derived from anaerobic digestion of pig slurry, cattle manure, energy crops and agro-industrial residues. However, still there is not enough knowledge about microbial community structure at different stages of the process as microbial population profiles are highly depended on organic materials used in composting as well as physicochemical conditions. Hence, further aspects associated with microbial diversity in compost process are still needed to be investigated in various compost products to have adequate knowledge about the system and optimize the operating conditions. In this study, comparison of yard waste, kitchen waste compost and compost of the solid fraction of digestate from anaerobic digestion of cattle manure in terms of waste degradation by measuring pH, temperature, C/N ratio, metals and, moisture content and microbial population profiles using next generation sequencing will be conducted to assess the correct evolution of the process and also to control regulatory compliance of the results. In order to evaluate adequate waste management, the effectiveness of kitchen waste plus digestate derived from anaerobic digestion of cattle manure, yard waste plus digestate derived from anaerobic digestion of cattle manure mixture will be also tested.

ID: 05 Modeling Contaminant Transport at Selected Catchments in the Marmara Region

Presenter: Zeynep Akdoğan

Increasing human activities and land use changes in recent years have contributed to water quality degradation by affecting the transport of contaminants to receiving waters. This necessitates the development of modeling approaches for planning and management of catchments. The aim of the study presented here is to develop a catchment hydrology and contaminant transport model for selected catchments in the Marmara Region and to predict total loads of nutrients and heavy metals to receiving waters from those catchments. The contaminant transport module of the model includes kinetic equations for nutrient loss and mathematical equations for heavy metal distribution in environmental compartments. Storm Water Management Model (SWMM) is used as the modeling environment for the conversion of predicted concentrations to catchment runoff contaminant loads. Total nitrogen, total phosphorus, copper, nickel, and zinc concentrations in runoff are estimated using previously analyzed soil samples collected from the different lands of the Marmara Region. Spatial data and concentrations are transferred to SWMM to develop the catchment hydrological model and describe the influence of land use and precipitation on contaminant loads. An integrated modeling procedure is developed by combining kinetic equations both for nutrient loss and heavy metal transport, and applied to the relatively urbanized catchments of the Marmara Region. Results revealed the validity of the proposed method, indicating the positive correlation between runoff production and contaminant loads in catchments ($R^2 > 0.9$). Heavy metal partition coefficients are found to be more effective in simulating runoff concentrations, when compared to the initial soil contaminant concentrations.



ID: 06 Effect of Quaternary Ammonium-Based Ionic Liquids on Glucose Fermentation

Presenter: SeyedMehdi Emadian

Lignocellulosic biomass is the most abundant renewable resource for biofuel production. Recently, ionic liquids became popular solvents for pretreatment of cellulosic biomass and conversion of carbohydrates in biomass to fermentable sugars. To evaluate how the ionic liquids affect fermentation, glucose fermentation by a co-culture of *Pseudomonas* sp. BIOMIG1 and *Serratia marcescens* sp. BIOMIG4 which are fermentative bacteria and resistant to BACs under aerobic and anaerobic conditions was monitored at different concentrations (0-1000 mg/L) of a mixture (1:1 w:w) of two benzalkonium chlorides (BACs); dodecyl benzyl dimethyl ammonium chloride and tetradecyl dimethyl ammonium chloride. Glucose was completely fermented within 24 hours under aerobic conditions. 2, 3- butanediol was the main product and its production was decreased from 45.2 to 21.2 mM as BACs increased from 0 to 1000 mg/L. In addition, acetic acid production was decreased and the citric acid production was increased by increasing the BACs concentration. About 77.5% of the glucose amended was converted to alcohols and acids within 14 days under anaerobic conditions. 2, 3-butanediol, ethanol and formic acid were the main products of the fermentation. BACs did not affect the yield of these products at the concentrations tested. Since *Pseudomonas* sp. BIOMIG1 is able to degrade the BACs aerobically, 100 and 65 % of BACs was degraded in flasks at 50 and 100 mg/L BACs concentration. These results show that BACs concentration affect the fermentation process under aerobic condition whereas no significant change was observed under anaerobic condition.

