Book of Abstracts

The First MEDRC Palestinian Water Research Alumni Forum (MPWR)

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Organized by

Chemistry Department at An-Najah National University, in association with Palestinian Water Authority (PWA) and Middle East Desalination Research Center (MEDRC) .

2018

Designed by: Eng. Nisreen Hamadneh

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Contents

Messages

On the behalf of An-Najah National University administration, and as acting president of the university, let me welcome all of you for the First MEDRC Palestinian Water Research Alumini Forum. Let me start with welcoming the distinguished delegate Dr. Brendin Smith, the director of MEDRC in Oman and the distinguished delegates Eng. Hazem Kittaneh and Dr. Subhi Samhan from the Palestine Water Authority (PWA). Finally, I would like to welcome all the postgraduate students from An-Najah National University and other universities who were awarded the MEDRC scholarship.

Again, it is my genuine pleasure to be here with you to celebrate this event.

The cooperation between An-Najah National University and PWA started over 7 years ago, in the scientific centers at An-Najah National University where we were able to aid in water pollution analysis. Afterwards, our professional relationship grew through a multitude of future projects and conferences.

Over the last 5 years ago, MEDRC promoted many scientific research projects in Palestine through PWA. This was achieved in providing master program scholarships. Over 207 scholarships were provided to Palestinian universities and An-Najah national university successfully obtained over 60% of them.

These scholarships paved the way for increasing amounts of graduate students in chemistry and different engineering programs. For example, the number of graduate students was about 10 students before the scholarship. Today we are graduating over 45 graduates annually. Furthermore, the quality of research and number of published papers increased dramatically, improving the reputation and over ranking of our university. I would like to also acknowledge the training of graduate student in Oman, along with MEDRC's sponsorship of 3 Ph.D students, enabling them to perform quality research, which really expanded the scope of what could be achieved.

Messages

We hope to achieve continued cooperation and support, in having more support for new graduate students and more training at MEDRC center in Oman.

An-Najah National University is an ideal choice for this gathering. It's the largest university in Palestine, and located in the very heart of Palestine. We have a multitude of research centers and plenty of dedicated hard-working researchers.

I wish you all the best of outcomes from your workshops and research.

In closing, let me thank the organizing committee for organizing this workshop and let me thank you again for being here at An-Najah National University.

Prof. Maher Natsha
Acting President
An-Najah National University

Messages

Dear Professors and Participants,

It is a great honour for me to express my gratitude to the organizers of the first Palestinian MEDRC Water Research Alumni Forum that is held at An-Najah National University in association with Palestinian Water Authority (PWA) and Middle East Desalination Research Center (MEDRC)

Dear participants of the Conference, It is completely logical that during the recent times, all countries including Palestine often focus their attention on the issue of water resources, and actions related to sustainable development.

I would like to mention that the experiences and lessons learned during the long collaboration between An-Najah Nation University, the PWA and MEDRC becomes the basis for implementation of new projects and programmes on water supply and formulation of new goals related to water resources.

The main objectives of this event are conducting comprehensive review of the progress achieved, as well as recommendations for the further actions that will be taken to support Master and Ph. D. students that conduct applied research and projects in the field of water treatment.

I am sure that many of you, distinguished participants of the Conference, will have an opportunity to participate in this important international event and to contribute to achievement of its goals and objectives.

I hope that following the results of today's event, held in cooperation with the PWA and MEDRC and other partners, effective practical steps will be developed to implement the internationally goals and objectives in the field of water treatment and resources.

Today's forum will provide an opportunity to prepare concrete recommendations on the topic that will be discussed.

I would like to take this opportunity to acknowledge MEDRC, the sponsors of the alumni I thank Dr. Brendan Smith from MEDRC who have travelled from Masquat in Oman to participate in this event. Special thanks are due to Eng. Hazem Kitani and Dr.Subhi Samhan from PWA for their time and efforts in organizing the forum.

Messages

I am confident that your active participation in this forum, and other forums and conferences will make a valuable contribution to the promotion of joint efforts to achieve sustainable development and use of water resources for the benefit of the future generation.

We at An-Najah National University have an ambition to increase cooperation with our colleagues in the Palestinian Water Authority and the MEDRC Foundation in the field of scientific research related to water purification. We hope that An-Najah National University will be an incubator and research center at the local and regional level. This ambition cannot be achieved without the support of our colleagues in the Palestinian Water Authority and MEDRIC Foundation. The Incubator will support scientists to develop their innovative technological ideas and set up new businesses in order to commercialize them. The center will act to promote R&D projects in collaboration with academic/research institutes and industry partners. In addition, the center will offer research services and act as development and test sites for industrial companies. This research center can succeed if it is established at An-Najah National University which has the elements of scientific research and the good experience in establishing, managing and utilizing specialized centers. An-Najah N. University had acquired an excellent reputation in the field of providing service to the Palestinian community and in collaboration with other private and public local and international sectors. It has strong collaboration with the Palestinian Standards Institution in the field of Accreditation of Palestinian Standards and it has many joined studies and projects with most of the Palestinian municipalities.

Taking this opportunity I would like to wish you all a Happy New Year. May the year 2019 bring new ideas and initiatives, new visions and achievements in the field of water resources.
I thank you all for your attention and wish you a fruitful deliberations, health and success.

Thank You
Dr. Maen Ishtaiwi
Chairman of Organizing Committee of MPWR
Dean of Faculty of science
An-Najah National University

Messages

Science, Creativity and Innovation Nexus for Water, Food and Energy Security Nexus

We extend our sincere thanks to the Middle East Desalination Research Center for its continuous support to the water sector in Palestine in the fields of scientific research and training. The Scientific Research Support Program aims at intensifying the applied scientific research and aims to contribute to the achievement of the strategic objectives of the Water Authority, namely, achieving water security. This program includes scholarships for Masters and PhD students. It also includes the support of complementary research towards the aim of improving the research from its theoretical stage to practical stages of excellence in order to be able to enter the market strongly and capable to contribute to the achievement of sustainable development. Through this program, scholarships were granted for 190 Master students and 9 PhD students, and 8 complementary studies were supported.

We also extend our sincere thanks to An-Najah National University for hosting and organizing this forum. We congratulate them on this distinguished scientific and research team and the distinguished relationship between the supervisor and the student. We also congratulate the University on its continuous progress on the international Ranking systems.

Thanks to the scientific, organizing and steering committees who made this forum possible. We are proud of this team for their outstanding efforts for achieving this remarkable success.

The success that has been achieved so far is just the beginning. There is a lot of work in the fields of science, creativity and innovation is still waiting for us in addition to the challenges that lie ahead of us. Increasing the per capita consumption of water to the acceptable level according to the standards of the World Health Organization could be the greatest challenge. It is also important to reduce water losses and preserve groundwater aquifers from pollution to obtain clean water for the different uses. Development of the institutional and

regulatory frameworks in light of the high population growth and cultural development trends is of great challenge. We need to work together in an integrated, harmonious and comprehensive way to solve our development problems in creative and innovative ways because civilizations are established by innovations and demolished by the loss of it according to the theory of English philosopher and historian Arnold Toynbee, who lived in the last century and studied civilizations that prevailed and then died in past. He wrote a book on his theory called "response and challenge" as Civilizations are held by peoples' ability to face environmental challenges and these civilizations collapse when people lose their ability to innovate.

We are now living in the age of communications and the Internet, where these sciences have dramatically developed over the last two decades. All the scientists, experts and engineers who speak at conferences, seminars and social networking sites say that sustainable development may be achieved with green and smart solutions.Using smart technologies as well as integrated and comprehensive planning between sectors, especially water, food and energy, which has become called lately the water, food and energy security Nexus.

Finally, I urge my colleagues at the Water Authority, Al Najah University and at the Middle East Desalination Research Center to keep looking for innovations and inventions from citizens, public and private sectors and from all levels of education from the primary to post-doctoral levels, sponsoring and incubating them through specialized incubators and accelerators in order to be able to build the state we all dream of.

Eng. Hazem Kittani
General Director of Technical Affairs
Palestinian Water Authority

Messages

On behalf of MEDRC, I would like to first give thanks to the remarkable efforts of our MEDRC Fellows, our partners in the PWA, and An-Najah National University, who have put this event together. The event is an opportunity to not only celebrate the outstanding research of some of Palestine's brightest students, but also to bring together different groups across academia, government, and the private sector, to share their perspectives and experiences on the most pressing water issues facing Palestine and the wider region.

MEDRC was formed by the Oslo Accords over 20 years ago, with the mission of working towards two of the most important issues facing the Middle East and the globe today--environmental stability and peace. Established as part of the Middle East Peace Process, MEDRC is a unique International Organization that works to build solutions to freshwater scarcity across borders and divisions.

