VAHVISTUS

كلية العلوم ظهر المهراز
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Faculty of Science Dhar El Marhaz

جامعة سيدي محمد بن عبد الله
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Sidi Mohamed Ben Abdellah University

UNIVERSITY SIDI MOHAMED BEN ABDELLAH, MOROCCO

FACULTY OF SCIENCE DHAR EL MAHRAZ, FEZ

LABORATORY OF NEUROENDOCRINOLOGY, NUTRITIONAL AND CLIMATIC ENVIRONMENT

&

LABORATORY OF BIOTECHNOLOGY

Organize an International Colloquium

VALORIZATION OF NATURAL AND SYNTHETIC BIOMOLECULES IN NOVEL DRUG-VECTOR NANOSTRUCTURES

15,16 April 2019

Fez, Morocco

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PLENARY CONFERENCES

BIOGRAPHIES of the LECTURERS

Prof. Dr. Andriy GRAFOV, Coordinator of Horizon 2020 MSCA-RISE-2016-734759 project acronym VAHVISTUS. He is a Professor of Inorganic Chemistry at the IGIC-NAS (Ukraine) since 2001. He received his University Degree (MSc) at the T.G.Shevchenko National University, Kiev, Ukraine since 1982 and Doctorate PhD in Chemistry at the Institute of General and Inorganic Chemistry (IGIC) of the Academy of Sciences of Ukrainian SSR, Kiev. Diploma issued by the Supreme Certifying Commission at the Council of Ministers of the USSR.

Doctor of Chemical Sciences at the V.I. Vernadskii IGIC of the National Academy of Sciences (NAS) of Ukraine, Kiev since 2001. Professor of Universities (qualified as) since 2005, National Council of Universities (CNU, France). For scientific expert positions, he is an expert of FP7, appointed scientific expert (EC-REA, Brussels, Belgium) since 2009 until 2013 and Expert of the International Association for the Promotion of Co-operation with Scientists from the New Independent States of the Former Soviet Union) (Brussels, Belgium) since 1998 until 2006. He was Co-ordinator of FP7-PEOPLE-IRSES-2011-295262 project acrconym VAIKUTUS since 2012 until 2016.

Positions at the IGIC-NAS (Kiev, Ukraine) in 1982 – 2001:

- ✓ PhD student (1982-1985), research chemist (1985-1988), junior scientist (1988), research scientist (1989), senior research scientist (1990-2001)
- ✓ Ukrainian Principal Investigator in an international cooperation project INTAS-UA-95-210 (EU – Ukraine) (1997-2000)
- ✓ Ukrainian co-director of Joint Italo-Ukrainian Laboratory “Innovative Materials” International full-time visiting positions (1998-2001)
- ✓ Visiting researcher (NATO) at the Laboratory of Macromolecular Chemistry and Advanced Organic Materials (LEMP-MAO) of the University of Montpellier 2, (Montpellier, France) (2004 –2006)
- ✓ Visiting Professor at E. Mano Institute of Macromolecules of the Federal University of Rio de Janeiro (IMA-UFRJ, Rio de Janeiro, Brazil) (2001- 2004 and 05-08. 1996)
- ✓ Guest Scientist (JSPS) at Muroran Institute of Technology (Hokkaido, Japan) (1999–2000)
- ✓ French Government fellow at the University of Montpellier 2 (France) (1997–1998)
- ✓ Visiting researcher at Swiss Federal Institute of Technology (Lausanne, Switzerland) (02 - 04 1995)
- ✓ Visiting Professor at the Institute of Chemistry, Inorganic Technologies and Advanced Materials of the National Research Council (ICTIMA-CNR, Padua, Italy) (1992 - 1994)

Research management and personnel administration, Grants:

- ✓ 5 Research Projects, visiting professor, responsible (Finland, France, Japan)