ID: 07 Biotransformation of Benzalkonium Chlorides by Immobilized Cells of *Pseudomonas* sp. BIOMIG1

Presenter: Fahri Koray Sakarya

Mass use of quaternary ammonium compounds (QACs) caused these chemicals to become an environmental concern. Little or no elimination of QACs in wastewater treatment plants necessitates a removal policy for these chemicals within treatment system before discharge. In this study, an advanced treatment system after biological treatment is proposed for efficient removal of benzalkonium chlorides (BACs) which are the most common type of QACs in consumer products. Cultures of *Pseudomonas* sp. BIOMIG1BDMA which can convert BACs into N,N-Dimethylbenzylamine (BDMA) were immobilized into Ca-alginate beads. Beads were optimized with respect to CaCl₂ concentrations and diameter for the best BAC biotransformation efficiency at a cell density of 107 cells/mL. Most efficient beads were 3 mm beads produced by using 0.15 M CaCl₂. Number of cells in these beads was found to be $4.6 \pm 1.4 \times 10^6$ per bead. BAC degradation kinetics were elucidated for the most common BACs found in the wastewater, C₁₂BDMA and C₁₄BDMA. The rate constant was estimated to be 0.46 μ M-BACs/hr. Continuous flow packed bed reactors were prepared using alginate beads as packing material and going to be operated at 5.3, 2.7, and 1.3 hrs empty bed contact times corresponding to 1.3, 0.8, and 0.3 mean residence times to identify the optimum operating retention time for >90% BAC removal.



ID: 08 Phylogeography and Evolutionary History Of Whiting (*Merlangius merlangus*) and Blotched picarel (*Spicara maena*) Along The Turkish Coastal Waters

Presenter: Aslı Ş. Şalcıoğlu

In aquatic environments, fish are accepted as one of the most important natural resources and reduction of the genetic diversity of natural fish populations has become an important fisheries management problem. Measuring genetic diversity in natural fish populations is essential for interpretation, understanding and effective management of fish populations or stocks. In this regard, conservation, management and phylogeographic studies of natural fish populations require the use of molecular markers to identify the representatives of individual stocks. Whiting (*Merlangius merlangus*) and blotched picarel (*Spicara maena*) are demersal fish species and specifically distributed in the Northern Hemisphere in the world. Whiting (*Merlangius merlangus*) is widely found in the Eastern North Atlantic and the Black Sea. On the other hand, blotched picarel (*Spicara maena*) is mainly distributed in the Mediterranean and Ionian Sea. Until now, several studies have been undertaken based on morphology and ecology of two species, however there are no studies have been conducted based on their molecular phylogeny and phylogeography in the Turkish coastal waters. In this respect, we intend to investigate different genes to understand phylogeography and evolutionary history of the two species. In addition, the Turkish Straits System, comprising such a biogeographical boundary that forms the connection between the Mediterranean and the Black Sea, will be investigated to better understand evolutionary history, phylogeography and its effects on the intraspecific gene flow of these fish species.

ID: 09 Improvement of Biomethane Production with Rumen Bacteria in Anaerobic Cattle Manure Digesters

Presenter: Gülşah Günel

The importance of economic and environment-friendly energy production is increasing in Turkey and in the world, because of the increasing population and fast-growing industry. Depletion of natural resources and the effects of their use, such as the climate change, revive the importance of the use of renewable resources. Recovery of biomass from animal manure is the most important application of anaerobic digesters. In the near future, it is projected to use anaerobic digesters more widely within the framework of the renewable energy production, integrated biotransformation concept and waste management. The aim of this study is to enhance anaerobic digester performance by enriching manure, finding the best ratio of rumen fluid and tap water, and the optimum biogas production temperature. The influence of rumen fluid contents on biogas yield from cattle manure will be analyzed using fluid rumen inoculums and batch anaerobic digesters at mesophilic temperatures. For the physical and chemical characterization of manure, total solids, total volatile solids, COD, TKN, alkalinity parameters will be examined. Volatile fatty acid amount will be measured with HP 5890 GC-MS. For the characterization of microbial composition of manure, genomic DNA (GDNA) will be isolated and extracted from the samples taken from the cattles stomach. The acquired GDNA's will be analyzed by next generation methods and will be characterized by the microbial communities' metagenomics studies. Besides, the quantification of the cellulose digesting species extracted from the samples taken from the rumen liquid will be carried out by using specific primer pairs and the Q-PCR method.