For more than 20 years MEDRC has led programs for cross-border water research projects across the Middle East, from Palestine to Oman. Following a process of restructuring and reform four years ago, the organization has tripled in size, and today is more active than ever.

In terms of research, our aim is to lead and support projects that have practical impacts. Right now, we are working on desalination technologies to provide drinking water in the aftermath of a humanitarian crisis; on solar desalination technologies; on energy recovery, and small-scale renewable desalination devices. We also work on areas such as Costing Models, Integrated Water Resource Management, the Nexus approach, and water & science diplomacy.

Our training activities are the most comprehensive in the Middle East. We have training programs that covers all areas of desalination, from small-scale plant operator training, to the design of mega-plants. We operate large-scale year-long training programs, such as 'Tahlya', that is training the next generation of Omani RO plant operators and supervisors. Common to all our programs is a focus on energy efficiency, minimizing environmental impact and mainstreaming

renewables. The training department also conducts consultancy in all aspects of desalination operation and design.

In Palestine, with our partners in the PWA, we conduct strategic trainings on critical water needs as prioritized by the PWA--ranging from desalination, to wastewater and agriculture, to billing and metering at water service providers.

Our development programs in Palestine and Jordan are focused on capacity building--from university capacity building to technical capacity building--supporting the education and research of the next generation of Palestinian water researchers, who will help solve the region's water problems, and lead the technical efforts for generations to come.

This MEDRC Alumni Forum is a showcase of those Fellows and their efforts, and has been organized by the Student Steering Committee, made up of some of our most outstanding MEDRC Research Fellows.

I would like to give a special thanks to Ms. Bayan Khalaf, our current PhD Fellow and former MSc Fellow, for being the Student Chair in organizing this event. I would also like to express my full gratitude and appreciation to the Palestinian Water Authority--particularly Eng. Hazem Kittani, Dr. Subhi Samhan, and Mrs. Suhad Almalki--for their continued support and coordination that allows us to have success with our programs in Palestine. Thank you as well to An-Najah National University, for being our hosts today and helping to coordinate this event, and for your continued excellence as one of the standout universities of the region, and in our Fellowship program--with 55 MSc Fellows, and 3 PhD Fellows to date.

I look forward to hearing our discussions today on these important topics. Thank you very much.

Mr. Brendan P. Smith
Development Cooperation Manager
MEDR

Organizers

An-Najah National University is a fully independent, non-governmental university, run by the Board of Trustees and the University President. The structure of the administration is composed of the University President, Assistant and Vice Presidents, University and Deans Council, Administrative Departments and the University Comptroller. The academic structure divides faculties into academic departments.

An-Najah seeks to provide as many facilities as possible to its students through providing each faculty and department with a computer lab for student use. This has created a ratio of three students to each computer. Physically and visually impaired students are welcomed at An-Najah as well. A special computer lab designed for the visually impaired converts all Microsoft Office files to Braille to allow students to share lectures and submit assignments either by email or through the Braille printers available. The university also allocates special cars to transport physically and visually impaired students between campuses.

An-Najah hosts more than 20 scientific centres that offer a wide range of services to the local society. Among those are two centres that are directly connected with the local society and seek to provide high services to the people in different parts of the country. The first one is the Community Service Centre which is involved in numerous projects to help Nablus and the Northern West Bank people. The Community Service Centre also collects blood samples from the community donators for transfusions and provides hot meals to the elderly and needy families in Nablus.

In addition to the Community Service Centre, there is the Energy Research Centre (ERC) which undertakes research projects in the field of energy. The centre has completed a number of projects in several Palestinian cities and villages such as Attouf Village in which the centre provided electricity through harnessing solar power for the first time. In its endeavor to lay down foundations for knowledge-based society, the university established the Centre of Excellence in Materials Science and Nano-Technology

(CEMSANT). The centre homes researchers and students to perform their works on preparation, modification and application of advanced materials. CEMSANT encourages research activities directed towards the benefit of the Palestinian society with regard to water, environment, health, renewable energy and agriculture.

To be in direct touch with the local community, An-Najah has its own radio and satellite television stations. Both offer programmes that provide practical training for An-Najah's students as well as an avenue to connect with the local and international community through the satellite station. To reach out to more students, videoconferences and e-learning lectures are both offered at An-Najah. The e-learning lectures are available for free on the university's website. Videoconferences have been organized with other academic, non-profit, and private institutions to discuss the academic and political situation with outside parties.

Organizers

Palestinian Water Authority (PWA) was established under Presidential Decree No 90 of 1995, which stated in article 1, the Palestinian water authority, as broad Water Act (2) for the year 1996 in article (2) on the establishment of the Palestinian water authority, which has independent legal personality and its own budget, so follow the Presidnt of the Palestinian national authority and have a head appointed by the President of the PNA.

The water authority aims to achieve integrated and sustainable asset management of ed water resources; protection and preservation within organizational tools help them to gain access to a healthy environment by ensuring a balance between quantity and quality of water available and the needs of the Palestinian people to achieve sustainable development through water resources.

And then the water law (3) for the year 2002 which define the framework and levels of water sector in Palestine, in order to regulate the sector and access to the service to the appropriate level on the one hand, and the protection of water sources, on the other hand, with the allocation of functions and powers of the management of the sector into three levels, namely the organizational level and the operational level and the political level.

Water Act No. 3 of 2002 authorized the Palestinian Water Authority the water sector management task, entrusted to regulate the sector and identified the relationship with the official, private enterprises and local government authorities, each according to his specialty and Legal reference.

Through the law No 14 of 2014 on water, the water authority's powers have been clarified and reduce intersection powers. And which also aims to manage and develop water resources in Palestine and to increase capacity and improve the quality and conservation and protection from pollution

drain and improve and upgrade water services by applying principles of integrated and sustainable management of water resources.

Palestinian water authority mission redrafted and defined its vision and strategic goals and objectives in line with its new duties and powers were as follows:

Mission of the water authority:

A public institution working to manage, develop and protect water sources with integrated and sustainable water supply to citizens valid for different uses and ensure the protection of the environment and the achievement of the development goals of Palestinian society.

Vision of the water authority:

Sustainable water sources able to achieve development and basic needs of the Palestinian people.

Organizers

Middle East Desalination Research Center

is an International Organizationmandated to find solutions to fresh water scarcity. Established in 1996 as part of the Middle East Peace Process it conducts research, training, development coopera--tion and transboundary water projects.

The MEDRC Headquarters is in Muscat in the Sultanate of Oman, where it operates a state of the art research facility including desalination plants, laboratories, lecture halls and administrative offices.

In delivering its mission, MEDRC aims to become a viable and transferable mechanism for governments seeking to address significant regional or trans-boundary environmental challenges.

Committees and Boards

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- Mr. Brendan Smith (MEDRC)
- Prof. Shehdeh Jodeh (NNU)

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- Dr. Nidal Zatar (Head of Chemistry Department , NNU)
- Mr. Brendan Smith (Development Cooperation Manager, MEDRC)
- Eng. Hazem Kittani (Director General of Technical Affairs, PWA)
- Dr. Radwan Qasrawi (Al-Quds University)

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Chairpersons

Dr. Maen Ishtaiwi

Dr. Maen Ishtaiwi, Dean of the Faculty of science in An-Najah National University, was born in Nablus (Palestine) on September 20, 1984. He obtained his B.Sc degree in Physics minor Electronics, from College of Science at An-Najah National University, in May 2007. During July 2007 – August 2008, he was a Teaching Assistant in Physics Department - An Najah National University, Palestine. He obtained TOPMED program scholarship to continue his higher studies in Italy. He obtained his M.Sc. degree in Electronics Engineering from Politecnico di Torino, Italy in November 2010. He obtained his PhD degree in Electronics from Politecnico di Torino, Italy in March 2014. Currently, he is working as an Assistant professor – Physics Department - An Najah National University.

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Dr. Nidal Zatar

Dr. Nidal A. Zatar, head of Department of Chemistry at An-Najah National University, was born in Nablus (Palestine) on December 1st, 1956. He awarded his B.Sc degree in chemistry from Birzeit University. He awarded his Ph.D degree in Analytical Chemistry from University of Kent at Canterbury, England, on February 1984. His Ph. D. thesis titled: Some Manual And Automated Optical Methods In The Selection Chemical Analysis of Europium, Terbium and Uranium. In the period 1984-1985 he was Assistant Professor at the College of Science and Technology, Abu-Deis, Jerusalem. In the period 1985-1993 he was Assistant Professor at the Department of Chemistry, An-Najah N. University. In the period 1993-Present he is Associate Professor at the Department of Chemistry Department, An-Najah N. University. In the period 1999- 2008 he was Director of Chemical, Biological and Drug Analysis Center. An-Najah N. University. In the period 2016 present he is Head of Department of Chemistry, An-Najah N. University. His research interests is:
Spectrophotometric determination of metal ions, pectrofluorimetric determination of metal ions, separation and determination of active components from medicinal plants, separation and determination of food additives using chromatographic techniques, analysis of pharmaceutical products, quantitative and qualitative determination of food products, toxicological analysis, Food analysis and determination of nutritional values and quantitative determination of pesticides in food products using GC/MS technique.