- ✓ Ukrainian Principal Investigator of the International Project INTAS-UA-95-210 (EU-Ukraine);
- ✓ Ukrainian co-Director of Joint Italo-Ukrainian Research Laboratory "Innovative Materials" (between the ICTIMA-CNR and the IGIC-NAS, 1998-2001).
- ✓ The cooperation gave rise to 17 articles published in peer-reviewed journals,
- ✓ 2 defended PhD theses at the IGIC-NAS, and a number of reciprocal visits.
- ✓ Research group head at the IGIC-NAS 1989-2001

Actual research subjects and subjects under development:

- ✓ Knowledge-based multifunctional nanocomposite inorgano-bioorganic materials
- ✓ Design, synthesis in-situ, characterisation, and application;
- ✓ Natural biopolymers and natural bioactive compounds for nanocomposite development;
- ✓ Polymers with tailor-made chain microstructure via coordination polymerisation;
- ✓ Biocompatible/biodegradable polymers
- ✓ Chemistry of multifunctional coordination compounds and inorganic materials: layered double hydroxides

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Pr. EL KHANCHOUFI Abdessalam is a Professor at the Faculty of Science Dhar El Marhaz, Department of Biology at Sidi Mohamed Ben Abdellah University, Fez, Morocco since 1988. He is Member of the Research and Cooperation Commission (2013-2014) and Coordinator of the Research and Cooperation Commission (2010-2011). He is a head of Environmental Geoscience Research Unit (2003-2009) and the DESS in Environment, Land Planning and Society (2003-2008). He was a Director National Institute of Medicinal and Aromatic Plants Taounate, USMBA, Taounate, Morocco (2009-2015). Author of 13 sientific publications, 73 scientific presentations of which 50 were presented in seminars et 23 presented in conferences as invited Presenter (COP 21, COP22, MEDCOP 21, CEDCOP Climat, Climatic Chance …). He was organized 20 seminars (one of them was the first forum sustainable agriculture and opportunitiessustainabledevelopment), 5 contributions in books or guides.

Management and Cooperation and Development Projects:

- (2013-2016) focus on tackling Climate Change through the implementation of new educational programs, including analysis and skills enhancement, implementation of Master programme, training of local professionals

- *National Coordinator of EC-funded project MEDINHNOALL*,Tempus IV (2010-2013) – promoting innovative thinking into the Higher Education institutions of the MEDA regionenhancing universities' contribution to the national and regional economic and innovation performance is among the most topical issues, including development of

strategies and instruments for a continuous promotion of innovation and entrepreneurship– youth employment, in MEDA Region

- *International Coordinator of MAP2ERAProject* (2010-2013) – reinforcement of the international research cooperation between Morocco's leading institute in medicinal & aromatic plants research NIMAP and European Research Area, including Build the cooperation capacity in NIMAP by providing a comprehensive training to members of the Moroccan research institute to develop/enhance their skills and competences with regard to building international research partnerships..

- *National Coordinator of EC-funded project TIES*, Tempus IV, (2010-2012) project purpose: to contribute to the development of international relations management (strengthening the know-how and management capacities) in HEIs in the MEDA region, in particular in Algeria, Tunisia, Lebanon, Egypt, Morocco, and Jordan

- *National Coordinator of EU Project EQUALISM*, Tempus III (10/2005-10/2006): consortium of the University of Provence, University of Alicante, Hassan II University and the Sidi Mohamed Ben Abdellah University in FEZ

Dr. Omar MOUNADI IDRISSI, is a pharmacist for 24 years. He obtained his doctorate in pharmacy in 1994 at the University of Claude Bernard Lyon France. He has a university degree in aromatic and medicinal plants and essential oils, a university degree in Biotechnology and a university degree in experimental toxicology from the University of Claude Bernard Lyon France. He is an expert in the field of phytotherapy, aromatherapy and nutritherapy. Ex-Member of the administration council of the Institute of Aromatic and Medicinal Plants. Thus, he is founder and director of the company LA MEDITERRANEENNNE DES AROMES in February 1998, specializing in the production and marketing of essential oils and aromatic and medicinal plants (Wholesale products for the international market). In 2004, he was the second Moroccan exporter on the American market. Founder of FLORAROME in April 2006, Society of conditioning aromatic and medicinal plants as well as essential oils. Also, he is Founder of the Bioxpert laboratories (the first Maghrebian laboratory for herbal medicine, aromatherapy and food supplements designed according to pharmaceutical standards). Participation in several international fairs (Interpack Dussldorf, PHARMINTECH Bologne, ALIMENTARIA Barcelone, Fancy Food New York, SIAL Paris, PHARMAGORA Paris, MENOP et GULFOOD Dubaï, SIAL Abu Dhabi).

