The Third International American Moroccan Agricultural Sciences Conference

AMAS Conference III

December 13-16, 2016
Ouarazate City Convention Center
Ouarzazate, Morocco

Promoting Cooperation in Scientific Research and Education Between USA and Morocco
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# MEETING PROGRAM

**Wednesday, December 14, 2016**

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5:00-7:30 pm  Official Opening & Reception (Refreshments are Provided)
My Abdelmajid Kassem, Prof. & Dept. Chair, Fayetteville State University, USA
Younes Belahsen, Prof. & Dean, Polydisciplinary Faculty, Ouarzazate University Ibn Zohr, Morocco
Ahmed Bouaziz, IAV, Morocco
Jack Turman, Indiana State University, USA
Mohammed Badraoui, INRA, Morocco
Abdelhafid Bendahmane, INRA, France
El Habib Choubani, President, Draa-Tafilalet Region, Morocco
Khalid Meksem, Professor, Southern Illinois University, USA

7:30-8:25 am  Registration
7:30-6:00 pm  Registration Desk Open
8:30-8:55 am  Welcome and Opening Remarks
My Abdelmajid Kassem, Prof. & Dept. Chair, Fayetteville State University, USA
Khalid Meksem, Professor, Southern Illinois University, USA

9:00-10:30 Concurrent Session I (Roome 1): Date Palm: Ecosystem’s Present and Future, Major Diseases, and Production Systems
Co-Chair: Mohamed Baaziz, Professor, Cadi Ayyad University, Morocco
Co-Chair: Ikram Blilou, Professor, Wageningen University, The Netherlands

9:00-9:15 Date Palm Adaptative Strategies to Desert Conditions. Ikram Blilou*, Professor, Wageningen University & Research, The Netherlands

9:15-9:30 Bacteria Isolated from Date Palm Rhizosphere and Promoting Date Palm Tolerance to Drought and Salinity. Ramona Marasco*, Research Scientist, King Abdullah University of Science and Technology (KAUST), Saud Arabia

9:30-9:45 Biochemical and Nutritional Characterization of Some Palm Date Varieties of Moroccan Oasis. Alem Chakib*, Professor, University Moulay Ismail, Errachidia, Morocco

9:45-10:00 Physicochemical Characteristics of Date Core and the Algerian Oil of Date Core of Two Varieties. Nehal Fatima*, University Hassiba Ben Bouali, Chlef, Algeria

10:15-10:30 Optimizing Growth and Tolerance of Date Palm (Phoenix dactylifera L.) to drought and Fusarium oxysporum f. sp. albedinis by application of Arbuscular Mycorrhizal Fungi. Abdelilah Meddich\textsuperscript{1\ast}, Toshiaki Mitsui\textsuperscript{2} and Marouane Baslam\textsuperscript{2\dagger}.

\textsuperscript{1} Département de Biologie, Laboratoire Biotechnologie et Physiologie Végétale, Faculté des Sciences Semlalia, Université Cadi Ayyad, Marrakech Morocco.
\textsuperscript{2} Department of Applied Biological Chemistry, Faculty of Agriculture, Niigata University, Niigata 950-2181, Japan.

9:00-10:55 Concurrent Session II (Room 2): Abiotic Stress and Water Management
Co-Chair: Adnane Boualem, INRA, France
Co-Chair: Ali Hammani, Professor, IAV, Morocco

9:00-9:15 Urban and Industrial Wastewater Sludge: A Waste or a Valuable Product? Abdelghani Sghir\textsuperscript{\ast}, Professor, University of Every, Paris-Saclay, France

9:15-9:30 Leaf Shrinkage due to Water Stress and its Relation with the Prediction of Vegetation Fire. Salah Eddine Essaghi\textsuperscript{1\ast}, and Mohamed Yessef\textsuperscript{2}. IAV, Rabat, Morocco

9:30-9:45 Floristic Diversity in Southwestern Morocco: Constraints and Opportunities. Fouad Msanda\textsuperscript{\ast}, Professor, University Ibn Zohr, Morocco

9:45-10:00 New Invasive Pest: Integrated Pest Management Strategies of the Prickly Pear Cochineal Dactylopius opuntiae. Rachid Bouharroud\textsuperscript{1\ast}, M. El Bouhssini\textsuperscript{2}, M. Sbaghi\textsuperscript{3}, S. Lhaloui\textsuperscript{2}, M. Boujghagh\textsuperscript{1}, K. EL Fakhouri\textsuperscript{2}, and A. Sabraoui\textsuperscript{2}.

\textsuperscript{1} Centre Régional de la Recherche Agronomique, Agadir, Morocco;
\textsuperscript{2} International Center for Agricultural Research in the Dry Areas (ICARDA), Rabat, Morocco; \textsuperscript{3} Division Scientifique INRA, Rabat, Morocco

10:00-10:15 Using subsurface Drip Irrigation for Date Palm Water Use Efficiency in Oasis Areas. Rqia Bourziza\textsuperscript{\ast}, Ali Hammani, and Ahmed Bouaziz. IAV Hassan II, Madinat Al Irfane. BP 6202-Instituts, Rabat, Morocco

10:15-10:30 Utility of Local Vegetable Crop Populations to Mitigate Yield Responses to Climate Change. Alan Walters, Professor, Southern Illinois University, USA

10:30-10:45 Identification and Characterization of Desert Endophyte Bacteria to Increase Plant Abiotic Stress Tolerance. Axel de Zelicourt\textsuperscript{\ast}, Assistant Professor, Institute of Plant Sciences of Paris-Saclay, France

10:30-10:55 Q&A - Panel Discussion (Session II, Room 2)
11:00-12:30 pm Concurrent Session III (Room 1): Date Palm: Ecosystem’s Present and Future, Major Diseases, and Production Systems  
Co-Chair: Mohamed Baaziz, Cadi Ayyad University, Marrakech, Morocco  
Co-Chair: Ikram Blilou, Wageningen University & Research, The Netherlands

11-11:15 “Bayoud” Disease in Date Palm: Current Status, Management, and Perspectives.  
Adil Essarioui*, INRA, Errachidia, Morocco.

11:15-11:30 Use of Arbuscular Mycorrhizal Fungi and Bacteria as New Strategy to Control Bayoud Disease in Date Palm.  
1 Equipe Protection, Amélioration et écophysiologie végétales, Faculté des Sciences et Techniques Errachidia, Université My Ismail, Meknes, Morocco

11:30-11:45 Transpiration and Groundwater Uptake of Date Palm (Phoenix dactylifera) in Tafilalet Oasis, Morocco.  
IAV Hassan II, Madinat Al Irfane. BP 6202 Instituts, 10101 Rabat, Morocco

11:45-12:00 pm Effect of Regulated Deficit Irrigation on Date Palm Productivity and Water Use Efficiency cv Majhoul.  
A. Sabri1*, A. Bouaziz2, A. Hammann2, M. Kuper2,3, A. Douaik1, and M. Badraoui1.  
1 Institut National de la Recherche Agronomique, Rabat, Morocco; 2 IAV Hassan II, Rabat, Morocco; 3 CIRAD, Montpellier, France.

12-12:30 Q&A - Panel Discussion (Session III, Room 1)

11:00-12:30 Concurrent Session IV (Room 2): Students Oral Presentations  
Co-Chair: Latifa Lefrere, Ibn Zohr University, Morocco  
Co-Chair: Abdelhafid Bendahmane, Vice-Director, INRA, France

11-11:15 Genetic Diversity of Several Annual Species of the Genus Medicago.  
Fairouz Lacheheb*, University Oran I Ahmed Ben Bella, Algeria

Hicham Karim1*, Hassan Boubaker1, Ayoub haloufi1, Asmaa Bouglad2, Abdellah Hamdaoui2, Fayza Tahiri Alaoui1, Latifa Askarne1, El Hassane Boudyach1, Fouad Msanda2, and Abdellah Ait Ben Aoumar1.  
1 Laboratoire de Biotechnologies Microbiennes et Protection des Végétaux, Faculté des Sciences, Université Ibn Zohr, Agadir, Morocco; 2 Laboratoire de Biotechnologies et Valorisation des Ressources Naturelles, Faculté des Sciences, Université Ibn Zohr, Agadir, Morocco.
11:30-11:45 Evaluation of Olive Tree Resistance to Verticillium wilt. Imane Ben Salah*
University Cadi Ayyad, Marrakech, Morocco.

11:45-12 “Ethnobotanical Study of Medicinal Flora in the Southeast Morocco: Case of Ouarzazat “Great Taznakht”. Youness El Ouazzani1,2*, Aziz Hasib1, Abdelali Boulli2, and Mustapha Bouzaid3. 1,2 Environment Laboratory and Valorization of the Agro-Resources, Faculty of Sciences and Techniques, University Sultan My Slimane, Beni Mellal, Morocco; 3 Laboratory of Bioprocesses and Bio-interface, Faculty of Sciences and Techniques, University Sultan My Slimane, Beni Mellal, Morocco.

12:00-12:15 Postharvest Control of Pathogenic fungi of tomato using two Brown Seaweed extracts; Cystoseira tamariscifolia and Bifurcaria bifurcata. Nadia Bahammou1*, O. Cherifi1, H. Bouamama2, and K. Cherifi3. 1 Laboratory of Food, Environment and Health, Biology Dept., Faculty of Sciences and Techniques, Cadi Ayyad University, Marrakech, Morocco; 2 Laboratory of Organic and Macromolecular Chemistry, Biology Department, Faculty of Sciences and Techniques, Cadi Ayyad University, Marrakech, Morocco; 3 Laboratory of Biotechnology and Valorization of Natural Resources, Biology Department, Faculty of Sciences, Ibn Zohr University, Agadir, Morocco.


12:30-1:50 pm Lunch (Provided)

2:00-3:15 Concurrent Session V (Room 1): Plant Genetics, Genomics, Biotechnology, and Bioinformatics
Co-Chair: My Abdelmajid Kassem, Prof. Fayetteville State University, USA
Co-Chair: Ahmed Bouaziz, Professor, IAV Morocco

2:2:15 Genetic Mapping of Soybean Seed Isoflavone Contents in Several Recombinant Inbred Line Populations Across Multiple Environments in the USA. My Abdelmajid Kassem1*, Plant Genetics, Genomics, and Biotechnology Laboratory, Dept. of Biological Sciences, Fayetteville State University, USA

2:15-2:30 The GmSNAP18 is the Peking-type rhg1-a Gene for Resistance to Soybean Cyst Nematode. Shiming Liu1, Pramod K. Kandoth2, Naoufal Lakhssassi1,2, Jingwen Kang3, Vincent Colantonio1, Robert Heinz2, Greg Yeckel2, Zhou Zhou1, Sadia Bekal1, Johannes Dapprich3, Bjorn Rotter4, Silvia Cianzio5, Melissa G. Mitchum2, Khalid Meksem1,†. 1 Department of Plant, Soil and Agricultural Systems, Southern Illinois University, Carbondale, IL 62901, USA; 2 Division of Plant Sciences and Bond Life Sciences Center, University of Missouri, Columbia, MO 65211, USA; 3 Generation Biotech, Lawrenceville, NJ 08648, USA; 4 GenXPro-GmbH,
Confirmation of Four Quantitative Trait Loci that Underlie Resistance to Soybean Sudden Death Syndrome Using NILs and SNPs.

Lee YC 1,2, MJ Iqbal 1,2, VN Njiti 1,4, SK Kantartzzi 1,2, and DA Lightfoot 1,2.* 1 Plant Biotechnology and Genomics Core Facility, Department of Plant, Soil, and Agricultural Systems, Southern Illinois University, Carbondale, IL 62901, USA; 2 The Illinois Soybean Center (Center for Excellence in Soybean Research, Teaching and Outreach), Southern Illinois University, Carbondale, IL 62901, USA; 3 International Programs of CA&ES, Environmental Horticulture Building Room #1103, University of California, Davis, CA 95616, USA; 4 Dept. of Biotechnology, Alcorn State University, Alcorn, MS; USA.

Improvement of Saffron (Crocus sativus) by Plant Biotechnology.

Mohammed Amine Serghini*, Professor, University Ibn Zohr, Morocco.

Evaluation of Safflower (Carthamus tinctorius L.) Accessions Using Agro-Morphological and Technological Parameters.

Karim Houmanati 1,2*, Mohamed El Fechtali 1, Hamid Mazouz 2, and Abdelghani Nabloussi 1,2. 1 INRA, Research Unit of Plant Breeding and Plant Genetic Resources Conservation, CRRA of Meknes, Po. Box 578, Meknes, Morocco; 2 University Moulay Ismail, Laboratory of Biotechnology and Molecular Biology, Faculty of Sciences, Meknès, Morocco.

Coffee Break & Posters Preparation (Refreshments are Provided)

Concurrent Session VI (Room 1): Animal Sciences

Chair: Mohamed Bouslikhane, Professor, IAV, Morocco

Lipid and Fatty Acid Composition of Longissumus dorsi muscle of Béni-Guil Sheep Fed on Different Dryland Forages in Eastern Morocco.

Kamal Belhaj 1, Farid Mansouri 1, Abdessamad Ben-Moumen 1, Marianne Sindic 2, Marie-Laure Fauconnier 3, Mohamed Boukharta 4, Hana Serghini-Caid 1, and Ahmed Elamrani 1. 1 Laboratoire de Biologie des plantes et des micro-organismes, Faculté des Sciences, Université Mohamed Ier, Oujda; Morocco; 2 Laboratoire Qualité et Sécurité des Produits Alimentaires, Gembloux Agro-Bio Tech, Université de Liège; Belgium; 3 Laboratoire de Chimie générale et Organique, Gembloux Agro Bio-Tech, Université de Liège; Belgium; 4 Institut Supérieur Industriel agronomique, Huy, Belgium.
2:20-2:40  Can Livestock Contribute to the Ecological Intensification of the Agriculture in the Oasis: A Case Study from the Drâa Valley? Taher Sraïri\textsuperscript{1*}, S. Mansour\textsuperscript{1}, V. Alary\textsuperscript{2}, and M. Benidir\textsuperscript{3}. \textsuperscript{1} Hassan II Agronomy and Veterinary Medicine Institute, Rabat, Morocco; \textsuperscript{2} International Center of Agricultural Research for Development (CIRAD), Montpellier, France; \textsuperscript{3} Regional Office of Agricultural Development, Ouarzazate, Morocco.

2:40-3:00  Reproduction of the Female D’man Sheep in the Moroccan Oases. Derqaoui Lahsen\textsuperscript{2}. Hassan II Agronomy and Veterinary Medicine Institute, P.O. Box 6202, Rabat, Morocco.

3:00-3:20  Epidemiological and Clinical Pathological Features of Edematous Syndrome in the Dromedary in the Southern Regions of Morocco. Khadija Boutkhoum\textsuperscript{1*}, Mohammed Bouslikhane\textsuperscript{1}, Jaouad Berrada\textsuperscript{1}, and Faouzi Kichou\textsuperscript{1}. \textsuperscript{1} Département de Pathologie et Santé Publique Vétérinaires, IAV Hassan II, Rabat, Morocco.

3:00-3:15  “Risk factors, Clinical, and Lesion Characteristics of Caseous Lymphadenitis or Abscess Disease of Sheep in Eastern Region of Morocco. Faouzi Kichou\textsuperscript{2*}, Ahmed Mechaal\textsuperscript{1}, Mohammed Bouslikhane\textsuperscript{1}, Ahlam Kadiri\textsuperscript{1}, Khalil Zro\textsuperscript{2}, and Jaouad Berrada\textsuperscript{1}. \textsuperscript{1} Département de Pathologie et Santé Publique Vétérinaires, IAV, Rabat, Morocco; \textsuperscript{2} Biopharma, Agdal Rabat Morocco.

3:15-3:55 pm  Coffee Break & Posters Preparation (Refreshments are Provided)

4:00-5:00 pm  Concurrent Session VII (Room 1): Plant Genetics, Genomics, Biotechnology, and Bioinformatics

Co-Chair: David Lightfoot, Professor, Southern Illinois University, USA
Co-Chair: Ahmed Bouaziz, Professor, IAV Hassan II, Morocco

4:00-4:15  How Large is the Genetic Diversity of Argan (Argania spinosa)? What Opportunities the Molecular Tools offer? Mohamed Louay Metougui\textsuperscript{2}, and Ouafae Benlhabib. Hassan II Agronomy and Veterinary Medicine Institute, Rabat, Morocco.

4:15-4:30  Genetic Diversity of Vicia faba L. Landraces in Morocco: A Reservoir for the Enhancement of the Competitive Ability to Weed Stress. Lamiae Ghaouti\textsuperscript{1*}, N. Aqtbouz\textsuperscript{1}, L. Belqadi\textsuperscript{1}, and W. Link\textsuperscript{2}. \textsuperscript{1} Département de Production, Protection et Biotechnologies Végétales, IAV Hassan II, Rabat, Morocco; \textsuperscript{2} Department of Crop Sciences, Georg-August Universität, Göttingen, Germany.

4:30-4:45  Sustainable use of Halophytes for the rehabilitation of Marginal Dry Areas in Morocco. Salma Daoud\textsuperscript{1} and M. C. Harrouni\textsuperscript{2}. \textsuperscript{1} Faculty of Sciences, Ibn Zohr University, Agadir, Morocco; \textsuperscript{2} Hassan II Institute of Agronomy and Veterinary Medicine, Agadir, Morocco
4:45-5:00  **Bluetongue in Morocco: Epidemiological Situation and Spatio-Temporal Modeling.**  

5:00-5:15  **Biological Control of Bacteria Onion Diseases Using a Bacterium, Pantoea agglomerans 2066-7.**  
El Hassan Achbani*, S. Sadik1,2, A. Bebouazza1, and H. Mazouz2.  
1 La boratoire de Bactériologie Végétale et de Lutte Biologique, URPP, CRRA de Méknès (INRA), Morocco;  
2 Faculté des Sciences de Méknès, Morocco.  
*Presenting author: achbani105@gmail.com.

4:00-5:00  **Concurrent Session VIII (Room 2): Food, Health, and Nutrition**  
Co-Chair: Jack Turman, Professor, Indiana State University, USA  
Co-Chair: Karen Midden, Professor, Southern Illinois University, USA

4:00-4:15  **The Important Role of Nutrition in Early Brain and Behavior Development.**  
Jack Turman*, Professor, Indiana State University, USA.

4:15-4:30  **Closing the Nutritional Gap in Moroccan Maternal and Child Health through Home Gardening.**  
Karen Midden, Professor, Southern Illinois University, USA

4:30-4:45  **Seasonal Variations of Metallothionein and Trace Metals in Edible Cockle Cerastoderma edule (L., 1758) in two lagoon ecosystems (Khnifiss and Oualidia).**  
Latifa Lefrere*, Ibn Zohr University, Morocco.

4:45-5:00  **Nutritional Anemia in Pregnant Women: Biological and Epidemiological Aspects.**  
Ibtissame Youlyouz-Marfak*, and A. Hilali. Laboratoire des Sciences et Technologies de Santé, Institut Supérieur des Sciences de la Santé, Université Hassan 1er, Settat, Morocco.  
*Presenting author: ibtissam.marfak@uhp.ac.ma.

5:00-5:15  **Q&A - Panel Discussion (Session VIII, Room 2)**

5:00-7:30  **Posters Session I (Posters 1-65)**
8:30-10:15 Concurrent Session IX (Room 1): Olive Tree Workshop I
Co-Chair: Nadia Wahid, Professor, Univ. Sultan My Slimane, Morocco
Co-Chair: Alan Walters, Professor, Southern Illinois University, USA


8:45-9:00 Integrated and Sustainable Management of the Olive Tree in the Gharb Region of Morocco. Nour Eddine Essafi, Ministry of Agriculture and Fisheries, Morocco.

9:00-9:15 Influence of Distance from Trees on Cereal and Legume Yield in Olive and Annual Crop Intercropping System in Northern Morocco. Amassaghrou Asmael, K. Daoui, K. Barkaoui, and A. Bouaziz. 1 IAV Hassan II, Rabat, Morocco; 2 CIRAD Centre International de Recherche Agron. pour le Développement, Rabat, Morocco; 3 INRA Centre Régional de la Recherche Agronomique, Meknès, Morocco.


9:45-10:00 Quality and Chemical Profiles of Monovarietal Olive Oils in Eastern Morocco. Ahmed Elamrani, Farid Mansouri, Marianne Sindic, Marie-Laure Fauconnier, and Hana Serghini-Caid. 1 Laboratoire de Biologie des plantes et des Micro-organismes, Faculté des Sciences, Université Mohamed Ier Oujda; Morocco; 2 Laboratoire Qualité et Sécurité des Produits Alimentaires, Gembloux Agro-Bio Tech, Université de Liège; Belgium; 3 Laboratoire de Chimie Générale et Organique, Gembloux Agro Bio-Tech, Université de Liége; Belgium.

10:00-10:15 Seasonal Changes of Macronutrients in Olive Tree Leaves. Karima Bouhafa; Lhoussaine Moughli. 1 Regional Agricultural Research Center, Meknes, Morocco; 2 Soil Science Department, IAV, Rabat, Morocco.

10:20-11:20 Posters Session I (Posters 66-100)
8:30-10:15  Concurrent Session X (Room 2): Aromatic, Medicinal, and Economic Plants
Co-Chair: Alan Walters, Professor, Southern Illinois University, USA
Co-Chair: Fouad Msanda, Professor, University Ibn Zohr, Morocco

8:30-8:45  Perfume Plants Innovation and Sustainability Using Modern Molecular Breeding Tools
Adnane Boualem*. INRA, Institute of Plant Sciences Paris-Saclay (IPS2), CNRS,
Université Paris-Sud Paris-Saclay, Bâtiment 630, 91405, Orsay, France.

8:45-9  Therapeutic Benefits of Bee Products. Badiaa Lyoussi, University Sidi Mohamed
Ben Abdallah, Fez, Morocco

9-9:15  Determination of Fat and Sugar Contents in Carob Pulp from Wild and Domesticated

9:15-9:30  In vivo Wound Healing Potential and Identification of Bioactive Compounds from
Pistacia lentiscus Leaves By HPLC-PDA-ESI-MS Detection. Halima Saiah1,4*, Rachida
Allem1, Meriem Mokhtar2, Wassila Saiah3, Fatima Zohra El Kebir4. 1 Faculty of
SNV, Department of Biology, University of Hassiba Ben Bouali, Chlef, Algeria; 2
Laboratory of Beneficial Microorganisms, Functional Food and Health, Faculty of
Natural Sciences and Life, University of Abdelhamid Ibn Badis, Mostaganem,
Algeria; 3 Department of Biological Sciences and Physiology, Laboratory of
Bioenergetics and Intermediary Metabolism, University of Sciences and
Technology Houari Boumediene, Algiers, Algeria; 4 Department of Biology,
Faculty of Life and Natural Sciences, University of Oran I Ahmed Benbella, Oran,
Algeria.

9:30-9:45  Biological Activities of Thymus leptobotrys and Thymus satureioides, two Moroccan
Aromatic and Medicinal Plants. Abdellah El Hamdaoui1,2*, Asmaa Bouglad1,2, Fouad
Msanda1, Abdellah Ait Ben Aoumar2, Hassan Boubaker2, Yassine El Maati1, Abdelkhaled El Moslih1,2,3, Fouad Achemchem3, El Hassan Boudyach2, and
Abdelhamid El Mousadik1,3 Laboratoire de Biotechnologies et Valorisation
des Ressources Naturelles, Faculté des Sciences, Agadir, Morocco; 2 Laboratoire
de Biotechnologies Microbiennes et Protection des Végétaux, Faculté des
Sciences, Agadir, Morocco; 3 Laboratoire des Sciences de l’Ingénieur et le
Management de l’Energie, EST, Agadir, Morocco.

9:45-10:00  Chemical Composition and Antimicrobial Activities of the Essential Oil of Some
Algerian Medicinal Plant. Qurida Chouitah1,2, B. Meddah1, A. Aoues2, and
P. Sonnet3; 1 BGMSS, Equipe Valorisation Therapeutique Bioconversion,
Microbiological Engineering and Health Security Universite de Mascara, Algeria;
2 Laboratoire de Biochimie Faculté des Sciences, Université d’Oran, Algérie;
3 UMR-CNRS 6219, Laboratoire des Glucides, UFR de Pharmacie, Université
de Picardie Jules Verne, Amiens, 80037, France.
10:00-10:15  **Summer Time Measured Climate Characteristics in a Moroccan Large Scale Canary type Tomato Greenhouse.** Hassan Majdoubi¹,²,³; Hicham Fatnassi²; Allal Senhaji³; S. Elbahi¹; Hassan Demrati⁴; M’hamed Mouqallid³, and Lahcen Bouirden⁴.
¹ Laboratoire de Recherche Scientifique et Pédagogique au Monde Méditerranéen, CRMEF Fes-Meknès, Morocco; ² INRA, Univ. Nice Sophia Antipolis, CNRS, UMR 1355-7254 Institut Sophia Agrobiotech, 06900 Sophia Antipolis, France; ³ Équipe de recherche en Énergétique et Mécanique des Fluides, ENSAM Meknès, Morocco; ⁴ Laboratoire de Thermodynamique et Énergétique (LTE), Faculté des Sciences, Agadir, Morocco.

10:20-11:20  **Posters Session II (Posters 66-100)**

11:25-1:00  **Session XI (Room 1): US-Morocco Research and Education Collaboration**
*Co-Chair: Khalid Meksem, Southern Illinois University, USA*
*Co-Chair: James Miller, MACECE, Morocco*

11:25-11:40  **Undergraduate and Graduate Studies in the USA.** My Abdelmajid Kassem, Fayetteville State University, USA.

11:40-11:55  **The Graduate School Opportunities at Southern Illinois University.** Karen Midden, Southern Illinois University, USA.

11:55-12:10  **My Life Experiences in the USA.** Oussama Badad, Fulbright Fellow, USA-Morocco.


12:25-1240  **50 Years of IAV.** Ahmed Bouaziz, IAV, Morocco

12:40-12:55  **Networking and Opportunities.** Khalid Meksem, Southern Illinois University, USA

1:00-2:30 pm  **Lunch (Provided)**

2:45-6:00  **Region Visits: Ait Ben Haddou Kasbah, STEP, Nour 1 Palmeraie**

6:00-10:00  **Awards, Closing Ceremony & Gala Dinner (Provided)**
8:00-12:00  Farms Visit: Office Regional de Mise en Valeur Agricole, Ouarzazate, Ministry of Agriculture and Fisheries

2:00 pm  Touristic Tour: Explore Southeastern Morocco! (Reservation Required)
I. SESSION I. DATE PALM I: ECOSYSTEM’S PRESENT AND FUTURE, MAJOR DISEASES, AND PRODUCTION SYSTEMS

Co-Chair: Mohamed Baaziz, Professor, Cadi Ayyad University, Marrakech, Morocco
Co-Chair: Ikram Blilou, Professor, Wageningen University & Research, The Netherlands

1. Date Palm Adaptative Strategies to Desert Conditions

Alejandro Aragón Raygoza, Juan Caballero, Xiao, Ting Ting, Yanming Deng, Ramona Marasco, Daniele Daffonchio and Ikram Blilou.

Abstract

Date palm cultivars are among the few plants adapted arid conditions, however, the molecular mechanisms conferring date palm tolerance remain largely unknown. As the root system is an important agronomic trait, having the proper root system architecture in a given environment is critical to allow plants to survive periods of water or nutrient deficit, and compete effectively for resources. Here we provide a detailed analysis of date palm root system architecture from embryogenesis to seedling state. We show that the described gene networks regulating stem cells in the model plants Arabidopsis and rice are also present in date palm, we have mapped their expression domains at the cellular resolution and we are currently studying their function in the model plant Arabidopsis. Using RNAseq technologies, we identified date palm genes differentially expressed in roots and shoots. We also show that date palm uses several adaptive strategies to survive desert conditions, ranging from its mode of germination to traits acquired by different cultivars and to the microbial community colonizing the date palm rhizosphere.

2. Date Palm Root Microbiome: the Ecological Services Involved in Plant Growth, Survival and Tolerance to Abiotic Stresses

Ramona Marasco1*, Maria Mosquiera1, Ikram Blilou2, and Daniele Daffonchio1

1 BESE, Biological and Environmental Sciences and Engineering Division, King Abdullah University of Science and Technology (KAUST), Saudi Arabia; 2 Wageningen University, The Netherlands

Abstract

Date palm (Phoenix dactylifera L.) is an iconic crop plant of desert environments capable to keep ecological dominance under arid conditions and high temperature, but yet very limited knowledge is available on its root microbiome and its contribution to the water and nutritional acquisition by the plant. Especially under the ongoing climate change the microbial communities associated with the root system is increasingly recognized as an essential resource for a sustainable and environmental friendly development of modern agriculture. Recent studies demonstrated that the beneficial-microbiome - naturally associated to all the plants - accomplishes essential functions and ecological services complementary to the adaptation features encoded by the host plant, but the undergoing mechanisms remain yet elusive. In this contest, we aim to reveal the dynamics and functions of endophytic bacteria associated to date palm root system.
in relation to promoting root growth and conferring abiotic stress tolerance. To unravel the mechanisms
used by endophytic bacteria, we took advantage of the model system Arabidopsis thaliana. We found
that the selected endophytic strains affect dramatically the root architecture, by increasing the number
of lateral roots and by promoting root hairs length allowing a larger surface area for resources acquisi-
tion. As result, the effects of bacteria on the root system conferred an ‘adaptive advantage’ to the plants
exposed to salt stresses. Using a series of reporter and mutants lines of A. thaliana, we show that the
observed effect in root architecture is strongly linked to the central signaling pathway of growth regula-
tor auxin. Our data suggest that beneficial root-associated bacteria can increase date palm tolerance
to stresses by directly reprogramming the root growth developmental program through the activation
of the auxin signaling pathways. We believe that the beneficial effect - observed in both in model and
crops plants - will be valuable for improving agriculture production under the continuous changing global
environmental conditions.

3. Biochemical and Nutritional Characterization of some dates varieties of Moroccan Oasis

Alem Chakib*

Faculte des Sciences et Techniques, University Moulay Ismail, Errachidia, Morocco.

Abstract

Long neglected, Moroccan phoenicole sector is restructuring; it became one of the pillars of the Green
Morocco Plan. The Draa-Tafillalet region has become a large modern palmaris planting site. However,
only a limited number of dates Moroccan varieties are now planted, which may present a danger to
biodiversity of the Moroccan palmaris. This work aims to identify in a whole variety of Moroccan dates
that are unknown to the general public but very appreciated by the local population of the oasis for their
dietary and virtues therapeutic. This work aims to identify in a whole variety of Moroccan dates that are
unknown to the general public but very appreciated by the local population of the oasis for their dietary
and therapeutic virtues. For this, biochemical, nutritional and the demonstration of biological activities
among these varieties were performed. Some of these features are likely to enhance their apprecia-
tion with customers and improve their competitiveness in national and international markets. Keywords:
Dates, biodiversity, dietary value, biological activity, therapeutic potential.

4. Physicochemical Characteristics of Date Core and the Algerian Oil of Date Core of Two Varieties

Nehal Fatima* and Abdelkader Dilmi Bouras

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Abstract

The date palm (Phoenix dactylifera L.) is a vital plant for the desert areas where it constitutes a base
of survival to their populations. Algeria annually produces 450,000 tons of dates which can present at
least 10% (45000 tons) of cores per annum. Many research tasks are devoted to the valorization of the
date core in various forms: activated carbon, supplement in food of cattle, preparation of the citric acid
and proteins, in traditional medicine. This work covers the determination of the chemical composition of
the powder of date core of two Algerian varieties (Deglet nour and Degla beidha) and the evaluation of
the antioxydant activity their extracts. The second part of the study is devoted to the’ study of the physico-
chemical characteristics of the oil of date core of the two varieties and determination of the composition in fatty acids by the method chromatographic in gas phase. Results obtained, arises that the date cores of the two varieties Deglet nour and Degla beldha 9,44 and 19,23% represent respectively, total mass of whole date. The physicochemical characteristics of these two varieties are extremely interesting, which in a certain manner justifies the valorization of this biomass. On the basis of composition of fatty acids, the oil of date core it is an oil (oleic) more than 50% of oleic acid (57,17%) for the variety Deglet nour and (52,40%) for the variety Degla béidha, one can use it like oils Cracklingfrying and for the production of margarine because of his high stability and resistance to the heattreatment. Consequently, it is very important to have more researches on date seed oil in the future to explore its useful effects potentials and Study its biological effects. Keywords: Phoenix dactylifera, date cores, valorization.

5. Propagation of Date Palm (Phoenix dactylifera L., cv. Ajwa) by Inflorescences

Ali Mohseen Al-Ali1* and Chien-Ying Ko2

1 National Agriculture and Animal Resources Research Center, Ministry of Environment, Water and Agriculture, kingdom of Saudi Arabia; 2 Taiwan Technical Mission in kingdom of Saudi Arabia. *Presenting author: amma2010@gmail.com

Abstract

The current method of date palm is using propagated of plant tissue culture technique for the field cultivation. Micropropagation of date palm from meristem for initiation has been reported and may be applied to efficiently generate a large number of disease free plants. However, they are often limited in some rare varieties because the date palm only produces offshoot during the vegetative development phase and the risk is very high, if unsuccessful the mother plant will become extinct. If we can obtain explants materials from inflorescent this problem will be overcome. This project activity was conducted plant tissue culture and genetic engineering Lab. at the National Agriculture & Animal Resources Research Center, Ministry of Environment, Water and Agriculture, Kingdom of Saudi Arabia, during period 2011-2013. Due to the limitations associated with shoot tip explant in the micropropagation of date palm, inflorescence explant is an ideal alternative. This study focuses on the methods employed for the, induction of callus or direct somatic embryogenesis from inflorescence tissue, establishment for regeneration system and using SRAP marker for evaluate of genetic stability. Female inflorescence of cv. Ajwa cultivar is used for culture initiation. The spikelet explants are cultured on medium and incubated at 25±2°C in the darkness. Callus will be obtained after culturing for 16 weeks by sub-culturing at every 4 week interval. Callus obtained after 30 weeks of culturing is transferred on to culture medium to induce somatic embryogenesis and plant regeneration. The regenerated plants using SRAP marker for evaluate of genetic stability. The result showed that the regenerated plants DNA are the same with mother plant. The technology of plants regeneration from inflorescent tissue of date palm was developed and effective in our laboratory.