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Chairpersons

Prof. Shehdeh Jodeh

Prof. Shehdeh Jodeh, A distinguished Professor at the Chemistry Department of An-Najah National University. He did his postdoctorate at Alamos National Labs, New Mexico USA (1991). He obtained his Ph.D in Physical Chemistry from Wayne State University, USA in 1990. His B.S Chemical Engineering from University of Mississippi (USA), 1987. His Master degree in physical Chemistry from Sam Houston State University, USA (1985). B.Sc in chemistry from Yarmouk University, Jordan 1983.

He worked as Research Scientist at General Motors R&D Michigan, USA from 1992-2004.

He published more than 150 scientific papers and supervised more than 60 graduate students at the chemistry department.

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Ms. Bayan Khalaf

Bayan Khalaf, PhD student in Chemistry at An-Najah National University, was born in Saudi Arabia on October 7, 1992. She graduated from Arab American University with a bachelor's degree in Chemistry in 2014. Through the period between 2014 and 2016, She worked as a tutor of Chemistry for high school and college students. In 2016, She obtained a master's degree in the field of Chemistry from An-Najah National University with an average of 3.61 out of 4.00. In the same year, She started working as a lecturer of Chemistry and Physical Chemistry in Arab American University. Her researches in both master and PhD are funded by MEDRC.

Bayan participated in many scientific papers; her researches are mostly concentrated on adsorption related water treatment. Such that, Purification of Groundwater from Heavy toxic metals using suspended polydentate supported Polymers that have very good adsorption efficiencies towards these toxic materials. Her main goal in this life is to be always an effective person in the world and hence be able to improve the situation in Palestine scientifically and economically to a high level. She has frequently attended and presented at international scientific conferences inside and outside Palestine, She has also been invited to several meetings and conferences.

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Chairpersons

Subhi Samhan; PhD in Natural Science from Martine Luther University, Halle Wittenberg Institute for Geosciences, Germany. 2013. Working as Director of Research and Development at Palestinian Water Authority since 1997 and represent PWA.

Samhan is national focal point for:

- National focal point for Sustainable Management of Available Water Resource with Innovative Technologies (SMART).
- Building Capacity and Institutional Reform for and Integrated Management of Water and Sanitation services in Rural Communities, 2009-2013, funded by Austrian
- Palestinian-Dutch Academic Cooperation Program in Water (PADUCO) 2013-2020Represent Palestinian Water Authority in Technical Advisory Committee
- Sustainable domestic Water Use in Mediterranean Regions project SWMED projects.
- Academic focal point for Austrian and Middle East Desalination Reseach Center (MEDRC) projects.
- Represent the Palestinian Water Authority in Innovative processes and practices for wastewater treatment and re-use in the Mediterranean region "INNOVA-MED, during 2007-2010. Funded by EU, www.cid.csic.es/innova-med/home.htm.

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Eng. Hazem Kittani

Hazem Kittani holds a Masters degree in Civil Engineering majoring in Hydraulics and Fluid Mechanics from the Missouri State University at Columbia in the United States of America. His current position is Director General of Technical Affairs at Palestinian Water Authority . He gained more than 25 years of experiences in civil engineering (construction-sites), and hands-on practical experience in designing, supervising, monitoring, and control manager in infrastructure related to water and wastewater systems in Saudi Arabia, Jordan and Palestine.

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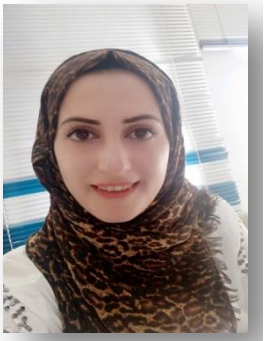
Abstracts

Oral Presentations

Areen Naji



Areen Naji has bachelor degree in Computer System Engineering from Arab American University, master in Advanced Computing from National An-Najah University. She has experience about one year in Software Engineering areas. Integrated Computational Systems design and development, Database architecture design, SQL programing, SQL Server Integration Services Package development.

Ms. Areen was one of the developers of a Barely culture project, which used recycled water and light, and had an extremely fast and good quality production.

Ms. Areen developed an intelligent traffic system, which is a computerized system counting the number of cars in the roads, feeding the numbers back to the controllers to have better traffic lights cycles distribution, and inform the users which path has the least traffic.

Ms. Areen is working at Palestine Exchange Company, AS Software Engineer in Information and Systems Development Department. She is a participant in development of the Central Depository and Settlement System.

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Smart Irrigation and Pollution Monitoring System

Adnan Salman, Areen Z. Naji

An-Najah University, Nablus, Palestine

Abstract

Anew unconventional efficient water management is required to meet the growing demand on fresh and clean water and to reduce wasted water which caused by ineffective water delivery. So we propose a smart water management system based on advanced Information and Communication Technology (ICT). The proposed system has two main objectives 1) Smart irrigation scheduling based on soil moisture, temperature, and the crop characteristics and 2) long term pollution monitoring based on recent advances in sensors technology. In addition to the main objectives, the

data gathered about the environment will be saved and shared for further data analysis and data mining to extract knowledge about the best agricultural practice.

This project uses the wireless sensor networks (WSN) in agriculture to gather vital environment parameters such as temperature, humidity, soil moisture, and pollution in a regularized timely manner. Then software on the computer will investigate the data and make decision on the amount of water to be delivered to the plant.

Finally the result system will be expert as a farmer, fill the plant environmental requirements, and save money by minimizing water consumption, and increase the yield and the quality of the crops.

Keywords

ICT, WSN

Nael A. Zidan

Nae'l A. Zidan received the B.S. in Computer Information Technology in 2005 from Arab American University-Palestine (AAUP). He is a Master candidate of Computer Science at AAUP.
He has 10+ years' experience of programming and development, networking, databases, and virtualization.
He works as an Information Technology Manager and IT Lecturer at Modern University College, Palestine.
His research interests include Computer Networks, Information Security, Artificial Intelligence and Internet of Things.
In 2017, he earned MEDRC Master's Research Fellowship Program for the Master thesis titled "TOWARDS A SUSTAINABLE AND SAFE WATER SECTOR: EXPLOITING INTERNET OF THINGS FOR BUILDING A SMART WATER MANAGEMENT SYSTEM".

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An IoT Based Monitoring and Controlling System for Water Chlorination Treatment

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[3]Research and Development Directorate ,Palestine Water Authority Palestine

Abstract

With the recent development of the Internet, the availability of a variety of low cost sensors and the evolution of the Internet of Things (IoT), the development of remote real-time monitoring and controlling systems – without the need of direct human intervention – has expanded significantly in various application domains. The Water sector is one of the most important industrial application domains that demands developing efficient and effective water quality monitoring and control; considering

the scarcity of natural water resources worldwide, and in Palestine region in particular. In this research work, we address the problems faced the monitoring and controlling of water chlorination that fully depends on human intervention. In addition, we propose developing an IoT based system prototype that remotely monitors and controls direct water treatment (Chlorination Treatment as a pilot phase) in Water Pumping Stations (WPS). The proposed system monitors the concentration of chlorine and controls the dosing pump to keep chlorine concentration as desired with little as possible human intervention. In addition, it monitors the chlorine level in tanks, and alerts the human operator for immediate actions in abnormal cases. A prototype of the proposed system has been set up to experimental test and validates our proposal.

May Saleh

May Saleh, Computer Employee in Palestine Technical University – Kadoorie. Was born in 1986 in Jordan On September 22th .
2009 she obtained a bachelor's degree, in Computer Information Systems from al-Quds Open University- Jenin.
2017 she obtained a master's degree in the field of Computer Science from Arab American University.
Through the period between 2009 and 2016, She worked as an Information Technology teacher for high school students of Directorate of Education – Qabatiya.
Currently she is working as Computer Employee in the Deanship of Admission and Registration at Palestine Technical University – Kadoorie.

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Prediction of Pipes Break in Water Distribution System Using Data Mining Tools "Case Study Nablus Municipality"

May Khalid Saleh, Amjad Rattrout *

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Abstract

The breaking of pipes in water distribution networks is one of the main reasons for the loss of water from the network, so there is an urgent need to control this problem to prevent water leakage from the pipes by continuous repairing and maintaining the pipes before the break. Therefore, there is a need to analyze and understand the data related to water distribution networks and to use this data in predicting the breaking of the pipelines and identifying the factors and variables that lead to break before broken pipes.