ID: 10 Comparative Performance of Descriptors in a Multiple Linear and Kriging Models: A Case Study on the Acute Toxicity of Organic Chemicals to Algae

Presenter: Gülçin Tuğcu

Quantitative-structure activity relationship studies are expected to reduce the cost and the number of organisms used for toxicity testing by relating properties of chemicals with their activity. They also fill the existing data gaps within the REACH regulatory framework in the European Union. Among the modeling techniques, whilst multiple linear regression (MLR) is attractive because of its simplicity, Kriging is successful in finding nonlinear relationships. The aim of this study is to model the acute toxicity of organics to freshwater green algae *Chlorella vulgaris* using Kriging and MLR with the same descriptors to compare the performance of models. A diverse data set on acute toxicity of 91 organic compounds from the literature was modeled. The data set was divided into training and test sets for external validation. Two significant descriptors selected via QSARINS program from 3000 calculated descriptors. Hydrophobicity and a 2D matrix-based descriptor were found to be important in explaining the toxicity. Models' applicability domains are defined via leverage approach and the ranges of the descriptors. The Kriging model performed better than the MLR model. Therefore, the Kriging model can be used to estimate the acute toxicity of untested organic chemicals, regarding its high external predictive ability, within the applicability domain of the model.

ID: 11 Molecular Structure-Adsorption Study on Current Textile Dyes

Presenter: Gülçin Tuğcu

The discharge of textile dyes into the environment has received great attention because of the hazard caused by their interference with the transmission of light through water and consequently detrimental effect on flora, fauna and environmental compartments besides the aesthetic considerations. Most commercial systems currently use activated carbon (AC) as sorbent to remove dyes in wastewater because of its excellent adsorption ability. Studies on Quantitative Structure-Property Relationship studies on the adsorption of textile dyes to AC are limited because it is difficult and mostly not possible to obtain the structure of a commercial dyestuff. In this study, the maximum adsorption capacities (Q_e) of the selected dyes representing the current textile industry at equilibrium with AC were assessed and modeled. The dataset spans with a wide range of 1.84 to 36.2 (mg/g) and consists of 33 anionic and water-soluble dyes. Multiple Linear Regression, Support Vector Regression (SVR), and Back-Propagation Neural Network (BPNN) models have been compared with this novel data set. 900 descriptors were calculated using SPARTAN and DRAGON programs. Genetic Algorithm implemented in QSARINS program was used to select the best set of three descriptors. SVR (using radial basis function kernel) and BPNN (with one hidden layer) models were developed with the same descriptors. Ionization potential, topological distances, and a property filter index found to be significant in modeling adsorption of dyes. Implementing both epsilon-SVR and nu-SVR versions gave matching results. BPNN model search with different training epochs and the number of neurons resulted in comparable predictions. The linear and nonlinear models were compared with respect to their prediction ability.