6. Optimizing Growth and Tolerance of Date Palm (Phoenix dactylifera L.) to Drought and Fusarium oxysporum f. sp. Albedinis by Application of Arbuscular Mycorrhizal Fungi

Abdelilah Meddich1*, Toshiaki Mitsui2, and Marouane Baslam2

1 Département de Biologie, Laboratoire Biotechnologie et Physiologie Végétale, Faculté des Sciences Semlalia, Université Cadi Ayyad Marrakech Maroc. 2 Department of Applied Biological Chemistry, Faculty of Agriculture, Niigata University, Niigata 950-2181, Japan. *Presenting and corresponding author:
Abstract

Date palm (Phoenix dactylifera L.) is an important agricultural and commercial crop in the North of Africa and Middle Eastern countries of Asia. Date palm tree could be used for generations to come due to its remarkable nutritional, health and economic value in addition to its esthetic and environmental benefits. Every part of the date palm is useful and the importance of the date in human nutrition comes from the acceptable taste and its rich composition of carbohydrates, salts and minerals. During the last decade, date palm plantations were subjected to degradation due to an extensive exploitation and to drastic environmental conditions. Furthermore, fusarium wilts (‘Bayoud’) are economically important soil-borne diseases that result in significant crop losses and damage to natural ecosystems. Plant-microbe interactions can be either beneficial or detrimental and a fast and accurate assessment of the surrounding organisms is essential for the plant’s survival. Arbuscular mycorrhizal fungi (AMF) are a major component of soil biofertility and its use can improve crop resistance to biotic and abiotic stresses. Our results revealed that mycorrhizal infection rates were higher and slightly affected by water stress. The inoculation by the Consortium Aoufous, G. monosporus or Glomus clarum increased biomass production of date palm instead of the attacks by the fungal pathogen F. oxysporum, whatever the water regime. AMF allowed leaf water parameters to be maintained in F. oxysporum-inoculated plants or not under water-limiting conditions. The mortality rate among the date palm trees infected by F. oxysporum was lower in mycorrhizal plants than nonmycorrhizal plants. Results showed that AMF decrease the deleterious effect of F. oxysporum on date palm, nevertheless the bioprotection effect against the plant pathogen was dependant on the type of AMF species. It therefore seems that the indigenous AM fungal community “Aoufous” take advantage to improve crop resistance to those harsh biotic and abiotic conditions. Keywords: Oasis ecosystem, drought, Fusarium oxysporum fsp. albedinis, mycorrhizal symbioses, date palm, tolerance, bioprotector agents.
II. SESSION II. ABIOTIC STRESS AND WATER MANAGEMENT

Co-Chair: Adnane Boualem, INRA, France
Co-Chair: Ali Hammani, Professor, IAV, Morocco

1. Urban and Industrial Wastewater Sludge: A Waste or a Valuable Product?

Hugo Maury and Abdelghani Sghiri*

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Abstract

Sewage sludge is produced by urban and industrial wastewater treatment plants. Because of it richness in nutrients and for environmental and economic reasons, it is used under specific conditions in agricultural purposes as fertilizer. This is still a risky utilization because of the persistence of many non-degraded dangerous pollutants in sewage sludge and cultivable and non-cultured potential pathogens. The aim of this presentation is to introduce and discuss scientific, technical, and economic reasons of sewage sludge uses. The consequences of this utilization on human and animal health as well as soil fertility and environmental degradation will be discussed. We will also discuss the many alternative ways of sludge and black water water re-use and recycling. Regulatory procedures and educational recommendations are more than needed to deal with this issue in a pragmatic and rigorous way.

2. Vegetation Fire as Related to Leaf Shrinkage and Water Stress

Salah Eddine Essaghi* and Mohamed Yessef

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Abstract

Leaf shrinkage provides insights into the potential variation of foliar SVR, within the same species, when leaf moisture content is changing in response to water deficit. Since SVR is among the most significant plant flammability features, leaf shrinkage would be a relevant component of fuel hazard assessment through its influence on SVR, enhancing—if it is taken into account—thereby the wildfire prediction accuracy. The purpose of this work is, first, to consider the leaf shrinkage by characterizing the plant species towards the shrinkability of their leaves, taking account the possible site effect, to characterize the behavior of shrinkage as a function of moisture content and finally to perform a classification for some dominant Mediterranean species based on the shrinkage levels. The assessment of the hierarchical relationships between the dimensional shrinkages is also aimed. Leaves and needles of thirteen tree and shrub species were harvested from six different sites in western Rif Mountains. Leaves dimensions and moisture content were measured regularly during a gradual drying at the laboratory. Dimensional shrinkages were calculated at each moisture content level. Dimensional shrinkages behaved similarly whether in leaf or timber and kept the same reporting relationships between each other. Among the species sampled in different sites, site effect is significant only in Pinus canariensis and Pistacia lentiscus. A classification of the plant species was carried out in three separate classes. Generally, shrinkage class of the plant species studied gave an idea on its flammability ranking reported in the literature, implying thus a cause-and-effect relationship between both parameters. Keywords: Dimensional shrinkage,
Leaves and needles, Foliar SVR

3. Floristic Diversity in Southwestern Morocco: Constraints and Opportunities

Fouad Msanda1, Abdelhamid El Mousadik1, Hassan Boubaker2, Baha Saadi1, El Hassan Boudyach2, and Abdellah Ait Ben Aoumar2

1 Laboratoire de Biotechnologies et Valorisation des Ressources Naturelles, Faculté des Sciences, Agadir, Morocco; 2 Laboratoire de Biotechnologies Microbiennes et Protection des Végétaux, Faculté des Sciences, Agadir, Morocco.

Abstract

The southwestern Morocco is one of Pleistocene glacial refugia in the Mediterranean bioclimatic region. It’s characterised by a typical infra Mediterranean vegetation making them among the most remarkable regions of North Africa and an important centre of plant diversity. The originality of this region is expressed by the presence of the Argan tree (Argania spinosa), the Moroccan gum tree (Acacia gum-mifera), the olive tree (Olea europaea subsp. maroccana) the Dragon tree (Dracaena draco subsp. aijal) and a thermophilic flora (Euphorbia officinarum subsp. echinus, E. officinarum subsp officinarum, E. obtusifolia subsp. regis-jubae, Kleinia antephorbium, Apteranthes burchardii subsp. maura, Aeonium arboreum). The sector is also characterized by many endemic species (Genista ferox ssp. microphylla, Bupleurum dumosum, Lavandula maroccana, Micromeria macropshipon, Sideritis cossoniana, Thymus maroccanus subsp. leptobotrys, Micromeria arganietorum, Apteranthes joannis ...). Finally, the flora of South-western Morocco is blessed with a rich Medicinal and aromatic species (Thymus satureioides, T. Maroccanus, T. Broussonnetii, Artemisia herba alba, Ceratonia siliqua ...). These Plants plays a very important socio-economic role and offer good potential for sustainable rural development. However climate change and ecological upheavals caused by deforestation and overgrazing give rise to a serious dysfunction, which affects majority of ecosystems. This talk highlights the interest of this biogeographical region and constraints to the development of its flora. Keywords: South-western Morocco, Biogeography, Endemism, Medicinal and Aromatic Plants, Sustainable development.

4. New Invasive Pest: Integrated Pest Management Strategies of the Prickly Pear Cochineal Dactylopius opuntiae

Rachid Bouharroud1*, M. El Bouhssini2, M. Sbaghi3, S. Lhaloui2, M. Boujghagh1, K. El Fakhouri2, and A. Sabraoui2

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Abstract

In Morocco, the prickly pear cactus Opuntiae ficus-indica grows in arid and semi-arid areas where it plays an essential role in the ecological system, preventing desertification and preserving biodiversity. The fruits are consumed as a food and cladodes as cattle feed. However, O. f. indica is subjected to several attacks by pests and diseases. The prickly pear cochinale Dactylopius opuntiae (Hemiptera: Dactylopiidae) (Cockerell) has been recently reported in Morocco. Our aim is to reduce the rapid spread of this devastating pest through the development of an integrated management strategy based on the study
of biology of this species in the environmental conditions of Morocco the use of natural enemies, biocides and resistant/tolerant cultivars. The evaluation of 249 cactus ecotypes (INRA-Agadir cactetum) is being explored for possible tolerance/ resistance to this cochineal. The goal of our efforts would be the implementation of a national integrated pest management strategy to control and limit the rapid spread of this cochineal to uninfested productive areas of cactus pear in Morocco.

5. Using Subsurface Drip Irrigation for Date Palm Water Use Efficiency in Oasis Areas

Raja Bourziza*, Ali Hammani1, and Ahmed Bouaziz

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Abstract

The subsurface drip irrigation (SDI) can be considered as a recent improvement of irrigation water application. The reason given is that it prevents or in most cases considerably reduces losses by direct evaporation, runoff and deep percolation. Due to its high efficiency potential, SDI system was recently introduced in Morocco. This paper deals with its application to the young date palm in the Tafilalet oases (Southeastern of Morocco) where an appropriate design and irrigation management of this system has to be proposed to farmers. A better understanding in local conditions of the infiltration process around a buried source, and its impact on plant growth is necessarily required. This study aims to improve the water use efficiency by testing the performances of SDI system, especially in areas where water is a limited source. To reach this objective, an experimental test has been installed on a farm plot in the region of Erfoud (Errachidia Province, Southeast Morocco) to characterize the respective performances of surface and subsurface drip irrigation on young date palm. The results show an increase in root development and in the number of leaves, as well as a substantial water savings due to lower evaporation losses compared to the classic drip irrigation. The results of this study showed that subsurface drip irrigation is an efficient technique, which allows sustainable irrigation in oasis areas. Keywords: Subsurface drip irrigation, evaporation, young date palm, performances, oasis areas.

6. Utility of Local Vegetable Crop Populations to Mitigate Yield Responses to Climate Change

Alan Walters1*, Mimouni Abdelaziz2, Rachid Bouharroud2, and Ahmed Wifaya2

1 Dept. Plant, Soil, and Agricultural Systems, Southern Illinois University, Carbondale, IL USA; 2 Institut National de la Recherche Agronomique (INRA), Agadir Center, Morocco. *Presenting author: awalters@siu.edu

Abstract

Future food security challenges must be met in part by developing agricultural technologies to mitigate plant responses to climate change, while at the same time, essential natural resources need to be conserved so that effective food production activities can be sustained for generations. Water is an increasingly limited resource influenced by a changing climate and has a definite influence on the long-term productivity of world agriculture. The utilization of more locally adapted crop germplasm (e.g., landraces) to mitigate the effects of drought due to fluctuating water supplies is a strategy that can be used to cope with these ongoing and future food security challenges. However, new crop variety development is generally non-existent in many developing countries, such as Morocco, with seeds typically sourced
from developed countries. This dependence is troubling as it creates a myriad of problems, especially for smaller subsistence farmers. The selection of locally adapted vegetable crop populations that could be readily adapted by smallholder farmers is an important step to increase food security in a changing climate. Although there are limited ongoing efforts to improve crop growth and productivity in developing countries having harsh, dry climates through new variety development, the absence of sustained vegetable breeding programs in these countries will continue to hinder food production, nutritional health and the resulting food security for generations.

7. Identification and Characterization of Desert Plant Bacterial Endophytes Inducing Abiotic Stress Tolerance in Arabidopsis thaliana

Axel de Zelicourt1,2*, Lukas Synek, Hanin Alzubaidy, Rewaa Jalal, Yakun Xie, Eleonora Rolli, Santosh Satbhai, Wolfgang Busch, Rene Geurts, Ton Bisseling, Maged Saad, and Heribert Hirt2

1 Institute of Plant Sciences Paris-Saclay (IPS2), CNRS, INRA, Université Paris-Sud, Université d'Evry, Université Paris-Diderot, Université Paris-Saclay, Bâtiment 630, 91405 Orsay, France; 2 Division of Biological and Environmental Sciences and Engineering, King Abdullah University of Science and Technology KAUST, Thuwal, Saudi Arabia. *Presenting author: axel.de-julien-de-zelicourt@ips2.universite-paris-saclay.fr.

Abstract

Food security is of major importance globally and harvest losses due to abiotic stresses amount to more than 60% of total productivity, making abiotic stress tolerance the main goal of crop improvement worldwide. The ability of a variety of plants to cope with stress conditions depends on their association with rhizosphere microbes and can potentially help increase food production in a sustainable way. However, so far neither the microbial diversity nor the mechanisms of their beneficial interaction with plants are sufficiently understood. Our project DARWIN21 (http://www.darwin21.net) is to isolate and characterize endophyte microbial strains that can help plants to survive and develop in harsh conditions. From an endophyte bacterial library isolated from desert plant roots of the Jizan region in Saudi Arabia, we have established a screening protocol to select strains that can enhance plant tolerance to salt stress in Arabidopsis thaliana. Using a number of anatomical and physiological parameters, we identified 37 strains, classified as STPRs (Stress Tolerance Promoting Rhizobacteria). For example, SA187 confers salt, drought and heat stress tolerance in Arabidopsis and enhances yield and biomass of crop plants under desert agriculture conditions. A detailed microscopic analysis revealed that SA187 colonizes both surface and inner tissues of Arabidopsis roots and shoots. Using biochemical, genetic and transcriptomic approaches, the ethylene pathway was found to be crucial for mediating the abiotic stress tolerance by SA187. These results prove that endophytic bacteria can enhance desert agriculture but may also reveal new strategies for breeding crops for enhanced stress tolerance.
III. SESSION III. DATE PALM II: ECOSYSTEM’S PRESENT AND FUTURE, MAJOR DISEASES, AND PRODUCTION SYSTEMS

Co-Chair: Mohamed Baaziz, Professor, Cadi Ayyad University, Marrakech, Morocco
Co-Chair: Ikram Blilou, Professor, Wageningen University & Research, The Netherlands

7. “Bayoud” Disease in Date Palm: Current Status, Management, and Perspectives

Adil Essarioui*

INRA, Errachidia, Morocco

Abstract

Date palm (Phoenix dactylifera) is an important food source and commercial perennial crop in the Sahara and North Africa. “Bayoud”, a vascular wilt disease, incited by the soilborne fungus Fusarium oxysporum f. sp. albedinis, has become a serious threat to date production in date palm-growing regions in Morocco and Algeria. Since it first appeared in Morocco in the late 19th century, the disease has spread throughout Morocco and into the western half of Algerian Sahara. Attempts to control the disease using systemic fungicides have been unsuccessful. In Morocco, date palm groves possess tremendous genetic variability that is the basis for mass selection and identification of many cultivars that combine resistance and good fruit quality. However, some of the cultivars most highly valued by growers for their quality and productivity are highly susceptible to Bayoud and require intensive management to control the disease. The discovery of soils that are suppressive to the disease and the isolation of many antagonists presents opportunities for the use of these antagonists as biocontrol agents, particularly in combination with soil solarization and fumigation, and soil amendments. Preliminary results indicate that soil solarization and fumigation in combination have the potential to disinfest soils and create an empty niche suitable for rapid colonization by biocontrol agents introduced with soil amendments to protect date palm from the pathogen. Research in this area is still in its infancy and Bayoud disease continues to prevent growers in Morocco from growing the best-but-susceptible cultivars of date palm.

8. Use of Arbuscular Mycorrhizal Fungi and Bacteria as New Strategy to Control Bayoud Disease in Date Palm

Fatima Jaiti¹*, Abdelhi Dihazi², Reda Meziani³, and Khalid Naamani⁴

¹ Equipe Protection, Amélioration et écophysiologie végétales, Faculté des Sciences et Techniques Errachidia, Université My Ismail, Meknes, Morocco; ² Laboratoire de Biotechnologie, de la Valorisation et de la Protection des Agroressources, Université Cadi Ayyad, Faculté des Sciences et Techniques, Marrakech, Morocco; ³ Laboratoire National de culture des tissus de palmier dattier, Institut National de la Recherche Agronomique, Errachidia, Morocco; ⁴ Equipe de Biotechnologie, Biochimie et Protection des Plantes, Faculté des Sciences Semlalia, Université Cadi Ayyad Marrakech, Morocco. *Presenting author: fatimajaiti@yahoo.fr.

Abstract

Fusarium oxysporum f. sp. albedinis (Foa) is a vascular pathogen that causes drastic reduction in cultivation and expansion of date palm in Morocco, leading to a considerable socio-economical impact. The control of Foa is difficult because chemical treatments are not effective and the prophylactic methods
are not of interest due to the contamination of several palm plantations and to their non-durable impact. Therefore, planting resistant cultivars constitutes the only efficient and economic method to control this Fusarium wilt "bayoud". A promising approach for minimizing the severity of diseases is based on the induction of systemic resistance using localized pre-treatment with elicitors in order to enhance resistance to pathogen infection. Arbuscular mycorrhizal fungi (AMF) have been shown to protect date palm seedlings against bayoud disease. Treatment with AMF reduced disease severity by 8–77% depending on the AMF isolate used. In addition, the AMF induce change in activities of two defence-related enzymes (peroxidases and polyphenoloxidases) and amplifies the accumulation of non-constitutive hydroxycinnamic acid derivatives, such as the sinapic derivative I2, known to play a crucial role in resistance of date palm to Foa. In the second part, two bacteria, Bacillus amyloliquefaciens strain Ag1 (Ag) and Burkholderia cepacia strain Cs5 (Cs), were examined for their potential to control this disease. Both bacterial strains inhibited both growth and sporulation of Foa. They released compounds into the culture medium, which resulted into cytological changes in Foa's mycelial structure. One month after inoculation, date palm defense reactions against Foa were different depending on the bacterium used, B. cepacia led to higher accumulation of constitutive caffeoylshikimic acid isomers while B. amyloliquefaciens triggered the induction of new phenolic compounds identified as hydroxycinnamic acid derivatives. Peroxidase activity has also been stimulated significantly and varied with the bacterial strain used and with Foa inoculation. These results highlight the importance of mycorrhizal fungi and selected bacteria as biocontrol agents to combat Bayoud disease and improve date palm culture in infected palm groves. **Keywords:** Arbuscular mycorrhizal fungi, Bacteria, Bayoud, Biological control, Date palm, *Fusarium oxysporum* f. sp. albedinis, Bayoud.

9. Transpiration and Groundwater Uptake of Date Palm (*Phoenix dactylifera*) in Tafilalet Oasis, Morocco

Wafae Elkhoumsi*, Ali Hammani, and Ahmed Bouaziz

IAV Hassan II, Madinat Al Irfane. BP 6202-Instituts, 10101 Rabat, Morocco.  

**Abstract**

Improved water management is one of the main challenges for the sustainability of the oasis ecosystem. Indeed, there is an urgent need to improve our knowledge concerning the water use by plants. The quantity of water transpired by plant is an important factor in investigating irrigation control and plant-water relations. In addition, the contribution of groundwater table to plant transpiration can be very important in these areas. The objectives of this research is to study the transpiration and groundwater uptake of date palm under oasis conditions. An experimentation was conducted in a plot of farmland located in the Tafilalet oasis. We have been able to calculate transpiration of date palm by using the Granieri's method for irrigated and non-irrigated date palm. The daily average values of transpiration are about 0.5 mm/day to 5 mm/day depending on the climatic demand. We have also established the relationship between transpiration and groundwater uptake. Indeed, during the dry season and without irrigation supply, 50% of date palm transpiration comes from groundwater table. These relationship is important for control irrigation and water supply, especially since we found that farmers are using more than twice as much water as is needed to irrigate the date palm. **Keywords:** Date palm, water use, transpiration, groundwater uptake, Tafilalet oasis.
10. Effect of Regulated Deficit Irrigation on Date Palm Productivity and Water Use Efficiency cv Majhoul

A. Sabri1, A. Bouaziz2, A. Hammani2, M. Kuper2,3, A. Douaik1, and M. Badraoui1,2

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Abstract

Regulated deficit irrigation is one of the ways to save water in regions with limited water resources, while limiting the impact on crop yields. To test the effectiveness of this approach on the productivity of date palm cv Majhoul, an experiment was conducted in Tafilalet (Morocco) for two consecutive years (March 2012-February 2014). The annual cycle of growth and development of this variety was divided into three distinct periods: the first from November to February, the second from March to June and the last from July to October. During these times, seven water regimes were applied under drip irrigation: farmer regime (T0), 100% (T1), 80% (T2), 60% (T3), 80-100-60% (T4), 150% (T5) and 60-100-80% (T6) ETM. The measures focused on the monitoring of meteorological parameters, the water irrigation and the evolution of date yields of Majhoul variety. The results at the end of the second year of this trial show that: i. Water regime has significantly affected the average yields and water use efficiency, ii. Water irrigation needs are, on average, 51 m³/tree/year, varying between 30 and 76 m³/tree/year, and iii. Average date yield and water use efficiency by water regime are 31, 61, 46, 39, 43, 45, and 59 kg of dates/tree/year and 0.44, 1.20, 1.13, 1.30, 1.07, 0.59, and 1.36 kg of dates/m³, respectively for treatments T0, T1, T2, T3, T4, T5, and T6. Thus, the water regime T6 has improved the water use efficiency and the conservation has allowed 14% of water irrigation compared to the T1. The regulated water stress strategy contributes to the rationalization of water and sustainability of oasis. Keywords: Regulated deficit irrigation, date palm, Majhoul, water use efficiency.
IV. SESSION IV. STUDENTS ORAL PRESENTATIONS

Co-Chair: Latifa Lefrere, Ibn Zohr University, Morocco
Co-Chair: Abdelhafid Bendahmane, Vice-Director, INRA, France

1. Genetic Diversity of Several Annual Species of the Genus Medicago

Lacheheb Fairouz*, Zenasni M, Ikhlef Z, Kalouaz S, Abdous F, and Fayad Lameche FZ

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*Presenting author:

Abstract

Our study aims to highlight a possible genetic variability of the globulin fraction of the electrophoresis technique on polyacrylamide gel electrophoresis (SDS-PAGE), reporting on four annual species of Medicago L. represented by 20 and accessions collected in different eco-geographical sites. General studied species generated 100 bands globulin whose number and frequencies vary from one species to another. Indeed, the high number of bands is marked in two species is noted in two species M. polymorpha and M. truncatula, per revenge against in species M. laciniata and M. arabica band recorded the number is less important. Of these, several bands globulins were specific to both species M. polymorpha and M. truncatula. Statistical analysis showed that the species belonging to different sections showed a large variability. The intraspecific polymorphism was highlighted by the hierarchical classification of accessions. The correlation with the geographic origins of populations was low. Improvement programs should take into account the level of genetic diversity between and within specific revealed by globulins. Keywords: Medicago, seed reserve protein, globulin, electrophoresis SDS PAGE.

2. Chemical Characterization and Antifungal Activities of four Thymus L. Species Essential Oils Against Postharvest Fungal Pathogens of Citrus

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Abstract

The aim of this study was to find an alternative to synthetic fungicides currently used in the control of postharvest fungal diseases of citrus. Antifungal activities of essential oils (EOs) from four Thymus species were investigated against Penicillium digitatum, Penicillium italicum and Geotrichum citri-aurantii. Chemical compositions of the EOs were also determined by GC-MS analysis. The GC-MS analysis of EOs obtained by hydrodistillation from aerial parts of four Thymus species reveals that their main constituents are carvacrol (76.94%) for T. leptobotrys, borneol (27.71%) and thymol (18.47%) for T. satureioides subsp. pseudomasticina, camphor (46.17%) and α-terpineol (7.69%) for T. broussonnetii subsp. hannonis, and carvacrol (32.24%), γ-terpinene (19.60%) and p-cymene (13.52%) for T. riatarum. In in vitro mycelial growth assay, complete inhibition of the three pathogens was obtained by T. leptobotrys and T. riatarum EOs, at 1000 µl l-1. The effect of EOs on spore germination varied significantly between tested
Thymus species. T. leptobotrys and T. riatarum EOs showed the strongest activity. The first species completely inhibited the spores germination at 250 µl l-1 (G. citri-aurantii) and 500 µl l-1 (P. digitatum and P. italicum), and the second species at 1000 µl l-1 (both Penicillium) and 2000 µl l-1 (G. citri-aurantii). The EO of T. leptobotrys had the lowest minimum inhibitory concentration (MIC) for the three pathogens (<500 µl l-1). T. leptobotrys, T. riatarum and T. satureioides subsp. pseudomastichina EOs may provide an alternative means of controlling postharvest citrus fungal pathogens. Keywords: Antifungal activity, Thymus leptobotrys, T. satureioides subsp. pseudomastichina, T. broussonetii subsp. hannonis, T. riatarum, essential oils, Penicillium digitatum, P. italicum, Geotrichum citri-aureanti. Citrus.

3. Evaluation of Olive Tree Resistance to Verticillium wilt

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Abstract

Verticillium wilt of Olive (VWO) caused by Verticillium dahliae Kleb is currently one of the most devastating diseases affecting olive tree in the world. So far, the use of resistant cultivars is the only effective method to control this vascular disease. The aim of this work was the assessment of symptoms of VWO in 20 olive cultivars from the world collection of olive tree located in Tassaoute (Marrakech, Morocco) and the evaluation of their resistance to Verticillium dahliae (VD) using a simple, fast and non-destructive method (twigs inoculated with a conidial solution). Resistance was evaluated by assessing symptom severity using a 0–4 rating scale. Cultivars were classified by combining the final mean severity (FMS) of the disease and the percentage of the area under disease progress curves (AUDPCP). Our results showed a high variability of cultivars’ resistance. Four groups were obtained; a group of highly susceptible cultivars (Arbequina, Aggezi shan, Doukar, Leccino and Picual), group of susceptible cultivars (Galegavulga, Souidi, Amphisis, Lagoydhera, Moroccan Picholine, Ifiri, Chemlal and Zaity), group of moderately resistant cultivars (Picholine of Languedoc, Jemribouch, Doebli, Hojiblanca and Koroneiki) and a group of resistant cultivars (Chetoui and Wateken). This result was compared with that obtained by the principal component analysis (PCA) taking into account all variables: FMS, AUDPCP, defoliation, leaf rolling, die-back, mortality and disease incidence. The PCA clustered the 20 cultivars into three classes; susceptible, intermediate and resistant class. This analysis confirmed the previous result however it provided an objective wider grouping of individuals. Therefore, to control the VWO, the four resistant cultivars; Wateken, Chetoui, Picholine of Languedoc and Jemribouch are recommended. Keywords: Olive tree, Verticillium dahliae, resistant cultivars, twigs, world collection of Tassaoute.

This work is carried out under the project ArimNet “Pestolive” supported by the Ministry of Higher Education, Scientific Research and Executive Training and the project “Rhizolive” supported by the Hassan II Academy of Science and Technologies.
4. Ethnobotanical Study of Medicinal Flora in the Southeast Morocco: Case of Ouarzazat “Great Taznakht”

Younesse El Ouazzani, Aziz Hasib, Abdelali Boulli, and Mustapha Bouzaid

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Abstract

Since the night of times, the men use plants to treat themselves. Even if the current pharmacopoeia eclipse them, many are those who are seduced by their medicinal skills. Over the last few decades, the medicinal plants perform a return in force, relying on values Safe, tested during long dates by our ancestors. As well, medicinal plants represent a treasure of data and information, for those who have decided to cure their daily ills differently, turning back to the chemical arsenal of the current medicine. This study has been carried out at the scale of the Region of Ouarzazat, which is renowned by a botanical biodiversity very important. We distributed 665 survey sheets during two months on 46 ethnobotanical fields, these survey sheets were completed by traditional practitioners, herbalists and users of medicinal plants of the community who are living in the town of the “Great Taznakht” as well as in the different Villages and surrounding Douars. The statistical treatment of the results obtained from the questionnaires sheets, has allowed us to target the plant species suspected having a caregiver power against various diseases, methods of preparation and more. Keywords: Ethnobotanical Survey, Medicinal and Aromatic Plant, Traditional Practice, Biodiversity, Pharmacopoeia, Ouarzazat, South East of Morocco.

5. Postharvest Control of Pathogenic fungi of tomato using two Brown Seaweed Extracts; Cystoseira tamariscifolia and Bifurcaria bifurcata

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Abstract

Fungicides are chemical compounds having toxicological properties, used by the farmers to fight against the phytopathogenic fungi. These fungicides neutralize and reduce the activity of fungi but they remain a worrying and frightening source of pollution and toxicity. To search for biological molecules with antifungal potential, this study was done to investigate the antifungal potentiality of the marine algae collected from the Moroccan coast Sid Bouzid El-jadida. Hexane and aqueous extracts of two algae species belonging to Phaeophyceae were screened for their antifungal activity against some tomato pathogenic fungi: Alternaria sp. and Botrytis cinerea. The overall results show that the fractions from hexanic (91,000 ppm) and aqueux extract (49,600 ppm) of Cystoseira tamariscifolia and Bifurcaria bifurcata exhibits remarkable biological activity with a very small amount of 100 µl. An interesting antifungal effect was observed for the hexanic crude extract of Cystoseira tamariscifolia where the inhibition zones were up
to 2 cm ± 0.18 and 1.32 ± 0.21 cm against B. cinerea and Alternaria sp., respectively. The Atlantic coast is a source of bioactive compounds with potential applications in controlling undesired microorganisms of crops. This may encourage the use of natural products to promote agroecology in substitution of chemical compounds in food systems, regarding risks of fungicides on human health and the environment. **Keywords:** Macroalgae extracts, Phaeophyceae, Phytopathogenic fungi, Tomato, Postharvest.

6. Rock Phosphate and Vesicular-Arbuscular Mycorrhiza Effects on Growth and Mineral Nutrition of Acacia gummifera Wild

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**Abstract**

The influence of arbuscular mycorrhizae (AM) and rock phosphate (RP) was studied on Acacia gummifera, an endemic and Moroccan spontaneous species which is experiencing a regression. They are also a source of firewood and charcoal and precious air fodder in the dry season. Acacias were inoculated or not by a mixture of two species of arbuscular mycorrhizal fungi (Glomus intraradices and Glomus mossae) to which were added two levels of RP: 0, 25 and 0.5g P/kg of soil. The percentage of mycorrhizal infection varied from 10 % to 25 % when RP applications increased. Acacia seedlings grew poorly without mycorrhizal colonization and without RP applications. However, AM plants with RP applications achieved better results in terms of content of P and N in shoot and root. In contrast, there were not additive effects of inoculation and fertilization on total biomass at any RP applications. However, mycorrhizal acacias took up more P and N at 0.25 g P kg⁻¹ of soil and above. These results suggest that AM are able to absorb P from soil and rock phosphate for a better mineral nutrition of Acacia gummifera. **Keywords:** *Acacia gummifera*, rock phosphate, arbuscular mycorrhizae

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Abstract

Soybean is one of the most important crops worldwide for its protein and oil as well as the health beneficial phytoestrogens or isoflavone. This study reports a relatively dense single nucleotide polymorphism (SNP)-based genetic map based on ‘Hamilton’ by ‘Spencer’ recombinant inbred line population and quantitative trait loci (QTL) for seed isoflavone contents. The genetic map is composed of 1502 SNP markers and covers about 1423.72 cM of the soybean genome. Two QTL for seed isoflavone contents have been identified in this population. One major QTL that controlled both daidzein (qDZ1) and total isoflavone contents (qTI1) was found on LG C2 (Chr 6). And a second QTL for glycitein content (qGT1) was identified on the LG G (Chr 18). These two QTL in addition to others identified in soybean could be used in soybean breeding to optimize isoflavone content. This newly assembled soybean linkage map is a useful tool to identify and map QTL for important agronomic traits and enhance the identification of the genes involved in these traits. Keywords: Soybean, single nucleotide polymorphism, Quantitative trait loci, isoflavone, daidzein, genistein, glycitein.

2. The GmSNAP18 is the Peking-type rhg1-a Gene for Resistance to Soybean Cyst Nematode

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Abstract

Two types of resistant soybeans [Glycine max (L.) Merr.] sources are widely used against soybean cyst
nematode (SCN, Heterodera glycines Ichinohe): The Peking-type soybean resistance requires both the
rhg1-a and Rhg4 alleles, and the PI 88788-type soybean resistance requires only the rhg1-b allele for
resistance. We identified, by map based cloning, targeted genome sequencing, haplotyping, and ge-
netic complementation, that the Peking-type GmSNAP18 alone is the rhg1-a gene conferring resistance
to SCN at the rhg1-a locus. In GmSNAP18, there are nine amino acid differences between resistant
(Peking-type soybean cv. Forrest and PI 88788) and susceptible (Essex) soybeans and five amino acid
differences between two resistant soybeans: Forrest and PI 88788. Our findings reveal that Peking-type
GmSNAP18 is most likely performing a different role in SCN resistance than PI 88788-type GmSNAP18.
To our best knowledge, this is the first report of a gene that evolved to possibly use two mechanisms
to ensure the same function within the same species, in this case, resistance to a pathogen. The knowledge
gained from this study can be readily used to improve nematode resistance of soybeans.

3. Confirmation of Four Quantitative Trait Loci that Underlie Resistance to Soybean Sudden Death
Syndrome Using NILs and SNPs

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Interpretive Summary

Using near isogenic lines to populate QTL regions with recombination events and a thousand SNP mark-
ers what was thought to be three QTL for resistance to soybean sudden death syndrome (SDS) caused
by Fusarium virguliforme were analyzed. One QTL was divided into 2 loci. Two of the now 4 loci were
mapped sufficiently accurately to infer candidate genomic regions with small numbers of genes. Closely
linked markers and interactions among loci were inferred that will improve the effectiveness of breeding
for improved resistance to SDS.

