



THE ATHENS INSTITUTE FOR EDUCATION AND RESEARCH

Abstract Book

11th Annual International Symposium on
Agricultural Research
16-19 July 2018, Athens, Greece

Edited by
Gregory T. Papanikos

2018

Abstracts
11th Annual International
Symposium on
Agricultural Research
16-19 July 2018
Athens, Greece

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Preface

This book includes the abstracts of all the papers presented at the 11th *Annual International Symposium on Agricultural Research (16-19 July 2018)*, organized by the Athens Institute for Education and Research (ATINER).

In total 26 papers were submitted by 26 presenters, coming from 15 different countries (Algeria, Brazil, China, Costa Rica, Czech Republic, France, Haiti, Iran, Japan, Italy, Kuwait, Mexico, Poland, South Africa, and Turkey). The conference was organized into 9 sessions that included a variety of topic areas such as Plant Physiology and Genetic Analyses, Soil Science, Plant Production and Technologies, and more. A full conference program can be found before the relevant abstracts. In accordance with ATINER's Publication Policy, the papers presented during this conference will be considered for inclusion in one of ATINER's many publications.

The purpose of this abstract book is to provide members of ATINER and other academics around the world with a resource through which to discover colleagues and additional research relevant to their own work. This purpose is in congruence with the overall mission of the association. ATINER was established in 1995 as an independent academic organization with the mission to become a forum where academics and researchers from all over the world could meet to exchange ideas on their research and consider the future developments of their fields of study.

It is our hope that through ATINER's conferences and publications, Athens will become a place where academics and researchers from all over the world regularly meet to discuss the developments of their discipline and present their work. Since 1995, ATINER has organized more than 400 international conferences and has published nearly 200 books. Academically, the institute is organized into seven research divisions and 37 research units. Each research unit organizes at least one annual conference and undertakes various small and large research projects.

For each of these events, the involvement of multiple parties is crucial. I would like to thank all the participants, the members of the organizing and academic committees, and most importantly the administration staff of ATINER for putting this conference and its subsequent publications together. Specific individuals are listed on the following page.

Gregory T. Papanikos
President

**11th Annual International Symposium on Agricultural
Research, 16-19 July 2018, Athens, Greece
Organizing and Academic Committee**

ATINER's conferences are small events which serve the mission of the association under the guidance of its Academic Committee which sets the policies. In addition, each conference has its own academic committee. Members of the committee include all those who have evaluated the abstract-paper submissions and have chaired the sessions of the conference. The members of the **academic committee** of the 11th Annual International Symposium on Agricultural Research were the following:

1. Gregory T. Papanikos, President, ATINER.
2. Anthony Koutoulis, Director, Natural & Formal Sciences Division and Associate Dean Research, College of Sciences and Engineering, University of Tasmania, Australia.
3. Saif Uddin, Director, Center for Environmental Pollution, Climate & Ecology (CEPCE) & Senior Research Scientist, Kuwait Institute for Scientific Research, Kuwait.
4. Margarita Gisela Pena-Ortega, Professor and Researcher, Chapingo Autonomous University, Mexico.
5. Tomas de Jesus Guzman Hernandez, Professor and Researcher, Costa Rica Institute of Technology, Costa Rica.
6. Majed Abu Zreig, Professor, IPDRE, Tottori University, Japan.
7. Cezary Sempruch, Associate Professor, Siedlce University of Natural Sciences and Humanities, Poland.
8. Nadhir Al-Ansari, Professor, Lulea University of Technology, Sweden.
9. Dawn Roberts-Semple, Assistant Professor, York College, The City University of New York, USA.
10. FeiBo Wu, Professor & Deputy Director, Institute of Crop Science, College of Agriculture & Biotechnology, Zhejiang University, China.
11. Sinan Ogun, Academic Member, ATINER & Head, RR Research & Development Ltd., Turkey.

The **organizing committee** of the conference included the following:

1. Fani Balaska, Researcher, ATINER.
2. Olga Gkounta, Researcher, ATINER.
3. Eirini Lentzou, Administrative Assistant, ATINER.
4. Konstantinos Manolidis, Administrator, ATINER.
5. Kostas Spyropoulos, Administrator, ATINER.

FINAL CONFERENCE PROGRAM
11th Annual International Symposium on Agricultural Research,
16-19 July 2018, Athens, Greece

PROGRAM

Conference Venue: Titania Hotel, 52 Panepistimiou Street, 10678 Athens, Greece

Monday 16 July 2018

08:00-09:00 Registration and Refreshments

09:00-09:30 [Welcome and Opening Address](#) (Room A - 10th Floor)

Gregory T. Papanikos, President, ATINER.

09:30-11:30 Session I (Room B - 10th Floor): Plant Physiology and Genetic Analyses

Chair: Cezary Sempruch, Associate Professor, Siedlce University of Natural Sciences and Humanities, Poland.

1. [Margarita Gisela Pena-Ortega](#), Professor and Researcher, Chapingo Autonomous University, Mexico, Esteban Solórzano-Vega, Professor and Researcher, Chapingo Autonomous University, Mexico, Juan Martinez Solis, Assistant Professor, Chapingo Autonomous University, Mexico & Juan Eduardo Coeto, Undergraduate Student, Chapingo Autonomous University, Mexico. Molecular Characterization of *Vicia faba* L. Minor and Equina Subspecies Lines through ISSR Markers.
2. Sholeh Ghollasimod, Associate Professor, University of Birjand, Iran. Comparative Mineral Elements Analysis and Nutritive Value Determination in Pistacia Atlantica Leaves.
3. [Juan Martinez Solis](#), Assistant Professor, Chapingo Autonomous University, Mexico, Leticia Faustino Martinez, Graduate Student, Universidad Tecnológica de la Huasteca Hidalguense, Mexico, Efrain Contreras Magaña, Assistant Professor, Chapingo Autonomous University, Mexico & Cuauhtemoc Hernandez Cuellar, Assistant Professor, Universidad Tecnológica de la Huasteca Hidalguense, México. Effect of Sulfuric Acid on Seed Germination of *Capsicum Annuum var. Glabriusculum*.
4. Makhosi Buthlezi, Researcher, Mangosuthu University of Technology, South Africa. Behavioural and Phylogenetic Relationships of the Groundnut Leaf Miner (*Approaerema* spp.) in South Africa, Mozambique, India and Australia.

11:30-13:30 Session II (Room B - 10th Floor): Plant Production and Technologies

Chair: Margarita Gisela Pena-Ortega, Professor and Researcher, Chapingo Autonomous University, Mexico.

1. [Cezary Sempruch](#), Associate Professor, Siedlce University of Natural Sciences and Humanities, Poland, Marta Chwedczuk, Siedlce University of Natural Sciences and Humanities, Poland, Leszczyński Bogumil, Professor, Siedlce University of Natural Sciences and Humanities, Poland, Czerniewicz Pawel, Siedlce University of Natural Sciences and Humanities, Poland, Becher Marcin, Associate Professor, Siedlce University of Natural Sciences and Humanities, Poland & Chrzanowski Grzegorz, Associate Professor, Siedlce University of Natural Sciences and Humanities, Poland. Biochemical Factors Affecting Bird Cherry-Oat Aphid Feeding Sites on Oat.
2. [Silvia Salustiano](#), Professor, Instituto Federal Goiano, Brazil, Natália Barbosa, Professor, University of Minho, Portugal & Tito Moreira, Professor, Catholic University of Brasilia, Brazil. Do Subsidies Drive Technical Efficiency? The Case of Portuguese Firms in the Agribusiness Sector.