ID: 12 Toxicity Modeling of Hazardous Air Pollutants on a Non-target Organism

Presenter: Gülçin Tuğcu

Hazardous air pollutants (HAPs) are compounds known to cause serious health problems. The updated list of HAPs of EPA includes persistent organic pollutants. As a result of natural and anthropogenic contributions, the concentrations of HAPs may be relatively high in all environmental compartments. Therefore, their potential toxicities must be studied for non-target organism such as *Tetrahymena pyriformis*. The aim of this study is to model the toxicity of 35 organic HAPs to *T.pyriformis*. The data set was divided into training and test sets, for external validation. Descriptors obtained from DRAGON and SPARTAN programs were used for descriptor search. We started to model the acute toxicity of HAPs with hydrophobicity. A descriptor, representing electronegativity improved the statistical parameters of hydrophobicity-based model. In an attempt to search for a better model, two significant descriptors were selected via QSARINS. A two-parameter model includes 2D topological descriptor and a 3D topological distance based descriptor weighted by Sanderson electronegativity. The statistical parameters of the two-descriptor model are better than the hydrophobicity-based two-descriptor model. Model's applicability domain is defined via leverage approach and the ranges of the descriptors. The CCC_{ext} is 0.923, reflecting a relatively good predictive power for the test set. The results reflect that our model can be used to estimate the acute toxicity of untested HAPs, regarding its high external predictive ability, within the applicability domain of the model.

ID: 13 Modeling Inhibition of Monoamine Oxidase by Xanthone Derivatives using Genetic Algorithm

Presenter: Gülçin Tuğcu

Monoamine Oxidase (MAO) is an important flavoenzyme responsible for the oxidative deamination of neurotransmitter and dietary amines. MAO inhibitors were used as antidepressants and as neuroprotective drugs in the treatment of other disorders such as Parkinson's disease. A Quantitative Structure-Activity Relationship (QSAR) model is a correlation between calculated properties of compounds and their experimentally determined biological activities. These QSAR relationships have been successfully applied in drug design and environmental risk assessment. The aim of this study is to develop QSAR models to predict MAO inhibitory activities of 42 xanthone derivatives. The IC_{50} (mM) values are from the literature¹. In this study, molecules were optimized with DFT (B3LYP/6-31G*) and descriptors were calculated using SPARTAN and DRAGON programs. The inhibitory activity data was divided into training and test sets using hierarchical clustering algorithm. Five significant descriptors were selected via all subsets selection followed by genetic algorithm using QSARINS program. The obtained model was validated according to widely accepted criteria in the literature.



ID: 14 By-Product Utilization Opportunities from Pretreatment and Fermentation Processes of Selected Agricultural Residues

Presenter: Hacer Yıldırım

Transportation sector is a significant contributor to greenhouse gases emission, accounting for about 23% of global CO₂ emissions [1]. Bioethanol from renewable resources, especially lignocellulosic materials is a potentially viable alternative to petroleum-derived transportation fuel. All lignocellulosic residues consist of three major chemical components: cellulose, hemicellulose and lignin. During the ethanol production, cellulose and hemicellulose turn to ethanol but while, lignin is removed from the system as waste. The remaining lignin can be utilized as a feedstock to produce valuable chemicals. The objective of this study is to recover lignin rich residues subjected to dilute acid/steam pre-treatment processes, and saccharification and fermentation process to produce activated carbon via pyrolysis. Chemical activation and carbonization methods were used to produce activated carbon from lignin rich residues. For this purpose, lignin rich residues were impregnated with different H₃PO₄/ lignin ratios (30% and 50% H₃PO₄ concentrations) and then carbonized for 1 hour at different carbonization temperatures (400, 500, 600, and 700 °C) under 200 ml/min N₂ flow. The optimum operational conditions were investigated by comparing yield, chemical recovery, and the surface area of the products. As a result, when the BET surface areas of the products are compared with the commercial activated carbon, it is observed that the products are proper to be used as an activated carbon.