Abstract

Soybean (Glycine max (L.) Merr.) cultivars differ in their resistance to sudden death syndrome (SDS),
caused by Fusarium virguliforme. Breeding for improving SDS response has been challenging, due to
interactions among the 18-42 known resistance loci. Four quantitative trait loci (QTL) for resistance to
SDS (cqRfs–cqRfs3) were clustered within 20 cM of the rhg1 locus underlying resistance to soybean
cyst nematode (SCN) on Chromosome (Chr.) 18. Another locus on Chr. 20 (cqRfs5) was reported to interact
with this cluster. The aims here were to compare the inheritance of resistance to SDS in a near isogenic
line (NIL) population that was fixed for resistance to SCN but segregated at two of the four loci (cqRfs1
and cqRfs) for SDS resistance; to examine the interaction with the locus on Chr. 20; and to identify can-
didate genes underlying QTL. Used were; a NIL population derived from residual heterozygosity in an
F5:7 recombinant inbred line EF60 (lines 1-40); SDS response data from two locations and years; four
segregating microsatellite and 1,500 SNP markers. Polymorphic regions were found from 2,788 Kbp
to 8,938 Kbp on Chr. 18 and 33,100 Kbp to 34,943 Kbp on Chr. 20 that were significantly (0.005 <
P > 0.0001) associated with resistance to SDS. The QTL maps suggested that the two loci on Chr. 18
were really three loci (cqRfs1, cqRfs, and cqRfs19). Small genomic regions encoding several candidate
genes were inferred. An epistatic interaction was inferred between Chr. 18 and Chr. 20 loci. Therefore, SDS resistance QTL were inferred to be both complex and interacting. **Keywords**: Fusarium; resistance; soybean; Glycine max; Forrest; SDS; near isogenic line; SNP. **Abbreviations**: Receptor like kinase (RLK); soybean cyst nematode (SCN); sudden death syndrome (SDS).

4. Improvement of Saffron (*Crocus sativus*) by Plant Biotechnology

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**Abstract**

Saffron describes both the *Crocus sativus* plant and the spice resulting from its dried stigmas. It is the most expensive spice in the world that is valued in refined culinary art, used in traditional medicine/cosmetic and as dye in textile and woodwork. The commercial part of saffron is the flower style composed of 3 stigmas. 150 to 200 flowers are needed to produce 1 gram of dried spice. Its exclusive vegetative propagation considerably reduces its biodiversity and excludes its improvement by classical hybridization, consequently, the use of other biotechnologies is required to improve its valorization. A lot of scientific work has focused on the morphological and physiological traits of saffron in terms of mass and sphericity of corms, the number of shoots and flowers per corm, the form and the mass of the stigma and the effect of temperature and irrigation on flowering. In all these characteristics, intrinsic variability of cultivars is present and asks a potential presence at the genetic level. The in vitro cultivation of saffron can allow the rapid multiplication of healthy selected material. At the molecular level, markers such as RFLP, PRAD and microsatellites and sequencing were a tool of choice for finding variability in saffron cultivars and irrefutably defining their molecular identity. The chemistry of saffron is mainly based on crocin, picrocrocin and safranal metabolites. Its study by chemical techniques such as UV-Vis, HPLC and GC attempt to explain the content of saffron secondary metabolites and to establish a chemical identity able to support the hallmarks of quality and to control the falsification of this spice. Packaging and storage of saffron have also sparked some experiments focused on the content of crocin which defines, most importantly, the product’s commercial category (ISO 3632 International Standard). The conference will highlight the most significant scientific results in saffron valorization and will present a synthesis of research conducted on different axes of saffron in our laboratory. **Keywords**: *Crocus sativus*, Saffron, Corm, In Vitro, Molecular Markers.

5. Evaluation of Safflower (*Carthamus tinctorius L.*) Accessions Using Agro-Morphological and Technological Parameters

Karim Houmanat\textsuperscript{1,2}, Mohamed El Fechtali\textsuperscript{1}, Hamid Mazouz\textsuperscript{2}, and Abdelghani Nabloussi\textsuperscript{1*}

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Abstract

Safflower (*Carthamus tinctorius* L.) is a minor hardy crop well adapted to semi-arid conditions, mainly in climate change context. In Morocco, it could be cultivated as good alternative for barley based monocropping system characterizing southern region of the country. Recently, a breeding program has been launched in order to develop varieties adapted to local environmental conditions and with high agronomic and technological performances. In 2013-2014, a total of 60 accessions from different origins of the world were evaluated in the INRA-experimental station located at Douyet (10 km from Fez city) for morphological, agronomic and technological traits. They were conducted following a complete-randomized-blocks design (CRBD) in two repetitions. Results showed large variability among these accessions for spinelessness level (SL), plant height (PH), earliness, branching, leaf rust resistance (RR), thousand seed weight (TSW), seed yield per plant (SYP) and seed oil content (SOC). Generally, genotypes with high seed yield per plant were also characterized by high TSW, early flowering and were dwarf and spiny. Average TSW was 15.50 g, with a high variation from 22 to 63 g. Seed oil content ranged from 20 to 42.1%, with an average of 28.20%. Average seed yield per hectare is about 2.1 t, and the highest yield ever observed was 7.9 t. The accessions studied were grouped into five pools on the basis of desired traits: seed yield per plant, seed oil content, spineless, earliness and resistance to leaf rust. In each group one could find the most interesting accessions for corresponding trait. Nature and composition of these groups must be confirmed in other environments. These groups will be considered as genetic pools and selected genotypes from each pool will be used as elite parents in our safflower hybridization program. **Keywords**: Morocco, semi-arid, genetic pools, hybridization.
VI. SESSION VI. ANIMAL SCIENCES

Chair: Mohamed Bouslikhane, Professor, IAV, Morocco
Co-Chair: Ahmed Elamrani, University Mohamed I, Morocco

1. Lipid and Fatty Acid Composition of Longissumus dorsi muscle of Béni-Guil Sheep Fed on Different Dryland Forages in Eastern Morocco

Kamal Belhaj¹, Farid Mansouri¹, Abdessamad Ben-Moumen¹, Marianne Sindic², Marie-Laure Fauconnier³, Mohamed Boukharta⁴, Hana Serghini-Caid¹, and Ahmed Elamrani¹*

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Abstract

Sheep meat of the Beni Guil breed is a famous meat in eastern Morocco. This sheep breed was integrated into the national program of agricultural development due to the nutritional and sensory properties of its meat widely consumed in eastern Morocco However, this good reputation is still only limited to the assessments of tasting panels. Thus the objective of this study is to assess from a scientific point of view the nutritional quality of this meat via biochemical analyses, examining major and minor muscle composition of the meat of this breed and specifically fatty acid (FA) composition of the longissumus dorsi muscle. In this first study, 10 longissumus dorsi muscle samples were selected and cut with the help of the agents of the National Association of Sheep and Goats (ANOC*). The results showed that 100g of fresh meat material contains 25.72% of dry matter, including 5.13% of Fat, 19.42% of protein and 0.93% of mineral matter. Qualitative and quantitative analyses of fatty acids of 10 samples allowed the identification of 27 components. Palmitic, Oleic and stearic esters were the main fatty acid methyl esters (FAMEs) identified. Saturated fatty acids represented about 41.13% of FAs, with the majority being palmitic acid (20.69%) and stearic acid (16%). The unsaturated fatty acids were principally represented by oleic acid (36.06%) and linolenic acid (9.64%). The average content of total fatty acids in meat samples analyzed is 24.98 grams per 100 grams of fat. Many reports in the literature have shown that the n-6 and n-3 polyunsaturated FA are important contributors to the savor and flavor of ruminant meat and that this composition is mainly correlated with feeding systems used in eastern Morocco. Keywords: Beni Guil, Sheep, longissumus dorsi muscle, Fatty Acid. *ANOC: Association National des Ovins et Caprins, translated as National Association of Sheep and goats.

2. Can Livestock Contribute to the Ecological Intensification of the Agriculture in the Oasis: A Case Study from the Drâa Valley?

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Abstract

Recent developments in the global agriculture have been characterized by the emergence of the concept of ecological intensification, as a means to decrease the use of inputs and their impacts on the environment, while increasing and/or stabilizing crops and livestock yields. In the meantime, research studies have emphasized the ability of crops integration with livestock farming systems to adapt themselves to numerous stresses (economic, climate, etc.) in comparison to specialized systems with only crops or livestock. In the oasis, such integration has been traditionally achieved, as it has allowed for centuries the resilience of the cropping activities, in an environment characterized by numerous constraints, particularly frequent water shortages. However, this resilience has nowadays become challenged by increased stresses, above all climate change and its consequences and also social changes, with growing demands of the local population for better livelihoods. Therefore, in this study, the focus was on the ability of livestock to contribute to the ecological intensification of the farming systems adopted in the oasis. A sample of twelve (12) farms located in the oasis of the Drâa valley was selected and it was representing four types of livestock systems (i.e. 3 farms per system). A follow-up of farms was adopted to characterize inputs uses, water volumes and their origins (rainfall, surface irrigation and groundwater) and incomes from crops. The same methods were used for livestock production. In addition, work needs for crops and livestock were also measured, by determining the contribution of off-farm work uses. The results showed the importance of crop/livestock association in all the systems, in order to implement a sustainable farming activity. The intensification of livestock systems (retrieved in farms with prominent off-farm feed uses, i.e. D’man breed flocks and dairy cattle) showed the best incomes from crops, and that was mostly remarkable for date palms, which benefitted from the surplus irrigation of the underlying alfalfa, as well as manure from the herds. In the contexts where agriculture intensification was not feasible (due to water, land or capital scarcity), livestock remained the main source of incomes, adding value to vast pastoral areas (as in the area of M’hamid EL Ghizlane) and to crop by-products (mainly date wastes). Altogether, the results imply the need of further research devoted to the performances of the farming systems in the oasis, and the use efficiency of scarce inputs, such as water, land and work. Keywords: Climate change, Crop-livestock integration, Ecological intensification, Incomes, Morocco, Oasis.

3. Reproduction Performances of the Female D’man Sheep

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Abstract

The D’man is the local sheep breed of the pre-Saharan regions of southern Morocco. It is located mainly in the oases of the Draa (Ouarzazat, Zagora, Tata, Guelmime), Ziz (Errachidia Arfoud) and Dades valleys. Its total population was estimated to some 200,000 head. It is raised in very small size herds (one ram and 3 to 4 ewes, on average) and kept indoors throughout the year. The diet is based on alfalfa and date wastes. The D’man breed is known for its exceptional reproductive traits, namely precocious puberty, high prolificacy and fertility rates, non seasonality and short postpartum anestrous. Puberty is commonly defined as the phase of life from which an individual acquires the ability to reproduce. In the female, it corresponds to the age at which it becomes able to ovulate, to manifest signs of heat, to mate and to carry out a gestation. In their native areas, D’man lambs reach puberty at an average age of 5 months (150 days). However, lambing was observed at eight months of age, corresponding to fertile mating at 3 months of age. In ewes born and raised outside the native area, the first estrus occurs at
212 to 229 days of age. The effect of birth season on age at puberty is controversial. Moreover, this parameter is genetically transmitted to the crosses between the D'man and seasonal breeds Sardi and Timahdite. At puberty, the average live weight of the D'man ewe lamb ranges from 18 to 24.5 kg (about 50% of mature weight). The precocity of this breed and its crosses allows the lengthening of their reproductive career. Lambing occurs all year around in the D'man sheep, which is in favor of the absence of seasonal anestrous in this breed. Experimental studies showed that ewes exhibit continuous sexual activity throughout the year. However, ewes show a period of decreased sexual activity from mid-March to mid-May during their first breeding season. Practically, this trait offers the possibility to use the D'man ewe according to a desired breeding program. In the D'man ewe, the duration of the estrous cycle is 1 7.5 days on average (14 to 21 days), with cycles of 1 7 and 1 8 days representing 60% of the cycles. The duration of estrous behavior (heat) varies from 12 to 72 hours with an average of 39 hours in aged females, with 50% of females in heat for 48 hours at least. In the young ewe lambs, estrus is relatively shorter and lasts 33 hours only. The lengthening of the estrus behavior increases the possibilities of mating and improves the fertility of the breed. Postpartum anestrous is the stage of sexual inactivity after lambing. In the D'man ewe, resumption of estrous and ovarian activities during the postpartum period is precocious. Indeed, ovarian and estrous activities resume lactating ewes within 45 days after lambing. The shortening of the post-partum anestrous period makes allowed accelerated lambing program. The D'man sheep is known for its multiovulatory ability. Thus, average ovulation rates range from 2.50 to 3.63 (1 to 8) with a higher incidence of double ovulations (32.9%). The average ovulation rate increases with age and then decreases slightly towards the end of the breeding career of the female, i.e. minimal (2.16) in ewes less than two years old maximal (3.63) at 4 to 5 years. The average litter size ranged from 1.90 to 2.27, according to the breeding system. In addition, the incidence of twining was highest (47.1%). Likewise, the litter size followed similar pattern as the ovulation rate. Given the reproduction performances of the D'man sheep, namely age at puberty, ovulation rate, fertility and prolificacy are genetically transmitted to the breed's offspring and its crosses with satisfactory heritability rates, the use of this breed is desirable in intensive lamb production systems.

4. Epidemiological and clinico-pathological features of edema syndrome in camel dromedaries in Southern areas of Morocco

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Abstract

This work is a contribution to studying the edema syndrome in camel dromedaries in Southern areas of Morocco. The aim of the work was to determine the epidemiological and clinico-pathological characteristics of this syndrome and make plausible suspicion relative to the causes implicated. To do so, clinical and epidemiological investigations were carried out in 46 herds of dromedaries in the areas of Laayoune-Boujdour, Guelmim, Es-Smara, Oued Ed-Dahab-Lagouira. Clinical examinations were performed exclusively on animals suffering from edematous syndrome. Additional investigations including hematological (hematocrit) and biochemical (ALT and AST, urea, creatinin, total protein and albumin) examinations were performed on blood samples harvested from sick and healthy animals. The results of this work showed a prevalence of 26% of affected flocks by the edema syndrome, an estimated overall individual prevalence of 0.5% and an average individual prevalence of 2.6%. The affected animals showed a chronic generalized passive edema localized mainly in the neck, flank and hindquarters areas. Biochemical tests revealed hypoproteinemia in sick animals as shown by a significant decrease in total plasma proteins.
and albumins. Post-mortem examinations carried out on a single case showed generalized edema (severe subcutaneous edema and serous fluid in body cavities), generalized serous atrophy of fat, congested liver of nutmeg appearance, flabby heart and bilateral atrophy and dilation of heart ventricles. The most prominent microscopic lesions were centrolobular passive congestion and important hemosiderin pigmentation in the liver consistent with the diagnosis of right heart failure. A lympho-plasmocytic enteritis and peri-bronchiolar and interstitial fibrosis of band-like areas in pulmonary parenchyma were also noted. Based on the above findings, the causes of edema syndrome could be trypanosomiasis, haemonchosis, mycotoxicosis, malabsorption syndrome, proteino-energetic malnutrition and/or liver failure. Keywords: Edema, Dromedary, Epidemiology, Biochemistry, Hematology, Histopathology, South of Morocco.

5. Risk Factors, Clinical, and Lesion Characteristics of Caseous Lymphadenitis or Abscess Disease in Sheep in Eastern Morocco

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Abstract

The aims of this study were to determine the prevalence and risk factors of caseous lymphadenitis in sheep in the Oriental region in Morocco, and to determine its clinical and lesion characteristics. Surveys were conducted in different provinces of the region. They focused on 6376 animals in 107 farms. In addition, search for lesions, and lymph node and abscess collection for histopathological examination were performed in five slaughterhouses of the region. The results showed that almost 100% of the farms (106 out of 107) were affected by caseous lymphadenitis. The overall individual prevalence of the disease was 24%, and the average prevalence in farms and slaughterhouses were 28 and 16%, respectively. Besides the poor hygiene and high density of sheep in houses, use of traumatic equipment (metal feeders, drinkers and fences) seemed to be the main factor that lead to the spread of abscesses between animals of a same herd. Superficial abscesses, open or not, surrounded by enlarged lymph nodes were present in all affected animals. The location of the lesions varied but about 79% of them were located in the head or the neck. Histopathological examination of lymph nodes revealed two types: active abscesses (87%), and lesions of diffuse and severe necrosis and suppuration of the lymphoid tissues (13%). In the lungs, abscesses were well defined and circumscribed. Keywords: Sheep, caseous lymphadenitis, abscess, risk factor, histopathology, epidemiology, Morocco.
6. How Large is the Genetic Diversity in Argan (Argania spinosa (L.) Skeels)? What Opportunities Present the Use of the Molecular Tools?

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Abstract

Argan tree (Argania spinosa (L.) Skeels) is a multipurpose species of great social and economic interest in Morocco. The Natural stands, in constant reduction, are more and more threatened by anthropomorphic pressures, and environmental changes, slowing the natural regeneration of the species. Given the situation, characterization and diversity studies are essential to determine where the genetic resources conservation efforts should be focused and facilitate the domestication process to decrease the intensive use of the forest and allow its regeneration. In this study, the agro-morphological diversity of argan trees was investigated over three years in the in situ preserved population of Admine, a protected area in south-western Morocco. A total number of 122 trees out of 1200 were characterized using 30 quantitative traits. Significant differences between genotypes and between years were seen for all traits. Correlation analysis between traits showed that vigor traits (leaves and shoots sizes) were positively correlated with fruit traits. Cluster analysis using Euclidian distances was used to establish the relationships among the argan germplasm and grouped the genotypes into five relatively homogenous clusters. The yield’s genotype × year interaction analysis, performed to help in the selection of highly productive trees, showed that the genotype factor contributed more to the yield’s variance than the year. But the genotype × year interaction explained more than 65% of the total variation, revealing specific response of each genotype to each environment and the complexity of this trait. Notwithstanding the importance of argan as an emerging alternative oilseed species, and the difficulty of generating reliable data for the selection of stable, plus-trees, and understanding the genetic background of this species from phenotypic data. Only a few molecular investigations have been reported in Argania and even fewer molecular tools, which are needed for advanced genomic studies and modern plant breeding, have been developed. Genomic analysis tools, such as sequence-based molecular markers (e.g., SSRs and SNPs), genetic linkage maps, and expressed sequence tagged (EST) collections have yet to be developed for Argania spinosa. Development of these molecular resources for argan will have a direct application to argan conservation and potential improvement (i.e. breeding and selection) of the species.

7. Genetic Diversity of Vicia faba L. Landraces in Morocco: A Reservoir for the Enhancement of the Competitive Ability to Weed Stress

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Abstract

Faba bean (Vicia faba L.), the major legume crop in Morocco with an acreage over 190,000 ha, is cultivated mainly as a break crop in cereal based cropping systems. It is an ancient crop in Morocco with a large extent of genetic diversity, mainly grown in rain-fed and marginal areas with high level of agrobiodiversity. Over 90% of the farmers are cropping local landraces based on traditional farming practices with very low inputs. Weeds compete with crop plants for light, nutrients, soil moisture and space. Above critical population thresholds, weeds can significantly reduce crop yield and quality. The yield loss attributed to weed stress in faba bean can amount 60 to 70%. Mechanical weeding is very rarely used especially for large cropped areas and chemical weeding is mainly used only in case of broomrape infestations. The high level of genetic diversity of the Moroccan faba bean landraces constitutes one of the few options available to the farmers to cope with weed stress. Indeed, a very valuable option for weed control is the use of genotypes with high competitive ability toward weeds. High grain yield, despite significant weed pressure, is an attribute of competitive crop genotypes. However no study has been carried out so far on the competitiveness of the Moroccan landraces toward weed stress. The identification of local populations with high competitive ability is a relevant approach responding to farmer's need and providing useful germplasm sources for breeders. The objective of the study is (1) to assess the genetic diversity of a collection of Moroccan faba bean populations and (2) to evaluate their competitive ability to weed stress. A set of 60 Moroccan local populations collected from Taounate province, and 2 checks (Aguadulce et Defez) which are commonly used cultivars, were (1) analyzed molecularly through Amplified Fragment Length Polymorphism (AFLP) markers based on four selective primer combinations to assess their genetic diversity and (2) tested under field conditions in four Environments to assess their competitive ability toward weeds. The trials were laid out as a split-plot design with two treatments (with and without weeds). The white mustard (Sinapis alba), a species related to wild mustard (Sinapis arvensis) which is a common weed of faba bean, was used as a model weed. AFLP analysis revealed a large diversity within the local populations (82%) compared to the diversity between the local populations (18%). Both levels of variation were significant. The analysis of variance showed that the differences between genotypes and treatments as well as their interactions were significant to highly significant for maturity, grain yield and grain yield components. Two indexes relative to yield loss (YL) and mean productivity (MP), were calculated based on grain yield to identify populations that combine both high competitive ability and high productivity. The populations were significantly different for both indexes. YL ranged from 8% to 81% with an average of 67%, whereas MP ranged from 11 dt/ha to 31 dt/ha with an average of 19 dt/ha. Aguadulce exhibited a MP of 21 dt/ha and a YL of 59%, whereas Defez was less performing with a MP of 12 dt/ha and a YL of 69%. A range of populations have proven to perform better regarding the indexes than the check cultivars. Two local populations exhibited a compromise with a low YL and a high MP. These local populations showing a high competitive ability are of interest for the farming systems where weeding practices are rarely or never applied. Keywords: Faba bean, Genetic diversity, Weed stress, Competitive ability.

8. Sustainable Use of Halophytes for the Rehabilitation of Marginal Dry Areas in Morocco

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Abstract

Salinity in the soil and water is a common feature in arid lands of Morocco. Moreover population increase
in these areas increases the pressure on fresh water resources and makes the supply more difficult. These areas are still inhabited by people who are attached to their land and to their traditions. This chapter presents a survey of agriculture in some salt affected areas (coastal and inland) in Morocco, its specificities, its forms of adaptation to the constraints and opportunities of saline environments, as well as the potential for survival in the future. Some considerations for the identification and the evaluation of the capacity of these marginalised areas to cope with drought and salinity problems based on the capitalization of the local know-how and the young human resources via appropriate valuing and training. This presentation also demonstrates the potential for the utilization of local and acclimated halophytic species by the adoption of a biosaline agriculture approach with the proposition of solutions for the restoration of biodiversity and productivity in salt affected areas in Morocco. **Keywords:** Morocco, arid lands, drought, salinity, local know-how, halophytes, traditional uses, young human resources, management, biodiversity, productivity.

9. **Bluetongue in Morocco: Epidemiological Situation and Spatio-Temporal Modeling**

Youssef Lhor*, M. Bouziani, H. Akhmouch, M. Benmchich, M. Bouslikhane, M. El Harrak, I. El Berbri, and O. Fassi Fihri

**Abstract**

Bluetongue (BT) is an infectious, arthropod borne viral disease of domestic and wild ruminants. BT is a notifiable disease of huge socio-economic concern and of major importance in the international trade of animals and animal products. Due to the segmented nature of genome, there is existence of high diversity in BT virus serotypes too as a consequence of genetic reassortments. Until 2004, BT was considered as an exotic disease in Morocco. However, from 2004 to 2015, at least two BTV serotypes (BTV-1 and BTV-4) were reported in the country. BTV-4 was introduced in September 2004 and produced an epizootic in northern Morocco but large vaccination campaigns with live attenuated vaccine contributed to the disease disappearance from the country. However, in 2006 and 2007, the widespread recrudescence and extension of a severe BTV infection in new areas with unfavorable environmental conditions suggest the introduction of a new serotype, BTV-1. In order to allow the monitoring and management of this animal disease, a mathematical model for predicting suitable areas for the occurrence of bluetongue disease have been established. The creation of this model is based on epidemiological data collected in the field by the veterinary services spread across the Moroccan territory and the regional analytical laboratories and veterinary research. These data will be combined with two other types of data: Remote Sensing (vegetation index, altitude) and climate (temperature, rainfall). **Keywords:** Bluetongue, epidemiology, modeling, Remote Sensing, prediction.

10. **Biological Control of Bacteria Onion Diseases Using a Bacterium, *Pantoea agglomerans* 2066-7**

El Hassan Achbani¹, S. Sadik¹, A. Bebouazza¹, and H. Mazouz²

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**Abstract**

Epiphytic microorganisms isolated from the olive knots, apple fruits and trees, quince, compost and water from different areas were screened for antagonistic activity against *Pseudomonas marginalis*, *Pseudomonas viridiflava*, *Xanthomonas retroflexus* and *Pantoea ananatis*, bacteria recently reported on onion
in Morocco. From 82 microorganisms tested for antagonistic properties against bacteria onion diseases, the strain Pantoea agglomerans 2066-7 was selected. This bacterium was very effective against Pseudomonas marginalis, Pseudomonas viridiflava, Xanthomonas retroflexus and Pantoea ananatis. Complete control at 106 CFU.ml-1 was obtained on wounded onions bulbs inoculated with 105 CFU.ml-1 of Pseudomonas marginalis and Pseudomonas viridiflava. At 107 CFU.ml-1 Pantoea agglomerans reduced Xanthomonas retroflexus and Pantoea ananatis decay by more than 90%. **Keywords:** Onion, Pseudomonas marginalis, Pseudomonas viridiflava, Pantoea ananatis, Xanthomonas retroflexus, Biocontrol and Morocco.
VIII. SESSION VIII. FOOD, HEALTH, AND NUTRITION

1. The Important Role of Nutrition in Early Brain and Behavior Development

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Abstract

The first 1000 days of life (from conception to the end of the second year of life) is a period of highly orchestrated brain development. The neural circuits that emerge during this period serve as the foundation for life long motor, cognitive, social, and emotional behaviors. Brain development during this period is dependent upon adequate nutrition, gene expression patterns, environmental conditions and early life experiences. The first objective of this presentation is to provide a brief overview of basic research studies that elucidate the role that macro and micronutrients play in the cellular processes that underlie brain development. The second objective to is to differentiate severe acute malnutrition, chronic undernutrition, iron deficiency and iodine deficiency, as all of these conditions serve as serious risk factors for altered brain development that results in poor motor, cognitive and emotional development. The third and final objective is to provide examples of strategies used to address these nutritional deficiencies. Interestingly, it is now observed that intervention strategies are often not replicated in other regions/cultures different from their origin. Developing an innovative interdisciplinary framework to address these deficiencies in different world regions is a global health priority. This presentation aims to stimulate creative discussions between neuroscientists, nutritionists, maternal and child health clinicians and agricultural scientists to design strategies that will successfully address nutritional deficiencies that continue to influence development of some Moroccan children.

2. Closing the Nutritional Gap in Moroccan Maternal and Child Health through Home Gardening

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Abstract

Gardens play a powerful role in the wellbeing of an individual and communities, if the opportunities are understood and utilized. Adults and children gain mental and physical benefits being outdoors, connecting with nature, gardening as well as including nutrient rich produce in their diets from their gardens (Louv, Kuo, Taylor, Mandel, Cobb, Simson and Straus). The powerful aspect of home gardening for urban or rural people is that the fresh healthy produce they grow can help close serious nutritional gaps leading to malnourishment or undernourishment. It is possible to address health issues generated from lack of specific nutrients by producing and consuming nutrient rich fruits and vegetables in home gardens. The World Bank data of 2008, emphasized that attention and changes are needed in Morocco to move towards the status of a developed nation and to provide greater health opportunities for children. The data found that 15% of infants in Morocco are born with a low birth weight, about 10% are wasted, 43% of those aged 15 and above are overweight or obese and 16% of children under the age of 5 are overweight (World Bank). UNICEF data for Morocco dating 2009 – 2013 reported 15% of infants are born with low birth rates, 15% are stunted, 2% are wasted, 3% are underweight, 11% are overweight
and there is an infant mortality rate of 18%. The World Bank states that there is food insecurity that accompanies the malnourishment resulting in a majority of these problems. Vitamin A, folic acid and iron are ‘fore-runner’s in the deficiencies (World Bank). All three of these micronutrients are available in common fruits and vegetables that can be easily grown in an economical fashion in a home garden. However, it may be a challenge for the average small farmer or homeowner to have access to seeds that offer the highest value. This problem demands collaborative action to move a nation forward for improved health efforts. The demands include scientists who understand the physical and mental nutrient requirements for a healthy body. It requires scientists in agriculture, through inquiry and research, to provide plant seeds that will fulfill these nutrient needs. To disseminate this information and product, educators at various levels are necessary to be the link from the scientist to the public. The possibility of utilizing home gardening to empower the general public in Morocco, especially women and children, to close the nutritional gap is feasible and realistic with the efforts of scientists and educators.

3. Seasonal Variations of Metallothioneins and Trace Metals in Edible Cockle Cerastoderma edule (L., 1758) in Two Lagoon Ecosystems (Khnifiss and Oualidia)

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Abstract

The aim of this study is to evaluate the seasonal variation of metallothioneins (MTLP) and some trace metals in the edible cockle Cerastoderma edule (Mollusca, Bivalvia, Linnaeus, 1758) in two Moroccan lagoons, Oualidia (north) and Khnifiss (south). Our work also takes into account the correlations between MTLP and metals as well as the influence of some biotic and abiotic parameters on the metal contamination. The samples are taken on a monthly basis, at low tide, from April to January. Thirty individuals are taken for quantifying the amount MTLP, while fifty individuals are used to calculate the condition index and quantify trace metals in the whole individual. Significant high values of metallothioneins levels are observed in bivalves of Oualidia versus those of Khnifiss. For metals, the contents of Cu and Zn are also higher in bivalves of Oualidia. About the Cd, the highest levels are recorded in molluscs of Khnifiss. Regarding the relationship between the rate of MTLP and metals, correlations have been established. The statistical treatment shows significant relationships between MTLP and metals (positive slope). For each metal, correlation with MTLP is also studied in both fractions (soluble and insoluble). It comes out that, in the case of Cd, the MTLP present a high correlation with the metal insoluble fraction; while in the case of Zn and Cu, the correlation with the MTLP is mainly linked to the metal in soluble fraction. The relationship between the biological (Condition index, MTLP) and physico-chemical parameters (Temperature, Salinity, pH, Cd, Zn, Cu) are performed by PCA. Two metals, Cu and Zn, are significantly and negatively correlated with salinity, while they are significantly and positively correlated to MTLP levels. These two metals are also strongly positively correlated with each other. Furthermore, the Cd levels are significantly and positively correlated with the weight (Condition Index). MTLP, Cu and Zn are negatively correlated with weight in C. edule. Keywords: Bivalves, Cerastoderma edule, Metallothioneins, Moroccan Coasts, Metals, Lagoons.
4. Nutritional Anemia in Pregnant Women: Biological and Epidemiological Aspects

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Abstract

Anemia, defined as a low blood hemoglobin concentration, is a common public health problem that affects all developing countries. The prevalence of anemia in pregnancy varies considerably because of differences in socioeconomic conditions and lifestyles. According to the World Health Organization, anemia affects almost half of all pregnant women in the world: 52% in developing countries and 23% in developed countries. The principal cause of anemia is iron deficiency. Reducing anemia is recognized as an important component of the health of women and children, and the second global nutrition target for 2025 calls for a 50% reduction of anemia in women of reproductive age. We will review relationships between nutritional deficiencies and anemia in pregnant women and finally identify future epidemiological and clinical research needs. In addition to iron deficiency, deficiencies in vitamin A and/or the vitamin B group (folate, cyanocobalamin) are implicated in anemia. Complex nutritional disturbances, such as those observed in starvation and protein/calorie deficiency, can also result in anemia. When anemia occurs as a consequence of these nutritional deficiencies, a complex cascade of pathophysiological events occur. These nutritional deficiencies and the associated pathophysiology contribute to maternal and infant mortality, and are associated with an increased risk of maternal-fetal morbidity, as well as a poor long-term nutritional status for a child. There is an increasing need for preconception and prenatal public health strategies that educate individuals about optimal nutrition programs that support healthy pregnancy and infant development. Integrating this information into educational curricula, pre-marital counseling, and prenatal care is needed to reduce the incidence of anemia during pregnancy and promote improved birth outcomes.
1. De Novo Sequencing Brings Insight into the Biology and Evolution of the Olive Tree Genome


Abstract

The olive tree (Olea europaea L.) is an economically-important fruit and oil tree. The olive tree is a diploid (2n=2x=46), predominantly allogamous, and largely vegetatively propagated species. The genome was sequenced and assembled with 246X coverage. SOAPdenovo suite was used to assemble reads, which resulted in a draft genome of 1.48 Gbp with scaffold N50 of 228 kbp. A total of 42,843 scaffolds (>1 kbp) were assembled (1.14 Gbp). Using a newly-constructed genetic map, 50% of the sequences were anchored onto 23 linkage groups, (572 Mbp). About 50% of the genome was composed of repetitive DNA. Transposable elements and interspersed repeats occupied 50% of the genome. Protein-encoding gene models were constructed. A total of 50,684 protein-encoding gene models were predicted, of which 31,245 were anchored. Heterozygosity was estimated to be about 1.3%. A phylogenetic tree was constructed where the olive-tree clustered with oil-crop sesame (S. indicum L.). Genes involved in oil biosynthesis, fruit ripening, secondary metabolite synthesis and alternate fruit bearing were annotated. Small RNAs and transcription factor genes were annotated. The annotated genes were further analyzed to build a protein-protein interaction network map. The olive tree reference genome is available at the Olive genome browser (http://h3abionet.fso.ump.ma/cgi-bin/gb2/gbrowse/olea_europaea/), and will serve as a crucial source for the study of the olive genome, and fruit tree genomics. More effective olive tree breeding programs will be enabled.

2. Integrated and Sustainable Management of the Olive Tree in the Gharb Region of Morocco

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Abstract

In the Gharb region, the olive grove occupies about 30 000 ha, of which almost all (88%) is located in the north area of Sidi Kacem province. The olive grove of Gharb is dominated by the variety “Picholine Marocaine” (92%) mainly characterized by its adaptability to various soil and climatic conditions and
olive qualities with dual purpose. Olive oil production (23583 T) is designed largely (75%) to the Crush. The new strategy of the Green Morocco Plan (GMP) has given considerable importance to small farmers (Pillar II), which aims to upgrade agriculture solidarity, the fight against poverty and improve the standard of livelihoods. 250 beneficiaries working upon 350 ha are concerned by the Integration Project of Climate Change in the implementation of the Green Morocco Plan (PICCPMV) funded by the World Bank and the Global Environment. This project aims mainly the conversion of the perimeter with the low-yielding cereal, located in remote and marginal areas, which will be replaced by an orchard of olive tree. New agricultural technologies for adaptation to climate change enhance the resilience of the olive grove in respect of climate change. Furthermore, integrated management, variety, supplemental irrigation and inputs are considered priority and sustainable technologies that are considered as part of the Pillar II. These technologies have a positive environmental impact, resulting in a reduction of the effects of erosion, mitigating the effects of climate change and improving water efficiency by supplemental irrigation. **Keywords:** Climate change, Supplemental Irrigation, Olive tree, PICCPMV, Pillar II.