3. Tomas de Jesus Guzman Hernandez, Professor and Researcher, Costa Rica Institute of Technology, Costa Rica, Freddy Araya Rodriguez, Professor and Researcher, Costa Rica Institute of Technology, Costa Rica, Guillermo Castro Badilla, Instructor, Costa Rica Institute of Technology, Costa Rica, Javier Obando Ulloa, Researcher, Costa Rica Institute of Technology, Costa Rica & Cristian Moreira Segura, Associate Professor, Costa Rica Institute of Technology, Costa Rica. Application of Passive and Active Solar Thermal Technologies as an Alternative to Traditional Drying Systems in Agricultural Production Units in the Northern Region of Costa Rica.
4. Omer Baris Ozluoymak, Electrical and Electronics Engineer, Çukurova University, Turkey, Ali Bolat, Agricultural Engineer, Eastern Mediterranean Agricultural Research Institute, Turkey, Ali Bayat, Head, Department of Agricultural Machinery and Technologies Engineering, Çukurova University, Turkey & Emin Guzel, Professor, Çukurova University, Turkey. Determination of Spraying Deposit Distributions of a Vision-based Real-Time Weed Detection and Control System.

13:30-14:30 Lunch

14:30-16:30 Session III (Room B - 10th Floor): Water Quality and Pollution

Chair: Saif Uddin, Senior Research Scientist, Kuwait Institute for Scientific Research, Kuwait.

1. Jose Juan Carbajal Hernandez, Research Professor, Centre for Computer Research – National Polytechnic Institute, Mexico, José Luis Vázquez Burgos, Student, Centre for Computer Research – National Polytechnic Institute, Mexico & Luis Pastor Sánchez-Fernández, Research Professor, Centre for Computer Research – National Polytechnic Institute, Mexico. Environmental Assessment for Chirostoma Estor Estor Water Management in Intensive Culture Using a Fuzzy Analytical Hierarchy Process.
2. Angelantonio Calabrese, Researcher, National Research Council, Water Research Institute (IRSA), Italy, Vito Felice Uricchio, Technologist, National Research Council, Water Research Institute (IRSA), Italy, Massimo Blonda, Researcher, National Research Council, Water Research Institute (IRSA), Italy & Claudia Campanale, PhD Student, National Research Council, Water Research Institute (IRSA), Italy. Use of Molecular Techniques for Identification the Kind of Nitrate Contamination in Groundwater.
3. Elmyre Clervil, PhD Student, Université Quisqueya, Haiti, Evens Emmanuel, Professor, Université Quisqueya, Haiti & Yves Pérrodin, Professor, Université de Lyon, France. Pharmaceuticals Compounds (PCs) in Urban Wastewater (WW) from Developing Countries: Environmental Concentrations and Toxicity.
4. Lise Charuaud, PhD Student, University of Rennes 1, France, Emilie Jardé, CNRS Research Scientist, University of Rennes 1, France, Anne Jaffrézic, Assistant Professor, UMR SAS, France, Thierry Panaget, Engineer in Charge of Regional Water Policy, Agence Régionale de Santé de Bretagne, France, Maud Billon, Engineer, Regional Environment Directorate Housing Renovation of Brittany, France & Barbara Le Bot, Professor, University of Rennes 1, France. Veterinary Pharmaceutical Residues in Water Resources and Tap Water in an Intensive Husbandry Area in France.
5. Jacobus Johannes Grobler, MSc Student, University of South Africa, South Africa & Kevin Mearns, Professor, University of South Africa, South Africa. Water Quality Management in the Wildlife Lodge Industry: A Multiple Case Study in South Africa, Namibia and Botswana.

16:30-18:00 Session IV (Room B - 10th Floor): Soil Science

Chair: Nadhir Al-Ansari, Professor, Lulea University of Technology, Sweden.

1. Francisco Fambrini, Professor, FESB - Fundação Municipal de Ensino Superior de Bragança Paulista, Brazil & Virginia de Souza Bueno, Professor, FESB - Fundação Municipal de Ensino Superior de Bragança Paulista, Brazil. Use of Pilon and Shannon Diversity Indexes in Description of Edaphic Fauna in Forests in South.
2. Haixia Wang, Doctor, Northeast Normal University, China. Study on the Contribution of Soil Fauna to Litters Decomposition in the Tundra of Changbai Mountains.

18:00-20:00 Session V (Room B - 10th Floor): ATINER's 2018 Series of Academic Dialogues A Symposium Discussion on *The Future of Teaching and Researching in a Global World*

Chair: Gregory T. Papanikos, President, ATINER.

1. Michael P. Malloy, Director, Business and Law Research Division, ATINER & Distinguished Professor & Scholar, University of the Pacific, USA. Experiential Learning in the Classroom.
2. Dawn Roberts-Semple, Assistant Professor, York College, CUNY. USA. Next Generation Air Quality Measurement Technologies.
3. Majed Abu-Zreig, Professor, International Platform for Dryland Research and Education (IPDRE), Japan. Jordan University of Science and Technology: Road to the Globe.
4. Juan Martinez Solis, Assistant Professor, Chapingo Autonomous University, Mexico. The Near Future of Agriculture Graduate Programs in Mexico.
5. Nadhir Al-Ansari, Professor, Lulea University of Technology, Sweden. Higher Education in Iraq.
6. Ronald Griffin, Professor, Florida A&M University, USA. Higher Education: Liberalism, Literature, and Law.

21:00-23:00 Greek Night and Dinner

Tuesday 17 July 2018

07:45-11:00 Session VI: An Educational Urban Walk in Modern and Ancient Athens

Chair: Gregory A. Katsas, Vice President of Academic Affairs, ATINER & Associate Professor, The American College of Greece-Deree College, Greece.

Group Discussion on Ancient and Modern Athens.
Visit to the Most Important Historical and Cultural Monuments of the City (be prepared to walk and talk as in the ancient peripatetic school of Aristotle)

11:15-13:00 Session VII (Room B - 10th Floor): Special Topics

Chair: Tomas de Jesus Guzman Hernandez, Professor and Researcher, Costa Rica Institute of Technology, Costa Rica.

1. Gustavo Bittencourt Machado, Adjunct Professor, Federal University of Bahia, Brazil. Brazilian Competitiveness and Food Security in the Animal Production Global Market.
2. Nadia Tirchi, Teacher Researcher, Université Djilali Bounaama Khemis Miliana, Algeria & Djeddar Miliani, Université Djilali Bounaama Khemis Miliana, Algeria. Effect of the Irrigation by the Pisciculture Water on the Populations of Earthworms and Nematodes in the Soil.
3. Lila Abidi, Teacher Researcher, Université Djilali Bounaama Khemis Miliana, Algeria, Sid Ahmed Snoussi, Teacher Researcher, University of Blida, Algeria & Maria Stela Bradea, Teacher Researcher, University of Blida, Algeria. Improvement of the Quality of the Tomato (*Solanum lycopersicum* L.) under the Influence of a Bio Fertilizer of Vegetable Origin.

13:00-14:00 Lunch

14:00-15:30 Session VIII (Room B - 10th Floor): Marine Biology and Aquaculture

Chair: Majed Abu Zreig, Professor, IPDRE, Tottori University, Japan.