ID: 15 Life Cycle Assessment of Different Cement Concrete and Their Impacts on Leed Certificated Buildings

Presenter: Begüm Hacıyusufoğlu

The ecosystems and biospheres of our planet are having destroyed due to the fossil fuel driven industrial development and excess production of goods. Fossil fuel combustion, land use change and overexploitation of resources have raised the global mean surface temperature. Concrete production is highly resource and emissions intensive process due to its cement content. Considering the CO₂ emissions associated with the calcination process and the combustion of fuels during clinker production, and the abiotic resource depletion of fossils and elements, a more eco-designed concrete should involve environmental friendly supplementary cementitious materials (SCMs) in cement and in concrete as well as RDF in fuel mix to create significant reduction in resource and emissions intensity. Moreover, the construction industry generates significant amount of waste that should be managed and integrated to value chain. In this study, integrated approach of application of RDF to energy targets, utilizing SCMs and construction and demolition waste (CDW) in concrete mix will be interpreted with Life Cycle Assessment (LCA) for different selected scenarios. The results represent the environmental savings through the integrated approach in terms of their relatively reduced contribution to global warming, acidification, photochemical ozone creation, eutrophication, human toxicity and abiotic resource depletion of fossils and elements.



ID: 16 Ecological Health Comparison for Different Personal Care Products in selected Accomodation Sector: A Case Study for Student Dormitory

Presenter: Rana Okur

The life-cycle environmental impacts of consumer products are increasingly argued for sustainable product design, environmental consumer information, and product policy making; indicating a very high demand for environmental data. Even though the presence of recognized tools for environmental decision support, as life-cycle assessment (LCA), limited LCA studies on the ecological impacts of personal care products (PCPs) exist. The application of such consumer products also generally raises concerns about environmental problems associated with extensive water use, organic load (as Chemical Oxygen Demand, Biological Oxygen Demand, Total Phosphorus and Total Nitrogen) to wastewater stream, and packaging-waste generation. Although production stage of selected product groups has contribution to environmental footprints, considerable impacts are caused in consumer use phase. One of the most problematic areas where both PCPs lead to excess amount of chemical pollution load in the wastewater treatment facilities is university dormitories. Development of water conservation technologies for Bogazici University's 4th Dormitory is in the scope of 'Green and Sustainable Campus Program' of Rectorate. The wastewater characteristics and chemical consumption information related to dormitory has been used for continual improvement in Green and Sustainable Campus Program by controlling the impacts of dormitory resident activities. The importance of the dormitories in campus sustainability has been standardized clearly with the technical approach of The Association for the Advancement of Sustainability in Higher Education (AASHE)'s The Sustainability Tracking, Assessment & Rating System (STARS) Checklist. STARS help institutions set and meet sustainability goals and promote information sharing about practices and performance among the campus sustainability community.

ID: 17 Biotechnological Approach for Recovery of rare earth elements and precious Metals From E-Waste – (BIOREEs)

Presenter: Merve Tunali

Electrical and electronic equipment are indispensable to modern societies with numerous applications in the field of medicine, transport, communication, education, security and environmental protection. Production of these electrical and electronic equipments and devices consumes many precious metals such as Ag, Au, Pt and Pd together with rare earth elements (REEs). It has been observed that the WEEE harbours substantially appreciable quantities of base metals, precious metals and rare earth elements (REEs) with potentially high economic values. E-waste can be used as a secondary resource for the recovery of REEs. There are several metallurgical processes for recovery of metals from e-waste such as pyrometallurgical processing, hydrometallurgical and biohydrometallurgical processing. Biohydrometallurgy processes are considered to be relatively low-cost, environmentally friendly and suitable for both large scale as well as small scale applications. The research work deals with the treatment of WEEE and recovery of precious metals and REEs using biohydrometallurgical approach. The green microalgae *Chlorella Vulgaris* and the brown microalgae *Phaeodactylum tricornutum* will be used as a biosorbent in this study. The lab-scale microalgae cultivation plant is installed in order to produce microalgae for biosorption process. A two-stage process based on bioleaching of base metals followed by leaching of precious metals and REEs will be developed for the biohydrometallurgical treatment of e-waste.