3. **Influence of Distance from Trees on Cereal and Legume Yield in Olive and Annual Crop Intercropping System in Northern Morocco**

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**Abstract**

In order to understand the effect of olive tree shade (Olea europaeae) on annual crops yield, in intercropping system in northern Morocco, vegetative growth and yield in association based on olive-cereal (durum wheat, soft wheat and barley) and olive-legume (chickpea, lentil, faba-bean) were evaluated at three sowing distance of crops. The crop year during which our study was carried out was a serious rainfall deficit, exacerbated by poor temporal distribution; it totaled 248 mm of rainfall between December and June, and the average temperature increased from 11.5 °C during the months of February and March to more than 23.3 °C in June. The first results regarding legumes showed that the grain yield of chickpea (up to 96 g/ linear meter) and faba-bean was important in the lines near the tree at a distance of 2 to 3.5 m marked by a strong shade. variance analysis results shown that there’s a very highly significant difference between the crop rows near the tree and those far from the tree between 4 and 5.5 m, against the performance of lentil that was important in the sunny lines (32g / linear meter) away the tree and very low among trees (16 g/ linear meter). For cereals, grain yield of durum wheat (49 g/ linear meter), soft wheat (51 g/ linear meter) and barley (31 g/ linear meter) responded in the same way, and all production components responded positively to the shade conditions against at the sunny sowing lines. In adverse weather conditions of this campaign, we concluded that the shade of olive trees had a positive effect on some parameters of crops yield, however, the annual crops were unproductive below and outside the olive canopy, and a second field experiment is necessary to better understand the effect of sowing distance between trees and annual crops to minimize interspecific competition and promoting complementarity between trees and annual crops. **Keywords:** Intercropping system; Olive trees; Annual crops; shade.
4. Some Results of Morphological Characterization an Agronomic Evaluation of the Main Olive Tree Varieties Investigated in Various Regions of Morocco

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Abstract

In Morocco, the olive cultivation is vested with great socio-economic importance. Today, the area devoted to olive cultivation has gone beyond 1 000 000 ha, thus representing more than half of the national arboreal area. Furthermore, the Contract Program for the Development of the Olive cultivation section which was established by the Ministry of Agriculture and the Green Morocco Plan, in its 2015 edition, has fixed as one of its major objectives the extension of olive cultivation to an area of 1.220.000 ha by the year 2020. On the national scale, the olive cultivation is mostly carried out in a traditional mode. In such conditions, the average harvest per hectare, between 1T/ha and 1.5T/ha are neatly inferior to the real potential production. The realization of higher levels of production and exportation fixed by the Contract Program mentioned earlier calls for and necessitates a modernization of olive cultivation.

In Spain, since 1986, the intensification of the production factors based on the use of performing and adapted varieties, the application of high densities, the drop by drop irrigation and the mechanization of the harvest which allows a substantial improvement, has made it possible to triple the quantity of the production between 1986 and 2003. In 2012, Spain has contributed, on its own, to 62% of the overall quantity of olive oil produced by the European Union. In Morocco, in terms of the research work which is being conducted by INRA on olive tree in various fields of experimentation, some national and international varieties of the latter have yielded higher levels of production which swing between 10T/ha and 17T/ha. Similarly, other specifications of agronomic interest have been spotted in some samples under investigation. The present communication aims to review some morphological characterization and evaluation results of agronomic performances of some national and international varieties of olive tree which have been studied in various experimentation fields and areas, the ultimate goal being to evaluate the degree of adaptation of these genetic resources to local pedo-climatic conditions.

Keywords: Olive tree, varieties, pedo-climatic, performances, adaptation.

5. Use of Vermicomposting Process to Reduce Toxicity of Olive Byproducts Using Eisenia andrei Earthworms

Hicham Lakhtar1*, Barhoum Kharbouch1,2, Abdelhamid El Mousadik2, Sevastianos Roussos3, Sandrine Amat4, and Nathalie Dupuy4

1 Laboratory of Biotechnology and valorization of Natural Resource (LBVRN), Faculty of Sciences, University Ibn Zohr, Agadir, Morocco; 2 Laboratory of Microbial Biotechnology and Crop Protection (LBMPV), Faculty of Sciences, University Ibn Zohr, Agadir, Morocco; 3 IRD - IMBE, Search institute for development Mediterranean Institute for Biodiversity and Ecology of marine and continental Aix-Marseille University, Campus St Jerome Sciences, Marseille, France; 4 Laboratory of Instrumentation and Analytical Sciences (LISA), Aix-Marseille University Campus Sciences St Jerome, Marseille, France. *Presenting and Corresponding author: h.lakhtar@uiz.ac.ma.

Abstract

In Morocco, large quantities of olive by-products (olive mill wastes and olive cake) are produced an-
nually. These by-products create serious problems for the environment, particularly groundwater and surface. Several biotechnological processes of olive wastes disposal including, composting, anaerobic digestion, evaporation, have been proposed but highly cost-effective in terms of operation and maintenance. However, the present study proposes a management system in which vermicomposting process could be adapted to the technical and economical requirements of the Moroccan olive sector. Indeed, the optimized mixture including olive cake, nitrogen source, bulking material was moistened by OMW with different dilution rate (M1: 0%, M2: 25%, M3: 50%, M4: 75%). Vermicomposting and a combination of thermophilic pre-composting and vermicomposting of the defined mixtures were compared as ways of phenolic removal and bioconversion of organic matter into vermicompost with high nutrient content. The vermicomposting parameters related to biomass gain and reproduction rate of earthworm were monitored. Similarly, C/N ratio and phenolic removal were recorded. The mixtures without OMW or 25% of OMW proved more suitable for both vermicomposting and combined thermophilic composting - vermicomposting as their vermicomposts were more stabilized and with higher nutrient contents than those made from mixtures with 50% and 75% of OMW. In addition, the reduction in phenolic compounds observed in mixtures M1 and M2 caused a decrease in phytotoxicity which results in an increase in germination index (GI >80%). **Keywords:** Olive by-product, Vermicomposting, Eisenia Andrei, Biocompost - Organic matter, Polyphenols, Phytotoxicity test.

6. Quality and Chemical Profiles of Monovarietal Olive Oils in Eastern Morocco

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**Abstract**

Olive oil becomes the object of a considerable amount of research. There are numerous data on chemical-physical characteristics and olive oils quality, of various origins from different world’s production areas, particularly Mediterranean countries. Paradoxically, very few data, on olive oil produced in the eastern Morocco. In this region, olive oil production is considered as an ancient activity, where old olive groves can still be observed, but recently monovarietal groves seem to be increasing and the olive cultivation is being improved by renewing old trees, reducing the association with other crops, selecting the olive varieties suited to local agro-climates and planting new single variety orchards. The aim is extension of olive grove surface areas and improvement of olive oil quality (according to the great *Morocco’s green plan) and this is leading to an increase in the prevalence of monovarietal olive oils. Thus the monovarietal oils produced from the ‘Arbequina’, ‘Arbosana’ and ‘Koroneiki’ varieties, which have recently been introduced under intensive cultivation in the eastern Morocco, underwent physico–chemical characterization to determine quality criteria, natural antioxidant content, fatty acid composition and triacylglycerol profile. The Rancimat test was performed to assess the oxidative stability of these monovarietal oils and their blends to determine the storage stability and the best shelf life of the blends. **Keywords:** Monovarietal-Olive oil, Arbequina, Arbosana, Koroneiki, Fatty acid, Triacylglycerol, Quality.

The Olive Oil agro-industry is one of the most concerned sector by *Morocco’s Green Plan (2010 - 2020) designed to promote the development of the entire agricultural and territorial potential and aims to meet new challenges facing Morocco’s competitiveness and opening of markets. Thanks to “Maroc-Belgique cooperation» for supporting financially this applied research.
7. Seasonal Changes of Macronutrients in Olive Tree Leaves

Karima Bouhafa¹² and Lhoussaine Moughli². ¹ Regional Agricultural Research Center, P.O.Box 578, Meknes, Morocco; ² Soil Science Department, Hassan II Agronomy and Veterinary Institute, P.O.Box 6202, Rabats-Instituts, Rabat, Morocco.

Abstract

Not provided.
1. Perfume Plants Innovation and Sustainability Using Modern Molecular Breeding Tools

Adnane Boualem

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Abstract

The overall world market of cosmetics, perfume, scents and fragrances is more than €425 billion. In France, the perfumery and cosmetics is a strategic industry sector as it represents a foreign trade surplus of €7.6 Billion more than the food industry ($6.3 Billion). Ambergris, the metabolic product found in the gut of some blue sperm whales and the best-known amber odorant has been particularly used in perfume industry for its intense fragrance and unequalled fixative properties. As a consequence of the growing demand for ambergris-type odorants coupled with the almost worldwide ban on whaling, perfume providers have been looking for new, commercially viable, synthetic substitutes. Among the most synthetic equivalents of the scarce natural ambergris source, ambrox became the most important one. The natural pools of precursors for the synthesis of ambrox include mainly sclareol. Sclareol, a diterpene secondary metabolite of high value for the fragrance industry, is extracted from clary sage plant (Salvia sclarea). Clary sage, the 3rd perfume plant cultivated in France, synthesized the sclareol in the glandular trichomes that densely cover flower calices. As for the vast majority of medicinal and aromatic plants, the cultivation of clary sage relies only on the use of indigenous local or introduced populations. Despite the fame of the French perfume industry and the economic importance of the sclareol and essential oil, clary sage cultivation is declining due to the low yield of the cultivated varieties and to the lack of breeding programs and innovation. To rise to the challenge of improving sclareol production, the FRAGRANCE project aims to establish and apply new breeding concepts to improve sclareol yield and production stability. We propose to improve our understanding on the molecular and genetic mechanisms of sclareol production and the temporal pic of its production. We aim also to deliver the tools and the necessary expertise to engineer high productive varieties by manipulating the sclareol pathway as well as agronomic traits such as clary sage vigor, flowering and plant habit. In this context we propose to engineer plant prototypes that will be tested in different locations for sclareol and essential oils production.

2. Functional Food Based of Powder Opuntia ficus Indica: Nutritional Effect

Bouchra Nabil*, Mostapha Mahrouz, Mohammed Bouchdoug, and Nadia Saadouni

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Abstract

A nutraceutical is a food which, in its natural or processed form contains, in addition to its nutritional com-
ponents, small amounts of other bioactive compounds that provide additional benefits to health. This is the case for the cladodes Opuntia ficus indica; which contain a set of bioactive compounds that have proven their importance in the prevention or cure of many chronic diseases (cancer, hypertension, obesity, cardiovascular disease), this is the reason why the powder dehydrated cladodes is sold widely used in pharmaceutical and food industry. The aim of this study was to evaluate the nutritional quality of Opuntia ficus indica cladodes belonging to the area of Marrakech-Morocco and compare it to the most food consumed in Morocco and that are rich in these components to enhance and justify his contribution during its use as a nutraceutical for therapeutic effect. Harvested rackets are washed and dried and then ground to get a fine powder; several analyzes were performed to visualize nutritional value (minerals, trace elements, dietary fiber, vitamins and total phenol content). The results show that the powder of Opuntia ficus indica cladodes presents an interesting source of major and secondary nutrients and trace elements essential to the growth and development of the human body since the levels of certain elements far beyond the daily needs recommended by WHO; for calcium with a 6 times more than the milk content. In addition, poly total phenols (having a very important antioxidant activity) and dietary fiber are found in the powder with considerable content. This work demonstrates the nutritional potential benefit attributed to this species, allowing the possibilities of using it as an alternative power source for both humans and animals for its remarkable therapeutic effect with no secondary effect. **Keywords:** Cactus (Opuntia ficus indica); Functional food; Nutritional quality, Therapeutic effect.

**Acknowledgments:** The authors gratefully acknowledge the Ministry of Higher Education, Scientific Research and Professional Training of Morocco, Priority Research program (PPR-B-Mahrouz-FS-UCA- Marrakesh).

### 3. Determination of Fat and Sugar Contents in Carob Pulp from Wild and Domesticated Moroccan Trees

Rababe Essoufi, José Manuel Igartuburu, Zineb Nejjar El Ansari, Brahim El Bouzdoudi, Francisco Antonio Macias Domínguez, José María Gonzalez Molinillo, and Ahmed Lamarti

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**Abstract**

*Ceratonia siliqua* L. (carob tree) is a fruit and fodder tree which has many favorable potentialities to soil conservation and rural development. This typical essence of Mediterranean flora has many socioeconomic, ecological and industrial interests. In order to valorize the Moroccan carob, we have carried out a study about fat and sugar composition on carob pods (pulp) of 12 wild trees and 8 domesticated ones from 15 different localities in Morocco. Fat content, identification and quantification of fatty acids on dry pods powder were determined after methylation by Gas Chromatography (GC) and Sugar content was studied through ion chromatography. Results show that fat content of carob pods from wild trees varies from 0.053 % to 0.727 %, while it varies from 0.079 % to 0.347 % for domesticated ones. Analysis of fatty acids methyl esters by Gas Chromatography allowed identifying and quantifying 10 fatty acids on dry pod powder. Oleic acid (C18: 1n-9c) is the most abundant one in all powder samples from wild and domesticated trees, except one wild tree whose the most abundant fatty acid is palmitic acid (C16: 0). The three most abundant fatty acids are oleic acid (C18: 1n9c), linoleic acid (C18: 2n6c) and palmitic acid (C16: 0). The most abundant saturated fatty acids are palmitic acid (from 8.57 mg/
100 g of dry matter to 154.05 mg/100 g of dry matter) and stearic acid (C18:0) (from 1.83 mg/100 g of dry matter to 38.52 mg/100 g of dry matter. Oleic acid is the main unsaturated fatty acid in all the samples (from 8.6745 mg/100 g of dry matter to 291.56 mg/100 g of dry matter), followed by linoleic acid (from 1.36 mg/100 g of dry matter to 95.07 mg/100 g of dry matter). Results obtained for sugar composition show that carob pulp contains up to 40% of sugars, which are sucrose, glucose and fructose, identified and quantified by ion chromatography. Sucrose (non-reducing sugar) is the dominant sugar in the carob pulp, with content varying from 192.10 to 351.60 g/kg of dry matter for wild trees and from 159.16 to 312.67 g/kg of dry matter for domesticated ones, followed by reducing sugars: glucose and fructose. Glucose content varies from 3.92 to 81.34 g/kg of dry matter for wild trees and from 3.57 to 36.03 g/kg of dry matter for domesticated ones. Fructose content varies from 12.48 to 92.55 g/kg of dry matter for wild trees and from 22.95 to 60.13 g/kg of dry matter for domesticated ones. Keywords: Ceratonia siliqua L., Pod Powder, Gas Chromatography, Ion Chromatography, Fat, Fatty Acid, Sugar, Sucrose, Glucose, Fructose.

4. In Vivo Wound Healing Potential and Identification of Bioactive Compounds from Pistacia lentiscus Leaves By HPLC-PDA-ESI-MS Detection

Halima Saiah1,4*, Rachida Allem1, Meriem Mokhtar2, Wassila Saiah3, Fatima Zohra El Kebir4

1 Faculty of SNV, Department of Biology, University of Hassiba Ben Bouali, Chlef, Algeria; 2 Laboratory of Beneficial Microorganisms, Functional Food and Health, Faculty of Natural Sciences and Life, University of Abdelhamid Ibn Badis, Mostaganem, Algeria; 3 Department of biological sciences and physiology, Laboratory of bioenergetics and intermediary metabolism, University of Sciences and technology Houari Boumediene, Algiers, Algeria; 4 Department of Biology, Faculty of Life and Natural Sciences, University of Oran I Ahmed Benbella, Oran, Algeria. *Presenting author: halimasaiahbio@yahoo.com

Abstract

The present study was carried out to explore the in vivo wound healing potential of Algerian Pistacia lentiscus and to identify the active compounds that may be responsible for its action. Polyphenols were extracted with 80% methanol. A 10% ointment was made up from methanol extract of P. lentiscus Studies were performed on excision wound model using the test ointment. The healing potential was assessed by measuring wound contraction rate and hydroxyproline content. In addition, histological evaluations of full thickness wounds on the 16th post wounding day were performed. HPLC-PAD-ESI-MS analyses were used for identification and confirmation of bioactive compounds. The test ointment-treated groups healed significantly faster, which was indicated by improved contraction rate (93.45±3.08) % in comparison to control group (73.12±3.51 %). Moreover, biochemical analyses revealed a significant increase in hydroxyproline contents of the ointment-treated wounds in comparison to control group. The results obtained from the histological evaluation indicated that ointment treatment of wounds promotes the process of wound healing by influencing fibroblasts proliferation, collagen synthesis and deposition and enhancing the rate of re-epithelialisation. The HPLC-PDA-ESI-MS studies revealed the presence of Catechin as a major compound. This study had demonstrated that the methanol extract promoted the acceleration of the healing process when compared to the control group. This might be due to the combined effect of the constituents present in the extract. Keywords: Pistacia lentiscus, Polyphenols, Wound healing, HPLC-PDA-ESI-MS.
5. Biological Activities of Thymus leptobotrys and Thymus satureioides, tow Moroccan Aromatic and Medicinal Plants

Abdellah El Hamdaoui1,2*, Asmaa Bouglad1,2, Fouad Msanda1, Abdellah Ait Ben Aoumar2, Hassan Bou-baker2, Yassine El Maati1, Abdelkhaelq El Moslih1,2,3, Fouad Achemchem3, El Hassan Boudyach2, and Abdelhamid El Mousadik1


Abstract

In the last decades, the essential oils and various extracts of plants have been of great interest as they have been the sources of natural products. The antimicrobial activities of essential oils and plant extracts constitute the basis of many applications, including food preservation, pharmaceuticals, alternative medicine and natural therapies. The Moroccan flora has more than 7000 species and subspecies among which approximately 800 are aromatic and medicinal plants. These plants are a potential source of natural bioactive molecules and can contribute to the economic development of rural populations. Essential oils of Thymus species are classified among the most powerful substances due to their strong antimicrobial activity, particularly against pathogenic microorganisms resistant to antibiotics (Bellakhdar, 2006). Thus, the aim of this study was to evaluate the antioxidant, insecticidal and antibacterial activities of essential oils of tow Moroccan aromatic herbs, Thymus leptobotrys and Thymus satureioides. The DPPH radical scavenging ability and Power reducing assay were used to evaluate the antioxidant activity of essential oils. While, the agar disc diffusion assay and broth macro-dilution method were employed for the determination of antibacterial activity against six bacteria, namely Listeria innocua (CECT 4030), Listeria monocytogenes (CECT 4032), Staphylococcus aureus (CECT 976), Bacillus subtilis (DSM 6633), Proteus vulgaris (CECT 484) and Pseudomonas aeruginosa (CECT 118). The results showed that Thymus leptobotrys oil was found the most active one as antioxidant product with an IC50 value of 0.148 mg/ml for DPPH assay and 0.023 mg/ml for Power reducing assay. Concerning antibacterial activities, results showed that both oils inhibited growth of all the tested bacteria with minimal inhibition concentration (MIC) and minimal bactericide concentration (MBC) lower than 2mg/ml. Both oils showed a moderate insecticidal activity against Tribolium castaneum. Keywords: Essential oil, aromatic and medicinal plants, biological activity, antioxidant activity, insecticidal activity, antibacterial activity.

6. Chemical Composition and Antimicrobial Activities of the Essential Oil of Same Algerian Medicinal Plant

Ourida Chouitah12, B. Meddah1, A. Aoues2, and P. Sonnet3

1 BGMSS, Equipe valorisation therapeutique Bioconversion, Microbiological engineering and health Security Universite de Mascara - 29000, Algeria; 2 Laboratoire de Biochimie Faculté des Sciences, Université d’Oran – 31000 Algérie; 3 UMR-CNRS 6219, Laboratoire des glucides, UFR de Pharmacie, Université de Picardie Jules Verne, 1 rue des Louvels, Amiens, 80037, France. *Presenting author: Chouitah_o@yahoo.fr.
Abstract

Although many pathogens can cause foodborne illnesses. These may also be potential bioterrorism agents for food sources. The aim of this study is the used of bioactive compounds of essential oil from glycyrhiza glabra leaves like antimicrobial activity and describes the chemical composition of essential oil. The essential oil of Glycyrrhiza glabra leaves was obtained by hydrodistillation and analyzed by GC and GC-MS. Other parameters such as refractive index, optical rotation; density, polarimetric deviation; freezing point and Solubility in ethanol are also measured. The main hydrocarbon and oxygen containing compounds were: Isoniazid (13.36 %); Diethyltoluamide (6.56 %), Benzoic acid (5.37 %), Benzene (4.58%), Linalool (2.25 %), Prasterone (5.63 %), Warfarin (1.43 %), Iodoquinol (1.90 %), Phenol, 4-(2-aminopropyl)(1.30 %). The antibacterial activity of the oil was determined using the agar diffusion method and it was found that it was active against Escherichia coli (ATCC 25923), Salmonella typhimurium (ATCC14028), Staphylococcus aureus (ATCC-29213), Bacillus subtilis (ATCC-6633), Escherichia coli (G-)( ATCC 35218) and Pseudomonas aeruginosa (ATCC 27853). 

Keywords: Food safety, Essential oil, antimicrobial activity.

7. Summer Time Measured Climate Characteristics in a Moroccan Large Scale Canary type Tomato Greenhouse

Hassan Majdoubi1,2*, Hicham Fatnassi2, Allal Senhaji3, S. Elbahi1, Hassan Demrati4, M’hamed Mouqallid3, and Lahcen Bouirden4


Abstract

Agriculture, especially horticulture production in protected environment is one of the main economic activities in Morocco. The area under protected agriculture increases over the last decades. Greenhouse climate factors required for the optimal plant growth involve photosynthesis and respiration. So, the major task in greenhouse construction is to optimize the conditions for plant development, generally during the off-season from normal outside field production. Consequently, to get crops growing properly and with optimum efficiency, we need to have accurate control of greenhouse climate parameters. Light, temperature, humidity and CO2 concentration need to be effectively adjusted to one another, and preferably as accurately as possible. We also need to control the influence of the wind, rain and sunshine on the internal climate. The aim of this study is to present and analyse the details of some summer measured climatic characteristics in real cultural conditions in a 1 ha canary type greenhouse, equipped with insect proof nets (20/10) and planted with a tomato crop, in the Souss Valley of Morocco. Results confirm the existence of a significant elevation of greenhouse temperature as compared to outside especially at midday time when this different equal 18°C. The opposite is valid in night-time; the outside temperature is higher than that of greenhouse, the different varies from 2°C in September period to 10°C in May. Also, results show that the greenhouse and outside air relative humidity values are similar during night time and its reach the saturation level, contrarily, during daytime the greenhouse relative humidity reaches the minimal value with 25%. 

Keywords: Greenhouse, microclimate, tomato, insect proof nets
XI. SESSION XI. US-MOROCCO RESEARCH AND HIGHER EDUCATION COLLABORATION

Co-Chair: Khalid Meksem, Southern Illinois University, USA
Co-Chair: James Miller, MACECE, Morocco

1. Undergraduate and Graduate Studies in the US

My Abdelmajid Kassem*

Plant Genetics, Genomics, and Biotechnology Lab, Dept. of Biological Sciences, Fayetteville State University, NC, USA. *Presenting author: mkassem@uncfsu.edu.

Abstract

In this presentation, I will discuss undergraduate and graduate studies in the US and opportunities for Moroccan students to attend US institutions of higher education including community colleges, four-year colleges, and universities. Emphasis will be on the graduate school and the cost of attending as an international student including tuition, room and board, and additional expenses will be discussed with detailed examples from several US institutions. Opportunities for scholarships, work study, and other financial aid opportunities will also be discussed.

2. The Graduate School Opportunities at Southern Illinois University, United States

Karen Midden*, Professor, Associate Dean, Landscape Architect

College of Agricultural Sciences, Southern Illinois University, Carbondale, Illinois, USA

Abstract

Southern Illinois University (SIU) Graduate School has a commitment to enhance advanced education through high quality instruction, experience and research for students. SIU is ranked by the Carnegie Foundation as being in the top 5% of all higher education research institutions in the United States, a ranking that must be earned and maintained through quality research and grantsmanship. The Graduate School offers master’s degrees in over sixty programs and the doctoral degree in over thirty programs. Graduate students are fortunate to study and research under the leadership of graduate faculty as they pursue advanced study leading to outstanding careers. There are ten colleges with programs and numerous departments within the colleges, one of which is The College of Agricultural Sciences. This college houses four departments with many disciplines within each department and they work collaboratively with outside departments. This presentation will provide general information about SIU, the Graduate School, requirements and opportunities to apply, study and research at SIU. An overview of the colleges will be provided with more specific focus on the faculty, areas of study and highlights of past graduates of the College of Agricultural Sciences Graduate Program.
3. My Life Experiences in the USA

Oussama Badad*

Laboratory of Biotechnology and Genetics, Faculty of Sciences, Mohamed First University, Oujda, Morocco. *Presenting author: oussama.badad@gmail.com.

Abstract

Far beyond the scientific exchange, the Fulbright experience is a cultural crossroad between the United States of America and the Kingdom of Morocco. The Moroccan students are not only research fellows they are also young ambassadors of the Moroccan history and culture. The Fulbright social experience was about discovering and melting into a new culture with all its components: the people, the food, the music, and all the traditions. Travelling north, south east and west to more the 20 states in 12 months while still doing great research, visiting the most significant places in the history of the US: capitols, white house(s), Museums, battle fields, cemeteries and music studios. This experience revealed some sides of my personality that I have never seen before brought joy and tears but made me the person I am today.

4. The Moroccan American Commission for Educational & Cultural Exchange Mission

James Miller

MACECE, Rabat, Morocco

Abstract

Not provided.

5. Fifty Years of IAV in Morocco

Ahmed Bouaziz

IAV Hassan II, Rabat, Morocco

Abstract

Not provided.

6. Networking and Opportunities

Khalid Meksem

Southern Illinois University, USA

Abstract

Not provided.
Poster #001. Natural Populations of Myrtle: Current Situation and Prospect of Use of Sustainable Domestication

Nadya Wahid*

Department of Life Sciences, Faculty of Sciences and Technical of Beni Mellal, University Sultan Moulay Slimane, BP 523, 23000 Beni Mellal, Morocco.

Abstract

Sustainable management of biodiversity plays a critical role in the economic, social and ecological. In Morocco, the use of plant genetic resources for the green economy is irrational with an imbalance between supply and ecosystem socio-economic demand. For example, the common myrtle (Myrtus communis L.) is one of the important medicinal and aromatic plants. In Morocco, the demand on was affected negatively in the last few years. Furthermore, the study focused on the analysis of the demand equation and offer on this species, noted that there is overexploitation naturally biomass for extraction of essential oils (EO). This study revealed that this species contributes most to the total annual value of exports (45%) of EO extracted from aromatic and medicinal plants. Although the productive potential of EO spontaneous myrtle populations is important, production is often linked to climatic and some populations are threatened with extinction (genetic diversity erosion) under the combined effect of anthropogenic pressure. Therefore, cultivation is becoming more important and it would be investire in establishing domestication programs and genetic selection, to meet the needs of sustainable socio-economic and ecological couple.

Keywords: Myrtle (Myrtus communis L.), ex-situ conservation, domestication, genetic selection.

Poster #002. Native Forest Degradation and Land-Use Changes as Main Drivers of Carbon and Nutrients in Semi-Arid Morocco

Mohamed Boulmane1*, Mohamed Saidi, Hayat Ooubrahim2, Mohamed Halim2, Mark R. Bakker3, and Laurent Augusto3

1 Laboratoire de Pédologie, Centre de Recherche Forestière, B.P. 763, Av. Omar Ibn Khattab; Rabat, Morocco ; 2 Université Mohammed V Agdal, Faculté des Sciences, Rabat, Morocco; 3 Bordeaux Sciences Agro, INRA, UMR 1391 ISPA, F-33170 Gradignan, France. *Presenting author: boulmanem@yahoo.fr.

Abstract

Land degradation and deforestation of natural forests are serious issues worldwide, potentially leading to altered land-use and carbon storage capacity. Our objectives were to compare carbon and nutrient pools in native oak forests and degraded land with alternative land-uses like eucalyptus plantations and croplands, and to assess the best harvest strategy for eucalyptus plantations. Carbon and nutrient pools in above- and below-ground biomass and soils were assessed by using stand inventories, harvested biomass values, allometric relationships, and selective sampling for chemical analyses. Harvest scenarios included stem-only, and various proportions of residues. Carbon pools in the total ecosystem were low in the degraded land and in croplands (6–13 Mg ha-1), and high in forests (60–92 in eucalyptus plantations; 87–110 in native forests). The soil nutrient status of eucalyptus stands was intermediate between
degraded land and native forests, and increased over time after eucalyptus introduction. All harvest scenarios for eucalyptus were likely to impoverish the soil, but at the moment the soil nutrient status has not been affected. Afforestation of degraded land with eucalyptus seems to be a useful restoration tool relative to carbon storage, but longer-term consequences on soil fertility and water need to be evaluated. Keywords: afforestation, carbon pools, soil nutrients, cork oak, eucalyptus.

Poster #003. Isolation and Identification of Entomopathogenic Fungi of the Mediterranean Fruit Fly (Ceratitis capitata)

Ayoub Hallouti1*, Hicham Karim1, Abdelaziz Zahidi2, Abdelhamid El Mousadik2, Abdellah Ait Ben Aoumar1, and Hassan Boubaker1

1 Laboratory of Microbial Biotechnologies and Plant Protection, Department of biologie, Ibn Zohr University, Faculty of Sciences, PO Box 8106, Agadir, Morocco ; 2 Laboratory of Biotechnology and Valorisation of Natural Resources, Department of biologie, Ibn Zohr University, Faculty of Science, PO Box 8106, Agadir, Morocco. *Corresponding author: Department of biologie, Ibn Zohr University, Faculty of Sciences, Agadir, Morocco. *Presenting author: hallouti.ayoub@gmail.com.

Abstract

This work forms part of biological control against crop pests and has as objectives search, isolation and identification of entomopathogenic fungi and the assessment of their pathogenic power against the Mediterranean fruit fly (Ceratitis capitata). Search, isolation and estimation of the abundance of entomopathogenic fungi were carried out on soil samples of Argania spinosa forests and citrus orchards. To trap the insect pathogenic soil fungi, we adopted the technique of using larvae of the fruit fly (Ceratitis capitata) as baits. The resulting fungal isolates are identified, based on macroscopic and microscopic criteria. After trapping, isolation and identification of fungal strains, a pathogenicity tests were used to select several fungal strains that have significant pathogenic powers against the Mediterranean fruit fly. The degree of virulence was estimated based on the ability of the fungus to induce the disease and / or death in the insect and also by calculating the lethal time 50 (LT50). The results obtained, demonstrated clearly the sensitivity of medfly of the different treatments tested and particularly to strains of Aspergillus niger and Epicoccum sp that have shown high mortality rates (more than 84%) and strains of Fusarium sp, Trichoderma harzianum of Scedosporium sp. and Ulocladium sp with more than 70% of mortality. Furthermore these strains showed short LT50 (less than 83 hours). All these results confirm firstly the presence of insect pathogenic fungi of the fruit fly Ceratitis capitata in the argan and citrus orchards soil, and prove at secondly the potential of insect pathogenic fungi in the fight against this pest. Keywords: Biological control, Ceratitis capitata, entomopathogenic fungi, citrus, Argania spinosa.

Poster #004. Endosymbioses Roots in Cytisus monspessulanus: Mycorrhizal Status and Phenotypic Rhizobia

Taoufik Belechheb1*, Abdelhay Arakrak1, Amin Laglaoui1, and Mohammed Bakkali1

Equipe de Recherche de Biotechnologies et Génie des Biomolécules (ERBGB), Faculté des Sciences et Techniques de Tanger, Maroc

Abstract

Plants have developed many strategies to cope with water shortages and essential nutrients from their
environment. One of the most interesting ways is the establishment of endosymbioses root with soil microorganisms. Thus the arbuscular mycorrhizal (AM), and soil bacteria nitrogen fixing grouped under the term of rhizobia promote the plants growth and resistance to many biotic and abiotic stresses. In order to assess the interactions between these microorganisms in the rhizosphere and the shrub Cytisus monspessulanus, three sites (R’milat, Boubana and Sloukia) were selected and sampled in the region of Tangier. Microscopic examinations of their roots revealed the presence of mycorrhizal fungi (AMF), with high colonization rates (over 90%), a relatively high density of spores with 3773 spores and the identification on the morphological basis of six genera: Glomus, Acaulospora, Entrophospora, Paraglomus, Septoglomus, Rhizophagus. The phenotypic characteristics (biochemical and physiological) revealed a widespread physiological diversity in rhizobia nodulating Cytisus monspessulanus: Assimilation of a wide range of sugars, amino acids and mineral salts, and a salt tolerance up to 5%, pH (3,5 to 10) and heavy metals.

**Keywords:** Cytisus monspessulanus, endomycorrhizae, Spores, Rhizobium, Tangier.

**Poster #005. Lipid Peroxidation of Argania spinosa Selected Lines Tolerant to Salt and Water Stress**

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**Abstract**

Lipids play an important role as the structural constituent of most of the cellular membranes. It is well known that free radical-induced peroxidation of lipid membrane is a sign of stress induced damage at cellular level. Therefore, the level of malondialdehyde (MDA), produced during peroxidation of membrane lipids, is often used as an indicator of oxidative damage. Argania spinosa (L.) callus tolerant to water and salt stress were selected. The effect of the procedure of selection followed on the levels of hydrogen peroxide (H₂O₂) and the degrees of the oxidative damage to the membrane lipids were examined. Analysis indicated that selected calli for both salt and water stresses maintained high levels of H₂O₂ compared to the non-selected calli while the differences in the content of malondialdehyde (MDA) was insignificant. Which indicates the lower level of oxidative damage caused after the selection procedure and the mobility of antioxidant system activity in order to limit cellular damages. **Keywords:** Argania spinosa, Callogenesis, salt stress, water stress, hydrogen peroxide, malondialdehyde, lipid peroxidation. This work is supported by the Hassan II Academy of Science and Technology and the Ministry of Higher Education and Scientific Research (Morocco).
Poster #006. Anti-Stress Molecules in Plants

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Abstract

For the adaptation to climate change, it is now essential to find new sources for food security mostly with the rapid growth of the world population. In the extreme conditions of life on earth, certain vegetal species presents a great capacity for survival in the arid climate and the Sahara. This property attracts the curiosities of the scientific world to study the biological mechanisms involved in this survival power. Our work try to identify and analyze the biological molecules involved in one of the metabolic pathways of certain of this plants types as argan, play an essential rôle both in the adaptation and the product yield of this plants species. The biotechnology research can be exploited for fighting against stress due to global warming for plants, by the exploitation of the molecules involves in stress resistance of plants naturally survivor at arid and Saharan climate. Keywords: Anti-stress molecule, biological mechanisms, Resistance, Adaptation.