Pr Souad Skalli, PhD of the Faculty of Pharmacy of Nantes (France) and the Faculty of Sciences of Meknes (Morocco), in medicinal plants (PM) and toxic, is since January 2017, Professor of Ethnobotany at the Faculty of Science (FSR) of Mohammed V University of Rabat. Previously, Pr Skalli worked at the Anti-Poison and Pharmacovigilance

Center, Morocco as Head of the Phytovigilance Unit from 2000 to 2016.

Pr Souad Skalli has also been an expert on the World Health Organization (WHO) since 2002. She has participated and led and animated numerous WHO workshops related to PM Pharmacovigilance and she is co-author of numerous WHO guidelines for the surveillance of adverse effects (AEs), safe use and medicinal properties of plants and herbal products.

His field of expertise also concerns the phytovigilance of interactions between PM and conventional drugs; PM and PM; essential oils and prescription medications. As such, a project on the elaboration of a guide on these interactions is in progress and where Pr Skalli is an active member. She has also helped set up and manage the pharmacovigilance of PM in many countries (Morocco, Senegal, Cambodia, United Arab Emirates and Oman).

Pr Souad Skalli, since 2013, has been invited to the International Pharmacovigilance Training Course at the UMC (Uppsala Monitoring Center, Sweden) as lecturer for the Phytovigilance course part. As she has been invited as a lecturer for many pre-conference courses at annual meetings of the International Society for Pharmacovigilance (ISoP). She has also given numerous lectures and courses to health professionals, mainly physicians and pharmacists, on topics related to PM: Phytotherapy, Ethnobotany, Medicinal Plant (PM), adverse effects, phytovigilance and PM-drug interactions.

She has organized with other colleagues many national and international meetings and has supervised doctoral theses of works on PM and phytovigilance of many students of the Faculty of Medicine and Pharmacy and the faculties of science of the kingdom.

Since its integration into the FSR, Pr Skalli has been working on three research projects that focus on drug-plant interactions in herbal medicine, medicinal plants with antidiabetic properties and medicinal plants with anticancer properties. His scientific research has resulted in several international publications with a Factor impact. These projects are realized in collaboration with several national and international institutions. She is since 2018 organizes a Phytotherapy-Aromatherapy DU in Rabat.

Prof. Dr. Aleksandr B. ROZHENKO, Professor of organic chemistry at State Shevchenko University (Kiev, Ukraine), Faculty of chemistry. He is a head of Department of Physicochemical Investigations at the Institute of Organic Chemistry, National Academy of Science of Ukraine since 2016. He got his PhD fellowship at the Institute of Organic Chemistry, Academy of Science of Ukraine (1987-1991) in organic chemistry, NMR spectroscopy under the supervision of Dr V.M. Bzhezovsky, Dissertation: "33S NMR investigation of the intramolecular interactions in linear and cyclic sulfones" in 1992.

He is researcher and senior researcher of the Institute of Organic Chemistry, National Academy of Science of Ukraine (1992-1996). Postdoctoral fellowship at the University of Bielefeld, Faculty of chemistry under the supervision of Professor Wolfgang Schoeller, working on quantum chemistry (1996-1998). He has been working as a senior researcher at the Institute of Organic Chemistry, National Academy of Science of Ukraine (2006-2015) and at the University of Bielefeld, Faculty of chemistry as a guest researcher (1998-2006).