1. Tomas Randak, Head of Laboratory, University of South Bohemia České Budějovice, Czech Republic, Katerina Grabicova, Academic, University of South Bohemia České Budějovice, Czech Republic, Roman Grabic, Academic University of South Bohemia České Budějovice, Czech Republic, Pavel Horky, Researcher, Czech University of Life Sciences Prague, Czech Republic, Milos Buric, Researcher, University of South Bohemia České Budějovice, Czech Republic, Martin Blaha, Academic, University of South Bohemia České Budějovice, Czech Republic, Pavel Kozak, Dean of Faculty, University of South Bohemia České Budějovice, Czech Republic & Ondrej Slavik, Academic, Czech University of Life Sciences Prague, Czech Republic. Psychoactive Compounds in the Aquatic Environment and their Effects on Aquatic Organisms.
2. Dayhoum Al Bassel, Professor, Fayoum University, Egypt. On *Anahemiurus Microcercus* Manter, 1947 and *Podocotyloides Petalophallus* Yamaguti 1934 Trematodes from *Epinephelus Guaza* Marine Fish from Libya.
3. Pavel Horky, Researcher, Czech University of Life Sciences Prague, Czech Republic, Ondrej Slavik, Czech University of Life Sciences Prague, Czech Republic, Tomas Randak, University of South Bohemia in Ceske Budejovice, Czech Republic, Roman Grabic, University of South Bohemia in Ceske Budejovice, Czech Republic, Karel Douda, Czech University of Life Sciences Prague, Czech Republic & Katerina Grabicova, University of South Bohemia in Ceske Budejovice, Czech Republic. Citalopram at Environmentally Relevant Concentrations Alter Fish Behaviour.

15:30-17:00 Session IX (Room B - 10th Floor): Climate Change & Other Issues

Chair: Dawn Roberts-Semple, Assistant Professor, York College, The City University of New York, USA.

1. Majed Abu Zreig, Professor, IPDRE, Tottori University, Japan. Climate Change Mitigation Using on-Farm Rainfall Harvesting in Jordan.
2. Ahmad Al-Mutairi, Research Associate, Kuwait Institute for Scientific Research, Kuwait, Saif Uddin, Senior Research Scientist, Kuwait Institute for Scientific Research, Kuwait & Abdulnabi Al-Ghadban, Principal Research Scientist, Kuwait Institute for Scientific Research, Kuwait. Ocean Acidification and Ocean Warming in Arabian Gulf.
3. Mohammad Al-Murad, Associate Research Scientist, Kuwait Institute for Scientific Research, Kuwait. Contamination of Shallow Aquifer's from Oil Field Operation: An Example from Wafra Area, South Kuwait.
4. Montaha Behbehani, Associate Research Scientist, Kuwait Institute for Scientific Research, Kuwait, Saif Uddin, Senior Research Scientist, Kuwait Institute for Scientific Research, Kuwait & Abdulnabi Al-Ghadban, Principal Research Scientist, Kuwait Institute for Scientific Research, Kuwait. ²¹⁰Po Transfer across the Marine Food Chain: An Example from Arabian Gulf.
5. Ilkay Yavas, Lecturer, Adnan Menderes University, Turkey. Effects of Silicon Application on Growth and Some Physiological Characteristics of Salt-Stressed Faba Bean.

20:00- 21:30 Dinner

Wednesday 18 July 2018
Mycenae and Island of Poros Visit
Educational Island Tour

Thursday 19 July 2018
Delphi Visit

Friday 20 July 2018
Ancient Corinth and Cape Sounion

Lila Abidi

Teacher/Researcher, Université Djilali Bounaama Khemis Miliana, Algeria

Sid Ahmed Snoussi

Teacher/Researcher, University of Blida, Algeria

&

Maria Stela Bradea

Teacher/Researcher, University of Blida, Algeria

Improvement of the Quality of the Tomato (*Solanum lycopersicum* L.) under the Influence of a Bio Fertilizer of Vegetable Origin

Seaweeds bio fertilizers constitute an excellent source of natural fertilizers used in farming. They act on the growth, the development and thus on the quality of the fruit which is an essential criterion for the consumer. The main purpose of the present work is to estimate and to compare the effect of various treatments with a bio fertilizer of vegetable origin, on the organoleptic and technological parameters of the quality of two varieties of tomatoes. The truck-farming tomato (Saint-Pierre) and the industrial tomato (Rio-Grande). For that, roots applications of the bio fertilizer were tested in four doses (25%, 50%, 75%, and 100%) and compared with a control at various periods of development of both varieties of tomatoes. It was noticed that the effect treatment exercises a very remarkable action on the following parameters: Brix, acidity, ratio Brix/acidity and ascorbic acid. The best technological qualities were obtained in the doses of 50%, 75% and 100% for both varieties of tomatoes.

Majed Abu Zreig
Professor, IPDRE, Tottori University, Japan

Climate Change Mitigation Using on-Farm Rainfall Harvesting in Jordan

Rainfall harvesting in arid and semi-arid regions increases soil water availability for plant during the growing season, thus increasing crop production. Jordan is facing the most serious water shortages in the Middle East. It is an arid country located east of the Jordan River with a land area of about 90,000km. Contour stone terraces have been widely used by Jordanian farmers in the hilly areas for soil and water conservation purposes. Traditionally, farm lands were subjected to systematic deep plowing to break up the surface rocks and then remove stones for installation of stone terraces.

A new land reclamation method for water harvesting has been experimented in the hilly parts of Jordan that improves the effectiveness of traditional stone terraces. The method consists of designing semi-circular stone bunds randomly based on the micro topography of land. Semicircular bunds were located at areas having deep soil pockets and adequate runoff rocky area and do not require deep plowing with minimum land disturbance. This method minimizes soil erosion and maximizes rainfall harvesting due to the high runoff efficiency from runoff rocky areas and promotes biodiversity. The cost of this method is about 85% less than that of the traditional stone terraces used by Jordanian farmers. Field evaluations showed that semi-circular bunds increased soil moisture in the cropping areas by about 7% compared to control areas. The soil depth in some of the cropping terraced areas increased by about 3 cm at the end of the 2003/2004 rainy season.

Dayhoum Al Bassel
Professor, Fayoum University, Egypt

**On *Anahemiurus Microcercus* Manter, 1947 and
Podocotyloides Petalophallus Yamaguti 1934 Trematodes
from *Epinephelus Guaza* Marine Fish from Libya**

50 specimens of *Epinephelus guaza* marine fish were collected from Missurata fish market in Libya. 2 different species of trematodes isolated from the intestine of fish were briefly redescribed. *Anahemiurus microcercus* Manter, 1947 and *Podocotyloides petalophallus* Yamaguti, 1934. The parasites were identified to the species level. The highest incidence of infection (94%) was recorded by *Podocotyloides petalophallus* Yamaguti, 1934 and the lowest (20%) by *Anahemiurus microcercus* Manter, 1947. The updated description agreed fully with the original description, but there are certain minor differences in the body shape and some measurements. The present work extends our knowledge about the prevalence of trematode parasites in commercial fish *Epinephelus guaza* in the Mediterranean Sea in Libya. The present work is reported for the first time in Libya.

Mohammad Al-Murad

Associate Research Scientist, Kuwait Institute for Scientific Research,
Kuwait

**Contamination of Shallow Aquifer's from Oil Field Operation:
An Example from Wafra Area, South Kuwait**

The oil abstraction operations result in the production of excess water which is regarded as produced water. The produced water is often discharged into evaporative ponds (EP) and affects the groundwater quality in shallow aquifers. In this study, a case study of South Kuwait is presented, where the groundwater is important since it supports an agricultural area that is considered strategic to meet the local demand of vegetables if imports are curbed due to any reason. This agriculture area is called the Wafra agriculture area, and the adjacent oil field is Wafra oil field. There was a massive EP that spanned over 3.5 km² in size and was used to discharge the produced water from Wafra Oil field since the early seventies of the last century.