Using of classical mathematical and statistical tools in identifying the parameters which play a major role in the prediction of pipes' break patterns is a complex task; because of the complexity of this system so that this research seeks to create an alternative model that is to be used for predicting pipes' breaks in water distribution networks and for identifying the variables that cause such breaks.

In this research, the applied dataset collected from the water distribution system in the Municipality of Nablus, which is one of the large cities in the northern West Bank area of Palestine that was taken as a case study. The R language was used to implement seven classification models for pipes break prediction depending on three data mining techniques that are Decision Tree, Logistic Regression and Support Vector Machine. The first three models were built by using one of these three techniques, then four new models have also been built by combining the two of these techniques.

Comparing the performance of these models shows that the new model that is built by combining the Logistic Regression and Support Vector Machine techniques, which is called LRSVM model that is most reliable model in the anticipation of pipes' breaks because it gave the best values for most of the calculated performance measures as its error rate varied between 0.01 and 0.12, and it may be able to save up to 0.97 water from the amount of water lost from the network, with an accuracy rate that may reach 0.99.

Mustafa Younes

Mustafa Mohammad Younes had Bachelor's degree in ComputerEngineering from Birzeit University in 2006.He hold Master degree in Advanced Computing from Al- Najah National University in 2018. He works at Al-Quds Open University- Salfeet Branch from 2008 and works as a head of Laboratory computers Section from 2015.

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A Cloud Application for Smart Agricultural Irrigation Management system

Mustafa Mohammad Younes[1], Adnan Salman[2]

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Abstract

Agriculture is one of the most important sectors of the Palestinian economy and it is the main consumer of fresh water. It is the broadest economic sector and plays an important role in the economic development of any nation. Several factors have a major impact on agriculture activities includes water availability, soil type, climate condition, fertilizers, and diseases. In conventional farming, farmers have to make decisions about all these factors. This include: what to grow, how to use the irrigation schedule, the type of fertilizers, and the best method to control pest and diseases. Farmer's decisions are based solely upon their experience, which can results in wasting valuable resources such as water, fertilizers, time,

labor, etc. Furthermore, conventional farming experience can result in growing plants that are not the most suitable for a particular soil and climate, which can cause less yield and profit.

In this thesis, we provide a cloud-based software application that is (combined with IoT devices) able to automates the irrigation schedule based on information obtained from agricultural experts and environmental data collected from the field by using sensors technology through Wireless Sensor Network (WSN). The application can easily be extended to automate fertilization as well as provide recommendation for weed and pest control.

Sarah Asaad

Sarah Asaad, was born in Nablus, Palestine, in 1993. She received the Bachelor degree in pure chemistry from an-najah national university, in 2014. And the master degree in chemistry from an-najah national university, in 2018. During the period of 2015 to 2017 she worked as lecture assistant at an-najah national university.
Sarah's master research thesis was concentrated on the adsorption and the photodegradation of water organic pollutants. Which was fully funded by MEDRC and Palestinian Water Authority. Her main goal in this life is continue her PhD study to be always an effective person capable to improve Palestine scientifically and economically to a high level.

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Clay-supported sensitized nano-ZnO in photocatalytic degradation of aqueous halophenols using direct solar light

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Abstract

This work describes the adsorption and photo catalytic degradation of aqueous 2-chlorophenol (2CP) contaminant using nano sized ZnO semiconductor photo catalyst. The ZnO particles are trapped into solid natural clay particles, producing a new highly active and easy to recover ZnO catalyst system. The degradation was performed under direct sun light. This research investigates the effect of sensitization on the photocatalytic efficiency. The prepared ZnO and prepared ZnO/natural clay systems were characterized by several methods, such as FT-IR, UV-Visible, Photoluminiscence, SEM and XRD which confirmed the ZnO formation in the composite catalyst. High Performance liquid chromatography was used to study the 2-chlorophenol adsorption and degradation. The results

showed that the 2CP photo-degradation on the sensitized ZnO/clay occurred with highest activity (~64% + 0.01) loss of 2CP compared with ZnO/Clay composite catalyst (~56% + 0.01) loss of 2CP under direct sun light under natural conditions. Effects of different reaction parameters onto photo degradation reaction of 2CP by natural clay/ZnO catalyst have also been studied. The ability of catalyst recovery and reuse in photo-catalytic reactions was also studied, the recovered catalyst showed loss in efficiency (~41%). Attempts were made to regenerate efficiency of recovered catalyst by adding new dye molecules. When calculating relative catalytic efficiency, in terms of turnover number, all recovered and regenerated catalysts maintained original efficiency of fresh samples.

Keywords

supported catalysts, ZnO, sensitization, anthocyanin, photo-catalysts, chlorophenol photo-degradation.

Inas Bsharat

Inas Bsharat has bachelor degree in Applied chemistry in 2015, master in Chemistry in 2018 from An-Najah National University, she currently PhD Student. She has worked as a teacher at The Ministry of Education and she worked as a responsible for quality at Balsam For Essentioal Oils in Jenin. Moreover, she training in a National Agricultural Research Center in Jenin about one year also she training in Vegetable Oil company in Nablus about four months. She was participating in 8th scientific exhibition of the Faculty of Science. Inas is working as a teacher at The Ministry of Education.

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The use of magnetic multiwalled carbon nanotubes functionalized with chitosan for nitrate removal from wastewater

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Abstract

This study aims to synthesis magnetic multiwalled carbon nanotubes functionalized with chitosan, and used for removal of nitrate from wastewater. The resulting adsorbent characterized by TEM, ATR, XRD, TGA and Raman analysis. This porous material showed a very good thermal and chemical stability and hence it can be used as perfect adsorbent to uptake nitrate ions from wastewater.
The concentration of the nitrate in the filtrate was determined using UV-visible Spectrophotometer. The results showed that the resulting product

has 97.25% removal efficiency of NO_3^- was achieved after 50 min. at pH = 2 and temperature 25°C, 250 mg weight of dose and initial concentration of 50 mg/L Cr (VI) solution. In order to investigate the adsorption efficiency for the adsorption of nitrate onto magnetic multiwalled carbon nanotubes functionalized with chitosan the effect of solution conditions on each adsorption process were studied.

The best equilibrium isotherm model for each adsorption process was investigated according to the value of the correlation coefficient of Langmuir and Freundlich isotherm adsorption models. The kinetics of adsorption were also investigated using pseudo first-order, pseudo second-order and intra-particle diffusion kinetic models. In addition, Van't Hoff plot for the adsorption was investigated in order to determine the values of enthalpy change and entropy change, and hence determining if the adsorption process is spontaneous or not, and if it is exothermic or endothermic one. The results showed that the adsorption followed Frenndlich isotherm and the mechanism of the reaction followed pseudo first-order kinetic adsorption model. The thermodynamic parameters of the adsorption proved that this process is endothermic ($\Delta H > 0$) and spontaneous ($\Delta S > 0$).

Keywords

Nitrate, MWCNT, Magnetic, Adsorption.

Rinad Hamed

Renad J.Y. Hamed, 32 years old, a Palestinian Senior Researcher at Palestinian Water Authority, and activist in Sustainable Development promotion. She is a science woman with a flair for the arts, Hold MSc., and B.Sc., in chemistry/ environmental and water fields at Al- Najah University, Birzeit University/Palestine.

She earned MEDRC fellowship in 2014, for MSc. Thesis titled: "Phytoremediation for treatment of brackish water in ground wells exist in Jericho districts". The research introduces new non- convention anal techniques in treatment water tackling main Sustainable Development goals and objectives concerning three main pillars.

In 2018, She earned MEDRC innovation fellowships for the new project titled "Phytoremediation and PGPRs techniques for treatment of brackish water as new technologies for climate change mitigation"

Renad a woman with an aptitude for what forefront of knowledge in the sustainable development fields, through learning or engagement to be one who can the contribute for the betterment of our life.

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PGPRs and Phytoremediation introduce new NEXUS Approach

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Abstract

Water, Food, Energy, are the three main pillars of NEXUS, as it should be considered in any implementation of non-conventional sustainable development (SD)research. Otherwise, concentrate on one of the pillars to reach other one and ignoring the third pillar lead to unsustainable development.

Moreover, what is also proposed by NEXUS or SD is to introduce alternative resources of mentioned pillars, through this assumption, the research presented the following module: NEXUS Hierarchy module beginning with alternative water resources (brackish water), Zero energy consumption,

ending with food production. The implemented methodology or the technique of this module was: Phytoremediation technique using PGPRs strains (Plant growth Promoting Rhizobacteria) to enhance Guar and Barely plants growth under saline conditions irrigation.