Poster #007. Nutritional Variation Among Ecotypes of Sulla (Hedysarum flexuosum L.) Grown in North of Morocco in Relation to Soil Properties

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Abstract

The use of legume forages species as fodder for ruminant is increasingly becoming important in livestock production. In order to evaluate endemic forage species, a prospective study was perform in different regions of Morocco, allowed the determination the area of distribution of Hedysarum flexuosum L. known as sulla. The aim of this study was to determine chemical composition, mineral content and in vitro enzymatic digestibility of the whole plant, leaves and stems of sulla collected at late vegetative stage in five locations (Khandak Lihoudi, Ksar Sghir, Melloussa, Boukhalef and Beni Guerfet). The Principal Component Analysis (PCA) was used to assess relations between the quality components of plants harvested at each site and soil properties. Significant differences existed among the plants in their energy value in term of feed unit for milk (UFL), feed unit for meat (UFV) witch ranging from (0.85 and 0.78) to (1.29 and 1.31) and nitrogen value computed as crude protein digestibility (ranging from 91.44 to 148.32 g/kg DM) depending on their soil origin. Soil nitrogen, phosphorus, potassium, were the main factors driving compositional differences among plants. On the basis of this study, Hedysarum flexuosum L. have better nutritive potential grazing compared to mostly legume forages used as fodder or grazed pasture that can provide suitable forage for livestock. Keywords: Hedysarum flexuosum L., chemical composition, enzymatic digestibility and soil properties.
Poster #008. Study of Agro-Physiological Behavior of Moroccan Varieties of Autumn Cereals (Soft Wheat, Durum Wheat, Barley, Oats and Triticales) to Assess their Potential for Adaptation to Climate Change Affecting the Semi-Arid Area of Abda, Morocco

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Abstract

The cereal cropping systems is the dominant activity in Moroccan agriculture. This production occupies a very important place in semi-arid areas of Morocco. Water is the major factor limiting this production in these areas. The main objective of this study was to focus on the identification of the varieties to improve water use efficiency and drought tolerance. The trial has been installed at the experimental station of the National Institute of agronomic research (INRA) of Jemaa Shaim (plain of Abda) in rainfed farming. 88 varieties of cereal species were used (32 varieties of durum wheat, 26 varieties of soft wheat, 17 varieties of barley, 9 varieties of oats and 5 varieties of triticale). The experimental device used is a completely random with three repetitions. The main results show a significant difference in the density of lifting between species (58 feet/m² for barley, 40 feet/m² for triticale, 39 feet/m² for durum wheat, 36 feet/m² for the soft wheat and 27 feet/m² for oats). In fact, 4 varieties of barley, 3 varieties of triticale, 3 varieties of durum wheat, one variety of soft wheat gave enough lifting rates compared to other varieties within each species. On the other hand, all the varieties of oats used gave very low densities. Biological performance registered with barley and triticale have been high compared to that recorded by oats, durum wheat and soft wheat which are respectively (11421, 10764, 5967, 2314 and 2175 kg/ha). In fact, 8 varieties of barley, 3 varieties of triticale, 6 varieties of durum wheat, 5 varieties of soft wheat and 6 varieties of oats gave biological yields high enough compared to other varieties within each species. However, in terms of grain yield, 7 varieties of oats have presented a fairly high grain yield (between 10.67 and 14.75 qs/ha), 5 varieties of barley (between 5.42 and 8.22 qs/ha), 4 varieties of triticale (between 6.38 and 8.94 qs/ha) and 5 varieties of durum wheat (between 5.71 and 7.39 qs/ha). On the other hand, all varieties of soft wheat gave a very low grain yields vary between 0.52 and 4.30 qs/ha. In conclusion, several varieties of barley and triticale have shown wide adaptation to stressful conditions experienced in the Abda area, followed by other varieties of durum wheat and oats. However, soft wheat varieties evaluated have shown poor adaptation to these stress conditions.

Keywords: Climate change, Barley, Durum wheat, Soft wheat, Oats, Triticale, Abda.

Poster #009. Decolourization of Methylene Blue and Acid Orange 7 Dyes from Aqueous Solution by Adsorption on NaOH Treated Eggshells as an Efficient Adsorbent :Batch Study and Fixed Bed Column using Response Surface Methodology

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Abstract

In this study, we investigated the adsorption of Methylene blue (MB) and Acid Orange 7 (AO7) dyes on a natural adsorbent, we have selected a food derivative product (eggshells) treated with NaOH (TES) as a new and potential biosorbent. Different models of adsorption isotherms in batch study were applied to fit experimental equilibrium data at different solution temperatures such as Langmuir, Freundlich, Temkin, and Dubinin–Radushkevich (D–R) and the isotherm parameters were calculated in order to describe the biosorption process; Temkin model fitted the adsorption data quite reasonably (R² > 0.98). A Comparison of different kinetic models parameters was evaluated for the pseudo-first-order, the pseudo-second-order, Elovich, Intraparticle diffusion and Bangham’s model. Results have showed that the adsorption of MB on TES dye followed very well the second order kinetic model. The thermodynamic parameters were evaluated; The negative values of ΔH° and ΔG° indicated respectively that the adsorption of MB onto TES was exothermic and spontaneous process. The continuous method was modeled by response surface methodology (RSM) and was optimized using Box–Behnken design (BBD). Fixed bed adsorption has become a frequently used in wastewater treatment processes. The effect of operating parameters such as flow rate, initial dye concentration, and bed height were exploited in this study. The studies confirmed that the breakthrough curves were dependent on flow rate, initial dye concentration solution of AO7 and bed depth. The precision of the equation obtained by Box–Behnken design (BBD) utility for modeling and optimization by response surface methodology RSM was confirmed by the analysis of variance (ANOVA). The optimum conditions proposed by Box–Behnken design (BBD) to reach the maximum dye removal through adsorption process. Under the optimum conditions, the removal efficiency of AO7 were 89.89% .

In summary, the results have established good potentiality for the waste eggshell particles to be used as a sorbent for the removal of MB from wastewater in batch study and was shown to be suitable adsorbent for adsorption of AO7 using fixed-bed adsorption column. Keywords: Biosorption, methylene blue, dye removal, kinetics, isotherms, thermodynamics, acid orange 7, bed depth, fixed-bed column, wastewater, TES, RSM, BBD, optimization, modeling.

Poster #010. Discoloration of Urbain Wastewater

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Abstract

The coloration of wastewater is one of the major problems faced by the wastewater treatment plants due to the toxicity of dyestuffs, their non-biodegradation and their resistance to conventional treatment processes. This problem is reflected in the treatment plant chosen as an example, where the effluent is treated but the coloration remains and resists during all stages of processing treatment. The molecules suspected of being the source of coloration are non-biodegradable. We did sampling in the station, then the activated carbon adsorption was carried out to try to recover these molecules by adding 100g of activated carbon to 100ml of the sample and stirring for 30 minutes. A second stirring, after filtration and adding 50ml of methanol is done. And to ultimately eliminate the traces of water we used sodium sulfate. We tried to characterize the resulting product by different techniques for characterization and microanalysis. It was therefore, characterized by methods: HPLC coupled mass, column chromatography and TLC. As investigated, it was two principal molecules with wavelength λ = 230 nm and the other
at $\lambda = 275$ nm, for which we have to specify the source and trying to eliminate them by an eco-process. It is up to us to propose solutions that are efficient, economic and ecological for bleaching effluents while respecting the standards. Note that sampling will run for a year to specify the industry likely to be the source of the coloration, and then we should propose solutions from the source, that surely would be more effective. **Keywords:** Wastewater coloration, dyes, adsorption, characterization technics.

**Poster #011. Ginger Extract Ameliorates Dyslipidemia in High Fat Diet Induced Obese Rats**

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**Abstract**

In recent years, ginger (Zingiber Officinale) has become a subject of interest because of its beneficial effects on human health, it is considered a common constituent of diet worldwide. Hypercholesterolemia have become a major problem. It is known to be a risk factor for the development of cardiovascular diseases. The purpose of the present study was to investigate the hypocholesterolemic effects of daily oral administration of ginger extract in rats. Rats (160-180gm) were divided into 3 groups: Group1: received normal diet, Group2 and Group3: received high cholesterol diet (1%) for 6 weeks. The group3 is post-treated with ginger orally for 6 weeks. Rats post-treated with ginger extract show significant decreased on plasma cholesterol, triglyceride and LDL-cholesterol. The plasma HDL cholesterol was significantly increased. It is conclude that the consumption of ginger is capable of improving hyperlipidemia.

**Poster #012. A Numerical Study of Different Materials by LRPIM Method Using RBFs**

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**Abstract**

The LRPIM meshless method employed for the numerical implementation of the equations of a elastostatic 2-D Solid problems based on the local Galerkin method formulation and by using the radial basis functions RBFs. We studied the effet of sizing parameter of subdomain and the parameter of RBFs Functions on the accuracy and convergence of the methods as a function of regular distribution number of field nodes for different materials and by comparison with results available from the litterature. **Keyword:** Meshless method, Radial basis functions, shape parameters, point interpolation method, different materials.

**Poster #013. Pheophytinization of Chlorophyll in Argan Tree Under Drought Stress**

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63
Abstract

The objective of the study was undertaken to characterize the pigment composition and to quantify the degradation of chlorophyll in the Argan tree under drought conditions. Plants aged two years, corresponding to four contrasting ecotypes of Argan tree, were exposed to three different irrigation regimes during two months. The concentration of anthocyanin and pheophytin increased significantly in all ecotypes under drought stress (P< 0.001). However, the Chl a/b ratio has decreased as the drought stress increased. In fact, our results showed high increase in percentage of pheophytinised chlorophyll suggesting that drought stress destabilize the chloroplastic pigment-protein complexes, rendering the chlorophyll susceptible to pheophytinization. The drought stress probably caused membrane disorganization in Argan tree and enhanced membrane permeability, which led to a kind of cascade reaction resulting in a lower pH and promoting pheophytinization. Intra-specific differences were observed in pigment composition among Argan tree ecotypes studied. According to Three-way ANOVA analysis, a significant ecotype x watering regime x time interaction was recorded for the anthocyanin and pheophytin contents (P< 0.05). Keywords: Argan tree, drought stress, pheophytin, anthocyanin.

*** This work is supported by the Hassan II Academy of Science and Technology and the Ministry of Higher Education and Scientific Research (Morocco).

Poster #014. Evaluating the eating behavior of Type 1 Diabetic patients receiving Functional Insulin Therapy in the Endocrinology Department of ERRAZI Hospital - UH Med VI Marrakesh

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Abstract

Functional Insulin Therapy (FIT) is a therapeutic educational method that helps ameliorate the glycemic control; it frees T1D patients from treatment constraints and improves their life quality. This study aims at evaluating the eating behavior of T1D patients receiving FIT, changes in metabolic parameters, and the frequency of hypoglycemia. This is an observational study conducted in the Endocrinology Department of the University Hospital Med VI in Marrakech. It covered 20 T1D patients receiving FIT (60% women/ 40% men; 75% between 19 and 37 years old; 60% of all the cases have had T1D for or less than 5 years / 40% for more than 5 years; HbA1c initial average: 9 (±2.05%). Concerning metabolic data: the frequency of hypoglycemia has decreased; 67% among the cases who had one session per month. A considerable modification is also noticed in the HbA1c; 3 months after FIT, HbA1c Average: 8.24 (±1.47%) and 6 months after FIT, HbA1c Average: 7.47 (±0.8%). Concerning nutritional evaluation, ½ of the participants of the current study have BMI > 25kg/m² vs BMI Average: 24kg/m². Current
weight average: 69 (±9kg) vs ideal weight average 61.4 (±6.61kg). Total Energy Intake Average 2830 (±80.35 kcal/day) vs Energetic Needs Average: 2550 (±394.03 kcal/day). Concerning life quality, 100% of T1D patients receiving FIT are pleased to have participated in the FIT as they have adapted their diet to fit their lifestyle. It is noticed that life quality of T1D patients receiving FIT has improved. Thanks to this method, T1D patients could consume food said to be “forbidden” for them earlier without any deterioration at the level of the glycemic control. In the end, T1D patients have truly become actors in their own health.

Poster #015. Chemical Tests for Available Soil Phosphorus

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Abstract

The research goal was to develop a simplified method for estimating the available phosphorus for routine analysis. This study compared the measured Soil-P using the ICP-NaHCO3 with the simplified extraction method (SM-P). The correlation (r=0.99) and the regression(using xlstat-pro) were employed for comparing the data of available phosphorus content in soil samples for a variety of Moroccan soil types, with contrasted physicochemical characteristics: Ali Moumen, Oued Qibane, Ouled Said, Settat, Dower Lhfaya, and Had Ghoualem (are located using ArcGIS 10.1 and fertiMap). SM-P is most suited for soils with pH ≥ 7 and CaCO3 content above 5%. In this experiment, several parameters are modified, the fineness, the type and degree of mechanical agitation, the color development solution (2.5% (NH4)6Mo7O24.4H2O, in 5 mol.l-1 H2SO4), 1 %(w/v) ascorbic acid solution), and the adaptation of the reading at 860 nm, are improving the accuracy of P analysis, the high correlation of this method with ICP-NaHCO3 content can be an indication for it. The results of this experiment showed that SM-P can be the best method for predicting the available phosphorus, simple, quick, and easy to execute. Keywords: Fertilizer Phosphate, Extraction Methods, Available Phosphorus, Moroccan Soils

Poster #016. Micropropagation of Thymus broussonetii Boiss., Threatened Medicinal and Aromatic Plant in Morocco

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Abstract

Within the Labiate family, with about 220 genera, the genus Thymus is one of the eight most important genera with regard to the number of species included, although this number varies depending on the taxonomical point of view. In Morocco, 15 species of this genus have been identified. These are rare, endemic and endangered species. Indeed, people used intensively and exploited haphazardly thyme
populations. Moreover, the interests of the pharmaceutical and food industries focus on specific chemo
types especially thymol. In such a situation, cultivated thyme represent an indispensable alternative,
via the selection of endangered species and the implementation of culture techniques under modified
environmental conditions (ex vitro culture) or controlled conditions in laboratories (in vitro culture). In vitro
vegetative multiplication is a good method for reproduction of genotypes and selected chemotypes of
certain species. Plants cultivated in vitro can be used for many purposes and then collection from their
natural shelters could be avoided, also, model systems to study the production and accumulation of me-
tabolites with a great interest could be developed. The present study reports an efficient protocol for in
vitro clonal propagation of Thymus broussonetii Boiss., threatened medicinal and aromatic plant in Mor-
occo. Initially, seeds collected from wild plants were used for in vitro culture establishment on Gautheret
basal salts medium without plant growth regulators. Then, aseptic and living explants were transferred
to Shah and Dalal medium for culture multiplication. Afterwards, we have selected one stable clone (the
longest one) and we have evaluated the effect of six macronutrients. After that, seven cytokinins in differ-
ent concentrations have been evaluated. Moreover, the effect of three polyamines has been investigated.
Thereby, seeds germination started from the fourth day with a survival rate of 24-28%. Furthermore,
Margara medium has been proved the most favorable for plantlets growing. Higher number of buds
(24.083±1.401) was obtained on Maragarra medium supplemented with 0.93 μM of DPU, it also ensures
good shoot multiplication with an average number of 1.833±0.177 and good root development with
an average number of 8.208±0.942 and a length of 1.254±0.085 cm. Also, 5 μM of Spermine gives
higher number of buds (26.833±1.789), a good shoot multiplication (1.958±0.153) and a good root
development (an average number of 8.917±0.782 and a length of 1.821±0.120 cm). Plantlets with
well developed roots were successfully acclimatized to ex vitro conditions and an in vitro propagation
was again established from the acclimatized and well grown plants. The in vitro culture system success-
fully established for Thymus broussonetii Boiss. offers a viable tool for mass micropropagation and con-
servation of this very threatened species. **Keywords:** Medicinal and Aromatic Plants, Thymus broussonetii,
Micropropagation, Cytokinins, Polyamines.

Poster #017. Influence of Hormonal Treatments and of Sucrose on the Micropropagation and Mi-
crotuberization of three Potato Varieties (**Solanum tuberosum** l.) adapted to Agroclimatic Conditions
in Morocco

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Abstract

The production of vitro tuber is one of the most efficient tools for the propagation of basic material, it
allows, at any period of the year, to obtain healthy seeds ready to be planted. In this context we attemps
to improve the micropropagation and microtuberization of some potato varieties. In our research, com-
parative studies have been achieved, we used the seeds of three varieties, E (Granola) C (999002), D
(998010) from of the International Center of Potato. Under different Murashige & skoog media, with dif-
ferent doses of growth regulators (6-benzylaminopurine (BAP)) and constant concentration of gibberellic
acid (GA3 ) and indole-3-acetic acid (IAA). The best regeneration of potato stem cuttings was obtained
with MS medium without hormone (M0). The M3 medium supplemented with 0.005 mg. L-1 of the indole-
3-acetic acid (IAA); 3 mg. L-1 of 6-benzylaminopurine (BAP) and 0.5 mg. L-1 gibberellic acid (AG3) has
shown positive effect on the number of stems formed. For tuberization, three types of Murashige & Skoog
(MS) media of tuberization, with, on the one hand, a sucrose concentration varied from 60 to 80 g L⁻¹, without hormones and on the other hand with different hormonal combinations (Kinetin + BAP) or (BAP). The results showed that the medium (M2), added with 80 g sucrose, 2.5 mg L⁻¹ kinetin and 0.5 mg L⁻¹ ABA is the best medium for microtuberization. **Keywords:** Solanum tuberosum, stem cuttings, microtubers, 6-benzylaminopurine, indole-3-acetic acid, gibberellic acid, kinetin.

**Poster #018. Artificial Regeneration of Cork Oak: Difference of Root System**

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**Abstract**

Nature is a source of life and survival condition, the man who lived in communion with nature has become a danger for it. He recognizes its value since the rift which was created between him and his environment by the industrialization and the multiple aggressions.

Since the beginning of the 20th century, the regeneration of cork oak has always been a problematic in the forest of Maâmora. Despite of all efforts to the preservation and conservation of the forest, ecosystems were constantly degraded over time. Several tests of regeneration have been initiated in recent decades by acorn or by plant. Although less studied than the aerial parts, the root system of the cork oak has been the work of the Forest Research Centre (FRC Rabat). If successful plantation is based first and foremost on the choice of species and genetic origins adapted to the plot to restore the quality of introduced plants also influences the recovery of plantations, in this context, our study is based on the production of plants of Cork oak from different origins and to compare between them which is the most adapted and resistant for the climate change. Also, to study more the root system and see the differences between the origins of Cork oak. **Keywords:** Cork oak, root system, climate change, ecosystem, Maâmora, artificial regeneration.

**Poster #019. Synthesis and Characterization of Acrylonitrile and Polyacrylic Acid Membranes for the Water Treatment Equipment**

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**Abstract**

Today, the water sources are overused and poorly protected in many parts of the world. Demography and induce human activity, on the one hand, an increase in water demand and, secondly, misuse and mismanagement of water resources management. Membrane processes are increasingly used in environmental protection, the production of drinking water and medical applications. Here we present a simple and effective method for the manufacture of ion exchange ultrafiltration membranes for removal of water pollutants. For synthesis of membranes, poly acrylonitrile (AN69) and poly acid acrylic (PAA) were dissociated separately in the solvent N, N-diméthylformamid (DMF), and mixed in portion well known. After the two polymers are blended, poured films on a glass plate and bring in an oven at a temperature and duration of well-defined time. The FTIR spectrum of the membrane AN69 / PAA shows a band at
1683 cm\(^{-1}\) that can be assigned to the vibration of the CO group indicating the presence of PAA and a peak very end to 2239 cm\(^{-1}\) shows the presence function CN in structure of AN69, the spectrum also rises moderately broadband in 1174 cm\(^{-1}\) corresponding to the groups asymmetrical sulfonate SO\(_3\)Na. Later we will study the morphology of the membranes using SEM and OM.

**Poster #020. Production of Saffron Corms (Crocus sativus L., Iridaceae) by In Vitro Culture**

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**Abstract**

Our purpose is to produce on a large scale of viable and producing microcorms to meet the needs farmers in seeds. We tested a cytokinin (kinetin) in three concentrations (6, 9 and 12 mg/l) and an auxin (2,4-dichlorophenoxyacetic acid, 2,4-D) in 0.1 mg/l on the direct production of microcorms within slices after 6 months of culture. In the darkness, explants react to 100%, but to the light, this percentage decreases in 52% (for 6 mg/l of Kinetin) and in 92% (for 12 mg/l of Kinetin). The number of microcorms formed by explant is not influenced by the dose of the Kinetin; it is one for explant cultivated in the light and of two for those placed in the darkness. The diameter of microcorm is maximal in the darkness (14.6 ± 1.21 mm) in the presence of 12 mg/l of Kinetin. However, it is minimal in the light (6.9 ± 0.4 mm). The combination of two other plant regulators, 2,4-D in 0.1 mg/l and BA with various concentrations (6; 9 and 12 mg/l) does not lead formation of microcorm in the light (0%). But, the explants placed in the darkness are 100% reactive and form a single microcorm of diameter between 2.8 ± 0.71 mm (BA in 6 mg/l) and 3.8 ± 1.03 mm (BA in 12 mg/l). We realized the test of seedling on microcorms in a hydroponic room (photoperiod 16 hours light / 8 hours darkness; 25°C). After 5 week, the percentage of germinated microcorms is 100%. **Keywords:** Saffron, Crocus sativus L., corm production, tissu culture.

**Poster #021. In Vitro Inhibitory Effect of Fungicides Against Colletotrichum acutatum, the Causing Agent of Strawberry Anthracnose**

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**Abstract**

Anthracnose is one of the most important strawberry (Fragaria x ananassa Duch.) diseases and can be a limiting factor for cultivation, because of its devastating nature, the sensitivity of cultivars and low measures efficiency for available control. Since 2012, three fungicides Basultra, Thiramchim and Thiramic (based on Thiram) were approved for agricultural use by ONSSA (Database, approval of chemical inputs) and to prevent disease, farmers in Loukous area use a product based on copper (Bordeaux Caffaro) as a plant protector from the anthracnose. The aim of this study is to know the impact of these fungicides on the different stages of the development of Colletotrichum acutatum. C. acutatum has been collected from strawberries attacked with anthracnose and purified in laboratory of plant biotechnol-
ogy in the faculty of sciences of Tetouan. The study of the inhibitory effect of the fungicides cited above against Colletotrichum acutatum has shown that the Thiram has a big effectiveness on germination and moderately effective on mycelial growth and sporulation. Copper has shown effectiveness on germination as variable activity in other life stages. 

**Keywords:** Strawberry antracnose, Fungicides, Thiram, Colletotrichum acutatum, Inhibitory effect.

**Poster #022. Determination of Total Polyphenols and Gallic Acid Content in Carob Pulp**

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**Abstract**

Extraction efficiency of total polyphenols (TP) of carob pods (*Ceratonia siliqua* L., Leguminosae family) was examined by performing extractions with various solvent systems, in order to evaluate and optimize the conditions for the recovery of polyphenols. Maximum quantities of polyphenolic components were found in 80% acetone extracts. By contrast, water was inefficient in extracting polyphenols. Total polyphenol compounds were identified with a yield of 11.19 g/kg (dry weight) as evaluated by measuring total polyphenol content using the Folin-Ciocalteu method. The profile was dominated by gallic acid (45.01% of polyphenols by dry weight). Carob leaves and the different parts of fruits were also analyzed for their total polyphenols and gallic acid content using HPLC. It was presumed that the leaves of the year contain higher values of phenolic compounds and gallic acid as well (45.26 g/kg of total polyphenols and 17.012 g/kg of gallic acid). Tegument contained appreciable amounts of polyphenols and gallic acid (26.30 g/kg TP and 2.512 g/kg of gallic acid), while only traces were detected in germ (germ meal) and endosperm (1.33 g/kg and 0.80 g/kg TP ; 0.997 g/kg and 0.715 g/kg of gallic acid respectively). It should be noted that there are some additional phenolic compounds present whose structures still need to be determined. 

**Keywords:** Carob tree, *Ceratonia siliqua* L., Leguminosae, Extraction, Polyphenols, Gallic Acid, HPLC.

**Poster #023. Resuscitation Study of Jorf Khettaras By Artificial Recharge Groundwater Erfoud, Morocco**

Youssef Saidi, Karima Ezziani, Mostapha Lakhlifi, Khadija El Kharrim, and Driss Belghyti


**Abstract**

The Khettaras of Jorf (Errachidia province), are part of the hydraulic basin Tafilalte, submitted a remarkable decrease in the water level for those functional, disappearance of water to the remaining, original 70 Khettaras only twenty that service. The folding of Khettaras of Jorf is explained by lower rainfall inputs. Jorf Khettaras play a key role in promoting agriculture in the oasis of Jorf and subsequently social stability of local residents. As part of its activities under the efforts deployed to preserving water
resources of the Jorf area, the Jorf Addil Sustainable Development Association AJADD, undertakes in partnership with the City Council of Jorf and the rural commune of Fezna to develop the study and realize resuscitation project khettaras Jorf by artificial groundwater recharge. The objective of this study is to investigate the technical feasibility of groundwater recharge and the definition of the right technology solution for the area.

Poster #024. Use of Feces Micro-Histological Analysis to Study Atlas Deer Diet (Cervus elaphus barbarous) in Tazekka National Park (Province of Taza, Morocco)

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Abstract

Atlas deer is a flagship species in Morocco. It was reintroduced in Tazekka National Park in 1994 to rehabilitate the natural state in the regions of Middle Atlas and Rif. The diet study was recommended by the National Strategy for ungulates in order to get useful data for the feasibility of a subsequent release. Very little research has been made on this species and its diet in Morocco. In this context, we aimed at studying the diet of Atlas deer and its seasonal variation. Feces were collected, during the years 2013 and 2014, in Bab Klati 520-ha reserve located in the west of the aforementioned park. The collection was performed in the existing four types of environments: that of Quercus faginea, that of Quercus suber, scrublands and clearings. Fecal samples were micro-histologically analyzed based on a reference epidermis catalog of all existing plants in the reserve. Poaceae species, the main representatives of the herbaceous category, were consumed at 28%, 37% and 43% of the diet in autumn, winter and spring, respectively. In summer, their consumption did not exceed 2%; because of their limited availability and the vegetation drying out. Pteridium aquilinum was consumed especially in summer (6%). Shrubs were represented by three main species: Ulex boivinii and Cytisus triflorus (Papilionaceae) and Lavandula stoechas (Lamiaceae). Consumption of U. boivinii was high in autumn (41%) and spring (31%) and low in winter (16%) and summer (6%). As for C. triflorus, the consumption was maximal in winter (30%), average in autumn (19%) and spring (18%) and lowest in summer (2%). L. stoechas was consumed mainly in autumn (8%). In the summer, trees were the main component of the diet and were represented by the oak species Q. faginea (61%), Q. rotundifolia (13%) and Q. suber (5%). Keywords: Tazekka National Park, Diet, Atlas deer, micro-histology, feces, Morocco.

Poster #025. Induction of Secondary Somatic Embryogenesis of Moroccan Cork Oak (Quercus suber L.)

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Abstract

Cork oak (Quercus suber L., Fagaceae) is one of the most important species of the Mediterranean basin due to its ecological and socio-economical interests. Nevertheless, the increasing demand for cork and the low natural regeneration provides lost of cork oak forest. Vegetative propagation of trees by somatic embryogenesis contributes to the regeneration of forests and their development. This technique al-
lows the formation of a high number of somatic embryos (large scale multiplication). Our study consists in testing the somatic embryogenesis technique on Moroccan cork oak (Quercus suber L.). We have induced primary somatic embryogenesis from leaves obtained from epicormic shoots forced to sprout from segments of branches of Quercus suber L. Firstly, we have collected branches from Quercus suber L. trees. They were sterilized and cultured in specific conditions. After 7 days of culture, branches began to emit epicormic shoots. Secondary, leaves obtained from epicormic shoots were used for induction of somatic embryogenesis. After series of transfers in culture media on various nutritive mediums with or without plant growth regulators (ANA and BA), primary somatic embryos were obtained. These embryos were multiplied by secondary somatic embryogenesis by a number of factors. Keywords: Cork oak, Quercus suber L., Fagaceae, secondary somatic embryogenesis.

Poster #026. Anti-adhesive Properties of Aqueous Extract of Culinary and Medicinal Plants Against S. aureus Adhesion of Supports Commonly found in Restorations and Kitchens Environments

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In food sectors, the presence of pathogens biofilms in food contact surfaces lead to a serious health problems. Bio-contamination of surfaces present a real problem in the food industry in general and especially in kitchens environments of collective restorations, as well as in other sectors. This problem was often the cause of many of food borne outbreaks and spoilage of various products and materials. The goals of the present work were investigate the effect of aqueous extracts of culinary and medicinal plants that are leptobotrys Thymus, Lavandula dentate, Allium sativum and Zingiber officinale, on the adhesion of Staphylococcus aureus on the surface of substratum. This effect has been shown in different processing times and on different media such as: granite, marble and stainless steel 304. marble and granite were chosen because they are a few literature reports on their behavior in terms of microbial adhesion. Treating the surface of the substrates by these extracts showed both anti adhesive and antimicrobial activity effective for the majority of the plants tested. Keywords: Bio-contamination, Staphylococcus aureus, adhesion, Marble, Granite, stainless steel 304, aqueous extracts of plants.

Poster #027. The Impact of Organic and Biological Amendements on Tolerance of Date Palm Seedlings Under Salt Stress

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Abstract

The date palm has suffered from the devastating effects of multiple constraints including salt stress. In this study we will evaluate the impact of two amendements, namely compost and mycorrhizal fungi (AMF) on tolerance of the date palm seedlings under salt stress. Six treatments were applied: compost, AMF and compost + AMF with (14 g/l of NaCl) and without (0 g/l of NaCl) salt stress. After 8 months of mycorrhization (5 months from the application of salt stress), AMF and compost seems to have a positive effect
on tolerance of the date palm subjected to salt stress compared to control. As a matter of fact, the two amendments, separate or combined, enhance growth and water parameters of the date palm with a high efficiency of the combination of the two amendments. In the absence of salt stress, the growth parameters (aerial elongation, leaf area, shoot and root dry matter) were improved by compost 54%, by AMF 77% and by compost + AMF 100% compared to control. The water parameters (stomatal conductance, content water and water potential) were improved by compost 95%, by AMF 168% and by compost + AMF 224%. Under salt stress, the growth parameters were enhanced by compost 57%, by AMF 100% and by compost + AMF 117% compared to control. The water parameters were enhanced by compost 140%, by AMF 202% and by compost + AMF 230%.

**Keywords:** Date palm, compost, mycorrhizal fungi, salt stress.

**Poster #028. Assessment of the Intra-Varietal Genetic Diversity of Some Fig Varieties (Ficus carica L.) Grown in Northern Morocco Using SSR Markers**

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**Abstract**

For centuries, the fig genotypes identification is based on the pomological characters. Therefore, the fig cropping is always accompanied by a non-precise recognition of varieties. The development strategy is faced with unavailability of authentic and selected plants. Most varieties widely cultivated in Morocco are polyclonal types with the presence of varietal confusion problems due to the problems of synonyms and homonyms. Through the microsatellite molecular markers, this research aims verifying the intra-varietal genetic diversity among four local fig varieties (Naboute, El Quoti, Ghoudane and Massari) widely grown in northern Morocco. Using six SSR loci allows to giving a hierarchical classification which shows perfectly that clones of each variety are grouped under a separate branch except for Ghoudane clones which are subdivided into two different subgroups. The factorial correspondence analysis has allowed to distinguish between genotypes belonging to the Taounate region and those of the region Ouazzane. This result indicates the presence of a clear phylogeographical structuring between the two areas. For Naboute variety clones of the Ain Taoujdate Experimental Station are different from the Taounate gene pool. Ghoudane clones are subdivided into close clones of Ouazzane group (GE1 and GE2) and other clones (GT1 and GT2) who establish a separate group. The pomological differences between Ghoudane of Taoujdate collection that the pyriform form and those of ENAM collection with a globular shape confirms this genetic distinction. Intra-varietal analysis shows a very low diversity among clones of El Qaouti and Massari varieties. This low variability is likely due to somaclonal variations or varietal confusion (synonyms / homonyms). However, the Naboute variety chows a clear intra-varietal genetic diversity. Part of clones are genetically close et the other the allelic differences are remarkable. This result can be explained by that the “Naboute” denomination was used by the Taounate region farmers for all cultivars with clear-figs, large-caliber and suitable for drying. This study shows that the varietal profiles of Naboute and Ghoudane display a wide diversity. However, El Qaouti and Massari varieties are mainly stable and authentic. A very large study that involves clonal selection is required to exploit this polyclonality for the selection of productive clones with great agronomic characters. **Keywords:** Ficus carica; intra-varietal diversity; SSR markers; polyclonal
Poster #029. Effect of Salt and Water Stress on Morphological Parameters, Physiological and Agromonic of four Medicinal Plants

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Abstract

Salinity is a common factor in the environmental stress seriously affecting crop production in different regions of the world. Morocco, which is known by the scarcity of rainfall in semi-arid and arid regions accentuate the salinization of irrigated areas and make them unsuitable for crops. Under these conditions, changes in morphophysiological and biochemical characteristics (leaf water potential, chlorophyll fluorescence, relative water content and sugar proline content are effective parameter sensing plant response vis-à-vis the stress, and also realize the water status of the plant and its ability to incorporate water especially under stress) are all parameters to follow when the stress study. As part of this approach and to explore the effect of salt stress on the behavior of the plant we are interested in nps four medicinal and aromatic plants namely Salvia officinalis, Cytrus cymbopogon, Lavandula dentata and Rosmarinus officinalis have a agronomic and socio-economic interests in the eastern region by applying 0.2.5 and 8 g NaCl concentrations in order to assess at first their vis-à-vis behavior salt stress and in a second time performance evaluation in essential oil and its chemical composition. The preliminary results show that these plants are resistant to salt stress for lower doses of 100 mM (0.086mM) NaCl beyond this value the plants wither.