This study was conducted to assess the impact of produced water on the underground aquifers. Twenty multi-channel wells were constructed, and groundwater samples were collected from these wells and analyzed for total dissolved solids (TDS), major anions and cations, Benzene, Ethylbenzene, Toluene and Xylenes (BETX), and polycyclic aromatic hydrocarbons (PAHs). The results of the analyses show that produced water was saline and had polluted the groundwater in the Wafra area. The salinity of groundwater in the western side of Wafra (adjacent to EP) was 30,000 mg L⁻¹ in the Lower Kuwait Group aquifer, while in the nonimpacted area the salinity is about 6,000 mg L⁻¹.

Due to concerns raised by the environmental authority, the evaporative pond was closed, and as a result, the TDS values started dropping from the peak values of 56,000 mg L⁻¹ in 2010 to 30,000 mg L⁻¹ measured in 2016, ensuring the sustainability of the Wafra agriculture area that helps partially meet local vegetable demand. The produced water should be injected back into deeper nonoil producing formation since surface disposal was also leading to soil salinization. As a remediation solution, the treated wastewater should be used for irrigation in Wafra agriculture area this could be a better quality water than the shallow brackish water in Kuwait Group Aquifer.

Ahmad Al-Mutairi

Research Associate, Kuwait Institute for Scientific Research, Kuwait

Saif Uddin

Senior Research Scientist, Kuwait Institute for Scientific Research, Kuwait

&

Abdulnabi Al-Ghadban

Principal Research Scientist, Kuwait Institute for Scientific Research,
Kuwait

Ocean Acidification and Ocean Warming in Arabian Gulf

The increasing atmospheric levels of carbon dioxide (CO₂) and other greenhouse gases have changed the global climate. The most pronounced effects of climate change on the marine environment is the ocean acidification (OA) and ocean warming (OW). The plants by the process of photosynthesis remove CO₂ from the atmosphere both in the terrestrial and marine environment. The most likely removal pathway for CO₂ in arid regions around the world is by aquatic sequestration; the situation is same in Kuwait. Arabian Gulf acts as a major sink in the Gulf, Biweekly measurement of pH and temperature in surface waters of the northern Arabian Gulf over a decade suggest that the Arabian Gulf waters are becoming increasingly acidic and warm with time. The effects of these physico-chemical changes are seen as coral bleaching and frequent fish kill episodes. Supporting evidence for increased CO₂ sequestration comes from increased marine primary productivity over the past decade. There is a need to tackle the issue of OA-OW on an urgent basis to ensure the long-term sustainability of marine ecosystem functioning. The pace of change in the Gulf waters is much higher than most oceanic waters suggesting that the biogeochemical functioning and osmoregulation can be affected in the much shorter span of time.

Montaha Behbehani

Associate Research Scientist, Kuwait Institute for Scientific Research,
Kuwait

Saif Uddin

Senior Research Scientist, Kuwait Institute for Scientific Research,
Kuwait

&

Abdulnabi Al-Ghadban

Principal Research Scientist, Kuwait Institute for Scientific Research,
Kuwait

**²¹⁰Po Transfer across the Marine Food Chain:
An Example from Arabian Gulf**

The tendency of ²¹⁰Po to concentrate in body tissue poses a serious concern of radiological safety. This study compiles available information and presents recent ²¹⁰Po data for the marine food web in the northern Gulf waters. Since ²¹⁰Po is concentrated in marine biota, a large number of samples of various marine organisms covering several trophic levels, from microalgae to sharks, were analyzed. ²¹⁰Po was found to be highly concentrated in several marine species with the highest ²¹⁰Po concentrations found in yellowfin tuna, i.e. 37.3-44.9, 451-548, and 1511-1693 Bq kg⁻¹ wwt in muscle, digestive system and liver, respectively. In most dissected fish samples, ²¹⁰Po showed increasing concentrations in the following order: edible tissue, gills, digestive system, liver and fecal matter. Fish feces had ²¹⁰Po concentrations several orders of magnitude higher than that in seawater, fish muscle, and the fishes' ingested food. The high ²¹⁰Po concentration in fish fecal matter suggests that the bulk of ²¹⁰Po content in fish is eventually excreted back into the environment as fecal pellets. In most fish high concentrations were noted in liver, with the highest ²¹⁰Po concentration recorded in yellowfin tuna liver. Moreover, ²¹⁰Po concentration in the soft tissue of tunicate and bryozoan samples were 872-1012 and 402-527 Bq kg⁻¹ wwt, respectively, far higher than that in fish muscle (0.04 - 44.9 Bq kg⁻¹ wwt). It was observed that the maximum ²¹⁰Po concentration in edible fish tissue among the fish in trophic level 2 was an order of magnitude lower than those in trophic level 3 and two orders of magnitude lower compared to fish in trophic level 4. The highest concentrations in the muscle tissue were observed in the following order: tunicate>bryozoan>mollusc>crustacean>algae>fish. Among all the biota analyzed, the highest overall concentration of ²¹⁰Po was noted in yellowfin tuna (*Thunnus albacores*) indicating a potential biomagnification of ²¹⁰Po in this particular top predator species.

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Brazilian Competitiveness and Food Security in the Animal Production Global Market

In the world, Brazil is an agricultural potency and a great producer in the animal global market. The country is the first exporter of chicken meat and other its industrialized foods; is the second one in the bovine meat and its industrialized foods and the biggest livestock in the world. It is the fourth exporter of swine meat and has enormous potentialities to extend its fish production from aquaculture production to feed its population and to export. Brazil had become a big player in the commodity markets. The classical and historical modernization process is accepted in Brazilian literature, with agricultural credits and agricultural research since the institution of the Empresa Brasileira de Pesquisa Agropecuária (Agricultural Research Brazilian Company), in 1972, as a public enterprise that has grown quickly, becoming the main agricultural research organization in the tropical zone. The Embrapa has developed various technologies for different production systems in the Brazilian diversity of ecosystems and biomes, including, equatorial and tropical forests (Amazon Forest e Mata Atlântica), caatinga (steppe), cerrados (savane), Pantanal Matogrossense and Pampa Gaúcho, fields for cattle breeding systems. The country became an important producer of hone, propolis to export.

The agrarian structure continues to be concentrated so this modernization is known for some researcher as conservator modernization that did not modified the land concentration. This modernization was possible by the green revolution with all technological packages, maintaining the best lands for the big producers. Several agricultural innovations from Embrapa has become possible the soybean producer in tropical regions with acid soils, for example. Brazil is the one of the main soybean producer in the world.

Recently, the world agriculture is changing based on biotechnologies, nanotechnologies, information technologies, precision agriculture, with the augmentation of patents and geographical indications.

Brazilian agriculture is the result of cheap natural resources exploration with successive technological and organizational innovations in the agricultural production systems.

The problem is to combine the animal production expansion and the environmental restrictions, mainly in the Amazon Forest and Cerrados. The productivity augmentation is the target of the researches aiming to avoid the space deforestation. This target consists to combine the environmental and economic perspectives, typical of the double green revolution. Embrapa develops researches based on green revolution historically, biotechnologies

(tendencies), agro-ecologies (tendencies) and double green revolution in less scale in the whole of researches. The private enterprises increased its participation in agricultural research in the world and particularly in Brazil, offering biotechnologies and machines for the farmers, so the public participation in these markets had decreased.