ID: 18 Assessment of occurrence and removal of steroid hormones in animal wastes

Presenter: Muhammed Fatih Sert

The occurrence of (EDCs) in environmental matrices even at very low concentrations creates increasing concern because of adverse effects of them on ecosystem and public health. Due to direct effect on endocrine system, steroid hormones are considered as an important group of EDCs. Animal feeding operations are one of the sources of this group of emerging pollutants since they are excreted naturally from the body of animals. Existing literature on the fate of steroids during animal management practices is not only scarce but also inconsistent. By this study, the fate of hormones during storage and disposal of animal waste will be investigated in most commonly applied farming operations. Free and conjugated steroid concentrations will be determined in liquid and solid wastes in different operation units of a farm. Evaluation of composting effectiveness for the degradation of steroid hormones in animal manure will be performed under controlled laboratory conditions. Effects of operational conditions of composting process on the physicochemical properties of manure will be assessed.

ID: 19 Life Cycle Assessment of an Anaerobic Digester Plant for Organic Wastes Generated from a University Campus in Istanbul

Presenter: Merve TUNALI

The amount of food waste generated from Bogazici University campuses is around 500 kg per day for weekdays during the education period. Food waste is mixed with other wastes and dumped to the landfill side. In this study, an integrated approach has been brought to assess the utilization of food waste of the university. Characterization of the food wastes, design of an anaerobic digestion plant and life cycle assessment of the plant is carried out. The average biogas potential is found as 0.140 m³/kg wet waste by the result of characterization experiments and Buswell Equation. Nearly 300 kWh energy can be produced by 28 kW cogeneration engine daily. The electricity and heat requirements of the plant are determined as 14.95 % and 30.53% of the total production, respectively. 16% of the heat requirement of the swimming pool in Hisar Campus can be achieved. In life cycle assessment study, special emphasis is given to global warming. Results showed that, anaerobic digestion is highly advantageous over current systems. 97.8% and ~85% reduction can be achieved for global warming and others (acidification, photochemical ozone formation, eutrophication), respectively. When overall energy requirement of the Hisar Campus is considered, the plant provides 7.23% reduction on global warming and more than 4% reduction for other categories. Composting is only advantageous when it is considered as a waste management option, since volume reduction is achieved. However, when the energy need of the composting plant is considered, impact of composting is assessed to be higher than other scenarios.



ID: 20 Solar Photocatalytic Degradation of Natural Organic Matter in the Presence of Mono and Co-Doped TiO₂ Specimens

Presenter: Nazmiye Cemre Birben

Natural organic matter (NOM) is comprised of many multifunctional sub-groups that may differ from each other in terms of chemical properties, size, structure, etc. Covering the major fraction of NOM, humic substances mainly humic acids (HAs) may give an idea about behavior of NOM as a result of the application of treatment processes. Although TiO₂ has been proven to be the most powerful photocatalyst so far, its wide band gap is the major drawback that limits utilization of visible light (<5%). Therefore, over the past years, most of the research on photocatalysis has been devoted to the synthesis and characterization of novel photocatalysts. Among many catalyst improvement techniques, doping has been shown to be one of the most promising options. The main approach was devoted to the application of non-metal (e.g. C, N, S, F doping or co-doping) and metal doping (e.g. Fe, Se, Cr, V doping) into TiO₂ structure. This study aimed to assess applicability of solar photocatalytic degradation process in the presence of doped TiO₂ specimens (C-doped, N-doped, S-doped, Fe-doped, Se-doped, S-N co-doped and Se-N co-doped TiO₂ specimens) for the degradation of a high molecular size fraction of HA (100 kDa) as the representative of NOM. Solar photocatalytic degradation experiments were carried out in an Atlas Suntest CPS+ solar simulator ($\lambda=300-800$ nm, $W=250$ Wm⁻²). HA was characterized by UV-vis spectroscopic parameters (UV254 and Color436, m⁻¹), advanced fluorescence techniques in terms of Excitation Emission Matrix (EEM) and dissolved organic carbon content (DOC, mgOrgCL⁻¹) prior to and following solar photocatalytic degradation.