Maurizio Avella, Research director at the Institute of Polymers, Composites and Biomaterials of Italian Research Council. Maurizio Avella has worked for more than 30 years on researches dealing with plastic materials. His main research interests include the following topics: study of interfacial phenomena in polymer-based multicomponent systems, achievement of polymer-based nanocomposites and environmental friendly materials. He has published over than 130 papers on topics related to polymer science. His H index is 41 (google scholar). In the frame of European Programs, he was international coordinator of five European projects and responsible for CNR of the research activities of many projects.

Recently, he was the international coordinator of the LITE MERMAIS project: "Mitigation of microplastics impact caused by textile washing processes". This project has tackled this pervasive source of marine ecosystems pollution by developing and validating innovative technologies, additives for laundry processes and finishing treatments of fabrics that can reduce the amount of microplastics released into wastewater and consequently in marine environment.

Dr Gemilson SOARES PONTES, has earned his bachelor degree in Biomedical Science and a Master Degree in Biology of Infectious and Parasitic Agents at the Federal University of Para, Brazil. He got his Ph.D. degree in Medical Sciences at the University of Tokyo, Japan. He has over five years of national and international teaching experience at both undergraduate and graduate levels, especially in the fields of microbiology and immunology. His specialties include molecular biology, immunohistochemistry, immunoassays, cell culture, animal manipulation, flow cytometry analysis, bioprospection of natural products, epidemiology, and clinical immunology and microbiology. He is currently Associate Researcher at Laboratory of Immunology and Virology of National Institute of Amazonian Research - INPA, Manaus, Brazil. His research has focused on host-pathogen interaction regarding immunopathogenic mechanisms, bioprospection of natural biomolecules with antimicrobial and immunomodulatory activities and epidemiology of emerging and re-emerging vector-borne

viruses in Western Amazon. He also provides consultation service in the field of Microbiology, bioprospection of natural products and Immunology.

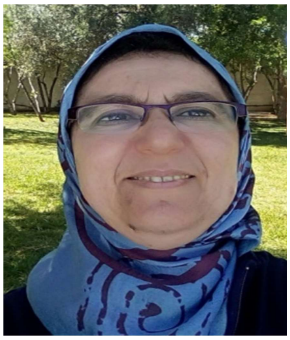
Anouar Alami is a Professor of Chemistry since 1992 at the Faculty of Science Dhar El Marhaz, Department of Chemistry at Sidi Mohamed Ben Abdellah University, Fez, Morocco. He received his French doctorate from the Montpellier II University, France in 1991, his state doctorate thesis degree in Organic Chemistry in 1991 (Sidi Mohammed ben Abdellah University of Fez, Morocco). In parallel to all his responsibilities, he had prepared a DEUG (2008) and a License (2010) in Private Law in French and a Master in Economics and Management (2013) at the Faculty of Economics, Law, and Social Sciences of Fez.

Among the responsibilities that insured:

- Head of Department of Chemistry, elected for two terms 2013-2015 and 2016-2017.
- Member of the Faculty Council (2013-2015 and 2016-2017).
- Responsible for the doctoral training "Bioactive Molecules, Health and Biotechnologies", FSDM, 2014-2018.
- Director of the Laboratory of organic chemistry, FSDM, 2014-2018.
- Coordinator of the Bachelor's degree program "Chemistry Sciences", FSDM, 2005-2012.
- Chairman of the Coordination Commission for Higher Education, emanating from the Board of Directors of the Academy of the Fès-Boulemane Region, 2009-2012.
- Elected member of the University Council, 2009-2011.
- Elected member of the University Management Board (2011).
- Elected member of the Faculty Council, 2006-2008.
- Elected member of the college of the chemistry department, 2000-2012.