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**Behavioural and Phylogenetic Relationships of the
Groundnut Leaf Miner (*Aproaerema* spp.) in South Africa,
Mozambique, India and Australia**

The groundnut leaf miner has increasingly become a major pest of groundnut and soya bean on the African continent since 2000. The origin of the pest in Africa is uncertain. Early reports in South Africa assumed it to be an invasion of *Aproaerema modicella* (Deventer) from the Asian continent, but subsequent mitochondrial DNA COI gene (mtDNA COI) analysis matched it to *A. simplexella* (Walker) from Australia. Prior to this, reports in the 1950s recorded the pest in Africa under the name *Stomopteryx subsecivella* (Zeller 1852). As a result of these apparent anomalies, we examined the genetic relatedness of the above species from Africa, India and Australia. Mitochondrial DNA COI analyses were performed on 44 specimens collected from South Africa, four from Mozambique, and three each from single locations in India and Australia. In the BOLD gene bank, 70% of the specimens analyzed matched the *A. simplexella* sequences from Australia (99%-100%), including all three specimens from both India and Australia, and two from Mozambique. The match for the remaining specimens was 98-99%. Two specimens, later linked with parasitoid sequences, did not match with any of the sequences in the BOLD gene bank. In the NCBI gene bank, 81% of the sequences matched 99-100%, and a further 15% matched 92-98% with *A. simplexella* sequences. Furthermore, it was found that *A. simplexella* responded to the species specific lure developed from the sex pheromone of *A. modicella*. MtDNA COI analyses and the similarities of the behavioural responses originally noted between the species revealed that the groundnut leaf miner in Africa, *A. modicella* in India and *A. simplexella* in Australia are very closely related, they presumably constitute a single species; therefore, it is essential to revise the taxonomy of these species.

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Use of Molecular Techniques for Identification the Kind of Nitrate Contamination in Groundwater

The ecosystems of the underground waters are characterized by the presence of limiting environmental factors (absence of light, limited availability of nourishing, low temperatures, etc.) that characterized the presence of peculiar microbial community well fit for conditions of "extreme" life. The microbial communities in the subsoil mainly consist of bacterias and Archaea, but also of protozoa, fungi and nematodes, and these microbial communities are active and remarkable for the trials bio-geochemical. The present microbial communities in the groudwater are mainly constituted by well adapted eterotrophy to the underground environment (Ghiorse & Wilson, 1988; Madsen & Ghiorse 1993) and they are characterized by the state of hydrological chemistry and geologic heterogeneity of the stratum (Madsen & Ghiorse 1993). Presence of different factors biotic and abiotic can check in direct or indirect way the microbial difference in the ecosystems.

Stability of the bacterial communities is interrupted if there is a contamination of the groudwater. Such change can determine three different dynamics of transformation of the microbial communities present: increase of already determined present bacterial (Cho & Kim, 2000; Baker et al., 2001; Ro`Ling et al., 2001; Franzosa et al., 2004b; Johnson et al., 2004); developed of new alien bacterial (Cho & Kim 2000); disappearance of some bacterial. The microbial communities of the groundwater develop according to the typology of contamination (point or diffused) and the category of contaminants (C. Griebler and T. Lueders, 2008)

The "standard" procedures of microbial community analysis, or "classical methods", provide for the identification of microorganisms from pure culture isolation, followed by tests that analyze some morpho-physiological and

biochemical characteristics. These analyzes are not sufficient to identify most species of microorganisms and are limited to cultivable species which represent a very small percentage of all species present in nature. Over the last few decades, research into environmental microbiology has shown that microbial communities play a functional role in controlling ecosystems, which cannot be attributed to individual species. For these reasons, new methodologies have been developed that have allowed to analyze the structure of microbial communities independently of the isolation phase, in order to characterize them as a whole. These techniques, which are based on the biomolecule produced by microorganisms study, they are joining and partly supplanting classical methods (Head et al., 1998).

Molecular diagnosis is generally more sensitive and / or more specific to traditional culture methods and requires shorter time for identification. The gene sequencing of amplified fragments also allows to identify the present bacterial species and to conduct molecular epidemiology studies and phylogenetic analyzes. With specific reference to the definition of the source of nitrate contamination, the identification of the microbiological species present in the groundwater allows to identify the source of contamination. Several studies have shown that certain sources of contamination are related to well-defined bacterial species, in particular anthropogenic contamination can be identified by identification of BIFIDOBACTERIUM (Barrett et al., 2002) and by ENTEROCOCCUS FAECALIS AND FACIUM (Boccia et al., 2002; Eigner et al., 2008), or contamination due to incorrect spillage or manure accumulation can be detected by identifying BACTEROIDES-PREVOTELLA, ENTEROCOCCUS AVIUM, ENTEROCOCCUS CASSELI FLAVUS, ENTEROCOCCUS DURANS, ENTEROCOCCUS GALLINARUM, ENTEROCOCCUS HIRAE, ENTEROCOCCUS SACCHAROLYTICUS (Savichtcheva et al., 2006).

For this purpose, a pilot action has been carried out to identify potentially contaminating sources of nitrate in the ground on the whole Apulian territory, distinguishing the origin of nitrate from mineral fertilizers, livestock effluents, urban wastewater, sewage sludge, etc. Consequently, the priority objective of this action was to identify with greater certainty the causes of nitrate contamination by distinguishing the agricultural, livestock or civil source. With specific reference to the definition of the source of nitrate contamination, the identification of the species present in the environmental matrix (water) of its nucleotide sequences allows to identify the certain source of contamination. Through the recognition bacterial species with their genetic kit, it is possible to determine whether contamination comes from a strictly anthropogenic source (such as untreated septic tanks or sewage sludges) or it comes from an inadequate spread of animal flywheels.

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**Environmental Assessment for Chirostoma Estor Estor Water
Management in Intensive Culture Using a Fuzzy Analytical
Hierarchy Process**

Chirostoma estor estor is an endemic and important fish that inhabits the Patzcuaro Lake region, located in Michoacan, Mexico. Overconsumption and ecological problems have endangered this important specie. Governmental organizations have focused on protecting this type of fish, creating new aquaculture technologies based on deep studies about its environment requirements and how it can be cultured. This work, proposes a computational model for water quality parametre assessment in intensive cultured ponds in order to preserve this kind of fish. Dissolved oxygen, pH, total ammonia, non-ionized ammonia, temperature and total dissolved solids were measured because they represent the most critical set of parameters. According to their importance in water quality and negative situations, importance weights have been defined using an analytical hierarchy process. As a result, a water quality indicator provides an evaluation concerning about the good or bad water quality condition generated by critical parameter interactions in intensive ponds. Chirostoma farms were assessed in order to improve water management processes in the growth, reproduction and survival of this important fish, preventing its endangered situation and providing an alternative for current fisheries activities.

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Veterinary Pharmaceutical Residues in Water Resources and Tap Water in an Intensive Husbandry Area in France

Background and objectives: The continuous use of veterinary pharmaceuticals may represent a diffuse and pseudo-persistent pollution in the environment. This is supported by the fact that veterinary pharmaceutical residues (VPRs) have been detected in natural waters at concentrations ranging from ng/L to µg/L, thanks to advances in analytical methods. Furthermore, there is a public health concern as VPRs may reach drinking water treatment plants, and consequently, the population could be chronically exposed to these compounds.

Brittany is an intensive husbandry area in France. Moreover, 75% of tap water in this region is produced from surface waters, which are very vulnerable to contamination. VPRs can be released into the environment either directly with urine and feces of animals in pastures or during aquaculture activities, or indirectly during the spreading of contaminated manure and slurry.