Poster #030. Effect of Environmental Conditions on Morphological Characteristics of Saffron (Crocus sativus L.) Moroccan Cultivars

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Abstract

Saffron is the most expensive spice in the world. In Morocco, saffron cultivation is localized in the Taliouine-Tazanakh region. The depth knowledge of Moroccan saffron cultivars and the selection of those with good performances constitute a solid base for the development of this sector and the conservation of this plant. This study aims to evaluate the morphological diversity of Taliouine’s saffron cultivars in two sites and to select those with the best quality. To reach this objective, corms of saffron from four provenances (Sidi Hssaine, Agadir Melloul, Zagmouzen and Askauen) were planted in two different sites (Taliouine and Faculty of Science, Agadir (FSA) and had been followed for four years. The measured morphological parameters are the number, weight and length of different plant organs, namely, corms, leaves, flowers and stigmas. The multiple analyses of averages highlighted significant differences between saffron provenances for different parameters. The number of flowers produced depends significantly on the corms provenance; it can be five times more important. The length, fresh and dry weight of their stigmas can show a difference 6 times higher. This agro-morphological characterization has revealed the existence of significant morphological variability within the Moroccan saffron. This variability
exists despite of the mode of vegetative propagation of the species. During the 4 years of study, the rate
of corm proliferation and their caliber had been better understood. **Keywords:** Saffron, Crocus sativus
L., morphological characterization, cultivars.

**Poster #031. Improved Micropropagation Method for in vitro Cormlet Production through Indirect
Organogenesis of Moroccan Saffron (Crocus sativus L.)**

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**Abstract**

Saffron is the most expensive spice in the world. This spice, also called 'red gold’, consists of the dried
stigmas of Crocus sativus L. It is a male-sterile and triploid plant (2n = 3x = 24) which belongs to the
iridaceae family. It spreads vegetatively thought the formation of daughters’ corms. Saffron is popu-
lar for its color, taste and aroma property due to its essential metabolites that are respectively crocin,
picrocrocin and safranal. The auto-triploid nature of saffron creates problems for sexual reproduction
and renders improvement by breeding practically impossible. Application of biotechnology, especially
tissue culture, can improve the quality and quantity of the saffron product, by the large production of
healthy selected saffron corms. In this work, an in vitro regeneration protocol was optimized through in-
direct organogenesis for the efficient multiplication of selected Moroccan saffron cultivars. The calluses
had been initiated after one month on MS medium supplemented with 3% sucrose, 100 mg/L ascorbic
acid and different combinations of PGRs. As result, we noted that the combination of 1 mg/L BAP and 1
mg/L NAA was efficient for callus initiation from the rectangular sections of upper part of corms tissue.
While, for shoots formation from calluses, maximum rates were founded in the combination of 2 mg/l
TDZ with 0.5 mg/l NAA. Shoots obtained previously from callus, were then transferred to the corms and
roots induction medium. As a result, we observed the formation of adventitious corms and roots in ½ MS
medium under the obscurity. **Keywords:** Corms, In vitro, Organogenesis, Crocus sativus, Callus, propaga-
tion, tissue culture.

**Poster #032. Molecular Identification of Moroccan Saffron (Crocus sativus L.) with Microsatellite
Markers**

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**Abstract**

*Crocus sativus* L. is a male sterile plant. Its flower produces stigmas that when dried, form the most expen-
sive spice in the world commonly known as ‘Red Gold’. The saffron name is usually used to refer both to
the spice and the plant itself. In Morocco, saffron is primarily cultivated in the area of Taliouine/Taznakht.
The improvement of the Moroccan saffron imposes it’s morphological, biochemical and molecular char-
acterization. The present study consists of an investigation and an evaluation of the genetic variability
of Moroccan saffron by molecular markers. It aims to develop its molecular identity and to get a data-
base allowing better management, selection, exploitation and protection of natural heritage. Samples were collected from four different selected areas (provenances) in the region of Taliouine/Taznakht: Sidi Hssaine, Agadir Melloul, Taznakht and Askaouen. Genomic DNA, was extracted from 40mg of leaves, using CTAB method and it has used as the matrix for PCR amplification. The microsatellite markers were selected for the identification and analysis of the genetic variability of cultivars of the Moroccan saffron, taking in account their large polymorphism, their specificity, their codominance and their reproducibility and stability. 359 EST sequences of genomic DNA of the saffron were collected from the National center for Biotechnology Information (CNIB). The SSRIT software has allowed the identification of 12 EST-SSR (SSRe) and 10 SSR from the genomic DNA (SSRg). The specific primers for each SSR region were determined by the software Primer 3 version 4.0.0. In addition, 12 pairs of primers developed by Nemati et al. (2012) among the Iranian saffron and three pairs of specific primers of Iris ensata, were also selected for the molecular characterization of the Moroccan Saffron. Preliminary results show that Moroccan saffron is genetically different compared to the Iranian saffron and the provenance of Sidi Hssaine is not only agro-morphologically but also genetically different compared to the other provenances. This data is invaluable for the improvement of the productivity of Moroccan saffron via SSR markers assisted selection. **Keywords:** Microsatellite, saffron (Crocus sativus), molecular markers, genetic diversity.

**Poster #033. Screening of Fucus spiralis Extracts in Biological Control of Postharvest Diseases**

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**Abstract**

Marine algae species are interesting sources of bioactive compounds that could possibly be used as functional components with antifungal, antibacterial and antiviral activities. The purpose of this research is to analyze the potential antifungal properties of seaweeds collected from the Cap Ghir: one of the unpolluted zones belonging to the region of Agadir. The floristic study of this zone, spanning from January to February 2016, permitted to identify 76 species divided into three classes: 48 florideae, 15 Phaeophyceae and 13 Chlorophyceae. The R/P proportion of the number of Rhodophyta (R) by the Phaeophyceae (P), calculated from Cap Ghir was estimated to be 3.2; This value matches with flora which develops in the warm-temperate regions. The antifungal potential properties of Fucus spiralis (brown algae) was analyzed against three species of phytopathogenic fungi: *Penicillium digitatum*, *Penicillium italicum* and *Geotrichum citri-aurantii* isolated from infected citrus fruit. Antifungal activity was evaluated by agar diffusion. The results obtained showed that aqueous extract inhibits the growth of these fungi to different degrees. Therefore, it would be interesting to compare the effect of extracts of the most abundant species of seaweeds in the region in stimulating defense responses and protection against pathogens on cultured plants (tomato, grape and potato). These results suggested that seaweeds collected from Moroccan Atlantic coast present a significant capacity which makes them an interesting screening for natural products. **Keywords:** Antifungal Activity, Seaweeds, Phytopathogenic fungi, *Penicillium digitatum*, *Penicillium italicum*, *Geotrichum citri-aurantii*. 
Poster #034. Antifungal Activity of Perydroxan Against Botrytis cinerea the Causal Agent of Gray Mold

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Abstract

Botrytis cinerea is among the principal fungal diseases on agronomically important crops. This fungus is able to develop resistance to a wide variety of synthetics compounds. This work focuses on the study of the antifungal activity of a new specialty called Perydroxan against the plant pathogenic fungus Botrytis cinerea. Different concentrations of Perydroxan were tested for their inhibitory effects of the mycelial growth and spores germination in vitro of B. cinerea. 100% inhibition of mycelial growth was achieved at the doses of 2.5% for B. cinerea. Moreover, spore germination of B. cinerea was 100% at a dose of 2.5% and for a contact time of 15 min. This study shows that Perydroxan has a significant inhibitory effect of the mycelial growth and germination of fungal spores of both fungi B. cinerea and P. digitatum. This product exhibits a very high potential for disinfection of packinghouse of fruits and vegetables. Keywords: Botrytis cinerea, Perydroxan, Antifungal activity.

Poster #035. Growth of Young Plum Tree as Influenced by Arbuscular Mycorrhizas Under Continuous Deficit Irrigation

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Abstract

This work aimed to improve efficiency of continuous deficit irrigation (CDI) on plum tree through using symbiosis with arbuscular mycorrhizal fungi (AMF). Thus, an experiment was conducted in pots to evaluate effects of arbuscular mycorrhizas on growth of young plum trees in two cases of CDI (50% and 75% of full crop evapotranspiration - ETC) compared to full irrigation (100% ETC). We used a mixture of two mycorrhizal fungi species, Rhizoglomus intraradices and Funneliformis mosseae. The measurements concerned: 1) morphological parameters of root system (total fresh weight, total dry weight, total volume and hairy root dry weight); 2) morphological parameters of aerial parts (primary shoot elongation, number of secondary shoots, trunk growth, leaf area, total fresh weight and total dry weight); and 3) nutritional status parameters (leaf phosphorus content and chlorophyll pigments content). Compared to full irrigation, the two CDI levels induced a significant decrease of hairy root percentage without significantly affecting total root weight and volume. Use of AMF enabled to limit this depressive effect because it stimulates root ramification, but this is effective only under moderate water stress (75% of ETC). Under this CDI regime, hairy root percentage has been enhanced by 87% in mycorrhizal plants comparatively to non-mycorrhizal plants. Deficit irrigation effects on vegetative growth were partially alleviated using AMF even under severe regime (50% of ETC): shoot elongation was higher for mycorrhizal plants exceeding non-mycorrhizal ones by an average of 13%. AMF induced also a significant increase of phosphorus, nitrogen and chlorophyll pigments concentration in mycorrhizal plants. Thus, AMF significantly improves...
CDI efficiency on young plum tree, even at level of 50% of ETc. The observed improvements due to AMF were considerable under 75% of ETc, suggesting possibility to adopt this CDI level associated with AMF to optimize deficit irrigation on young plants of this rosaceous under low water availability conditions. **Keywords:** *Prunus domestica*, continuous deficit irrigation, arbuscular mycorrhizal fungi.

**Poster #036. Evaluation and Comparison of Standards of Quality of the Plants of the Thuja *Tetraclinis articulata* Vahl Masters Products in three Nurseries Moroccan Forest**

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**Abstract**

The Thuja (*Tetraclinis articulata* Vahl Masters) is an endemic species of Morocco; it occupies the fourth place after the Aleppo pine, the green oak, and the cork oak. It presents a great ecological interest which allows him to effectively contribute to the socio-economic development of the country. However, its extended is threatened as a result of multiple factors, mainly related to the vagaries of the weather and the human activities. In this regard and to preserve this species, the Office of the High Commissioner to the Waters and Forests and to the fight against desertification has undertaken since several years a few strategic measures by installing a large number of forest nurseries in Morocco in order to rectify the faults recorded in relation to the natural regeneration of this gasoline. However, the results on the grounds of reforestation remain unsatisfactory and often, it assigns this failure to the poor quality of the plants produced in nurseries. Where the interest of achieving a screening on the quality of these plants in order to optimize their farming practices and as a result increase their rate of regeneration once put in earth. In this context, three different Moroccan nurseries (Sidi Yahia, Bni souhane and Droua) have been the subject of this study by comparing the quality attributes of plants products. Then for each nursery, 21 plants were sampled. The morphological characters have been assessed through measures of height, root collar diameter and biomass. The results obtained from the different settings have found that the production of seedlings of red cedar differs from a nursery to another. Also, the nursery of Sidi Yahia is the one that presents the greatest values unlike other nurseries. But this result does not justify that this nursery is the most effective in terms of production of plants. In effect, it has been found that the plants products are not balanced, which reflects failures at the level of the technical measures adopted during the cultures (watering, fertilization…). It would be essential to review the route of production of seedlings of red cedar in the nursery in proposing other more effective standards that can be used to better assess and enhance this production. **Keywords:** Thuja (*Tetraclinis articulata*), Comparison,, growth, height, diameter, nursery

**Poster #037. The Inhibitory Effect of *Thymus leptobotrys* Essential Oil Against Alternaria spp.**

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Alternaria is a genus of filamentous ascomycetes containing many species of economic importance. The present study aims to determine the inhibitory effect of essential oil extracted from Thymus leptobotrys. The essential oil was obtained by hydrodistillation using Clavenger apparatus. The Carvacrol was the main compound with a proportion of 70.54% of the oil. β-Caryophyllene and ρ-Cymene were present at lower level with 5.45 and 5.28 respectively. The agar dilution method was used for the antifungal test using. The test was made on potato dextrose agar (PDA) medium and the Petri dishes were incubated at 22°C during 15 days. 100 % of the inhibition of the mycelia growth was found at at 400 and 500 ppm inhibited by the radial growth of the fungus. Keywords: inhibitory effect, Thymus leptobotrys, Alternaria spp, agar dilution method, PDA medium, YMA medium.

**Poster #038. Biofilm Formation of Lactic Acid Bacteria on Stainless Steel Surfaces**

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Abstract

The biofilm formation of pathogenic bacteria creates major problems in food industry such as food contamination and materials deterioration. In the literature we found some successful examples of using non-pathogenic bacteria Generally Recognized as Safe (GRAS) to ensure food safety and to protect against biofilms formed by undesirable spoilage and/or pathogenic bacteria. The aims of this work were; to evaluate the ability of thirteen lactic acid bacteria to form biofilm on abiotic surfaces (Stainless steel 316 and Stainless steel 304), and to determine the physicochemical properties of substratum and bacterial surfaces using contact angle measurements. The results obtained show that all lactic acid bacteria have higher ability to form biofilm on two substratum. Keywords: Lactic acid bacteria, Biofilm, Stainless steel, physicochemical properties.

**Poster #039. Potential Antagonism of Some Trichoderma Strains Isolated from Moroccan Soil Against three Phytopathogenic Fungi of Great Economic Importance (Fusarium oxysporum, Verticillium dahlia, and Rhizoctonia solani)**

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Abstract

In this study, 17 Trichoderma strains were isolated from different soils (crop fields and Argan forests) in Morocco. Purified single-spore cultures were identified to species-level using molecular methods and tested for their potential antagonism against three phytopathogenic fungi of great importance in Morocco (Fusarium oxysporum, Verticillium dahliae and Rhizoctonia solani). After DNA extraction translation elongation factor (tef1) was amplified in extracts of 17 strains, sequenced and compared with their ex-types. As a result, three species were identified among the strains, which clustered in two different subclades of Trichoderma: The species T. afroharzianum, and T. Guizhouense belong to the Harzianum clade, while T. Longibrachiatum belongs to the Longibrachiatum clade. Investigation of potential antagonistic effects of these strains against the soil-borne phytopathogens Fusarium oxysporum, Rhizoctonia solani and Verticillium dahliae was conducted in a dual culture plate assay. All Trichoderma isolates showed effective antagonistic performance by decreasing Ra: radial of pathogens’ mycelium confronting Trichoderma isolates. Trichoderma afroharzianum showed significant differences when comparing control radii Rc with the radii confronting antagonist Ra (P < 0.05). The highest Percentage Inhibition of Radial Growth (PIRG%) was obtained for isolate T2.1 against Fusarium. In the other hands, T9i12 which is a reesei species shows a high radial inhibition of pathogens’ mycelium. Keywords: Trichoderma spp., Fusarium oxysporum, Verticillum dahliae, Rhizoctoniasolani, antagonistic fungi.

Poster #040. Control of Spring Generation of Aonidiella aurantii (Hemiptera, Diaspididae) Citrus Pest in Souss Region

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Abstract

In many citrus areas around the world the California red scale (CRS) Aonidiella aurantii is considered a key pest. If there is no control, it is able to induce in two to three years, the dieback of infested citrus. In Souss region, chemical control of CRS is difficult, since the number of interventions pesticides in each production cycle has been steadily increasing for many years resulting in an elimination of natural enemies. In addition, these random treatments are frequently followed by recurrent infections in a short time. In this context, with the aim to prevent risks of infestation and to control CRS, four techniques of agricultural warning are used in conjunction including: trapping of the adult males, dynamics of pest population and its main parasitoid Aphytis melinus; monitoring the fixing of CRS young stages on young fruits and use of the day-degree concept. For each of these four methods, a chemical intervention threshold is defined. In this part of work conducted since February 2015 in biological and conventional citrus orchards, we are interested to pest spring generation responsible for the majority of damages. In the conventional orchard, cumulative day-degree has reached the value of 297 °day in mid-April 2015. Between late May and early June, 2400 males were trapped; with a rate of sensitive stages exceeding 70% and a fixing rate of the young stages on fruits of 6%. These thresholds are recommended for chemical intervention against CRS spring generation. In the biological orchard without any chemical treatment, cumulative day-degree is recorded at the last week of April 2015; levels for sensitive stages and of trapped males are observed respectively until the 1st weeks of July and August. In Souss region, one systematic treatment at least (organophosphate insecticide) is applied each year by producers in June when temperature begins to rise. The combination of the four warning agricultural methods and thresholds cited above an intervention period, which will change according to the year, has been defined. In 2015, characterized
as dry and hot, chemical intervention by an organophosphate in conventional orchard was adopted in June; at harvest percentage of fruits without CRS has exceeded 96%. In addition, 1st treatment with an organophosphate (full dose (150 cc / hl)), and 2nd with the same product (half dose only (75 cc / hl)) + paraffinique oil ((1%), at a dose of 150 cc / hl) gave similar results at harvest, respectively 0.14% and 0.10% of infested fruits. These results are encouraging since we will reduce to half the cost and quantity of chemicals products used in each production cycle and could be easily extended to monitor CRS pest. The active parasitism of A. aurantii by A.melinus exceeded 87% in biological orchard, but only 45% in conventional orchard was recorded. Thus, in conventional orchards, to enhance activity of A. melinus in controlling CRS populations in Souss region, conservative releases should be applied when parasitoid activity is most important and augmentative releases when parasitoid activity is very low. Keywords: A. aurantii, A. melinus, citrus, agricultural warning, parasitism, day-degree, population dynamics.

Poster #041. Population Dynamics of Eutetranychus orientalis Klein (Tetranychidae, Acari) in Citrus Orchard in Taroudant Region

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Abstract

Like any specialized crop, citrus in the Souss region are subject to attack by a particular fauna, which develops at their expense. The level of outbreak is sometimes so important that it requires chemical interventions, biased by the choice of product and the time of application, otherwise the entire harvest, or at least part, would be compromised. Thus the control of outbreak of mites and especially those of E. orientalis has become a priority in order to establish an integrated control program against this pest and reduce risks to human health and the environment of chemical products increasingly toxic and selective. In this context, this work was conducted in a plot of Navel untreated by any miticides for two years. With the aim to determine the rate of infestation and calculate days mites, 25 old leaves of 10 trees at 1.5 m above ground are sampled randomly from the four cardinal positions and in the middle every two weeks since February 2016. A leaves infestation rate from 60% to 70% was observed between February and March, which coincides with a mild winter, dry (20 mm between February to April) with very low relative humidity (minimum of 30% on average). These conditions seem favourable in the Souss, to the very early resumption of life cycle of this pest. In population, there is dominance of the egg stage (70%), larvae and pupae (18%) compared to adults (males and females) with only 12%. In addition, E. orientalis prefers areas of tree, exposed to sun (East), less shady and dusty. The mite by eating of the tree causes cumulative effects with its outbreaks. The sampling method used in this work reveals an average number of mobile forms of mites / leaf / tree between 6 in early February to 4 in mid-March. Cumulative day mite was about 82 in February and reached to 268 in May. With the observed mite density, significant damages to plants were recorded. The effect of E. orientalis on fruit yield and effects of Euseius stipulatus on the control of E. orientalis populations remains to be assessed since our observations coincided with the period of flowering and fruit growth. Keywords: Eutetranychus orientalis, Mite, mite day, integrated pest control, Euseius stipulatus.
Poster #042. Nitrogen, Phosphorus and Potassium Exports Assessment in Wheat and Validation Model ‘Nutrient Expert’ for the Recommendation of Fertilizers in Rain fed and Irrigated Condition in Morocco

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Abstract

Wheat is the second most important cereal in Morocco after barley. It is grown primarily under rainfed conditions. In Morocco grain production varies from less than 10 to more than 70 quintals / ha and this according to the climatic conditions prevailing systems of production and cultivation techniques adopted. Studies on the international scale fertilization showed that fertilization contributes over 50% to the improvement of production. Also, surveys of farmers in four regions of Morocco namely Abda, Chaouia, Tadla and Sais showed that the quantities of fertilizers applied to corn is generally weak and unbalanced which affects the quantity and quality yields. Fertilization is an important step in the production of wheat and must be reasoned to improve improving land productivity and water use efficiency and lower losses to surround that can sometimes have effects damaging the quality of soil and groundwater. Thus, in response to the increased cost of fertilizer and the awareness of the risks of environmental degradation, the fertilizer must be adapted and adjusted better to the soil characteristics and culture. To better enjoy the fertilization, the farmer must adopt the concept ‘4B’ which is based on providing the right source at the right dose at the right time and place. The main objectives of our research are the reasoning of the fertilization of wheat in rainfed and irrigated area in Morocco under the concept ‘4B’, the assessment of exports of wheat crops in major nutrients; nitrogen, phosphorus and potassium, and validation of the recommendation model fertilizers ‘Nutrients Expert’. To answer our objective, tries in fields with omitted nutriment (omission plot)) of a surface of a hectare are installed at the farmer’s in four regions of Morocco; Abda, Chaouia, Sais and Tadla. The tries are constituted by seven treatments; contribution of NPK, contribution of PK (-N ), contribution of NK (-P ), contribution of NP(- K ), recommendations based on the soil analysis, recommendations based on the model ‘ Nutrient Expert ’ and the practice of the farmer. Keywords: Fertilization, wheat, Nutrient Expert.

Poster #043. Identification of Mineral Content of 8 Khalts and Varieties of Date Palm in South of Morocco

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Abstract

The date palm (Phoenix dactylifera L) is one of the oldest fruit species in Morocco with high ecological significance and socioeconomic. Fruit, dates, are sources of minerals that could constitute a significant raw material for food. Many studies have focused on the nutrition and agro-industrial characterization of Moroccan dates from the known varieties of date palm (Phoenix dactylifera) while those dedicated to
the characterization of unknown clones called khalts remain far fewer. The objective of our work was to
determine the mineral composition by ICP of eight cultivars “khalts and varieties” of southern Morocco.
Our study included a comparison of these fruits in minerals content. The pulp of the eight fruits studied
was more rich in minerals (calcium, magnesium, potassium, iron, manganese) than some widely consumed
fruits. The content of some trace elements (zinc, copper) has not exceeded the toxic threshold, indicating
that the consumption of these fruits would not be detrimental to public health. The results of the analyzes
are very promising and deserve further investigation in order to select clones with great nutritional and
health interest and may also be valued at the agro-industrial level. Keywords: The date; fruit quality;
minerals; valuation.

Poster #044. Characterization of the Vulnerability of a Vertisoil Compaction in the Semi-Arid Conditions

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Abstract

Modern agriculture pushes to make intensive use of heavy machinery. The traffic of these machines can
cause compaction of the soil and greatly influences their physical properties in the case of bulk density
and porosity, which limits the ability of the soil to store water and facilitate the movement of air. As a
consequence, hinder root development and growth of plants are impeded. This study is designed to
evaluate the compaction of a vertisoil followed in direct sowing with two methods of measurement vertical
and horizontal penetrometries. In order to evaluate the compaction in a vertisoil, a tool of horizontal
measures of compaction was developed and compared with a vertical cone Penetrometer. The measure-
ment tool is based on a Plough fitted with tine system and hydraulic cylinder coupled to a pressure sensor
(Bosch®, P max = 1500 Bars). The Penetrometer (cone V) was also connected to an equivalent hydraulic
pressure sensor to evaluate the effort of vertical penetration. The results obtained with the horizontal
method has allowed into areas of compaction taking into account variations of voltage in different point
of measurement to the experimental block. Variations in voltage obtained in the Center (473.5 - 630.8
mV) and in the extremities (480 mV-700 mV) of the experimental plot gave the efforts of penetration
(50-350 Kgf) and (50-550 Kgf), respectively. Furthermore, the vertical method to detect maximum volt-
eges of 694 mV (50 Kgf) and 935 mV (730 Kgf) in the Center and the extremities of the plot, respec-
tively. This observation has shown that the extremities are a compacted compared to the Center area.
This is explained by intensive agricultural machinery traffic in areas of turnings. Keywords: Compaction,
Horizontal Penetrometries, Vertical Penetrometries, Vertisoil.

Poster #045. Performance of a Solar Pumping System

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Abstract

In the last few years, photovoltaic energy sector was consistently grown in several countries, according
to its economic and environmental benefits. Nowadays, economic and social development in Morocco is based on improving water resources management and promoting efficient irrigation technologies as a part of a global and integrated policy development. This study aims to evaluate the performance of a solar pumping system using maximum power tracking technology (MPPT) according to variability of the daily solar radiation and its impact on the pump response. The evaluation of MPPT behavior showed that its efficiency kept low (80%) according to deficiency of its algorithm to improve the outputs of the photovoltaic panel \( (P_{\text{max}} = 300\text{W}) \) and the DC diaphragm pump SHURFLO \( (P = 60\text{W}) \). Keywords: photovoltaic energy, MPPT, solar irradiation, DC pump, efficiency.

**Poster #046. Monitoring and Microbiological Bioremediation of Pesticides in Soils of Fez-Meknes Region of Morocco**

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**Abstract**

For decades, the majority of modern crop protection practices are based on the use of chemicals for the plant protection. The excessive use of chemicals was considered indispensable for the success of an agricultural development strategy which is quick and more intensive with the aim to increase food production. Despite their importance, the misuse of chemicals can cause direct and indirect threats for humans, animals and for the all environmental system. These risks are related to the chemicals nature that are toxic for all living beings and present a negative impact on the environment. The soil is one element of the environmental ecosystem the most threatened by the chemicals contamination. This element is a very low renewable resource knowing that contamination can be fast, however it needs more time to remedy and regenerate. This contamination or pollution influences directly (runoff or leaching by seepage) water (groundwater or surface: rivers, lakes, ground water, etc). Once these two essential components of the environmental ecosystem are contaminated by chemical inputs, the rest of the components will be affected. Man is affected either directly by consuming contaminated products or indirectly through intermediate channels. According to WHO the increase of the diseases rate (such as colorectal cancer, leukemia, allergies, Parkinson, etc.) can be caused by environmental pollution mainly by chemical inputs. The Meknes region is one of the largest agricultural areas in Morocco which explain the excessive use of chemicals. In this context, and with the aim to participate to the sustainable development of agricultural practices, we have to find a new alternative based on the study of bacterial strains able to degrade the active molecules of the chemical products. These bacterial strains will present an important biotechnological application for the bioremediation of the contaminated soils. Keywords: Soil; Chemicals; Pollution; Bacteria; Bioremediation.

**Poster #047. Evaluation of Seed Production of Interspecific Wild and Cultivated Crosses of Beets**

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Abstract

The genetic structure of species related to wild beets is the primary basis to valorize their genetic potential. These plant genetic resources are an important genetic reservoir used to supply sugar beet germplasm via inter-specific crosses through the transfer of genes of interest. Selected offspring genotypes have a remarkable interest from a food perspective, for biotic and abiotic stress tolerance. Thirteen crosses have been realized in the experimental field of Merchouch a favorable site for vernalization required for the sugar beet seed production. Results showed successful crosses between wild and cultivated beets with a yield per plant ranging from 50 to 80g. Evaluation based on morphological and genetic traits showed a difference in inherited characters between the crosses according to the parent genotypes. Hybrids issued from the selected crosses are being evaluated for ploidy and biotic stress resistance. **Keywords:** Interspecific crosses, genetic structuration, beet populations, sugar beet, wild beet.

**Poster #048. Evaluation of Microbiological Quality of Turkey Meat Marketed in Kenitra City, Morocco**

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Abstract

The contaminations of turkey meat with a variety of pathogenic microorganisms represent a public health problem, and its consumption may cause infections and intoxication. The aim of this work was to evaluate the microbiological quality of turkey meat marketed in some districts in Kenitra city. Between June and September 2014, 120 samples of turkey meat were collected and analyzed by using standard bacteriological methods. The analysis of samples has showed three pathogenic germs; 82 strains (68.33%) of Escherichia coli, 22 strains (18.33%) of Klebsiella and 16 strains (13.33%) of Pseudomonas. The findings of this study showed the poor microbiological quality of turkey meat marketed in this city. This is mostly due to poor sanitary conditions of the processing environment. This is posed a serious public health risk to consumers particularly if the meat is not adequately boiled. Therefore, there is the need to implement improved hygiene and to apply effective monitoring throughout the production and distribution of turkey meat products. **Keywords:** Turkey meat, microbiologic quality, germs, Kenitra.

**Poster #049. Antibacterial, Antioxidant Properties of Essential Oils from four Moroccan Plants**

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Abstract

Morocco is characterized by a remarkable floristic diversity includes an important potential in medicinal and aromatic plants. The valorization of this heritage requires a perfect knowledge of the properties to put in value. The objective of this work is to evaluate the antioxidant and the antibacterial potential of essential oils of four Moroccan aromatic and medicinal plants, namely Lavandula sp., Thymus sp., Teucrium sp. and Mentha sp. Results showed that the average yields of the essential oils of the air-dried aerial parts of Lavandula sp. Thymus sp., Mentha sp. Teucrium sp. and were 2.06%, 1.33%, 0,8% and 0,19% (v/w, on dry weight basis), respectively. The antioxidant activity oils was measured using the stable radical 2,2-diphenyl-1-picrylhydrazyl (DPPH), results revealed that Teucrium sp. and Thymus sp. essential oils present an interesting antioxidant activity, with a median inhibitory concentration (IC50) of 4.57 and 4,88mg/ml respectively. The antibacterial activity was evaluated by the wells method on solid medium against four pathogens bacteria Gram + (Listeria innocua, Listeria monocytogenes, Staphylococcus aureus, Bacillus subtilis) and two Gram- (Proteus mirabilis, Pseudomonas aeruginosa). Results showed that both oils inhibited growth of all the tested microorganisms. However, the inhibitory effect varied according to plant species and bacterial pathogens. Mentha sp. presents the highest zones inhibition. Thus, this study suggests the possibility of using the oils of these species in pathogenic systems to prevent the growth of bacteria and as natural antioxidant and food preservatives. Keywords: Aromatic and Medicinal Plants; Essential oils; antioxidant activity, antibacterial activity.

Poster #050. The Use of Citrus aurantium Peel Powder to Fight Against Callosobruchus maculatus (Coleoptera, Bruchinae)

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Abstract

Aromatic and medicinal plants are used not only as a source of medical care but also to fight against many pests including Callosobruchus maculatus: main pest of legume seeds. During the storage process, the most vegetables’ seeds are affected by several pests such as Callosobruchus maculatus. This study focuses on the insecticidal activity of Citrus aurantium powders against C. macualtus elevated at the expense of Cicer arietinum seeds (L). Laboratory’s experiment was carried out under controlled conditions (27°C, 70 ±5% relative humidity and 12 hours of light). The results obtained for the studied parameters indicate that powders extrated from the orange peel have an insecticidal activity against weevils, after (1 to 5) days exposure the lowest LC50 and LC99 range respectively from 74.59 to 2.19 and 257.24 to 16,52mg/50graines for females and 42.06 to 0,99mg / 50graines and from 89,79 to 15.74 mg / 50graines for males. In fact, En effet, longevity obtained with the control is 9,1 to 7,73 days, for males 5 to 3,7 days and for females de 6 à 4,7 days. The Citrus powders exert negative effects on all the parameters of the weevil, and can be used against C. maculatus. In addition, they are derived from botanical products, biodegradable, renewable source, economic and have low environmental impact and often undetectable. Keywords: Citrus aurantium, Cicer Arietinum, powders, Callosobruchus maculatus.
Poster #051. Lipid and Fatty Acid Composition of Longissimus dorsi Muscle of Béni-Guil Sheep Fed on Different Dryland Forages in Eastern Morocco

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Abstract

Sheep meat of the Beni Guil breed is one of the main Moroccan local meats, integrated into the program of agricultural development due to the savory, nutritional and sensory properties of sheep meat of Moroccan highlands (Beni Guil). However, this good reputation is still only limited to the assessments of tasting panels. Thus, the objective of this study is to assess from a scientific point of view the nutritional quality of this meat via biochemical analyses, examining major and minor muscle composition of the meat of this breed and specifically fatty acid (FA) composition of the longissimus dorsi muscle. In this first study, 10 longissimus dorsi muscle samples were selected and cut with the help of the agents of the national sheep and goat association. The results showed that 100g of fresh meat material contains 25.72% of dry matter, including 5.13% of Fat, 19.42% of protein and 0.93% of mineral matter. Qualitative and quantitative analyses of fatty acids of 10 samples allowed the identification of 27 components. Palmitic, Oleic and stearic esters were the main fatty acid methyl esters (FAMEs) identified. Saturated fatty acids represented about 41.13% of FAs, with the majority being palmitic acid (20.69%) and stearic acid (16%) The unsaturated fatty acids were principally represented by oleic acid (36.06%) and linolenic acid (9.64%). The average content of total fatty acids in meat samples analyzed is 24.98 grams per 100 grams of fat. Many reports in the literature have shown that the n-6 and n-3 polyunsaturated FA are important contributors to the odor and flavor of ruminant meats and that this composition is mainly correlated with feeding systems used. Keywords: Beni Guil, Sheep, longissimus dorsi muscle, Fatty Acid.

Poster #052. General Chemical Composition of Almonds (Prunus Amygdalus Miller) Grown in Eastern Morocco

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Abstract

The production of almond's kernel has increased more and more in eastern Morocco, from 136 000 T in 2012 to 183000 T in 2015. To valorize this kernel, we have analyzed chemical composition of five varieties, which were determined as Marcona, Fournat, Ferragnes, Ferraduel and Bedi. Total sugar was ranged between 6,2086 for Marcona and 8,5462 % for Fournat. Total protein was changed from
19,4167 for Ferragnes Ferraduel to 22,261% for Beldi. Total fiber was varied from 15,4197 for Marcona to 18,150% for Beldi. Ashes was ranged between 2,9079 for Marcona and 3,5606% for Beldi. Oil content was changed between 51,4741 for Beldi and 56,5688% for Ferragnes Ferraduel. This large oil content requires us to determine the characteristics of this almond oil. Fatty acid profile was identified, and Oleic acid, Linoleic acid, Palmitic acid and Stearic acid were ranged from 60,76 for Marcona to 69,306% for Ferragnes Ferraduel, between 20,545 for Ferragnes Ferraduel and 27,45% for Marcona, between 7,0692 for Ferragnes Ferraduel and 8,010 for Marcona and from 2,009 for Beldi to 2,743 for Marcona, respectively. After all, oxidative stability was done to know which oil bears more, and we have concluded that Ferragnes Ferraduel tolerates more of them all. Keywords: almond oil, fatty acid, sugar, protein, fiber oil content, ashes.