The technique tackled water scarcity management by using alternative water resource in agriculture and zero energy consumption, to obtain yield without unfriendly environmental results. the technique depends on phytoremediation using two strains of PGPRs (Plant Growth Promoting Rhizobacteria) obtained from Prof. Glick, from Waterloo University, Canada and brackish water obtained from Jericho ground wells. These strains used for germination of different plant species such as (Barely, Guar, Broad beans), to enhance their salinity tolerance and improve their yield under saline condition. All the trails carried as lab and greenhouse trails. The obtained greenhouse results indicated that salt stress substantially reduced stomatal conductance, transpiration rate, relative water content (RWC), total chlorophyll content, chlorophyll a, chlorophyll b, carotenoid content, plant height, leaf area, dry biomass, seed yield, and salt tolerance index for non-treated trials (or trails without PGPRs). Meanwhile, PGPR's strains treated trails, irrigated with under three different saline irrigation conditions (3.12, 5.46, and 7.81 dS m−1), improved all the aforementioned parameters.

Measurement of PGPR growth under saline NaCl solutions: Different concentrations of NaCl – TSB solution were prepared, to test performance of PGPR salt tolerance on two plant species. show % of control – Absorbance for UW3 at λ = 600 nm in NaCl - (TSB) solution (0 g, 0.05g, 0.08g, 0.10g, 0.16g, and 0.24g).it showed UW3 germination were increased under saline condition at different time interval, until it reached maximum levels and it became constant without any incensement after 8 hours.

NaCl accumulation in plant tissue for total dry mass ranged from 36.3-8357.5 mg, and for Ratio of Cl/Na 0.6-1.01 for experimental results compared to theoretical atomic weight equal 1.5.

Sawsan Jaber

Sawsan Jaber is Part-time teacher in Haja Andaleeb Al-Amad Nursing and Midwifery College, she graduated in 2012-2013 the first on her classes with BSc in pure Chemistry. For one academic year including summer semester (2013-2014) she worked as research and teacher assistant in Chemistry labs in An-Najah National University. In 2015, she enrolled at An-Najah National University in master program in Chemistry and graduated in 2018 with GPA 4/4. She is participating multi conferences while her BSc and MSc studying, she Participated in the Second Palestinian International Graduate Conference on Natural, Medical and Health Sciences and Humanities (SPIGCNMHSH 2017). Moreover, participating in both 7th scientific exhibition of the Faculty of Science and The Second French- Palestinian festival. Take part and organize The Fifth Palestinian International Chemistry Conference in 2011. She was Volunteering in ANU Library, helping university's students find books which they need, and assist employees organizing books inside library in 2012. Currently, Sawsan is working as Part-time chemistry teacher in Haja Andaleeb Al-Amad College.

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Photo-mineralization of aqueous gram positive and gram negative bacteria together with their organic components using sensitized ZnO nano-particles

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Abstract

Photo-degradation is an attractive process to purify water from organic and microorganisms. Unlike earlier practices of inhibiting bacteria by ZnO nanoparticles (ZnO-NPs), This work describes complete mineralization of inhibited bacteria and degradation of their organic content. Two types of

bacteria are described here, namely Gram negative (-ve) K. Pneumoniae and Gram positive (+ve) S. aureus G +ve are examined here. Both naked ZnO and sensitized ZnO\Anthocyanin are tested against both bacteria using solar light simulated radiations. Within 60 min both types of bacteria are totally deactivated, leaving amounts of organic matter in water. After enough exposure time (3 h) about 98.7% of G + ve S. aureus and 45.2% of G –ve K. pneumoniae bacteria are completely mineralized leaving no organic matter in water. The results show the feasibility of using ZnO-NPs as effective catalyst for solar driven disinfection of water from two types of bacteria leaving no hazardous materials behind.

Abdallah Murrar

Abdullah Murrar has bachelor degree in Finance, first master in Business Administration, other master in Strategic Planning from Arab American University, currently PhD Student. He has experience about 18 years in financial management areas. Supporting the municipalities, ministries, and water providers in financial systems, financial management capacity building, financial polices and bylaws, economic studies and planning.

Mr. Murrar published 10 papers in international journals, subjects in financial sustainability, costing water services, and efficiency and development of water sector.

Mr. Murrar worked Water Tariff Specialist in Water Council, he worked director of software development of financial systems. He has been working with USAID, and worked previously with international donors as, World Bank GIZ as financial management consultant.

Mr. Murrar was speaker about financial sustainability, environmental economic development in local radios, local conferences, regional conferences, and invited to speak in international conferences as Bath city in UK, Nano city in France, and Malaysia.

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The Impact of Water Price on the Financial Sustainability of the Palestinian Water Service Providers

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Abstract

The impact of water sales price on the performance of water service providers is typically something of a mystery. High prices mean more revenue and profit; but it may lead to less bills collection and encourage the illegal connections. Yet, this argument has not been fully addressed in the Palestinian water sector; this research evaluates the effect of average water prices on the financial sustainability key indicators as collection efficiency, profit or loss percentage, non-revenue water, staff productivity, daily consumption, operating, and maintenance cost. The average price of cubic meter sold is segmented into low, medium, and high categories. Multivariate analysis shows that there are significant differences in profit or working ratio, daily consumption, and operating cost based on the different price categories. Further significant differences have been found in non-revenue water, collection efficiency, and water production based on low and high price categories. On the other hand, no significant difference has been found in staff productivity. The results show high price set by Palestinian water providers, leads to an increase in the bill collection rate and profit margin. However, negative relationship has been found between the price on one hand, and non-revenue water, average daily consumption, and water production on the other hand. The implication of these findings reveal that the Palestinian water providers should increase water prices gradually to cover operating and maintenance cost for better financial performance and sustainability.

Keywords

Collection Efficiency, Palestinian Water Service Providers, Performance, Water Price.

Amani Jabari

Eng. Amani Jabari was born in Hebron, Palestine. She obtained her B.Sc. in Civil Engineering specialization in Surveying and Geomatics Engineering from College of engineering and technology at Palestine Polytechnic University, Palestine. She worked as teaching and research Assistant in College of Engineering and Technology, Palestine Polytechnic University (PPU). In 2018 she obtained her M.Sc. degree in water and environment engineering from Institute of water and environmental studies- Birzeit University, Palestine. Her research was funded by MEDRC organization. Currently, she is working as Civil engineer, land and water settlement authority, Palestinian authority.

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Optimization of Energy Consumption in Jericho Wastewater Treatment Plant

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Abstract

In the whole water-wastewater cycle, wastewater treatment systems considering as the most energy consuming part. In this research the main aim is to optimize and reduce the energy consumption in wastewater treatment plants by use the best way to increase energy efficiency in the Jericho wastewater treatment plants, identify areas for conservation, and

to determine where energy is being used inefficiently, and to make energy efficiency through energy management, improving equipment, run the equipment for fewer hours.

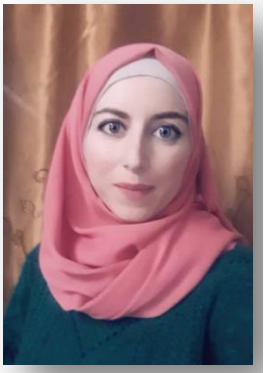
All historical plant performance and energy consumption for 2015 and 2016 was obtained from Jericho municipality to evaluate the plant performance, and energy consumption in each category in every stage at the WWTP; it was divided to seven stages. These data were used to determine the energy consumption as kWh in different units through many equations, and as (kWh/kg $_{(BOD,\ TSS,\ TN)}$ in operational years 2015, 2016, the target year 2020, and the ultimate year 2025.

In this research it was found in Jericho WWTP the energy consumption (kwh/m^3) considered to be high in first operational year, which means that the WWTP working inefficiently at first. But it was noticed that the energy consumption decreased with years, and this is confirmed with the concept of (economies of scale). It is clear that the reactor stage which contain aeration blower is the most energy consuming stage according to the energy consumption value and literature, it reaches 465kwh/day, and it represents 68% of the total consumption. From calculation the results are obtained show that the most energy consumption between the three water qualities is total Nitrogen (TN), it consumed energy18 times more than the other wastewater quality for one kilogram. In contrast of expectations that the energy consumption decreased despite the increasing of total load of wastewater entering the WWTP, this decreases due to the organization of the operation of WWTP, and had an efficiency operational plan of WWTP.

Keywords

Energy consumption, energy efficiency, water qualities, wastewater treatment plant.

Ayaa Hisham



Ayaa Hisham obeise, Water and Environmental engineer and Researcher at ARABESC office . was born in Nablus , Palestine . She graduated from An- Najah National University with a bachelor's degree in Civil engineering in 2011. She hold Master degree in water and Environmental engineering at An- Najah National University in 2017, through MEDRC fellowship.