The project aims at realizing an overview of the contamination (types molecules and levels of concentrations) of water resources and tap water in an area subjected to a high subjected to a strong agricultural pressure.

Selected sites and sampling strategy: 25 catchments (23 surface waters and 2 ground waters) used for tap water production in Brittany, located in intensive husbandry watersheds (ARS / DREAL 2013-2015). Sampling strategy's purpose is to reflect variations in veterinary practices, manure/slurry spreading times and water regime (low water or high water) (Jaffrézic et al., 2017). Four sampling campaigns (March 2017, May 2017, September 2017 and January 2018) were carried out on the sites of interest, on water resources and corresponding tap waters (200 samples).

Methods: 35 VPRs ranked according to 4 criteria: veterinary practices in Brittany (Soulier et al., 2015, ARS/DREAL 2013-2015), pharmacokinetics, fate in the environment and analytic feasibility (Lise Charuaud Ph.D., 2016-2018). VPRs are analyzed by solid phase extraction, followed by a liquid chromatography separation coupled with tandem mass spectrometry detection.

Results: VPRs were quantified in water resources (23 surface waters and 2 groundwater) in 25% (January 2018) to 47% (September 2017) of the samples according to the campaigns. The diversity of quantified molecules was greater during the low water levels period campaign in September (10 different compounds). The quantified concentrations ranged from 5 ng.L⁻¹ (quantification limit) to 2946 µg.L⁻¹, for the antibiotic sulfadiazine in September.

In the corresponding tap waters, VPRs were also quantified in 4% (March 2017) up to 65% (May 2017) of the samples according to the campaigns. Positive samples percentage and diversity of quantified molecules were greater during manure/slurry spreading period in May. Concentrations in tap waters ranged from 5 ng.L⁻¹ to 211 ng.L⁻¹, for the florfenicol antibiotic in September.

Conclusion: VPRs have been quantified both in water resources and tap water in Brittany. Thus, the population may be exposed chronically via tap water to those contaminants. To our knowledge, this study in the most complete dataset of contamination by VPRs in France (200 samples), over a long period (about 1 year) and at the scale of an entire region.

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Pharmaceuticals Compounds (PCs) in Urban Wastewater (WW) from Developing Countries: Environmental Concentrations and Toxicity

Pharmaceuticals and personal care products (PPCPs) are emerging environmental contaminants, whose potential risk for the ecological environment has caused wide attention in recent years. Not only the multiple activities that take place in health centers- hospitals (surgery, drug treatments, radiology, cleaning of premises and linen, chemical and biological analysis laboratories, disinfectants, detergents, drug residues, etc.), but also the modern animal production practices are increasingly large sources of pollution for water resources. In fact, many of these contaminants are found in hospital effluents, in urban effluents and ultimately in water resources. The consumption per person and the occurrence of PCs in waste water in developed countries (USA, China, India, France, UK, and Germany) have been largely identified, these study present an overview. Compare to that the human consumption and the occurrence of PCs in waste water in developing countries like Haiti is very limited, probably due to the relatively limited available data and the informal market of PCs and non-controlled operation of health centers. This study summarized environmental concentrations of PCs and their toxicity with a focus on developing countries, especially in Haiti¹. Among the PPCPs (antibiotics, analgesics, steroids, antidepressants, antipyretics, stimulants, antimicrobials, disinfectants, fragrances, cosmetics, etc.,) this study has focused on the human consumption and the occurrence of two pharmaceuticals compounds (PCs), antibiotics and anti-inflammatory in WW. This article helps understand the general situation and the potential risk of PCs in developing countries especially in Haiti.

¹ This data are being processed.

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Use of Pielou and Shannon Diversity Indexes in Description of Edaphic Fauna in Forests in South

The recognition and identification of the fauna and flora of an area, in particular a conservation unit, is of fundamental importance to protect and conserve local biodiversity. Agroforestry Systems (AFSs) are forms of use of land or management, in which tree species (fruit and timber) are combined with agricultural crops. When compared to conventional agriculture, AFSs such as advanced systems for supplying green fertilizers, controlling weeds and mainly, recovering and maintaining soil fertility, since it maintains a great variety in the fauna, simultaneously or in temporal sequence promote the economic and ecological benefits. A diversity index is a mathematical measure of species diversity in a community.

Measuring diversity is important in understanding the structure of the community. Diversity indexes are important because they provide more information about a community than just species richness. Diversity indexes also consider the relative abundance of different species and provide information on the rarity of the species, as the number of different species present as well. The biodiversity of edaphic fauna can be measured using statistical parameters derived from the idea of Entropy. In the present work, the following parameters were used: the Pielou index, Pielou Equability, Pielou Equitability and Shannon-Wiener index. Five areas were selected: one for AFS, one Pasture Area, and one Preserved Forest area located at Private Reserve of Natural Heritage (RPPN) Serrinha Farmer (Serrinha Neighborhood - Bragança Paulista city, São Paulo State, Brazil). The fourth place was an area formerly used as a vegetable garden in a basic education school in the same city, and the fifth was an area for eucalyptus (Eucalyptus) in the rural zone of city of Pedra Bela, São Paulo. The area of the greatest biodiversity was the Eucalyptus Plantation, followed by the area of Preserved Forest and Agroforestry. The Pasture area was in fourth place, presenting the largest number of individuals, however, divided into a few groups. The area of lower biodiversity was the area represented by the vegetable garden.

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**The Effect of Some Treatments on Breaking Seed Dormancy
and Seed Germination in *Vaccinium Arctostaphylos* L.
(Cranberry)**

In this study, the nutritional factors and mineral elements contents in *Pistacia atlantica* during four months were determined, leaf oil was extracted and fatty acids in the oil were identified by GC. The results showed the moisture and total ash percentages were 0.11% and 6.73 %, respectively. The crude fat and ADF contents of leaf which collected on October 28th were found to be 5% and 24.38%, respectively and were the highest in comparison to the other months. The crude fiber and NDF contents of leaf collected on May 5th and the protein and carbohydrate contents in leaf collected on June 5th were high. Also the mineral elements values such as Ca, Mg, K, P, Na, Zn, Fe and Mn in *P. atlantica* leaves were determined and it was noted that the highest concentration of minerals was belong to K in the leaf collected on May 22th. *P. atlantica* leaf is a good source of nutritive and mineral elements and the carbohydrate content makes leaves as a rich source of energy for the livestock. The ratio of unsaturated fatty acids was higher than the saturated ones. Linolenic and Palmitic acids are major unsaturated and saturated fatty acids in plant leaf.

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Water Quality Management in the Wildlife Lodge Industry: A Multiple Case Study in South Africa, Namibia and Botswana

Water is one of the most important substances on earth as all living organisms require it to survive. It is a vital component for human survival in the form of direct consumption as well as food production. Water is equally important for the tourism industry as water is utilised throughout the tourism value chain for the provision of services to guests. Many tourism lodges in the wildlife lodge industry in South Africa, Namibia and Botswana are in remote areas where little to no infrastructure exists. These lodges are dependent on natural water sources such as rivers, dams and boreholes to supply their water demands. Another significant aspect of the lodges is that staff have to reside on the property due to the lack of nearby housing, roads and public transport. One of the challenges for the lodges is that residing staff have to use the water for domestic purposes and therefore managers have to ensure that the water quality is of such standard that it does not pose health risks for staff and guests. Water quality management in the wildlife lodge industry is one of the most important, if not the most important aspect of the industry. The authors obtained secondary data in the form of water quality analysis done at the lodges across these three countries. The study investigated whether lodges did water quality analysis at source, tap and wastewater discharge. Furthermore, the results of the water quality analysis were subjected to their adherence to the relevant water quality standards of each country. These results provided important information regarding the comprehensiveness of the water quality analysis. The frequency of water quality testing was also determined as this provides a measure of the adherence of lodges to the legal, concession or company requirements as stated in various standards and procedures. The authors concluded that the current systems can be improved to ensure that water quality is managed more sustainably in the wildlife industry. The biggest concern relates to wastewater discharge, where very little water quality at points of discharge is available, this has the potential to cause pollution and ecosystem degradation.