Poster #053. Root Growth of Date Palm (Phoenix Dactylefera L.) Under Drought Stress

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Abstract

The palm date tree is a symbolic species of the Mediterranean countries, it is a long-lasting plant, cultivated for a long time for his fruits which establish the base of the human and animal food his presence creates a microclimate allowing the development of diverse essential animal and plant forms of life for the preservation and the survival of the populations of the desert. Numerous studies were made on the palm tree and the production of dates. However, the knowledge concerning the root system of the palm date tree are very limited. Indeed, not much information is available concerning his root structure. It is probably due to the difficulty of the observation and the collection of the precise and coherent information concerning the subterranean part (party). The architectural analysis of the system root is essential to describe his main functions, It consists in classifying the various axes making up the plant according to their morphology, position or according to their dynamics of growth, is a way to try to understand certain effects of the ecological or agronomic problems. The main objective of this project is to follow the spatiotemporal development of the root system of the palm date tree by the observation of the root parameters of the palm date tree of three cultivars, to establish a 3 D root model using XPLO software.

Poster #054. The Variability of the Main Components of Dates Depending on Soil Factors and Cultural Practices

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Abstract

The date palm is one of the oldest cultivated plants; it is the backbone of the oasis ecosystem in view of its economic, social, ecological and cultural. Its fruit contains certain nutrients and is a good source of energy; it has high levels of carbohydrates, proteins, minerals, vitamins and fiber. This composition varies
depending on the cultivar, soil parameters, cultural practices and the maturation phases. The South East Moroccan economy heavily depends on the exploitation of palm groves. The average annual production of dates in Morocco exceeds 100 000 Tones, 25% are high quality dates, 35% are of average quality and 40% are of low quality. The composition of Moroccan dates was the subject of several studies, but none has been conducted on the variability of the latter based on cultural and edaphic factors. The objective of our study is to evaluate all these parameters and their influence on the main components of dates and subsequently their quality. To achieve, a biometric characterization, a physicochemical and a microbiological analysis will be conducted on 5 main cultivars from palm groves situated in FIGUIG, TINJAD, ERFoud, RISSANI, ZAGORA TATA namely ‘Aziza Bouzid’, ‘Assiane’, ‘Boufeggous’, ‘Jihel’ and ‘Majhool’. We will then proceed to an assessment of physicochemical soil parameters such as texture, limestone and salinity, in addition to an assessment of cultural practices such as irrigation modes, fertilizer types and pollination modes. This project will contribute to the development of good agricultural practices, help improve the quality and increase the quantity of Moroccan date production.

**Poster #055. Estimating Sap Flux Densities in Date Palm Trees Using the Heat Dissipation Method**

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**Abstract**

Water is essential for life of living beings. In plants, the water requirement measurement is a crucial part of understanding the physiology of tree, and dynamics of water transfers in forest stands. Improved water management in oasis system is one of the main challenges for the preservation of its agricultural system. The date palm is the backbone of the oasis ecosystem Saharan and pre-Saharan regions of Morocco. This tree is one of the oldest fruit species with high ecological and socioeconomic importance. The term water consumption of the palm is an essential indicator of water management constraints and the overall water balance. A quantitative approach continuously overall water operation has become possible due to thermal methods of measurement of sap flow. The present study is interested in continuous measuring sap flow densities in date palm using the heat dissipation method, to ensure optimum water consumption for quality production and good profitability. **Keywords:** Water balance, sap flow, date palm, thermal method.

**Poster #056. Saffron (Crocus sativus L.) Yield Parameter Assessment of Stressed Corms Stored in Low Temperature**

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**Abstract**

Saffron (Crocus sativus L.) is the most expensive spice in the world. It is cultivated in Morocco for centuries and used for culinaries, medicinals and cosmetics. This study aims to optimize saffron yield parameters (saffron morphology, flowering and corm yield) focusing on its performance for semi-arid region of
eastern Morocco using low temperature storage and salt and drought stresses. Corms obtained from salt and drought stresses and stored under cold storage at 4 °C for 7 and 14 days (with a control kept at room temperature) were cultivated in open fields at the Experimental Station of the Faculty of Sciences of Oujda. The number of flowers formed, the yield of spice saffron per corm and daughter corm yield depended on storage temperature and cold-storage duration. Flowers from the corm cold-stored for 14 days formed earlier than other treatments. Flower number, fresh stigma yield decreased gradually with increasing duration of cold-storage. Similarly, leaf number and plant height showed the same decrease with increasing of cold storage period. Diameter of produced daughter corms was largest in control. However, increasing of cold storage time increases the number of small daughter corms per plant. Cold storage induces precocious dormancy. Overall, no benefit resulted from cold-storage of corms; also, corms from stressed plants had no effect on the studied parameters. Keywords: Saffron, cold storage, stressed corms, flower yield, corm yield.

Poster #057. The Effect of Different Concentrations of Indole-3-Butyric Acid (IBA) and the Season on the Resumption Release Date Palm (Phoenix dactylifera Variety: Aziza Bouzid)

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Abstract

The Farmers of Figuig have great difficulties in the multiplication of date palm sucker, especially the variety of Aziza Bouzid whose regeneration rate is very low and does not exceed 10%. In this work, two factors influencing this regeneration were studied: the season of transplantation and hormonal dose of indole-3-butyric acid (IBA) used. The results showed that the warmer, spring (April) and summer (July), are the most favorable for a rooting release season of the variety studied Aziza Bouzid. IBA treatments have improved, in a very remarkable way, the rate of regeneration of waste arriving at a rate of 100% for the concentration of 300ppm IBA in the spring season. Keywords: Date palm, regeneration rate, IBA, season, variety Aziza Bouzid.

Poster #058. Effect of Sustainable and Regulated Deficit Irrigations on the Production and the Quality of Young Apple Trees

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Abstract

This study attempts to determine of the effect of deficit irrigation on apple trees cultivated in the region of Imouzzer Kandar, Morocco. An experimental trial was set up on trees of the variety Gala planted in 2012. The experiment was designed to study the behavior of apple trees to (i) three different sustainable water irrigation (SDI) conditions in relation to crop evapotranspiration: 100% ETc, 75%ETc, 50% ETc), and (ii) two regulated water restriction (RDI) conditions (75% ETc or 50% ETc) during two stages,
fruit setting and growth-maturation. The 75% ETc and 50% ETc are. In addition to these treatments, another severe deficit irrigation treatment receiving 27%ETc was also studied, where irrigation was based on an integrated approach using in-situ climatic stations for weather monitoring, probe capacitance for soil humidity control and dendrometer for water plant response. The results show a significant effect of the sustainable deficit irrigation (SDI) on all measured parameters. Irrigation according to the 75% ETc has achieved the highest vegetative growth, fruit weight, caliber, sugar content and firmness. They also show that the regulated deficit irrigation treatments (DRI) of 50% ETc applied during the fruit setting stage proved to be of no negative effect on apple trees, but showed rather a significant increase in yield, fruit caliber and weight, without affecting firmness and sugar content. As for the severe deficit irrigation treatment, the registered fruit yield was lower than the control treatment, but higher compared to the treatment receiving 50%ETc over the whole cycle. However, qualitative parameters such as firmness and sugar content showed a significant improvement compared to the control treatment. The highest economic gain index was recorded for the treatment which received 50% Etc for the fruit setting stage and the lowest one was noted at the treatment which received 50 % ETc throughout the crop cycle. Keywords: Apple, Gala, Deficit irrigation, SDI, RDI.

Poster #059. Prevalence of Antibiotic-Resistance of Commensal Escherichia Coli Isolates from Broiler Chickens

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Abstract

In the context of ensuring the safety of animal production and increasing the economic income, the poultry production depends mainly on veterinary drugs. So, the intensive use of these drugs has led to the emergence of multi-resistant bacteria, leading to a global health problem. The aim of this study was to investigate the prevalence of antibiotic-resistance in Escherichia coli isolated from broiler chickens. A total of 31 strains of Escherichia coli, that have been the subject of previous studies, were tested for their resistance against 10 antibiotics (amoxicillin, ciprofloxacin, colistin, Tetracycline, Doxycycline, Ofloxacin, Flucloxacillin, Gentamicin, Stryptomycine, and sulfamethoxazole / trimethoprim combination) by using disk diffusion method. The results show that all isolates developed resistance to antibiotics to varying degrees; resistance to flucloxacillin (100%), tetracycline (90.32%) and doxycycline (70.96%) was significantly higher (p<0.05), compared to the other antibiotics. An average resistance was observed with amoxicillin (45.16%) and sulfamethoxazole / trimethoprim combination (58.06%). The lowest resistance was recorded with Stryptomycine (25.80%), ciprofloxacin (22.58%) and ofloxacin (19.35%). The results of this study provide evidence for significant antimicrobial resistance of E. coli isolates from broiler chickens raised on farms without recorded antimicrobial use. Other studies examining isolates from defined geographic locations are required to more accurately detect temporal and spatial differences in antimicrobial resistance in strains of E. coli. Keywords: antibiotic resistance, Echerichia coli, broiler chicken.
Poster #060. Antioxidant Activity of the Essential Oil of an Endemic Species of Morocco: Thymus marrocanus

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Abstract

The Lamiaceae family which includes 7200 species distributed in 240 genres, is divided into 7 subfamilies. The Thymus marrocanus genus belongs to the subfamily of the fact nepetoides. This study was designed to examine the phytochemical screening and antioxidant activity of the essential oils of Thymus marrocanus stem, flower and leaf. Thymus marrocanus aerial parts were the valuable organs (flower and leaf), for the essential oil production representing a yield of 2.1\% (w/w). The phytochemical screening of Thymus marrocanus stem, leaf, and flower was characterized by high proportions of reducers compounds, flavonoids and catechin tannin compounds. Antioxidant activities of the essential oil from aerial part of Thymus marrocanus were evaluated by using three methods: free radical scavenging activity DPPH (2,2-diphenyl-1-picrylhydrazyl), the Ferric Reducing Power (FRAP), and \(\beta\)-Carotene. The first method showed that the essential oil of the aerial part has an ability important to reduce the iron compared to BHT. The antioxidant activity obtained by the second method showed that the essentials oil from the aerial part of Thymus marrocanus (IC\textsubscript{50}= 0.542\pm 0.0012 \mu g/mL) is more important than those obtained from antioxidants used in food and pharmaceutical industries namely Butylated hydroxytoluene (BHT) (IC\textsubscript{50}= 0.854\pm 0.0041 \mu g/mL). \textbf{Keywords:} Essential oil; Lamiaceae; Thymus marrocanus; DPPH; FRAP; \(\beta\)-Carotene.

Poster #061. Influence of Arbuscular Mycorrhiza and Rhizobia Strain on the Growth and Physiological Parameters of Alfalfa (Medicago sativa) Under Salt Stress

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Abstract

The Interactions benefits of the dual inoculation of legumes with nodule bacteria and arbuscularmycorrhizae (AM) are established. However, plant responses to this dual inoculation vary depending on the plant. The current study aimed to compare the effectiveness of autochtonous mycorhizal isolated from palm grove of tafilalet in Morocco and/or rhizobial strain RhOL1 on two Medicago sativa varieties (Dennmate and a variety australiene). Under 0mM NaCl the dual symbiosis formed by AM fungi and Rhizobia were able to improve significantly dry matter production of variety australiene in comparison with the single inoculation and the control. But no significant deference is detected between the single and dual symbiosis for Dennmate. For both varieties salt stress significantly reduced plant biomass and physiological parameters as stomatal conductance. However, plants water parameters didn’t show any significant
variation. But, these effects can be reduced by the single or dual inoculation with arbuscular-mycorrhizal autochthonous (AM) fungi and rhizobia strain. Our results suggested that Medicago sativainoculation with rhizobia strain (RhOL1) and/or arbuscular-mycorrhizal autochthonous (AM) fungi could help to alleviate salt stress effects. **Keywords:** Salinity, Dual inoculation, Growth parameters, Physiological parameters, Alfalfa.

**Poster #062. Effect of fluorescent Pseudomonas on the two Spotted Spider Mite Tetranychus urticae** *(Acari: Tetranychidae)*

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**Abstract**

The two spotted spider mite Tetranychus urticae *(Acari: Tetranychidae)* is a phytophagous pest that can cause significant yield losses in many agricultural crops, including fruits, cotton, vegetables, and ornamentals. This mite has been recorded to feed on more than 180 plant species in both greenhouse and outdoor environments. To control T. urticae, farmers spray usually chemicals (miticides) despite their harmful effects on the environment and human health. This study investigated the effects of Pseudomonas isolates (Q036B, Q110B and Q172B) as a biological control agent of T. urticae. The bacteria were isolated from tomato rhizospheric soil. Leaf dip bioassay was adopted to test the miticide effect of Pseudomonas isolates. Five concentrations of bacteria were used, 102, 104, 106, 108 and 1010 CFU/ml. The mortality rates were assessed 24, 48 and 72h after treatment. Control leaves were dipped in sterilized distillate water. Ten to 15 adults of T. urticae were introduced in Petri dish containing treated leaves and 3 replicates were used for each concentration. The statistic analysis shows that all bacteria and their concentrations significantly reduce the total numbers of T. urticae adults compared to control at 72h. The mortality rates ranged from 49.9 to 97.8 % for Q172B and Q036B respectively. The results of this study indicate that the fluorescent Pseudomonas isolates have an efficient activity to control T. urticae and can be promising tools to build up a biological control strategy. **Keywords:** Tetranychus urticae, Biological control, Miticide, Pseudomonas.

**Poster #063. Potential Symbiotic Fixation of Nitrogen in Different Soils in Morocco Case of Chickpea**

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**Abstract**

The main objective of the research work was to evaluate the symbiotic fixing potential of different soils of Morocco in relation to chickpea. For this purpose, three experimentation were conducted: (1) the estimation of the size of the natural populations of Rhizobium sp (cicer) indigenous to the soils of study, (2) the evaluation of the efficiency of these indigenous naturel populations, and (3) the study of the response of chickpea to inoculation in a pot trial with non-disturbed soil under greenhouse conditions. All the soils
of the studied sites harbored natural population of Rhizobium sp (cicer). We were not able to determine the size of these natural populations by the MPN plant infection count because most probably the plant growth system used was not adequate. The test of efficiency revealed the presence of in the studied soils two groups of populations. The first group contained populations of Rhizobium sp (cicer) as efficient as the reference strain IBJM. The populations of this group belonged to the soils sampled from Meknes2, Settat and Tissa. The second group comprises populations of Rhizobium sp (cicer) inefficient less efficient than the reference strain IBJM. The populations of this group were harbored by the soils sampled from Maaziz, Marchouche, DidiBettache, Meknes1, Khénifra, GharbetFès. Out of the 10 study sites, live showed positive response to inoculation in terms of dry matter yield. These are the sites of Maaziz, SidiBettache, Khénifra, meknes2 and Fès. The response to inoculation was also expressed by an increase in % N and N yield in the sites of maaziz, sidiBettache and Khénifra. The later three sites emerged from the 10 study sites by a net increase due to inoculation of the symbiotic parameters (nodulation), as well as of the yield parameters. (M and dry matter). The non-response of chickpea to inoculation in the remaining sites was due to the presence of efficient population of Rhizobium sp (cicer) and/or high available nitrogen. **Keywords:** Rhizobium, chickpea, inoculation.

**Poster #064. Biodiversity and abundance of ants (Formicidae) in the Argane (Argania spinosa) forest in the South-west of Morocco**

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**Abstract**

Ants (formicidae) have an important role in the functioning of the terrestrial ecosystem. Ants clean and enrich the soil, contribute to spread seeds and to prey on other organisms. This study focused on comparing biodiversity and abundance of ants in tow Argane forest separate areas in the South-West of Morocco. The first one is located in Aoulouz (Taroudant) and the second in Sidi-Ifni. Sampling was carried out using mouth aspirator during late spring (May). Litter of tow frames of 1 m² each for every tree were collected then kept in ethanol 75%. In each site seven locations were sampled and tow samples were collected for each location (Total= fourteen samples per site). Preparation and slides mounting of specimens were conducted in the plant protection laboratory at National Institute for Agricultural Research (INRA), Agadir. Identification is performed using a binocular microscope and based on specific key for each family, subfamily, genus and species. A total of 10 species of ants were identified in Sidi-Ifni and only 3 in Aoulouz. The Shannon indexes (H') estimated were respectively 1.37 and 0.15. The most important genus identified was Monomorium which is represented by 97% in Aoulouz and 60.7% in Sidi Ifni. This work will contribute to understand different ecological relationships in the Argane forest ecosystem functioning. **Keywords:** Biodiversity, Ants, Monomorium, Argane forest, Shannon index.
Abstract

Seed production analysis in plant breeding has a basic role in the selection of performing germplasm. Conducting such study on the sugar beet (Beta vulgaris L.) in Moroccan climate conditions is an important step to determine adapted cultivars, for breeding program initiated by INRA-Morocco. In order to achieve the general purposes, a maternal pedigree selection method is adopted, concerning that crop, seed production require particular conditions to initiate bolting and transit to reproductive stage. Low temperatures (vernalization) followed by long photoperiod are needed for flowering induction. The present study aims to evaluate the biennial seeds production tendency of 40 selected sugar beet genotypes, derived from the second cycle of selection. These individuals were transplanted into the experimental field Merchouch as a vernalizing site and were carried out by polycross design block during the 2013-2014 and 2014-2015 campaigns. Collected data showed a total response to the vernalization and resistance to early bolting, during 2013-2014; grain yield per plant showed a high variability ranging between 68,80g and 410g. 1000-seeds-wieght recorded results between 18g and 36g. During the second year, grain yield varied between 56 g/plant and 300g/plant, 1000-seeds-wieght register a values between 16g and 28,50g. Germination test showed high result between 80% and 100% for both years, after 3 days incubation. Results prove the genotypes capacity to biennial production of quality seeds with some variation in yield components. Keywords: Sugar beet, genotypes performances, seed production, breeding program, selection cycle.

Poster #066. Valorization of Solid Sludge from Phosphates in Arboriculture and Forestry Using Microorganisms

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Abstract

Morocco is the world’s leading exporter, and the third largest producer of crude phosphates. It contains the 75% of the known phosphate reserves on the planet. The OCP Group (The Cherifien Phosphates Office) specializes in the extraction, recovery and marketing of phosphates and their by-products. Each year, more than 23 million tones of minerals are mined. The treatment of phosphates, by wet process, generates a lot of sludge. This pulp containing 10% solids represents 90% of the rejects from the factory. The volume of this sludge is all the more important, as the production of phosphates increases. The presence of phosphorus in this sludge means loss of phosphates during treatment, from the industrial point of view, this loss obviously leads to lower yields. But it is mainly from the environmental point of view that this
loss has serious consequences because of the rejection of a large mass of sludge in nature. They constitute
a major source of environmental pollution, which can have a negative impact on the natural environment.
The OCP Group is committed to promoting the use of phosphates as part of a vision of sustainable ag-
ricultural development that respects the environment. Consequently, the search for appropriate solutions
to the pollution risk posed by this sludge and the recovery of some of this lost phosphorus becomes nec-
essary. The objectives of this work are: To upgrade the sludge generated as a growing substrate, which
can be used in nurseries in the production of fruit plants and forests, this substrate will recover much of
the phosphorus lost, its richness in mineral element especially phosphorus will eventually allow a good
resumption of plants. And the evaluation of the effects of substrates with microorganisms (bacteria) on
the growth, development and vigor of plants.

Poster #067. The Convective Solar Drying of Cherries

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Abstract

Fruits are integrated in daily food. They are an inexhaustible source of nutrients, an essential part of diet.
Cherry is one of the most appreciated fruit by consumers due to its precocity and excellent quality as a
food. Sweet cherry fruit has relatively low caloric content, low glycemic response, high antioxidant activ-
ity and major amounts of important phyto-chemicals: anthocyanins, quercetin, hydro-xycinnamates, vita-
min C, carotenoids and melatonin as well as nutritive compounds such as sugars and organic acids. Cherry
have a limited life time does not exceed 21 days, which requires conservation to ensure their presence
throughout the year. Convective drying is one of the oldest methods of food preservation, often realized
in natural conditions as for example solar drying. The hot air drying reveals several advantages that
entail its wide use in industry and in food industry especially, as it is relatively cheap and easy operated
drying technology. The process is based on partially solar convective drying. Therefore, it is overridden
to understand mechanisms influencing the treated cherry drying process. For this, we studied the behavior
of the product dried in a partial solar convective dryer operating continuously. The experiments were
performed under real weather conditions. We studied the effect of drying temperature using different
temperature ranging from 60 to 75° C with air flow drying of 300m3/h. The main aim of the studies
was to find the possibly best drying conditions, by which the drying time was shortened and the product
quality degradation was minimized. Keywords: drying, solar energy, cherry, conservation process.

Poster #068. Biological Activity of Some Aromatic and Medicinal Plants Parts Extracts Against Eu-
tetranychus orientalis (Acari: Tetranychidae) Under Laboratory Conditions

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**Abstract**

One of the main pests of citrus in Morocco is the phytophagous mite *Eutetranychus orientalis* (Acari : Tetranychidae) [1;2]. To manage this pest, synthetic chemicals have traditionally been used, some of which are well known to be potentially toxic to the environment and humans [3; 4]. Therefore, alternative strategies for pest management in citrus orchards have been developed in recent years, including biological control with natural enemies such as predators, parasitoids, and entomopathogenic microorganisms as well as chemical control using plant extracts. Such extracts have shown toxicity to insects which has positioned them as a common alternative in programs of integrated pest management [5]. The objective of this study was to evaluate the effect of aqueous extracts of four aromatic and medicinal plants on female of *E. orientalis* under laboratory conditions. All the extracts exhibited significant female adult mortality in comparison with the control. *Zingerber officinalis* L. (root), *Jatropha curcas* L. (seeds) extracts had significantly higher mortality rates, greater to 90%, than *Pelargonium graveolens* L. (leaves) and *Rosmarinus officinalis* L. (leaves), that did not exceed 67%. Our results showed that several plant extracts have good potential for acaricidal activity and are worth further investigation. **Keywords:** *Eutetranychus orientalis*, aromatic and medicinal plants, aqueous extract, acaricidal activity.

**References**


**Poster #069. Importance of Bituminaria bituminosa to Restore Defraded Sylvopastoral Systems**

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**Abstract**

Seven million Moroccan use abusively forests and place them under heavy pressure. This population increase and consequently enhance their land requirement for food crops and wood for domestics and industrial use. Moreover, 93% of the national territory is subject to desertification and soil erosion. These natural changes cause environmental, social and economic problems. To fight against deforestation in order to preserve the sylvopastoral systems it’s indispensable to look for alternative strategies based on the use of biological tools such as the use of plant adapted to drought and low soil fertility (*Bituminaria*...
bituminosa) mainly when it's combined with plant growth promoting rhizobacteria. The aim of present study is to select the best complex "Bituminaria bituminosa-plant growth promoting rhizobacteria" showing the best growth (symbiotic relationship). The choice of this leguminous shrub due to its importance; it's wild word thanks to its potential on the nitrogen-fixation (Bituminaria bituminosa) and also due to their use as good fodder. The experience was conducted in the greenhouse in the Faculty of Sciences of Meknes. We used plastic pots, distributed in a completely randomized block. Each pot contains sandy soil which is nutrient-poor. For that we prepared the inoculation treatment, in the presence and absence of phosphorus fertilizer. Five repetitions are done for each treatment. The inoculum was prepared with two plant growth promoting rhizobacteria in erlenmyer. Inoculation alone showed a low beneficial effect on the height, the biomass production and the mineral nutrition. While the effect of the inoculation combined to the presence of phosphorus fertilization is more important. The complex "Bituminaria bituminosa-plant growth promoting rhizobacteria" will constitute good solution in semi-arid and arid regions and thus it will contribute to the preservation of the environment. Keywords: phosphorus fertilization, inoculation, Bituminaria bituminosa, plant growth promoting rhizobacteria.

Poster #070. Phytochemical and Antibacterial Studies on the Phenolic Extract from Eucalyptus gomphocephala

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Abstract

This work presents a contribution to the detection of biological activity of some secondary metabolites of Eucalyptus gomphocephala, which is a Myrtaceae plant family of Zerhoun (central Morocco). The plant was subjected to phenolic compounds extraction. The antibacterial activity carried on bacterial strains pathogenic, Pseudomonas aeruginosa by Aromatogram method and the macrodilution method in liquid medium, showed that the extracts tested are endowed interesting antibacterial activity with inhibition zones can reach 2.9±3.5 cm in diameter. We have processed the quantitative colorimetric determination by a UV-Vis spectrophotometer for total polyphenols and flavonoids and a qualitative analysis by high performance liquid chromatography (HPLC) coupled with mass spectroscopy. Quantitative determinations of total polyphenols by the Folin-Ciocalteu reagent and flavonoids by AlCl3 method revealed the richness of ethyl acetate extract in total polyphenols. Qualitative analysis by HPLC / ESI-MS revealed the presence of quercetin. This molecule was tested by the macrodilution method in liquid medium, which showed greater activity than the ethyl acetate extract. The results obtained in this study suggest that the quercetin may be used in the treatment of infections caused by Pseudomonas aeruginosa. Keywords: Eucalyptus gomphocephala, Pseudomonas aeruginosa, polyphenols, antibacterial activity, HPLC/MS, quercetin

Poster #071. Smart Irrigation Controllers for Water Management


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Abstract

Today's irrigation controllers offer a variety of features and program options and improve the flexibility of an irrigation system. Water management is important in many countries, particularly in Africa where water resources are scarce. In this paper we propose better management of irrigation systems on the basis of a moisture control soil through a network of wired sensors in current, in association with two smart devices for agricultural uses in order to optimize the use of water resources with efficient management. First, we propose a low cost smart irrigation controllers based on very cheap microcontrollers adapted to agricultural users with various options such as SMS text control. Second, we develop a new electronic floatless relay. A floatless relay is a device used to detect the level of water within a tank or it's may be used as pump controller.

Poster #072. The Fertilizing Components of Seaweeds


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Abstract

Morocco with its long coastline has a high abundance and diversity of seaweeds (more than 143 algal species in El Jadida’s coastline). During centuries seaweeds were applied to increase the fertility of soil, foliar applications of algal extract shown many beneficial effects. Seaweeds have big potential and it is not well exploited. Seaweeds actions on plants are tangibles such as improving rest break, bud burst and yields, upgrading the resistances in the stress biotic and abiotic and the stimulation of the vegetal defense. Now several products with seaweeds are marketed, but these uses are much limited comparatively to the richness of their composition. The biochemical characterization of seaweeds revealed answers about their beneficial effects on plants, tests we have run determined the quantity of total sugars and protein in four species of seaweeds, the tests were made on samples preserved in various conditions (fresh samples, frozen samples, dries samples). The study showed differences in the contents of parameters studied according to seaweeds species and according to the state of matter. The analysis and the quantification of the components of seaweeds in particular in protein and in total sugars will help to value them and to adapt their use in agriculture and in other domain.

Poster #073. Mycorrhizal Colonization Response to Water and Salt Stresses on two Plant Species to be used in Degraded Sand Dunes’ Rehabilitation Programs

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Abstract

In this study, mycorrhizal colonization rates of Essaouira sand dunes arbuscular mycorrhizal fungi were observed in response to water and salt stresses, applied separately on two plant species : Retama mono-
sperma and Acacia gummifera. These species were selected due to their high plasticity and tolerance for abiotic stresses, and to be used in Essaouira sand dunes ecosystem restoration. Mycorrhizal inoculum was prepared from a mix, sampled from the rhizospheric soil of Retama monosperma and Juniperus phoenicea, which are well established species on the dunes of Essaouira. The experiment lasted 6 months. The results were then compared and tested with an ANOVA for a p-value of five percent. The stresses had a little but significant impact on the colonization rates of plant roots. Overall, the mycorrhization rates showed some diminution between extreme treatments and almost no significant difference between close range treatments. **Keywords:** Water stress, Salt stress, mycorrhization, Nitrogen, Phosphorus, Colonisation.

**Poster #074. Correlation Between Climatic Conditions and Severity of Potato Soft Rot in Morocco**

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**Abstract**

Potato (Solanum tuberosum), the third biggest crop in Morocco (Terta et al., 2010; Faquihi et al., 2015; Faostat, 2015), is prone to a wide range of diseases which drastically reduce yield and quality (Gardan et al., 2003; Czjakowski et al, 2011). The most common pathogens which affect potato are pectolytic enterobacteria (Pectobacterium atrosepticum Pectobacterium carotovorum,.. (Duarte et al., 2004, Van der merwe et al., 2010)) which cause stem and tuber rot in potato (Czjakowski et al., 2011). What makes the disease very difficult as it is made; is the fact that the symptoms developed on the plant are not strain specific but are dependent on the climatic conditions prevailing at the infection stage (De Haan et al., 2008). The main objective of this study is monitoring the prevalence of this disease in the different regions of Morocco known by a difference of climatic conditions. During the years 2015 to 2016, different potato fields and the most important potato storages in Morocco (Moyen Atlas, Loukkos, Doukkala, Haute Moulouya, Haouz, Chaouia, Sais, Elgharb, Sous, Oriental) were surveyed and samples were collected from tubers and plants suffering from soft rot disease. Seventy five fields were visited. Different symptoms of soft rot, black leg, wilting were found. Prevalence varies from 0 to 14%. In the same region, prevalence could vary from 1 to 8% (Haute Moulouya) and from 0 to 9 % (Haouz). This study shows that in Morocco, there is not always a correlation between the climatic conditions and the degree of severity of the disease (prevalence percentage). **Keywords:** potato, climatic conditions, prevalence, soft rot.

**Poster #075. Drought tolerance gene integration in immature embryos of Moroccan durum wheat by Agrobacterium tumefaciens-mediated transformation**

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Abstract

Wheat improvement by genetic engineering requires the delivery, integration and expression of defined foreign genes into suitable regenerable explants. In our experiment, we focused first on the effect of auxins 2,4-D and picloram in the plants regeneration. Further, we used Agrobacterium as mediated transformation technique with pHVA1-FL plasmid containing drought tolerance gene HVA1, and selectable marker bar gene. In the first experiment, we used immature embryos (IE) from three durum wheat varieties (Amria, Chaoui and Marouane) for callus induction. As first result, Picloram noticed a positive effect in plantlet regenerations, and regenerate a high number of plants compared to 2,4-D. Thereby, picloram is selected for genetic transformation experiment and added in induction medium. The transformation step was released using intact immature embryos, half immature embryos and small pieces of immature embryo of the same three varieties of durum wheat. The percentage of regeneration of ‘Chaoui’ was high when we used half embryos, a similar regeneration rate was observed for variety ‘Amria’ in all explant, further; variety ‘Marouane’ was regenerated only in half embryos. A successful integration of HVA1 gene was confirmed by analyzing the plantlets using PCR amplification.

Poster #076. Characterization and identification of agroforestry system using field survey: a case study in Saïs region (Morocco)

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Abstract

For several years in Morocco, water has become the limiting factor in agricultural productivity. Between short, intense and sometimes destructive rainy periods, and long dry periods. In Morocco agroforestry is adopted in mountainous and oasis regions where water and/or land resources are limited as a solution to the negative impact of monoculture oriented intensification. The main objectives of this work were: i) to determine the importance of agroforestry systems in Saïs region, Morocco, ii) to identify the main reasons and farmers motivations underlying these association types, iii) to catch local knowledge and iv) finally to better understand the role of legumes and cereal in the system. The surveys were conducted in 2015-2016, 80 farmers participated in our study 60 from Moulay Driss Zerhoun and 20 farmers from Ain Taoujdate, during the period of investigation we covered a total area of 344 hectares. Most of the study area is used for agriculture. Very little is still under natural forest or is bare rock. The dominant land use is rainfed cropping. There are several agroforestry systems such as, olive groves, prickly pear, agaves around the plots of annual crops. There are also agro-silvicultural and silvo-pastoralim. The density structures of olive trees in Saïs region varies between 8*8m and 12*12m, the common density registered is 10*10m; the survey revealed that 95% of farmers cultivate cereals, forage, legumes and vegetables in association with olive trees depending to irrigation. The distance left between olive tree and the first line of cultivated crop varies between 0 and 2 m for cereal, while it varies between 1m and 2m for crops cultivated in lines, according to these practices, it seems clearly that crops may compete with trees for water and nutriments especially in association with cereal. According to farmers wheat is more competitive than forage (barley), and legumes are more stabilizing soil fertility. The survey showed also that farming techniques of intercropping legumes with trees are not well mastered by farmers. In fact, the farmers do not take into account the whole system (crop and trees) when managing their fields, especially when they supply fertilizers. In our sample, organic fertilization is the most practiced in the
area, 76% of the farmers apply different amounts of organic manure which ranged from 25 to 40 Kg/tree; on intercropping plots and the rest 24% of farmers bring mineral fertilizers for legumes and olive trees. Grain yield is not interesting compared to the potential of the area; in intercropping grain yield of faba-bean is 1 ton/ha while in monoculture it can reach 1.5 ton/ha, chickpea 0.3 ton/ha and lentil 0.5 ton/ha. **Keywords:** Agroforestry, olive, legume, cereal, survey, Saïs.

**Poster #077. Survival and Post Vitro Development of Micropropagated Date Palms Inoculated with Arbuscular Mycorrhizae**

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**Abstract**

In the arid Moroccan region area, date palm (Phoenix dactylifera) plays an important social, environmental and economic role; this tree constitutes the principal financial resources and food sources of oasis cultivators and contributes to the development of subjacent cultures. However, drought, salinity and fungal disease such as vascular wilt (Fusarium oxysporum sp. albedenis) considerably decrease the palm grove yields. Colossal efforts were made for multiplying clones selected for their resistance to environmental stress. Nevertheless, some hindrances still occur such as the transfer of in vitro plantlets to ex vitro conditions. Previous studies have shown that inoculation with endomycorrhizal fungi at the time of transplanting the micropropagated plantlets from axenic to ex vitro conditions significantly improves survival and growth due to improved absorption of nutrients and water, and to increased stress tolerance. The aim of this study was to combine the use of arbuscular mycorrhizal fungi with micropropagated date palms to determine whether AMF could enhance transplanting success and plantlet acclimatization. In vitro-grown plantlets were transplanted to a sterile substrate and inoculated with three fungi strains. After ten months of growth, results shown that AMF enhance the survival and development of the plantlets during the acclimatization phase. **Keywords:** Date palm, Symbiosis, Arbuscular mycorrhizal fungi (AMF), Acclimatization, Vitro-plants, Micropropagation.