Concerning the scientific research side, the Laboratory of organic chemistry developed new methodologies of synthesis of heterocyclic compounds as amino acids and their precursors (heterocyclic amino-aldehydes and amino alcohols) as well as the studies of the biological, electrochemical and structural properties of the synthesized products. Prof. Anouar Alami has taken part by conferences and communications in national and international congresses and published the results of research in heterocyclic chemistry, science didactics, applied research in pedagogy, ICT and distance learning (+ de 70 publications in indexed journals, + 150 oral and poster presentations, presented in national and international colloquium)

Prof. Dr Oleksandr KOSTIUK, is a professor of chemistry at the Institute of Organic Chemistry, National Academy of Sciences of Ukraine. He is a head of Organophosphorus Department since 2009. He received his PhD degree in Kyiv (Ukraine) in 1991. Then, he joined Institute of Organic Chemistry where in 2009 he received Doctor of Sciences degree in organic and elementoorganic chemistry. His research focuses on the synthesis and the chemistry of organophosphorus compounds, the design and synthesis of functionalized phosphines and carbenes. He is the author of 100 peer-reviewed publications. He has supervised 5 PhD students and several post-docs.



Prof. Dr. Kawtar BENBRAHIM, is a Professor at the Faculty of Science and Technology, Fez since 1994. Responsible for General Microbiology, Food Microbiology and Microbial Ecology courses. She earned its PhD thesis in Applied Microbiology at Moulay Ismail University (Meknes) in 2004. She is Coordinator of a Morocco-Tunisian cooperation project (10/MT/14). Member of the SATELIT Project (Academic Solutions for the Euro-Mediterranean Territory Leader of Innovations and Technological Transfers of Excellence). She has supervised several Masters and National doctoral theses in relation to the biological fixation of atmospheric nitrogen, with the valuation of medicinal and aromatic plants, and with microbial Biotechnologies. Author of about 40 articles in international journals. A book chapter. More than 20 papers in national and international conferences.

Main scientific interests:

- Plant-microorganism interactions (nitrogen-fixing bacteria and/or phosphate solubilizers, endomycorrhizal fungi).
- The microbiology of water.
- The antimicrobial, antioxidant activities of medicinal and aromatic plants.

Dr. Iriyna GRAFOVA, Research scientist at Laboratory of Inorganic Chemistry, University of Helsinki. She received his PhD degree in Chemistry in 1997. Then, she qualified as Maître des conférences in 2005 by National Council of Universities (CNU, France) Section 33: Chemistry of Materials. The research fields of his interest concern knowledge-based multifunctional inorgano-biorganic nanocomposites and their medical, cosmetic, and engineering applications. In particular, his activity is mainly devoted to:

- ✓ composite vehicles for topical drug delivery and cosmetic applications
- ✓ nanobiocomposites for targeted drug delivery

- ✓ nanocomposites with natural fibre and nature identical clays for cosmetic and engineering applications
- ✓ solubilisation of hydrophobic active compounds in aqueous media

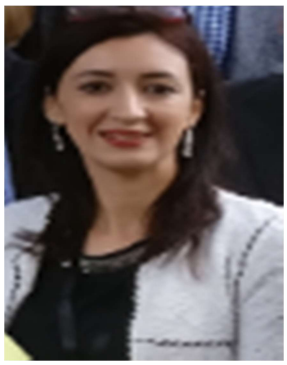
She got several international full-time positions such as NATO Visiting Scientist at the University of Montpellier 2 (France), (Laboratory of Molecular Aggregates and Inorganic Materials – LAMMI, and Laboratory of Macromolecular Chemistry and Advanced Organic Materials - LEMP-MAO) from 2004 to 2008, working on development of in-situ procedures for obtaining of heterogeneous polymerisation catalysts by treatment of layered double hydroxides and development of new polymers and composites for proton exchange fuel cell membrane applications, and others Visiting Scientist at E. Mano Institute of Macromolecules of the Federal University of Rio de Janeiro (Rio de Janeiro, Brazil) (2001.2004), at the University of Perugia (Perugia, Italy) in 1995 and at the Institute of Chemistry, Inorganic Technologies and Advanced Materials of the National Research Council (ICTIMA-CNR, Padua, Italy) (1993-1994).