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Application of Passive and Active Solar Thermal Technologies as an Alternative to Traditional Drying Systems in Agricultural Production Units in the Northern Region of Costa Rica

In light of the changes that are taking place at the level of climatic variability and the increase of greenhouse gases produced at local, regional and international level, as a result of the different human activities, as well as the current dependence on fossil fuels; we must react replacing existing technologies with cleaner, safer and more innocuous ones.

There is an urgent need to find new alternatives to support with clean technologies the productive processes of small and medium agricultural and agroindustrial producers. With this, we aim to mitigate the effects of greenhouse gases to help reduce the impact of climate change from the local, as well as, improving production processes and their innocuousness in farms and small agroindustries.

The objective of this work was to design, build and evaluate the implementation of solar thermal systems for process of drying of grains, seeds, fruits and other agricultural and agroindustrial products. The designed systems were active and passive namely: thermosiphon and forced hybrid, with air and hot water, as well as with auxiliary system LP gas. Four prototypes with satisfactory results were built and evaluated at the production level, one passive and three forced.

They have been able to supply more than 50% of the energy required by the drying and dehydration process of several products. The results show the efficiency of the solar systems as an alternative and clean energy resource for the production units in Costa Rica, ready to be used efficiently reducing the carbon footprint at the local level. The drying curves of several products and the times achieved are shown. The economic analysis shows that the recovery of the investment is achieved in three years.

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Citalopram at Environmentally Relevant Concentrations Alter Fish Behaviour

Pharmaceuticals are considered as one of the most important threats for aquatic ecosystems worldwide. Their effects are related to the increasing amount of pharmaceuticals used and to the fact that they are subsequently discharged from the wastewater treatment plants in biologically active form to freshwaters. Especially consumption of antidepressants is increasing nowadays with their reported common occurrence in various systems of aquatic environment. The aim of the present study was to determine the effect of antidepressant citalopram in environmentally relevant concentration on the behaviour of chub *Squalius cephalus*. Laboratory experiments were conducted repeatedly during the six weeks long exposition as well as after the two weeks long depuration period. Comparison of exposed and control fish showed differences in various behavioural characteristics like movement activity, aggressiveness or boldness. Our results suggest that citalopram used for depression treatment in human medicine significantly alter fish behaviour in freshwaters with possible consequences for the whole ecosystems.

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Effect of Sulfuric Acid on Seed Germination of *Capsicum Annuum var. Glabriusculum*

Capsicum annuum var. glabriusculum locally known as a “chiltepín” is a wild type chili pepper with an important consumption and market in Mexico. Usually it is produced in non-commercial agricultural systems and therefore there are not improved varieties available for farmers. Because chiltepín’s seed present germination problems, several experiments have been done in order to improve the percentage of germination and emergence. The aim of this research was to determine the effect of four sulfuric acid concentrations (20, 40, 60 and 80 %) and four soaking periods (1, 2, 3, and 4 hours) on seed germination and seedling vigor. An experiment was carry out under a completely randomized experimental design with four repetitions of 100 seeds each, including seeds soaked in distilled water as control. Standard germination test on top of paper was conducted in a germination chamber Seedburo® for a period of 21 days, at a temperature of 25 °C and 90 % of relative humidity. The data were analysed through analysis of variance and Tukey's means test. Sulfuric acid affected the seed coats and, consequently the imbibition of seed and the germination process were improved; however, the sulfuric acid affected negatively the expression of seedling vigor. It is concluded that the use of sulfuric acid as a scarification method in *Capsicum annuum var. glabriusculum* is not recommended.

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Determination of Spraying Deposit Distributions of a Vision-based Real-Time Weed Detection and Control System

Recent advances in technologies such as sensors, computers and digital image processing systems make a major contribution to the agriculture. In recent years, machine vision systems are being used extensively for detecting and spraying the weeds in fields. By using digital image analysis techniques, the herbicide consumption and environmental pollution risks decrease to the minimum level.

In this study, a vision-based automation system, which was effective and convenient for spraying herbicides in the site-specific applications, was developed and tested for real-time detection, tracking and spraying of artificial weeds. The imaging system could capture images of artificial weed samples moving on a conveyor belt which could be controlled by an inverter drive system and 3 phase 4 pole electric motor at speeds of 0.5, 0.75, 1, 1.25, 1.5, 1.75, 2, 2.25, 2.5, 2.75 and 3 km/h, respectively. Both the webcam and solenoid-activated spray nozzle were mounted at a height of 50 cm above the conveyor belt consecutively. The LabVIEW programming language was used for image processing and software development. The green target objects were identified using the greenness method, which compares the red, green, and blue intensities while processing the image. When green pixels were greater than the red and blue pixels, the automation system decided that object as a plant. A data acquisition card and a relay card were used to activate the solenoid valve of spraying nozzle according to the green color pixels of artificial weed and its coordinates. Filter papers were used to detect the distribution difference of the spraying liquid on the artificial weeds for aforementioned test speeds. A spraying solution with 0.4 g/l tap water of Brilliant Sulpho Flavin (BSF) was sprayed to the targets. The amount of BSF deposition on filter papers was determined by a spectrofluorophotometer device.

Consequently, the automation system could detect and spray the artificial weeds successfully but spraying performance decreased with increasing in spraying speeds of the system.

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**Molecular Characterization of *Vicia faba* L. Minor and Equina
Subspecies Lines through ISSR Markers**

Fava bean is an important crop in Mexico, both for human and animal consumption. Small grain fava beans are an excellent source of protein for animal feeding and human consumption, while their seed size allows mechanical seed planting. However, despite their production value, little is known about genetic variability present within these groups. Then, in the present study, ten *Vicia faba* L., var. minor lines and five *Vicia faba* L., var. equina lines were characterized using 14 ISSR (Inter Simple Sequence Repeat) primers. A total of 117 amplified bands were obtained, 87 of them polymorphic (74 %). Primers UBC-807, UBC-818, UBC-890 and ISSR9 had a high degree of confidence to identify genetic variability of fava bean and were able to separate tested lines according to their botanical type. Dice similarity coefficient (1 - S) between pairs of lines was used to construct a dendrogram. An analysis of molecular variance (AMOVA) showed that molecular variation between botanical types was higher (55 %), however variation within types was also considerable, suggesting the convenience of keeping all tested materials for breeding purposes in this crop.