Ayaa has Seven years' experience as Water and Sanitation Engineer in designing, planning, supervising, and managing in infrastructure projects, in addition a researcher in Water and Environmental issues. Also she participated in workshops related to water and waste water management and several conferences; lastly it was in First Palestine Intentional Water Forum.

Ayaa currently, looking forward to continue her studies to get PhD degree in water and environmental engineering. Her main goal to be effective and successful person to be able to develop the situation in Palestine scientifically and economically to a high level.

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The Assessment of Private Sector Participation through different Contracting Models on the Sustainability of Desalination Plants

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[2] Abdel Fattah Hasan; Assistant Professor, Department of Civil Engineering- An-Najah National University , Nablus ,Palestine

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Abstract

Seawater desalination plant plays an important role to meet the growing need of water especially in Gaza strip, where the levels of total dissolved salts have been rising continuously over the last two decades, and became in Gaza strip, far in excess of the WHO standards.

Still, there are problems in the application of such technology, including cost, lack of expertise and managerial competence to operate the desalination plant. Therefore, governments look for Public-Private Participation (PPP) expression which means getting the private sector involved in the construction and operation of desalination plants through different contracting models.

The main purpose of this research is to study and decide the most efficient and sustainable PPP contracts used for desalination plants in Palestine.

So, the adopted approach for selecting the optimal PPP contract was based on extensive literature review to summarize the most well-known PPP contacts and several meetings with experts who have a good background about the desalination process, PPP contracts, sustainability …etc., to finding the beneficial tool to collect the data.

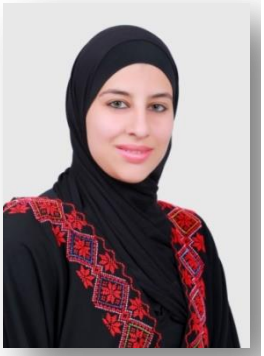
Data collected through interview structured, targeted to different organization related to water sectors, or concerned of infrastructure projects and based on five indicators: financial, institutional, technical, socioeconomic, and environmental viabilities. Through the analysis process of the data collected using SPSS program, three points will be assessed; first, the importance rate for sustainability of each of five indicators (financial, technical, institutional, social, and environmental viabilities) for desalination plant in Palestine. Second, sustainability of each of the five indicators that effect on deciding the structural framework of PPP contracts. Third, the different contracting models.

By the end of analysis, the concession contract (Green field contract) got the highest score with weighted average 3.3 through overall assessment of PPP contracts, that means this contract is the optimal contract which is simulating the reality of the infrastructure in Palestine, achieving the sustainability of the desalination plant, and improving the efficiency of the service to satisfy the citizens

Keywords

Gaza strip , Private Sector Participation (PPP) , PPP Types , Desalination Plant , Sustainability.

Hana' Jardaneh



Hana' Muhammed Jardaneh, Agricultural Engineer, Hold MSc., in plant production in 2018 and B.Sc., in plant production & protection from the Faculty of Agriculture and Veterinary Medicine at An-Najah National University.
She worked as Chief Executive Officer (CEO) at Natural Alternatives Company, and now she is working as a Volunteer at Near East Foundation & Palestinian Center for Agricultural Research and Development on Palestinian Agricultural Water Management Project
She has a Certificate of Excellence in contribute to the success of the project environmental communication, American Consulate General – Jerusalem & Center for Environment
She Represented Palestinian Alumni through participation in Oral Presentation in Omani Desalination Researchers Network Meeting & MEDRC Alumni Lecture Series, Muscat, Sultanate of Oman

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The Effect of Bacillus megaterium on Barley Tolerance to Salinity

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Abstract

Barley is the forth important cereal crop in the world, and salinity is one of the most limiting factor for crop productivity. This research aimed to study the impact of Bacillus megaterium inoculation to three varieties of barley under 5 different salinity level (0, 50, 100, 150 & 200 mM).
This study revealed that B. megaterium have positive impact on agronomic traits of barley such as on leaf length, width and number, root weight, shoot weight and plant height and chlorophyll B. megaterium inoculation show increasing in the level of awn roughness slightly.

At moderate salinity level the response of plants to bacterial inoculation was positive on K+, Ca+, N+ and P accumulation this indicate that B. megaterium increase uptake of nutrient under saline condition to certain degree.

The study indicates that B. megaterium improve the growth of Nabawi and Icarda5 barley's varieties under saline condition and reduce the accumulation of Sodium and Chlorides compared to non-inoculated plants.

Keywords

Barley, Salinity, Bacterial inoculation, Bacillus megaterium

Poster Presentations

Sabreen Daghra

Sabreen Daghra, a teacher and environmental activist, was born in Palestine on November 18, 1991. She graduated from Al-Quds University with a bachelor's degree in Earth and Environmental Science / Minor Biology in 2013. She Study of the United State Institute for Student Leaders on Global Environmental Issues. She got a scholarship in a master program from MEDRC. Through the period between 2014 and 2016, She worked on her research and also as a teacher assistance at Chemical and Biology Analytical Center at Al-Quds University. In 2018 she obtained a master's degree in the field of Environmental Studies from Al-Quds University with an average of 86.8%. She elected to be the vise-president of the 6th Asia Pacific Youth Parliament for Water in 2017 and she got a Water award for her exceptional participant in the parliament from Wilo foundation. She got the East-West Center Institutes on Environment Alumni Leadership Impact Award 2017 for her contribution to community development and collaborative leadership in addressing environmental challenges.

Sabreen participated in many national and international scientific conferences during her study and after, her researchers were related to wastewater treatment such as purification of secondary treated wastewater using epuvalisation technique and Micelle-clay complex adsorbent. She aims to improve the situation in Palestine, she believes we can do it if we raise and educate the generation that cares about the environment.

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Purification of Wastewater Using Ornamental Plants

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Abstract

The scarcity of freshwater in most countries is an increasingly acute problem, the agriculture sector is the largest consumer for water supplies and the utilization of treated wastewater would provide multi-benefits to include an affordable solution for water shortage. The effluent of the secondary treatment process at Al-Quds University wastewater treatment plant was treated using an Epuvalisation system. The Epuvalisation

technique is a hydroponic treatment, a technique that used for secondary wastewater purification. The Rosemary (Rosmarinus officinalis) and Geranium plants (Pelargonium hortorum) were selected for Epuvalisation system. Both freshwater and secondary treated wastewater were applied to the system in a greenhouse and in a closed-loop for many days.

The results of water quality analysis of both TWW and FW using the Rosemary and Geranium plants showed a remarkable decrease of BOD and COD for TWW and FW as a control. The removal percentage of electrical conductivity in FW and TWW using Geranium Plant decreased to half, almost the same in TDS. The removal percentage in TWW of SS was 95%, PO4-3 was 89%, Cl- was 60%, TN was 98% and K+ was 59%. The results have shown that the Epuvalisation system is a promising technique for wastewater treatment using the Rosemary and the Geranium plants.

Keywords

Epuvalisation; Wastewater; Treated wastewater; Hydroponic; Ornamental plants; Geranium Plant; Rosemary Plant.

Rawan Ateeq

Rawan Ateeq, was born in 1989 in Roujeeb- Nablus (Palestine) On June 26th.

- 2011 she obtained her B.A in Applied Chemistry from An-Najah National University.
- In 2017 she obtained her master degree in Environmental Science from An-Najah National University.
- 2012-2013 work as a chemical analyst in the HELEN factory for chemicals.
- 2013- 2015 work in ELIT academy for training
- Currently, she is trainer and volunteer at PARC (Palestinian Agriculture Relief Committee).
- she is starting her organic agriculture project : Arum, Gundelia tournefortii, and medical plants"

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Phytochemical screening and adsorption of Cu, and Ni ions from aqueous solution using activated carbon from Cupressus Sempervirens, P.halepensis fruits

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Abstract

Objectives: The current investigation aimed to remove copper and nickel ions from aqueous solution by adsorption activated carbon, as adsorbent prepared from Cupressus sempervirens and Pinus halepensis fruits using different activated agent. This study also aimed to determine the antioxidant test for volatile oil from Cupressus sempervirens and Pinus halepensis.

Methods: The samples of Cupressus sempervirens and Pinus halepensis fruits were collected from different areas of Palestine. Physical and chemical activating was studied in adsorption experiments; it was conducted at different parameters such as: concentration, pH, time, dosage and temperature. Different activated agent also studied to determine the

maximum surface area for Cupressus sempervirens and Pinus halepensis fruits. SEM, EDX and iodine number tests were studied to support the results. Antioxidant capacity was estimated by using DPPH assay and UV-spectrophotometric method. In addition percentage yield of Cupressus sempervirens volatile oil was determined using ultrasonic microwave cooperative extractor/ reactor.