ID: 21 Decision Making Tools in the Production Systems of Personal Care Products

Presenter: Şila Temizel

Life Cycle Assessment is a method of analyzing the environmental impact of products and services that considers their full life cycle. Companies can use LCA for modelling the environmental impacts of a new process, driving some innovations and/or improvements on the products, corroborating marketing activities with scientific reports etc. There is an international standard for LCA called ISO 14040:2006, which lists some applications as identification of improvement possibilities, decision-making, choice of environmental performance indicators and market claims. Additionally, the Open Working Group by UNSDSN recommended 17 global sustainable development goals and 169 accompany targets. In this study, Goal 12, which is "Ensure sustainable consumption and production patterns", will be examined by applicability of suggested targets. The goal of this study is to evaluate the ecological footprints and integrate results with eco-labelling approach for selected products. The product data and the consumer use data will be collected from industry. Environmental impacts of different PCPs' formulations will be studied by using EcoInvent database and CML assessment methodology. Defining boundaries is an important stage to implement a LCA study. In this study the stages are selected as raw material acquisition, manufacture, distribution, consumer use and disposal. The following environmental parameters will be considered; global warming, acidification, eutrophication and photochemical ozone creation potentials, greenhouse gas emission, water consumption and waste generation with emphasis on global warming and water consumption. Overall normalized environmental impacts will also be assessed. In conclusion of this LCA study; ecological footprints of selected personal care products will be expressed.



ID: 22 Evaluation of Organic Farming as a Sustainability Indicator for the Selected Rural Region

Presenter: Gülsüme KÜLÇE

In recent years, there has been an increasing awareness of the need to manage the impact of human activities on the environment. Sustainable communities play an important role in developing this awareness especially on the regional basis. The aim of the study is to develop proposals for the sustainability approach of the town with special emphasize on organic agricultural activities. Concerning the residents and visitors sustainable approach, an integrated survey was conducted among the citizens of Akyaka Region in order to assess the potential of organic farming as a sustainability indicator. The main idea behind this is to assess the state of organic farming applications and level of awareness among farmers and the degree of interest of local community in organic products. Within this respect, two separate questionnaires were prepared; one for farmers and the other one for consumers. Questionnaires were conducted with both farmers at the local marketplace and residents at restaurants, hotels of Akyaka. Moreover, 135 consumers and additional 30 farmers from the surrounding villages of Akyaka were interviewed. The number of interviewed participants corresponds to 6.6% of the total target people which is above evaluation limit of 5%. The information obtained from Organic Consumers' Questionnaire for Akyaka Region was analyzed by using Statistical Package for the Social Sciences (SPSS, version 21.0) statistics program. In conclusion, among many areas about environmental management systems, organic farming was selected as the key topic of this thesis.

ID: 23 Fate of Micropollutants During the Advanced Treatment of Sewage Sludge: Degradation of Triclosan

Presenter: Nazire Mercan

Antimicrobials are emerging organic contaminants that enter wastewater network as consequence of human activities. In contrast to other emerging organic contaminants, antimicrobials have the potential to cause a secondary pollution. In order to eliminate the environmental risk of both antimicrobial and antimicrobial resistance bacteria pollution the treatment of these contaminants in sewage sludge could be necessary. Considering these facts, the fate of a model antimicrobial Triclosan (TCS) in waste secondary sewage sludge was investigated during the application of heat and ferrous iron activated persulfate process. An experimental design methodology was applied for this thermochemical process to evaluate the combined effects of selected parameters. The degradation rate of TCS was >99.9% with 22.7 mM dose of persulfate and 0.5 molar ratios of $\text{Fe}^{2+}/\text{S}_2\text{O}_8^{2-}$ at 75°C in 90 min treatment period. While increasing dose of persulfate and temperature have positive influence on TCS degradation higher dose of Fe^{2+} reduced the treatment efficiency of the process. However, the addition of iron to persulfate process shortened the treatment period required for effective antimicrobial degradation, enhanced the solubilisation of sludge constituents, and caused a reduction in AOX values of sludge by providing both sulphate and hydroxyl radicals in the sludge. The beneficial effects of iron addition in persulfate process were not limited with these it also provided the recovery of phosphorous in the solid phase of the sludge and improved sludge dewaterability. Activation of persulfate with MW irradiation resulted in lower extractable protein in the sludge than that obtained by Heat/ $\text{Fe}^{2+}/\text{S}_2\text{O}_8^{2-}$ treatment.