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Psychoactive Compounds in the Aquatic Environment and their Effects on Aquatic Organisms

Pharmaceuticals (PhACs) is one of the important groups of emerging environmental contaminants that are extensively and increasingly being used in human and veterinary medicine. Pharmaceuticals are excreted unchanged or as metabolites into sewage water. Not all of these compounds are removed during treatment processes and they enter to aquatic environment. Thus aquatic organisms are unintentionally exposed to a mixture of pharmaceutical residues in their natural habitats. While PhACs toxicity for mammals is studied in depth, reports on ecotoxicity and especially ecological effect of these highly biologically potent compounds are underrepresented. Some groups of PhACs such as antidepressants, psycholeptics, anxiolytics, analgesics, opioids, illicit drugs, etc. are designed to impact pathways in human brain. The presence of these psychoactive compounds in the aquatic ecosystem can result in behavioural changes of exposed animals associated with e.g. predator-prey relationships, social traits, reproduction, migration strategy. The aim of our project was to assess the occurrence of wide spectra of psychoactive compounds and some their metabolites in real sites of aquatic environment of the Czech Republic and to study effects of selected

compounds (sertraline, citalopram, tramadol, methamphetamine, venlafaxine, oxazepam) at environmentally relevant concentrations on behaviour of exposed aquatic organisms (fish, crayfish, dragonfly nymphs) in laboratory conditions. The groups of testing organism were exposed to single compound or mixture during defined times before the behaviour testing. The reactions of exposed organisms to different impulses were compared to non-exposed (control) animals. The records of camera systems and PIT tag systems monitored movement activity were used for the experiments evaluation. The results obtained in our studies have demonstrated that many target compounds is present not only in water but also in fish (e.g. sertraline, citalopram, mirtazapine). The sertraline accumulates in fish tissues especially in the brain. The results of laboratory studies suggest significant influence of environmentally relevant concentrations of the most of tested compounds (esp. methamphetamine, sertraline and citalopram) on selected behavioural characteristics of tested organisms. Further research is needed to provide information about potential ecological effects related to presence of psychoactive compounds in aquatic environment.

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Do Subsidies Drive Technical Efficiency? The Case of Portuguese Firms in the Agribusiness Sector

Successive reforms in the Common Agricultural Policy (CAP), enlargements of the European Union (EU) and pressures in the public budget increase the need for empirical studies to assess the role of subsidies in shaping firms' performance and, hence, to support policy-makers decisions and decision-making in the productive sector. This paper assesses whether subsidies affect the technical efficiency of 1,943 Portuguese agribusiness firms over 2007-2015. By applying stochastic frontier models and fixed-effects model, in order to calculate the average efficiency of these firms, the results show different effects of subsidies among agribusiness sectors. The stochastic frontier model revealed that the subsidies have a positive and significant impact on the technical efficiency of three sectors, animal production, manufacture of food and manufacture of paper. Further, with the exception of firms in the forestry and logging sector, Portuguese agribusiness firms had higher average efficiency levels when subsidised, which provides evidence that subsidies could be important and contribute positively to the technical efficiency of Portuguese firms.

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**Biochemical Factors Affecting Bird Cherry-Oat Aphid
Feeding Sites on Oat**

Aphid species are characterized by different preferences in relation to various organs of the host plants. Predominant on cereals cultivated in Central-Eastern Europe, *Sitobion avenae* F. occurs on generative organs, while *Rhopalosiphum padi* L. prefers vegetative parts of plants. However, the reasons for these differences are not clear. Therefore, an attempt was made to determine the chemical composition of various parts of oat (*Avena sativa* L.) plants settled by the bird cherry-oat aphid.

The obtained data showed that in the period from the first appearance (the third decade of May) until the population collapse (the first decade of July), the bird cherry-oat aphid mostly inhabited the fourth and the fifth leaf blade and least the youngest oat leaves and stem. Chemical analyzes proved that the most preferred parts of plants were characterized by the highest content of amino acids and other nitrogenous compounds. It was also found that the leaf blades, chosen by aphids, were characterized by a higher level of soluble sugars, phenolic compounds as well as carbon and hydrogen, and lower oxygen concentration than the other analysed plant parts.

The presented results indicate that selection of feeding places by *R. padi* on oat plants has a chemical bases. The share of individual groups of the studied biomolecules and makroelements in this process is diversified.

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Effect of the Irrigation by the Pisciculture Water on the Populations of Earthworms and Nematodes in the Soil

The abundance of the animal populations in soil can be influenced by irrigation as well as the source of the irrigation water. This survey consists to the assessment of the effect of the irrigation by the pisciculture water, used in the setting of the integration of the pisciculture to agriculture, on the densities of the populations of earthworms and nematodes in soil. The test has been achieved in full field: a plot of land has been divided in four under plots, two have been cultivated in peas and the two others have been cultivated by bean. For the two cultures, one of the under plots has been irrigated by the pisciculture water and the other has been irrigated by the water of boring (serving like a control). To estimate the abundance of the populations of the both groups of animals in both under plots for the two cultures, sampling has been done before the implementation of the culture (before the irrigation) and at the approach of the harvest (to see the effect of the irrigation). Methods of sampling and extraction appropriated were used for every group of animals. The results revealed that earthworms are positively affected by the pisciculture water since, their abundance and their biomass were significantly more elevated in the under plots irrigated by the pisciculture water in comparison to the under plots irrigated by the water of boring for the two cultures, Two groups of nematodes have been studied: cyst nematodes and the free living nematodes. The first were not significantly affected by this type of irrigation. However, for the second group, we noted a negative effect only in the plot of land cultivated in bean.

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Study on the Contribution of Soil Fauna to Litters Decomposition in the Tundra of Changbai Mountains

Material cycling and energy flowing are the basic process of ecosystem and maintain the stability and balance of ecosystem. Litter decomposition is the main way of material cycling and nutrient supply in natural ecosystems. As a typical representative of alpine tundra, Changbai Mountain's Tundra plays an important role in maintaining the stability and running of the tundra ecosystem. As the participant, the functions of soil fauna cannot be neglected in litter decomposition and nutrient release. At present, the study of the contribution of soil fauna to litters decomposition in Changbai Mountain tundra has not been reported yet. In order to reveal the contribution of soil fauna on vegetation litters decomposition in Changbai Mountain tundra, in this paper, the dominant species, *Vaccinium uliginosum* and *Dryas octopetala var. asiatica*, were selected as the research object. And from setting different mesh sizes of litterbags (2mm and 0.01mm) with the litters of *Vaccinium uliginosum* and *Dryas octopetala var. asiatica*, the functions of soil fauna to litters decomposition was studied. The test results showed that the decomposition rates of different species litter were different. In prophase, the decomposition rate of *Vaccinium uliginosum* litter was faster than *Dryas octopetala var. asiatica* litter. The decomposition rate in 2mm mesh size litterbags were significantly faster than in 0.01mm. Based on above, the meso-micro soil fauna played an important role in litter decomposition. In different interannuals and seasons, the cumulative decomposition quantity and the individual density and the group density of soil fauna in different litterbags were different. For the calculation results, we found that the contribution of meso-micro soil fauna to the decomposition of litter was obvious in the middle and later periods.

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Effects of Silicon Application on Growth and Some Physiological Characteristics of Salt-Stressed Fava Bean

Salinity is one of the major environmental stress all around the world which seriously threatens crop productivity because of the hinder plant growth. And, the problem of salinization is increasing steadily. Silicon is known to ameliorate the deleterious effects of abiotic stress on plant growth. This study investigated the application of silicon (Si) on the growth and physiology of faba bean under salinity conditions. After 30 days of growth faba bean seedlings were applied 4 different saline applications (50, 100, 150 mM NaCl). One week after of the salt application, foliar silicon application (2 mM) was carried out using sodium silicate. Salinity stress decreased faba bean growth by increasing the salinity levels. Besides, chlorophyll index values were reduced with increasing salt concentrations. During salinity stress, Si prevented oxidative damage by increasing the activities of antioxidant enzymes. Overall, the results illustrate that Si application induced resistance against salinity stress in faba bean by regulating the physiology and antioxidant metabolism.