Results: The obtained results showed that the activated carbon produced from Cupressus sempervirens and Pinus halepensis fruits give good percentage yields which reach up 40% and 68%, respectively. Optimum percent of Cu removal was 99.9% when Cupressus sempervirens fruit activated carbon (dosage 0.2g, at pH=12) is used while Ni removal was 99.6 % (dosage 0.2g, at pH=2). Optimum percent of removal was 99.1% when Pinus halepensis fruit activated carbon (dosage 0.2g, at pH=4) is used, while Ni removal was 98.5% (dosage 0.2g. at pH=7). The results showed that equilibrium time of Cu, Ni adsorption on CFAC and PFAC is 24 hours. The optimum temperature for Cupressus sempervirens and Pinus halepensis was 25ºC.

Surface area determined by iodine number showed 726m2/g for Cupressus sempervirens using H3PO4 (phosphoric acid) as activated agent and 1257.3 m2/g using NaHCO3 (Sodium bicarbonate) for Pinus halepensis, the SEM-EDX analysis showed the same results. Adsorption isotherms were studied at 25ºC, Freundlich isotherm was fitted for Cupressus sempervirens and Pinus halepensis.

On the other hand, antioxidant activity showed different results in different areas in Palestine. The IC50 of the antioxidant Cupressus sempervirens in Palestine can be ranked: south Palestine>north Palestine>middle Palestine, and for Pinus halepensis: north Palestine>middle Palestine>south Palestine, by using Trolox as a reference.

Conclusion: Results of this study show that both of Cupressus sempervirens and Pinus halepensis may be useful for the development of method for removal of different heavy metals in different parts of these plants also it can be used as alternative to the commercial activated carbon.

Samar Abed Alqader

Samar Abed Alqader, bachelor degree in biology in 1998 from An-Najah National University. Diploma in methods of teaching science in 2001 from Beit Beril collage in Kefar Saba. Master degree in environmental science in 2017 from An-Najah National University, was born in Palestine on December 31, 1976. Researches in master is funded by MEDRC (**Enhanced Phytoremediation Of Olive Mill Wastewater "Zibar" Using Plant Growth Promoting Rhizobacteria (PGPR) With Barley and Clover).**

*1999-2004 teacher in Ministry of Education schools.

*2004 –until now headmistress in Fatima al-Zahra school /Tulkerm.

*2013-Participate in the Second Palestinian Conference in learning and teaching math's.

*Participate in many Conferences in Ministry of Education.

*2003 Got an award of Elham Palestine.

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Enhanced Phytoremediation Of Olive Mill Wastewater "Zibar" Using Plant Growth Promoting Rhizobacteria (PGPR) With Barley and Clover

Samar Abed Alqader, Shehdeh Jodeh, Raed Alkowni

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Abstract

Olive mill wastewater (OMWW) has negative environmental impact. Utilization of OMWW in irrigation is difficult due to the toxic effect. Different phytoremediation methods were used to improve the use of OMWW in irrigation.

In this research, PGPRs were implemented to investigate their efficiency of improving the phytoremediation technique for plants irrigated with olive mill waste water. Two strains of PGPR (UW3, Pseudomonas putida(A). UW4, Pseudomonas putida(C) with unassigned one (B)) were used with Barley (Hordeum valgare L.) and clover plants (Trifolium sp.). All trials were carried in a designed green house in faculty of agriculture at An-Najah

national university in Tulkarem for 30 days. Plants irrigated with different concentration of OMWW (0%, 10%, 25%, and 50%). Seeds of both barley and clover irrigated by different concentration of olive mill waste water, showed significant differences in germination among the concentration levels of OMWW. It was notable that the OMWW has negative impact on seed germination of both plants.

Neither barely nor clover plants treated with PGPRs had significant improvement in biomass compared with those irrigated with fresh water. Root length was decreased significantly with the increase of OMWW levels (57.8 and 58.5cm respectively). The OMWW application significantly reduced the shoot length. OMWW at 50% reduced the stem length (15.5 cm). A similar trend was observed with other measures (both fresh and dry weight of the plant). OMWW application was highly reduced both weights of stems and roots of both plant species.

For clover plants, root length, shoot length, wet weight (P=(0.0057-0.0001), were reduced, however, total dry weight, dry weight of roots, and dry weight of shoots ($p < .05$). The higher root length was observed with the control and 10% OMWW (25.22and 23.98 cm, respectively). Regarding shoot, shoot length was reduced, the lowest shoot length was observed (4.879) at 50% zibar application. Wet weight of clover was differs significantly among the different concentration of OMWW and different type of bacteria used.

Pulse Amplitude Modulation (PAM) fluorometry showed no improvement in photosynthesis. Barely plants their values of Fv/Fm were ranged from (0.55 -0.68), which mean that plant is under stress, and its photosynthesis not proceed as it should be, and NPQ values ranged (0.11-0.17). The same was for clover plants treated with PGPR (UW3), irrigated with fresh water, 10% concentration of OMWW, values of Fv/Fm are closed to 0.8 and NPQ are decreased to .07.Other Trails of clover plants values of Fv/Fm were ranged from (0.62 -0.70), and NPQ values ranged (0.04-0.16).Which mean that plant is under stress, and its photosynthesis not proceed as it should.

Impact of Irrigation with Desalinated Brackish Water on the Productivity and Fruit Quality of Tomato Crop Planted at Marj Na'aja Village

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Abstract

Agricultural wells salinization is a major problem facing the agricultural sector in Palestine Over the past 3 decades, agricultural wells salinity has raised from 570 ppm in 1967 to reach 4500 ppm in 2012.

The research was conducted during the fall season of 2013/2014, at Marj Na'aja village, four categories of water treatment were used T1 is the desalinated water with EC=200 ppm and two blended water treatments T2 with EC=750 ppm and T3 with EC=1600 ppm and the last treatment T4 the raw saline water with EC= 4500 ppm.

The highest tomato plat yield were at TDS 750 ppm (20 kg per plant), TDS 1600 ppm (18.8 kg/plant), raw saline water (13 kg/plant), and the lowest productivity at 200 TDS ppm (12 kg/plant).

The fruit quality showed significant variations in the parameters, the (TSS) were lowest at TDS 200 ppm and highest when plants were irrigated with raw saline water, then with blended water with TDS 750, and 1600 ppm respectively.

The heavy saline soil fertility decreased dramatically when irrigated with desalinated water for all macronutrients N, P, K, and Ca, while the raw saline water give the highest soil fertility as the concentration of the macronutrients was slightly decreased at the end of cultivation season.

Keywords

Desalinated, Blended Water, Saline Water, Productivity, Quality, Fertility.

Study the Effect of Reed Tissues on the Adsorption of Heavy Metals and Bacteria from Sewage Water

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Abstract

The main problem here is to study the potential of Phragmites australis and Phragmites used in the purification plant in Sarra village (leaves, stems and roots) to absorb a specific heavy metal ions (Fe^{3+}, Cd^{2+} , Cu^{2+} , Ni^{2+} and Pb2 +) and their ability to stop bacterial activity in sewage water.
Several experiments were conducted under different conditions and variables such as temperature, pH, concentration of metal ions, plant biomass and contact time to determine the optimal conditions for the best adsorption of the metal ions specified in the research. It was observed that the removal of these ions from the aqueous solutions was at a concentration of 20mg / L and a temperature of 25°C and acidity around pH = 7 and within 15-30 minutes.

The highest uptake rates under the optimum conditions for metal ions were obtained using the biomass of both plants as follows: Iron 77% absorbed by roots, Cadmium 72% absorbed Phragmites australis leaves
88% copper absorbed by phragmites australis leaves and stalks, 93% nickel absorbed by phragmites australis and lead absorbed with the highest percentage which was 97% by the stalks of Phragmites australis, so the absorption of lead element was studied under the influence of different conditions of temperature, pH and contact time.
Experiments were done to examine the behavior of absorption under competitive conditions in the presence of ions together in water. The

results showed that the order of percentages for the removal of metal ions was as follows: $Pb^{+2} > Cu^{+2} > Fe^{+3} > Ni^{+2} > Cd^{+2}$.

The results and analysis showed that the adsorption process can be described according to the Langmuir model, indicating that the adsorption process is monolayer. The negative ΔG values indicate that the adsorption process is appropriate and spontaneous at the specified temperatures. The negative value of ΔH° indicates that the adsorption process is exothermic and is favored at low temperatures not more above room temperature, and the value of ΔH° is much lower of those associated with chemical adsorption, confirming the physical nature of the adsorption process. The small positive value of ΔS° indicates structural changes on the biomass surface, and that the disorder has increased near the adsorption surface during the adsorption process.