She has participated as an Ukrainian Team Leader (ISPE-NAS) in cooperation Project INTAS-UA-95-210 (EU-Ukraine, 1998-2000) and others research projects such as Magnus Ehrnrooth Foundation projects 2011-2018, FP7 IRSES VAIKUTUS Project 2012-2016 by the European Commission and Horizon 2020 VAHVISTUS Project 2017-2021 by the European Commission.

Prof. Dr. El Mestafa EL HADRAMI, Professor of Higher Education Class C and Vice Dean for Research and Cooperation, Sidi Mohamed Ben Abdellah University, Faculty of Science and Technology Fes Morocco. Its areas of competence are Organic Synthesis as the Chemistry of sugars, amino acids and heterocycles; Chemometrics as Experimental Plans; multivariate analyzes. He obtained his PhD thesis (Organic Chemistry) in 1993 at the Faculty of Sciences Marrakech, Morocco and a PhD (Organic chemistry) in 1989, Montpellier II University, France.

The responsibilities exercised by Prof El Mestafa EL HADRAMI are Director of the Center of Doctoral Studies "Sciences and Techniques of the Engineer" of the USMBA since November 2014, Head of the Chemistry Department from November 2003 to November 2006, Director of the organic chemistry laboratory from March 1999 to July 2005, Responsible for the research team "bioorganic chemistry" from March 2005 to December 2014, Head of the research team "Bioorganic chemistry & chemometrics" since January 2015, Coordinator of the "Agricultural and Food Industries" sector from July 2007 to July 2011, Coordinator of the Master Science and Technology Chemistry and Chemical Analysis: Application to the industrial quality management since July 2006, Responsible for the UFR DESS Chemometrics and chemical analyzes from July 2004 to July 2007 and Responsible for the Mastery of Analytical Techniques and Quality Control (June 2000 - July 2009). He has supervised 15 doctoral theses supported, 4 PhD thesis in progress and more than 50 DESS and

Master Students and engineers. Author of 60 publications, more than 10 conferences in national and international congresses, more than 120 oral and poster communications, organization of several national and international scientific events and expert to several international scientific journals.



Prof. Dr. Dalila BOUSTA, Professor of Phytopharmacology at the Faculty of Sciences of Fez, Sidi Mohammed ben Abdellah University of Morocco Since 2003. She received his PhD degree in Pharmacology at Lorraine University in Metz-France. Since 2011 until 2015, she is a Vice Director of Research, Cooperation and Training in National Institute of Medicinal and aromatic Plant NIMAP- Morocco. Since 2006 until March 2015, she is a Head of Research team in Phytotherapy and Traditional Pharmacopeia, in National Institute of Medicinal and Aromatic Plants, Morocco. She is Coordinator of University Diploma in Traditional Pharmacopeia and Phytotherapy at the NIMAP of Morocco since 2010 until 2012 and Coordinator of Organic certification procedure of some wild and cultivated medicinal plants in Taounate region, Morocco since 2011 until 2012. She is Consultant for a pharmaceutical company, (France) since 2012. Since 2011 until now, she is Permanent member of scientific committee of Phytotherapy journal and Reviewer in several International journals such as Toxicological and Health industry", Phytotherapy, Springer, BioDiCon; Moroccan Journal of Biology.

In the frame of European Programs, she was Moroccan coordinator of several European projects and responsible of the research activities of many projects:

- ✓ Moroccan Coordinator of the European Program H2020 (2016-2021): Research group: Ethnobotanical and Toxicological Investigations on the FSDM-USMBA-Morocco side, Project Acronym: VAHVISTUS - Project Number: 734759, "Integrative development of smart drug-vector nanostructures for adaptive drug delivery into target cells".
- ✓ Coordinator on the Morocco side, Erasmus + Mobility Program with the University of Helsinki in Finland (2018-2020);
- ✓ Coordination of MOOC Project (2017-2018): Massive Open On line Courses: Title: Phytotherapy and Moroccan Traditional Pharmacopoeia, Moroccan Ministry Call (MESRSFC), / Cooperation and Cultural Action Service (SCAC) of the Embassy of France (SCAC);
- ✓ Moroccan coordinator of the project of Interuniversity Scientific Cooperation (AUF-PCSI), N° BMO / A710-SN2012-049 "valorisation of food residues in the development of nutraceuticals with anticancer potential and / or redox modulator" (2012-2014);
- ✓ Member of the pilot team of the CNRST Project - 'Eco-extraction of Saffron bio-waste: Green technology and alternative solvents', Typology A (2014-2017);
- ✓ Member of the pilot team of CINEA Project, Program capacities, call ID, "FP7-INCO-2013-9", proposal N ° 609495 "EUMED cooperation to foster innovation and

exploitation in the agro-food domain" (2013-2016);

- ✓ Member of the pilot team of of the EMAP-FP7-INCO-People -IRSES Project "Edible Medicinal and Aromatic Plants"; FP7-PEOPLE 2009-IRSES, n° 247548 (2011-2014);
- ✓ Member of the pilot team of 7PCRD Grant agreement no: 266575, MAP2ERA, Strengthening EU cooperation capacity of the National Institute of Medicinal and Aromatic Plants of Morocco: Towards Morocco's integration into the ERA (2012-2013).

She is the author of 60 publications in Ethnopharmacology, biomedical research, medicinal plants and derivatives, 4 National patents in valorization of PAM, 1 International patent in valorization of PAM, 1 Book, 1 chapter of Book and more than 30 lectures and oral communications.

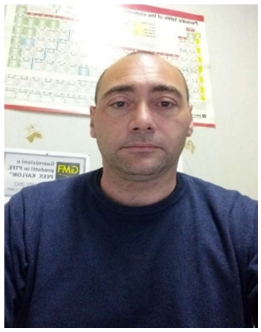
Dr. Adib BENFEDOUL, Doctor in pharmacy at the Faculty of Bordeaux and holder of a pharmacy in Bergerac. He received his Master's degree in Health Law at the Faculty of Law in Bordeaux and a Master's degree in Business Administration at IAE at the Faculty of Economics of Bordeaux. He obtained its Master Practitioner Certificate in Traditional Aromatherapy (French Aromatherapy Federation) and an Aromatherapy DU at the Faculty of Dijon.

Iryna Nahorichna, Ph.D. in Bioorganic Chemistry at the Institute of Bioorganic Chemistry and Petrochemistry of National Academy of Sciences of Ukraine, Department of Physiologically Active Compounds Synthesis in 2011. Thesis for a Candidate's degree in Chemistry on the specialty Bioorganic Chemistry "1,3–Dihydrooxazino–,furo–,spiropiranocoumarinsand 6 hetarylcoumarins, synthesis and properties". Project Coordinator since 2015 till now, JSC Farmak, Department of Research and Development. Coordination the program or project planning and implementation, including assessing needs, setting goals and objectives. Monitoring and track project's progress and handle any issues that arise. Contractual support of R&D projects, coordinate project proposals, timeframes, schedule and budget. She is responsible for identifying and resolving project issues, making sure the project progresses on schedule and on budget.

Spoluka Chemical Company (aka Life Chemicals, Inc.) Kiev, Ukraine, Leading Specialist in Customer Service Department (2011-2014), Coordination of Custom Synthesis Projects and Building Blocks Projects, working with key customers, managing customer expectations, handling complex and escalated customer service issues/complaints; tracking interactions with customers and suppliers from ordering through billing; providing support to the sales team, ensuring all sales and service objectives were met; writing reports and business correspondence etc. Spoluka Chemical Company (aka. Life Chemicals, Inc.) Kiev, Ukraine,

Senior Engineer (2009-2011), Participation and development of commercial and research projects in the field of synthesis of organic compounds; development of novel synthetic methodologies towards organic compounds; experience in synthesis of multi-step synthesis and small molecular libraries. Synthesized a wide range of organic molecules; interpretation of NMR, MS spectra for the structural characterization of organic molecules.