**Poster #078. Effect of two Biostimulants on the Productivity of Mejhoul Date Palm in Tafilalet Oases**

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**Abstract**

Nowadays, in the dry climate zones, such as oases; the improvement of the dates production as well as its physical and chemical characteristics, consider one of the fundamental goals. The experiment was conducted out during 2016 season, in a conventional production of palm dates Mejhoul, under the climatic conditions of Tinejdad, Errachidiya region, Morocco. The aim of this study is to evaluate the effect of two biostimulants including Protifert LMW 6.3 (4 ml.L⁻¹) and Vitazyme® (1.3 ml.L⁻¹) on yield and quality of dates. Therefore, three variants were compared (Control, Protifert, and Vitazyme). The applications of two biostimulants were repeated three times after pollination in particular to late April,
mid-July and mid-August. The experimental design is completely random blocks with 3 repetitions and 3 trees per variant (a total of 27 palm trees). Observations were made on fruit dimensions (width and length), fruit weight, flesh weight, seed weight, seed/fruit report, pulp/fruit report and yield. Data shows that the treatment has affected significantly all of the parameters studied. Indeed, Protifert LMW 6.3 has enhanced yield per tree by 18 and 27 %, respectively compared to Vitazyme and Control. As for fruit dimensions, Protifert spawned longer fruits over Vitazyme and Control, whereas, both biostimulants induced fruit of the same width but larger than those from the Control trees. In addition, fruit weight ranged from a maximum of 14.51g recorded by Protifert LMW 6.3 and a minimum of 10.32g observed in the Control. However, fruits of treated trees Vitazyme were richer in flesh (92.62%) compared to those obtained by untreated palm (90.78%), besides their environmentally safe effect as non-chemical tool. 

**Keywords:** Biostimulants, date palm, Mejhoul, production, Quantity, Quality.

**Poster #079. Preliminary Evaluation of Stevia Under Moroccan Climatic Conditions**


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**Abstract**

Stevia is a relatively unknown crop in Morocco, with great potential as a natural sweeteners source. Stevia has a high content of low calorie sweeteners, which are up to 450 times sweeter than sucrose. Stevia can be cultivated as an irrigated annual crop in Morocco. Present study deals the yield and quality response of stevia to the edapho-climatic conditions in twelve different areas in Morocco. Stevioside (STV) and rebaudioside A (RA) are the main sweetening compounds of interest. It was shown that stévia can grow in saline regions with electrical conductivity (EC) of soil and irrigation water greater than 2 mS/cm, as was recorded in Berkane with ECw= 2,97 and ECs= 4,54 also in Marrakech with ECs=9.68 mS/cm. Besides, the organoleptic quality (RA/STV) is greater when the pH of the irrigation water tends to acidity (RA= 8,61g/100 in Oulmes). Also the plant is sensitive to day length and the cultivation in areas with long days, with at least 12h of day length, would be ideal for high steviol glycosides and biomass yields.

**Poster #080. Optimization of growth and development of date palm seedlings by using organic and biological fertilizers**

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**Abstract**

The aims of our study are to evaluate the effect of compost produced locally and seaweed liquid extract on four parameters: growth, physiology, histology and mineral nutrition of seedlings of the date palm (Phoenix dactylifera). After 4 months of greenhouse cultivation, we evaluated the parameters on palm trees subjected to different treatments applied. The results showed the importance of the two amend-
ments on the date palm grown in greenhouse. Indeed, the production of fresh and dry matter of the aerial part is significantly improved by different treatments applied compared to the control and 20% compost-extract combination. In addition, chlorophyll fluorescence (Fv/Fm) is enhanced in all different treatments compared to the control. However, stomatal conductance is highly affected positively for seedlings amended to 5% compost compared to the control. In addition, the number of conductive tissues (xylem and phloem) was very significantly increased by the various treatments compared to the control. In the same way, the number of sclerenchyma fibers is also improved in plant treated except to those treated with the algal extract compared to control plants. Furthermore, the phosphorus content of the aerial part is improved in the palm trees treated with algal extract, 5% compost-extract combination and 5% compost compared to the control. While, the potassium content of the aerial part was very significantly improved by 5% compost. Finally, the compost with a low dose (5%) seems to be the best amendment for improving the growth and vigor of young palm trees. Keywords: Date palm, compost and algal extract.

Poster #081. Genetic Identification of Adaptation and Impact of Genotype by Environment Interactions on Argan Tree Ecotypes

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Abstract

Argania spinosa, Skeels. is one of endemic species to Morocco, is currently extended in arid and semi-arid south west Morocco region. It plays a very important role and an irreplaceable one for local populations. In addition, it’s an essential component of forest ecosystems biodiversity. Initially and for the purpose of preserving and understanding the distribution of this tree species, a study of the variation and the influence of environmental conditions on the morphology was carried out on different ecotypes of Moroccan argan forest. This study is based on surveys and collections of argan genotypes as well as on the analysis of climatic and soil factors (temperature, rainfall, altitude, soil components, etc.). Individuals were selected previously to be tested on different environments. Trials are held in four regions of Morocco, where the soil and environmental conditions are different, to evaluate genotype x environment interactions. Evaluation is based on 20 morphological traits and 12 molecular SSR species specific markers. Results of this study will contribute to identify genetic ecotype of argan forest and to determine the adaptability of different genotypes, for Argan breeding programme. Keywords: Argania spinosa, adaptability, soil factor, genotype x environment interactions.

Poster #082. Evaluation of Some Fruit Quality Traits of Eight Tomato Varieties (Solanum lycopersicum) Grown in four Different Moroccan Regions

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Abstract

For organoleptic and nutritional quality characterization of eight tomato varieties cultivated in four different regions in Morocco (Berkane, Hoceima, Figuig and Rissani), several physicochemical parameters such as pH, titratable acidity (TA) and total phenolic compounds were analyzed on mature tomato fruits. The pH measure did not change between varieties. However, titratable acidity was ranged between 2.1 g/l for white Rissani variety to 5.6 g/l for black Rissani. With total polyphenols content test, Figuig 2 and Hoceima showed the greatest value ranged between 125 and 122 mg/100g respectively. Results of this analysis showed that physicochemical parameters could be used for varietal characterization and join those obtained with morphological and molecular tests underlining that Figuig and Hoceima varieties were the most interesting of the eight tested ones. Keywords: Tomato, physicochemical parameters, pH, titratable acidity (TA), total phenolic compounds.

Poster #083. Evaluation of Some Date Palm Males Used in Pollination in Figuig Province

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Abstract

Date Palm (Phoenix dactylifera L.) is a dioecious plant with separate male and female trees. The high nutritive value of the date fruits and the substantial quantities produced justify the need for ameliorating the production by using new methods for breeding and selection of new cultivars male palms which have a high viability and compatibility with female cultivars and which have a good effect on quantity or quality of fruits produced. The principal characteristics to be desired in a male palm are, roughly in order of importance: fertility, blooming early in season. Abundance of flowers and pollen to this may be added production of good characters in the fruit (Poperoe 1923). In the present study, several visits were carried out to the date palm farms in Figuig region, 40 male date palm trees were selected from different local farms. Pollen viability was determined by in vitro germination, the results indicated that maximum and minimum germination percentage was 90%-18%. Several morphological characteristics of the selected date palm males inflorescences were studied. These characteristics included spathe length, spathe width, peduncle length, peduncle width, flower spik length, strands length and number of strands by spathe. Keywords: Pollen, viability, morphological characteristics, vitro germination.

Poster #084. Comparative Antioxidant Activity, Polyphenolic and Flavonoids Contents of the Argania Spinosa Pulp of Different Regions of Morocco

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Abstract

Argania spinosa (L.) Skeels is a tropical plant, which belongs to the Sapotaceae family. In Morocco this tree is considered an important forest species due to its botanical, social and economical interest as well
as its environmental value. Recently, many beneficial bio-molecules compounds have been identified from various parts of the A. spinosa, which can play a beneficial role in fighting disease and could be used in pharmaceutical and personal care product industries. Phenolic and flavonoids compounds, as secondary metabolites, are a large group of molecules widely distributed in plants. Phenolic compounds can play the role of antioxidants through different mechanisms, Previous research has reported that phenolic composition is vastly influenced by biotic and abiotic factors. The present study was conducted on the A. spinosa pulp to show the antioxidants levels, polyphenolic and flavonoids contents in this pulp, coming from different areas of Morocco, and compared them with each other, beside of showing the geoclimatic influences on the composition. **Keywords:** Argania spinosa pulp, antioxidant, polyphenolic compound, flavonoids.

**Poster #085. Essential Oil: Adsorption Properties of Thymus willdenowii Boiss. as a Green Inhibitor for the Corrosion of Mild Steel in 1M HCl.**

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**Abstract**

Medicinal and aromatic plants is a very wide area and in the process of processing requires specific knowledge and expertise of each group of plants and products. According to the definition of the World Health Organization (WHO) in medicinal plants include plant species of which one part or more parts containing biologically active substance that can be used for therapeutic purposes or for chemical and pharmaceutical synthesis, then the group of medicinal and aromatic plants, which include plant species containing biologically active substances with practical applications in pharmaceutical, food and cosmetics industry, and industry additives, aromatic preparations, etc. The analysis of Thymus willdenowii (TW) essential oil by Gas Chromatography (GC) and Gas Chromatography-Mass Spectrometry (GC/MS) allowed the identification of 32 components which accounted to 97.6% of the total amount. Among them, the main components were thymol, p-cymene, Ý-terpinene, borneol and carvacrol respectively. The inhibitive effect of this essential oil on the corrosion of mild steel in 1M HCl solution has been investigated by weight loss measurement as well as potentiodynamic polarization and electrochemical impedance spectroscopy (EIS) techniques. The gravimetric results indicate that TW oil exhibits good inhibition efficiency in 1M HCl solution. Electrochemical impedance spectroscopy measurements revealed that the charge transfer resistance increases with increase in the concentration of essential oil. Linearity of Langmuir isotherm adsorptions indicated the monolayer formation of inhibitor on mild steel surface. **Keywords:** Essential Oil; Thymus willdenowii; Mild steel; Corrosion inhibitor; HCl.

**Poster #086. Chemical Composition and Antibacterial Activity of Essential Oil of Anise (Pimpinella anisum L.) Seeds from Morocco**

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Abstract

Anise (Pimpinella anisum L.) is cultivated in Morocco and used as a culinary spice. In this work, the chemical composition of the essential oil obtained by hydrodistillation of anise seeds was analyzed by gas chromatography-mass spectrometry (GC-MS), and components were identified. Anethole (81.19%) and himachalène (6.22%) were found to be the major components. The antibacterial activity and inhibitory concentration of essential against several food-borne pathogens were evaluated. The results showed that the gram positive and gram negative strains of bacteria had different sensitivities to essential oil of anise seeds, the essential oil exhibited antibacterial activity against Bacillus cereus, Escherichia coli, Staphylococcus aureus and Salmonella thyphi according to the results of minimum inhibitory concentration. With the rice of this study, we can conclude that the seeds essential oil of anise could be regarded as a very promising preservative for food industry which is able to prevent the microbial growth responsible for the deterioration of food. **Keywords:** Pimpinella anisum L., anise, Essential oil, Antibacterial activity, chemical composition.

Poster #087. Action of Physiological Factors on the In Vitro and In Vivo Development of the Argan Tree (Argania spinosa L. Skeels.)

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Abstract

The argan tree (Argania spinosa L. skeels) is an endemic tree of southwestern Morocco. It is very appreciated for the quality of its oil and wood. It plays important roles in the socio-ecological, environmental, economic, medicinal and cosmetic domains. Currently, the argan forest tree suffers from alarming degradation. Since natural regeneration cannot ensure the reconstitution of this species, several methods of classical multiplication have been tested. However, the results obtained were insufficient. To respond to the strategy of the “Green Morocco Plan”, aimed at the improvement and mass production of this species, the use of biotechnology and more particularly the in vitro micropropagation technics and in vivo multiplication are necessary. The work done and the results obtained seem encouraging and promising. **Keywords:** Argan tree, Argania spinosa, micropropagation, in vivo, in vitro.

Poster #088. Nutritive Value of Argania spinosa by Products for Livestock Feeding

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Abstract

During the process of argan oil production, significant amounts of by-product are obtained that could be recycled and become a valuable food source for livestock. The main objective of this study was the evaluation of the chemical composition of the oilcake and argan pulp. Thus the statistical results revealed a highly significant difference between the two by-products. However, the oilcake has a high content of crude protein (43.2% DM) but a low total sugar content (X% DM), while the pulp is moderately high in total sugars (12% DM) but poor in crude protein (7.82% DM). Because of their high sugar and protein, both by-products are so important for livestock in term of energy and protein. Keywords: Argan, cake, pulp, crude protein, total sugars.

Poster #089. Detoxification of Argania spinosa Cake: Impact on the Performance of the Livestock Subjected to Fattening

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Abstract

The use of the Argania spinosa cake for livestock feed is limited due to the presence of some antinutritional compounds, including saponins which give it a very bitter flavor. That makes the cake of Argania spinosa unpalatable by livestock. The Chemical composition attest that the cake of Argania spinosa is a good source of protein (44.61%), total sugars (20.15%), MG (19.09%), CB (8.71%), NDF (17%), ADF (14.09%), ADL (10.39%), saponins (2.15%). Therefore, it could be inferred, that the cake of Argania spinosa is a strategic resource to fill the nutritional gap which characterizes the national animal feeding. In order to improve the quality of the argan cake and make it more appetizing for gap, a chemical treatment with citric acid C6H8O7 was carried out on the argania spinosa cake. Keywords: Argania spinosa cake, Saponins, Detoxification, Acid treatment.

Poster #090. Microbiological Monitoring of Hemodialysis Center Surface's in Morocco

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Abstract

The risk of infection in hemodialysis reality was approached by several publications that estimate that nosocomial infections are 100 times more common than in the general population. Microbiological monitoring of the hospital environment is a focus of the fight against these infections policy, although the involvement of the environment in their occurrence is not, to date, precisely known. As part of a quality approach and to control the hemodialysis environment, we conducted an investigation prior to any cor-
rective action. With the main objective to assess the percentage of contamination of surfaces treatment wards and identify the seeds isolated, it consists of a microbiological monitoring of surface’s hemodialysis center of Fez city. Surface samples totaled 100 points, and concerned the generators, tables, beds and the most commonly objects by the patient’s, such as remote controls. The identification of bacteria was based on the morphology, Gram staining and biochemical classical gallery. The percentage of total contamination was 97%. The contamination was evident at both generators as tables, beds and other objects. We found that 94% were bacteria, and 6% were molds. The Gram positive accounted for 85.81%, predominantly for the genus Staphylococcus (61.70%), followed by Bacillus sp (12.78%), Streptococcus (11.34%), bacilli Gram negative non fermentative (10.64%), and fermentative Gram-negative bacilli (3.54%). To prevent environmental contamination, it is recommended to master the cleaning procedures, train staff in hospital hygiene, and respect the standard precautions. Keywords: Hemodialysis Centre, nosocomial infections, monitoring, surfaces, percentage of contamination, germs.

Poster #091. Cystic Echinococcosis: Epidemiology, Socio-Economic Impact and Consequent Control Actions Undertaken in Morocco

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Abstract

Echinococcus granulusus, is the causal agent of cystic echinococcosis in humans, domestic and wild herbivores. Disease transmission occurs by ingestion of parasite’s eggs living in the small intestine of canids, especially dogs. It is a cosmopolitan disease ranked among the major zoonoses and cause heavy consequences on health and huge economic losses. According to the latest WHO estimates, this disease is responsible of annual losses of 1-3 million DALYs (Disability Adjusted Life Expectancy Years) and of $ 3 billion (US $) for the treatment of patients and for livestock losses. In Morocco, an annual average surgical incidence of approximately 4.2 cases per 100 000 inhabitants was recorded (2009-2013), involving an estimate of over 20 million MAD (~ € 2 million) as annual amount of medical expenses. In livestock, losses associated with infected organs seizure in slaughterhouses, were estimated at 10 million MAD / year (~ € 1 million / year). To address this situation, the main undertaken actions in the field, were conducted mainly by the IAV Hassan II team. The targeted regions were the province of Khénifra (2000-2007) and, recently, the province of Sidi Kacem (2009-2014), as part of major research American and European projects, BAFI and ICONZ respectively. Field studies involved the disease control approaches and alternatives. The results of these actions were very promising. However, as they were located and project related, sustainability was not ensured. Thus, cystic echinococcosis is still prevailing in the country with socio-economic and public health consequences. It was concluded that any selected control action should include health education and community based approaches.

Poster #092. An Ethnopharmacological Survey of Plants Used in Traditional Diabetes Treatment in the Region of Beni Mellal – Khénifra, Morocco

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Abstract

This study was carried out in the Region of Beni Mellal–Khenifra, deemed by a sizeable botanical biodiversity, the informations has been collected from herbalists, traditional healers and diabetics. For about forty years ago, diabetes has been a real public health problem in the world. It is the most common metabolic pathology characterized by chronic hyperglycemia resulting from a partial or complete deficit of the pancreas cells to synthesize insulin and / or tissue resistance to insulin. Many plants are traditionally considered as antidiabetic. Some of them have led to the development of several medicines, and in front of the considerable increase in the number of diabetics and the elevation of the financial value of certain synthetic drugs, researches has begun to evaluate the pharmacological actions of these medicinal plants anchored in the mores and traditions of the population. The statistical treatment of the results obtained from the question sheets, allowed us to target the plant species suspected to have a caring power against diabetes. **Keywords:** Phytotherapy, Medicinal flora, Biodiversity, Ethnobotany, Antidiabetic.

Poster #093. Oil Content and Main Consituents of Cactus Seed Oils Opuntia ficus Indica of Different Origins in Morocco

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Abstract

This paper describes the chemical composition of 17 oil samples obtained from cactus seeds collected from five different origins in Morocco, the major producer of cactus seed oil. The oil content of the samples varied in a relatively small range between 5.4 g/100 g and 9.9 g/100 g. The main fatty acids of cactus seed oil are oleic acid (20.5 g/100 g) and linoleic acid (62.3 g/100 g) representing 80–84% of the total fatty acids. The main component of the tocopherol fraction is gamma-tocopherol (83–90%). It is followed by alpha- and delta-tocopherol whereas beta-tocopherol is found in lower amount. In all samples beta-sitosterol was found as the main phytosterol (80.0% to 84.5%). This phytosterol is also typical for many other edible vegetable oil. This study, carried out on randomly selected samples, clearly demonstrates that origin does not have an effect on the chemical composition of cactus seed oil. **Keywords:** Cactus seed oil, fatty acids, tocopherols, phytosterols, Morocco.

Poster #094. Management of Chickpea Pod Borer Helicoverpa armigera (Hübner): Use of Bio-Pesticides

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Abstract

*Helicoverpa armigera* (Hübner) is one of the most important insect pests worldwide. The larva feeds on various important crops such Tobacco (*Nicotiana tabacum*), tomato (*Solanum lycopersicum* L), chickpea (*Cicer arietinum*) & cotton (*Gossypium hirsutum*); causing important damages. In the last decades, synthetic chemicals were frequently used to manage this insect throughout the world. The intense application of pesticide has led to major problems in term of insect resistance, environment pollution, in addition to their high cost. Research on bio-pesticides has been gaining increased attention and many plant extracts and essential oils have shown promising activities in insect control. On this context, biological activity of 12 essential oils and 4 plant extracts were studied using third instar larva of Pod borer *Helicoverpa armigera*. The aim of this study was to identify efficient botanical pesticide for to control of this pest under laboratory conditions using three types of tests: direct contact (Topical method), systemic effect and fumigation. Results showed that essential oils were more promising than the plant extracts in term of larval toxicity on the Pod borer. **Keywords:** *Helicoverpa armigera*; essential oil; chickpea; bio-pesticides

Poster #095. Value Addition of Some Moroccan Regional Products by Liquid Fermentation: Production of Date and Apple Vinegars

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Abstract

Six strains of acetic acid bacteria were isolated from Moroccan local products and evaluated for their industrial vinegar production potential. Two of them, namely AF01 and CV01, isolated from apple (*Malus domestica*) and cactus (*Opuntia ficus indica*) fruits, respectively, were selected and investigated for their thermoresistant and thermophilic properties. A biochemical and molecular study based on a 16SrDNA gene sequence analysis confirmed that the two isolated strains belong to *Acetobacter pasteurianus* with 99 % of homology. Their growth and acetic acid production capacity were compared with (1) the thermoresistant reference strain *A. senegalensis* isolated from mango (Senegal) and (2) other, wild acetic strains belonging to *A. pasteurianus* (LMG 1632, LMG 1607, LMG 1701, DSM 2324 and DSM 4491). The two strains showed very good growth and noticeable acetic acid production ability at high temperatures (38 to 41°C). A thermophilic character was noted for AF01 strain. Indeed, this bacterium grew better at 38 than at 30°C. Subsequently, a semi-continuous fermentation was performed in a 20L Bioreactor for both selected strains. A total amount of 7.64% and 10.08% acetic acid was achieved at the end of fermentation, respectively for AF01 and CV01 strains. Process fermentation of CV01 strain was marked by the ability to produce gluconic acid during acetic fermentation. Finally, an enzymatic study was carried out on the selected strains AF01 and CV01 to confirm the tolerance of their enzymes responsible for acetic fermentation process to high temperature. Results clearly showed that the two strains exhibited high ADH and ALDH enzyme activity at either 30 or 38 °C as compared to the mesophilic reference strain LMG 1632 which exhibited marked thermal inactivation rate. It is concluded that the two selected strains are well-suited to industrial use for vinegar production in Morocco. **Keywords:** Vinegar; Acetobacter; Thermoresistance; Bioreactor; Enzyme activity; Morocco.
Poster #096. QTL Underlying Reniform Nematode Resistance in Soybean Cultivar ‘Hartwig’

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Abstract

Nematodes are one of the most destructive plant-parasitic pests in soybeans [Glycine max (L.) Merrill]. Among the nematodes, soybean cyst nematode (SCN, Heterodera glycines Ichinohe), southern root-knot nematode [RKN, Meloidogyne incognita (Kofoid and White) Chitwood], and reniform nematode (RN, Rotylenchulus reniformis Linford and Oliveria) are often the most problematic in soybean yield production. The plant introduction PI437654 has been used previously to map RN quantitative trait loci (QTL). However, ‘PI437654’ is non-domesticated. ‘Hartwig’ was the first domesticated cultivar to introgress some of the resistances from ‘PI437654’. The aims here were to map QTL underlying RN resistance in ‘Hartwig’. A cross between ‘Flyer’ and ‘Hartwig’ (n=92) was created to map QTL that underlie both SCN and RN resistance. The F × H population was phenotyped at the nematology lab at the University of Arkansas in 2014 and 2015. The F × H was genotyped with 140 polymorphic microsatellite markers (simple sequence repeats, SSR). In this study, 4 SSRs were highly significant (P< 0.001) associated by ANOVA and composite interval mapping and each were determined to identify a QTL. There were QTL on Chr. 12 (LG H, Satt353), and 3 on Chr. 18 (LG G, Satt275, Satt163, and Satt309). The beneficial alleles all derived from ‘Hartwig’. Satt353 has previously been reported to link to sudden death syndrome (SDS) QTL, and all three Satt markers on LG G have been reported to link to rhg1. Therefore, ‘Hartwig’ and cultivars derived from it (‘Anand’, ‘Ina’) may be used to address the growing RN problems.

Poster #097. Soybean Mutations Mapping: Applications in Functional Gene Analysis and Soybean Improvement

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Abstract

The alteration of fatty acid profiles to improve soybean oil quality has been a long time goal of many researches through the world. Biodiesel is an up and coming trend in energy production. Breeding effort can be undertaken in order to produce higher energy profile soybean oil. Using the ethyl-methanesulphonate (EMS) mutagenesis effects on DNA, significant changes to the genes and gene network underlying oil profile can be achieved, these changes are hard to accomplish under standard breeding techniques. High content Linolenic acid is very important for fuel and Biodiesel production, but disadvantageous for food production due to the fact that the oil is oxidized easily and the foods go rancid quickly. However, soybean oil with elevated oleic acids is desirable for food. Oleic acid is a monounsaturated fatty acid that improves the nutrition and oxidative stability of soybean oil compared to other oils. The main purposes of this work were to mutation breed new soybean [Glycine max (L.) Merr.] sources containing
high level of seed oleic acid good for the soy industrial and food production, on a background conferring the resistance to soybean cyst nematode (SCN), the most devastating pest in soybean production. A subset of the EMS mutagenized developed population containing about 1000 families was screened using forward genetics approach to identify mutants within the FAD2 genes. Mutations within the FAD2 genes encoding the Fatty acid desaturase were identified. Five soybean mutants with high levels of oleic acid were identified presenting 2.5 times more content than the Forrest WT. These mutants were further identified to carry one mutation each in both FAD2-1A and FAD2-1B isoforms.

Poster #098. Influence of Drought Stress on Several Root Traits and their Correlation with Seed Protein and Oil Contents in Soybean

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Abstract

The important crop soybean [Glycine max (L.) Merr.] is cultivated worldwide and the US is its number one exporter. However, farmers face many challenges in cultivating soybeans, including drought and diseases that reduce yields drastically. The root system is very important for plants, including crops, because it receives water and minerals from the soil so that the plant/crop can photosynthesize, grow, and increase its yield. The objective of this study was to grow the ‘MD 96-5722’ by ‘Spencer’ recombinant inbred line (RIL) population (n=86) in the greenhouse under normal (Group I) and drought stress (Group II) conditions, and compare the root length (RL), root surface area (RSA), average root diameter (ARD), and average root volume (ARV) in the two groups of plants. WhinRhizo software was used to measure the root traits and SPSSTM was used to evaluate population performance under normal and drought conditions. JMPTM was used to compare the root traits under normal and drought conditions, and to analyze the correlation between root traits, protein and oil contents. The results showed that there is a huge variation in these traits among the parents ‘MD 96-5722’ and ‘Spencer’, and among their RILs. For Group I plants, the RL of parents and RILs ranged from 20.67 cm to 2,327.88 cm; the RSA ranged from 4.57 cm² to 1,176.79 cm²; the ARD ranged from 0.38 mm to 4.04 mm; and the ARV ranged from 0.08 cm³ to 47.34 cm³. For Group II plants, the RL of parents and RILs ranged from 15.70 cm to 3,562.42 cm; the RSA ranged from 4.15 cm² to 829.72 cm²; the ARD ranged from 0.24 mm to 5.74 mm; and the ARV ranged from 0.03 cm³ to 23.67 cm³. It is clear from the results that Group I plants have higher means of RL [572.58 cm vs. 537.33 cm], RSA [201.20 cm² vs. 165.50 cm²], ARD [3.96 mm vs. 1.45 mm], and ARV [6.31 cm³ vs. 5.61 cm³] compared to Group II plants which demonstrates that drought-stressed plants have reduced overall plant growth and development. However, statistically, these differences were not significant; therefore, further studies with several replicates should be conducted both in the greenhouse and the field in order to determine the effects of drought stress on the ‘MD 96-5722’ by ‘Spencer’ RILs. Moreover, studies of quantitative trait loci (QTL) mapping of the root traits studied here are underway to genetically map QTL for these root traits in this soybean RIL population. Keywords: Root length (RL), Root surface area (RSA), Average root diameter (ARD), Average root volume (ARV), MD 96-5722, Spencer.

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Abstract

Yield is a multi-factorial trait determined by several genetic traits and highly correlated with important agronomic traits in many crops including soybean [Glycine max (L.)]. Plant height, seed and pod numbers, and seed weight are all components of yield and polygenic in nature. The objective of this study was to identify quantitative trait loci (QTL) for days to germination, days to flowering, plant height, pod number, seed number, 100-seed weight, and total seed weight in soybean using the PI 438489B by ‘Hamilton’ recombinant inbred line (RIL) population (PIxH, n=50). A total of 18 QTL were found on 10 different chromosomes. Three QTL for days to germination (qDG001-qDG003) have been identified on chromosomes 5b, 6, and 13b. Two QTL (qDF001 and qDF002) have been identified on chromosomes 9 and 13b, respectively. On QTL for plant height (qPH001) have been identified on chromosome 6. Four QTL for pod number (qPN001-qPN004) had been identified on chromosomes 5a, 6, 8, 9, and 11c, respectively. Two QTL for seed number (qSN001 and qSN002) have been identified on chromosomes 5b and 11b, respectively. Five QTL for 100-seed weight (qSW001 to qSW005) have been identified on chromosomes 5a, 6, 8, 9, and 11c, respectively. Two QTL for total seed weight (qTSW001 and qTSW002) have been identified on chromosomes 5b and 17c, respectively. The QTL identified here may be introduced in breeding programs to develop soybean cultivars with high yield potential. Keywords: soybean, QTL, days to germination, days to flowering, plant height, pod number, seed number, seed weight.

Poster #100. Forward and Reverse Genetic Screening of Genes Underlying Stearic Acid Content in Soybean

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Abstract

Stearoyl-acyl carrier protein desaturase (SACPĐ), which has four isoforms in soybean: SACPD-A, -B, -C and -D, converts stearic acid into oleic acid, influencing and controlling the accumulation of seed stearic acid. Stearic acid is a desirable constituent of oils for food use because it is less likely to be incorporated into cholesterol esters and has a neutral effect on the concentration of the blood serum LDL cholesterol. Stearic acid may be useful to eliminate the need for chemical hydrogenation of soybean oil in the production of trans-free margarines and shortenings. The available soybean lines with high level of seed stearic acid are mostly susceptible to soybean cyst nematode (SCN), one of the most devastating pests in soybean production. In order to improve the quality of soybean oil and processed foods, chemically
mutagenized soybean using EMS has been developed in this work. A subset of the mutagenized population containing about 1000 families was screened using reverse (Tilling) and forward genetic screening approaches to identify mutants within the SACPD genes. Using a forward screening approach, we were able to identify four mutants: F605, F620, F714, and F813, all of which contain high level of seed stearic acid with an increased level of up to 2.4 times. Each of these four mutants was identified to carry one missense or nonsense mutation of SACPD-C: Q83* (F605), L79F (F620), D77N (F714), and P102L (F813), among them, Q83*, L79F, and P102L are the new SACPD-C alleles identified in soybean. However, none of the four mutants exhibited mutations in SACPD-A, SACPD-B, and SACPD-D. Furthermore, reverse genetics was used to identify mutants within the other SACPD isoforms. Thus, we identified one missense SACPD-A mutant: F1396 (D277G), three missense SACPD-D mutants: F2360 (G263E), F2374 (E37K), and F2487 (T297M), and all the four lines were measured to contain the same level of seed stearic acid as the wild type Forrest. Thus, only the mutations of SACPD-C isoform perfectly correlate with the alteration of soybean seed stearic acid phenotype, suggesting SACPD-C is most likely responsible for the accumulation of stearic acid in soybean seed.
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Biography

Dr. My Abdelmajid Kassem earned a B.S. degree in Plant Biology at Mohamed V University, Rabat, Morocco in 1992. After graduation, he went to France then to the USA to pursue his graduate studies. Dr. Kassem earned a M.S. in Enzymatic Engineering, Bioconversion, and Microbiology from the University of Picardie Jules Verne in Amiens, France in 1995. After that, he joined the “Center for Excellence in Soybean Research, Teaching, and Outreach” at Southern Illinois University, Carbondale, Illinois, where he earned his Ph.D. in Plant Biology (Minor: Plant Genetics, Genomics, and Physiology) in December 2003. Before finishing his doctoral dissertation, he was offered a high school teaching position at Chicago Public Schools where he taught AP Biology, Biology, Chemistry, and Environmental Sciences from 2001 to 2004. In fall 2004, Dr. Kassem joined Kean University, NJ as Assistant Professor of Botany and worked there from 2004 to 2006. In 2006, Dr. Kassem joined the Department of Natural Sciences, Fayetteville State University, NC as an Associate Professor of Botany and was promoted to Full Professor in 2009 and Dept. Chair in 2010. During the academic year 2014-2015, Dr. Kassem served as the Dean of the School of Arts and Sciences at the American University of Ras Al Khaimah in United Arab Emirates (UAE) and returned back to his position of Chair in fall 2015. Dr. Kassem serves as an Advisory Board member of Scientific Journals International (SJI), an Associate Editor of Journal of Forestry, Horticulture, and Soil Science, the Editor-In-Chief of Atlas Journal of Biology, and a member of the Editorial Board of Journal of Biotech Research. Dr. Kassem is the Co-Founder, CEO, and Managing Editor of Atlas Publishing, LP. Dr. Kassem’s research interest and expertise is genetic and quantitative trait loci (QTL) mapping of important agronomic traits in soybean and other plant species. He is a standing member of several professional societies such as North Carolina Academy of Science (NCAS), Association of Southeastern Biologists (ASB), American Society of Plant Biologists (ASPB), and the High Council of Moroccan American Scholars and Academics (HC-MASA) of which he is a Co-Founder and served as President and Vice-President. Dr. Kassem serves as a regular reviewer for several international journals and granting agencies.
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Biography

Dr. Khalid Meksem received a BS degree in Biology from University Hassan II, Morocco in 1989, an MS degree in Plant Molecular and Cell Biology at the University of Paris XI, France, and a PhD in Genetics, Biochemistry, and Botany in 1995 at the University of Colon and Max Planck Institute, Germany. In 1996, Dr. Meksem joined the Department of Plant, Soil, and Agricultural Systems, Southern Illinois University, Carbondale, IL, USA as a Postdoctoral Fellow where he worked from 1996 to 2000. Dr. Meksem served as an Assistant Professor from 2000 to 2004 then as Associate Professor from 2004 to 2009, and was promoted to full Professor in 2009. Dr. Meksem’s research interest cover both, structural and functional genomics, and his long time area of interest is the molecular dissection of plant disease resistance mechanisms to nematodes and fungi. Dr. Meksem is serving as Editor-in-Chief of Plant Genome and Systems Biology, as Associate Editor of the International Journal of Plant genomics, and as reviewer for a number of international scientific journals as well as for several granting agencies.
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