The results confirm that the biomass of the plant is effective, suitable and safe in removing heavy metal ions from sewage water. Phragmites from Sarra (leaves, shoots and roots) had been tested for their antibacterial activity and the result was negative.

Continuous flow system ZnO-based catalyst for aqueous chlorophenols degradation with direct simulated solar

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Abstract

Water pollution has become a major concern that motivates Scientists to solve. This is due to the tremendous pollutant sources and types that affect the water quality. This work shows a safe method to remove2-chlorophenol (2-CP) pollutant from water, and to avoid its hazards completely. The method used in our study is photo degradation using commercial ZnO nano-particles as the photo catalyst. The continuous flow reaction system was carried under solar simulated light. The commercial ZnO nano-particles were plated on a glass dish, and characterized by scanning electron microscopy (SEM) and X-ray diffraction (XRD).Under neutral conditions, using 2-CP (40 ppm), pH=6 , light intensity 1 sun, the results show an 58% 2-CP photo degradation after one hour, 98% photo degradation after 3 hours, and complete mineralization after 6 hours. The

results were confirmed by UV-Visible spectrophotometer and total organic carbon TOC in treated water. The study shows the feasibility of using the photodegradation method to eliminate 2-CP from contaminated water. Effects of different reaction parameters, onto photo degradation reaction of 2CP, such as pH, light intensity, concentration of 2-Chlorophenol, and exposure time have all been studied. High Performance liquid chromatography was also used to study the 2-CP photo degradation. Values of: photo degradation percentage, turn over number (T.N.), turnover frequency (T.F.) and quantum yield (Q.Y.) were all calculated as measures for relative catalyst efficiency in the photo degradation process.

Generating Fresh Water from Highly Concentrated Salty Water Using Thermochemical Cycles

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Abstract

By using desalination plants, large amounts of potable water will be produced but also large amounts of highly concentrated salty water will be created. So there is an urgent need to find a suitable way to solve this problem, or reduce its effect.

To achieve this aim, a systematic experimental approach was carried out on four samples of different hydrated salts which are calcium chloride ($CaCl_2.H_2O$) , sodium sulfate ($Na_2SO_4.10H_2O$), magnesium chloride ($MgCl_2$), and Alum (Potassium aluminum sulfate $KAl(SO_4)_2.H_2O$), to determine the number of thermochemical cycles that can be done for each type of these salts. The cycles were done at 120°C, and the results show that $MgCl_2$ and Alum ($KAl(SO_4)_2.H_2O$) served for three cycles and then failed, also the cycles of $CaCl_2$ were 9 cycles. However, $Na_2SO_4.10H_2O$ took 39 cycles before failing. So, the experiments focus was given to sodium sulfate more than other salts.

Hydration and dehydration reactions for sodium sulfate sample were carried out at different temperatures in order to find the time, rate, and activation energy of these reactions at each temperature.

Results of this research project show that, when the temperature increases the time of reactions (hydration and dehydration) decreases. The XII dehydration time of $Na_2SO_4.10H_2O$ at (120°C, 150 °C, 170 °C, and 200 °C) was 180 min, 90 min, 30 min, and 20 min, respectively. On the other hand, the hydration time of Na_2SO_4 at (4 °C, 25 °C, and 30 °C) was 30 hr, 32hr, and 96hr correspondingly. The rate of reaction increased by increasing temperature for both hydration and dehydration. The activation energy

was calculated for dehydration reaction, it was 54176.46J/mol, while it was 31875.90 J/mol for hydration of sodium sulfate.
Finally, it is concluded that brine water can be used to generate fresh water using thermochemical cycles for sodium sulfate.

Solar Light in Degradation of Organic Contaminants Present in Secondary Treated Waters

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Abstract

Waste waters are being treated in Palestine at large scale in treatment stations in different areas. The stations use primary and secondary treatments for water, and the resulting water may still include different types of soluble organic contaminants. The produced waters are therefore unsafe to use by either humans or animals. Treatment of water by several methods such as chlorination, peroxidation, ozonation and UV radiation is being used globally. However, all these are costly. In our project we use direct solar light to photodegrade remaining organic contaminants of the treated water. Activated carbon supported ZnO (AC/ZnO) is used as photodegradation catalyst. This method is safe as the organic materials are expected to be converted into safe mineral compounds. We have seen promising results. We found that the organic compounds exist in the treated water in concentrations up to 30 ppb. Out of these organics, 80% have been totally degraded leaving no organic traces, as confirmed by total organic carbon (TOC) analysis. We have studied different parameters (such as catalyst amount, temperature, pH and time) to find out the reaction optimum parameters. The results show that using 0.2 g ZnO per 100 ml of wastewater, at pH 5.5 for 2 h give best results. Degradation efficiency was studied using UV / visible spectroscopy and TOC. The current stage of the project involves photodegradation using the supported system Ac/ZnO. The goal is to enable recycling of the catalyst for multiple reuse.

Keywords

ZnO & supported catalysts; Secondary treated water; Photodegradation, water purification.

Assessment of Reverse Osmosis Process for Brackish Water Desalination in the Jordan Valley

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Abstract

This thesis investigates the assessment of three suggested energy systems that power an existing desalination unit, which are: Photovoltaic (PV) system, Diesel Generator (DG) system, and hybrid powered system. All systems use Reverse Osmosis (RO) technology to desalinate Brackish Water (BWRO) in Az Zubaidat desalination unit located in the Jordan Valley in the West Bank.

A general framework was followed; a cost analysis procedure was conducted which analyzed the economic viability of the systems using

Hybrid Optimization of Multiple Energy Resources (HOMER Pro) a software program developed by the U.S National Renewable Energy Laboratory.

Three different scenarios were analyzed economically and environmentally using HOMER Pro ,the third scenario was to operate the system for twice the time as it is using hybrid system consist of Photovoltaic/Battery/diesel generator (PV/Battery/DG) with different sensitivity variables which gave an optimal configuration with the least COE of $0.424/kWh when the fuel price is minimum(1.3$/L) and the solar scaled average is maximum(8.91kWh/m^2/day) , for both 6 and zero Interest Rate(IR) ,the best configuration compromises of 10 kW diesel generator, a 27.2 kW of PV modules and 24 batteries of 1.75 kWh capacities, and the system has 70% renewable energy fraction with a 68% GHG reduction.

We recommend that policy makers should take into consideration ccombining both renewable and conventional energies with desalination units; in addition, designing such units should be an integrated process between both engineers and economists.

Keywords

RO, PV, solar energy

Nanotech based filtration of advanced treatment of wastewater

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Abstract

In this research a new innovative modification on the traditional tertiary filtration-treatment units using zinc oxide nano photocatalysis is suggested to improve the quality of the treated effluents. The value of this idea lies in using cheap nano materials in modifying the filtration medias which grantee longer operation time with less frequently need for backwash or regeneration of the filtration media what makes the filtration process more sustainable and economically convincing solution.

In this research, the nano zinc oxide catalysis was successfully lab synthesized from high purity graded raw chemicals (99.5%) and also from commercial raw materials (purity $\geq$ 95%). No significant difference in the size of the produced catalysis based on the purity of the raw material. Where, the zinc oxide nano photocatalysis was produced in size of 69 nm from commercial zinc sulfate heptahydrate and size of 29 nm from graded zinc sulfate heptahydrate. In the same manner, nano ZnO catalysis which was produced from commercial micro-sized ZnO have a size of 28 nm which is greater than the nano ZnO catalysis originated from graded raw micro-sized ZnO by just 11 nm.

Photocatalytic degradation ability of the produced nano catalysis was tested in batch experiments as powder or after pre-depositing it on the surface of activated carbon or recycled glass. The nano photocatalysis produced from commercial raw chemicals (ZnSO4.7H2O and micro-sized ZnO) shows high degradation ability for the pollutants in the secondary wastewater with efficiency reaches 85% of total chemical oxygen demand (COD) in the powder batch, and exceeds this value to 97% in the batch of pre-deposited nano catalysis on the surface of the recycled glass.

Carbon and recycled glass were tested as nano photo catalysis carrier. The activated carbon didn't show the sought after results where the nano catalysis easily escaped to the solution in the batch experiment moreover the black imperial structure of the AC obstructed sun light and ultraviolet light which activate the photo catalytic reaction causing deficiency in activation of the nethermost photocatalysis. Unlike AC filtration media, the filtration media made of crushed glass allows the UV to penetrate its structure and therefore activating the pre-doped nano photo catalysis even in the bottom layers of it.

Finally, the results of this research are the milestone of other researches in order to develop a self-cleaning filtration media.