ID: 24 Evaluation of Phyto-remediation Technology for Bioleaching and Recovery of Metals and Rare Earth Materials from Waste of Electrical and Electronic Equipment

Presenter: M.Meriç Tunalı

Rare earth elements (REMs) and heavy metals (HM) cause various ecological and environmental problems. Since they are valuable, there is a big interest to recover them. Among several physico-chemical processes, their biological recovery is one of the most cost-effective and environmentally friendly technology to recover these precious compounds and also alleviate problems associated with their uncontrolled release to the environment. However, it is difficult for plants to survive in polluted tailings. Soil microorganisms like arbuscular mycorrhizal fungi (AMF) can provide beneficial symbioses to its host plant and has widely adopted for the recovery of the degraded ecosystems polluted by metals. On the other hand, little is known about whether AMF plays role in facilitating the sequestration of these metals. The objective of this proposal is to investigate the uptake of metals including REMs by phytoremediation techniques when plants are inoculated with AMF. Moreover, the present work will also investigate relations between contents of metals in soil and their accumulation in different morphological parts of plants. Furthermore, glomalin which is a glycoprotein produced by AMF in large amounts in diverse soils will also be investigated for its potential ability to sequester heavy metals and REMs.

ID: 25 Mitonuclear Discordance in the Marbled Crab, *Pachygrapsus marmoratus* (Fabricius, 1787) along the Mediterranean Coasts of Turkey

Presenter: Cansu Çetin

The marbled crab, *Pachygrapsus marmoratus* is a commonly found species in the Mediterranean and along the coasts of Turkey. Its distribution extends the north-eastern part of the Atlantic Ocean. Here, using putatively neutral and fast evolving microsatellite markers, we found high levels of genetic differentiation between populations of *P. marmoratus* constrained to the Mediterranean coasts and those distributed all around the Turkish coasts. The use of putatively neutral and fast evolving markers, microsatellites, enabled a clear discrimination of two populations of *Pachygrapsus marmoratus*, throughout the Turkish coasts. Both populations, however, share the same or have very similar mtDNA CO1 haplotypes. Connection between the Black Sea and the Mediterranean, which has been interrupted several times in the past, might have influenced the pattern detected in this study. Two relevant explanations for this observed cytonuclear discordance include retention of ancestral polymorphisms or gene flow after secondary contact. Although both of these processes might have contributed to this discordant pattern, the former is considered to be more likely because no geographical patterns were detected. Mitochondrial markers with faster mutation rates than CO1, in addition to microsatellites, and sampling individuals from the rest of the Mediterranean and from the Atlantic Ocean can be useful in resolving the pattern. Especially, obtaining samples from the African Mediterranean coasts can be crucial because they would shed light into the origin of common population. In addition, RAD sequencing might be effective in resolving the phylogeography of the species.



ID: 26 Effect of Ultrasound and Microwave Pre-Treatments on EPS Structure and Dewaterability of Aerobically and Anaerobically Digested Sludges

Presenter: Duygu Dinçer

This study investigates the effect of ultrasonic and microwave pre-treatment applications prior to aerobic and anaerobic digestion of waste activated sludge in terms of stabilization efficiency, change in extracellular polymeric substances (EPS) structure and dewatering properties. The soluble and bound EPS and digestion parameters (TS, VS, COD, CST) were monitored, as the digestion reactors were operated. The results showed that the applied disintegration methods proved to enhance the solubilization of the EPS and hence; increase the protein and carbohydrate removal efficiencies in the sludge. As a result, the dewaterability of the sludge deteriorated right after the ultrasonication and microwave disintegrations. However, as the EPS removal was enhanced, dewaterability of the sludge increased during the digestion.