Engineer, Design and synthesis of bioactive compounds and natural product analogues; spectroscopic techniques for the structural characterization of organic molecules (NMR, MS, FT-IR, UV-Vis) at the Department of Physiologically Active Compounds Synthesis, Institute of Bioorganic Chemistry and Petrochemistry NAS of Ukraine (2003-2009). Author of about 6 scientific articles; 3 thesis.



Pierfrancesco Cerruti is research scientist at IPCB-CNR. He graduated in Organic Chemistry and got his Ph.D. in Materials Engineering at the University of Napoli Federico II. The research fields of his interest concern polymeric materials and their blends, biobased and biodegradable composites and nanocomposites, stimuli-responsive materials, as well as polymer degradation and stabilization. He's responsible for the polymer processing lab at IPCB-CNR. Dr. Cerruti has been co-advisor of 4 PhD, 12 Master, and 5 Bachelor theses. He has participated as a research unit leader and technical board member in several Italian and EU-funded research projects. The main fields of interest are the preparation and characterization of synthetic and natural polymers and composites for *packaging, sustainable agriculture, renewable energy, biomaterials.* In particular, his activity is mainly devoted to:

- Polymer degradation and stability;
- Shape memory polymers;
- Biobased and biodegradable polymers, blends and composites;
- Nanostructured hybrid materials;
- Polymer-based micro-and nano-particles for triggered and controlled delivery.

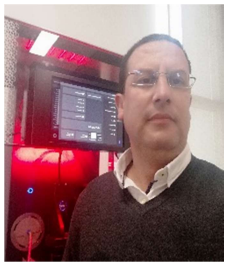
The results of the scientific activity have been reported in over 75 papers in ISI journals, 5 patents, 5 book chapters.

Martina Ussia is a Ph.D. Student at the CNR-IMM Catania Unit. She obtained two Master Degrees in Chemical Engineering and Organic and Bioorganic Chemistry in 2016 and 2012 respectively. In the same period, she won a scholarship at the Institute of Biomolecular Chemistry (CNR-ICB Catania Unit), by working on the "Spin-Off" PO FSE project (sochimsal.icb.cnr) from 2015 to 2016. Her main research is focused on the development of new stimuli-responsive nanocomposites based on graphene in addition to organic and/or inorganic semiconductors for water and biomedical applications. She won the graduate student award of the Italian Macromolecules Association

(AIM) at the Macrogiovani 2016, 2017 and 2018 Meetings. Here results were presented at several European and International conferences: E-MRS Spring Meeting 2017 (Strasbourg), Italian Nordic Polymer Future Meeting 2017 (Pisa), Elsevier International Conference of Hybrid Nanomaterials (HYMA2019). She also attended school in Transport Phenomena in Polymers and Hybrids materials organized by European Polymer Federation.

She spent three months as a Visiting Scholar at the University of Florida (Gainesville) under the supervision of prof. Brent Sumerlin, working on novel RAFT copolymers based on porphyrins molecules.

Dr. Abbamondi Gennaro Roberto, Dr. Gennaro Roberto Abbamondi is a researcher in the field of Biomolecular Chemistry, collaborating with the CNR-ICB (National Research Council of Italy - Institute of Biomolecular Chemistry) since 2008. He has an international PhD in "Environment, Resources and Sustainable Development", joint PhD between Parthenope University of Napoli (Napoli - Italy) and Hasselt University (Hasselt - Belgium). He has been working as a Post-Doctoral Researcher at Hasselt University in 2015 and at the University of Toulon (Toulon, France) in 2016. Recently he worked on the evaluation of the nutritional properties of different tomato cultivars and new tomato hybrids, on sustainable crop production practices to improve yields and nutritional quality of tomato fruits, on Bioremediation and Plant growth promotion, on Quorum Sensing mechanism in bacteria and Archaea, onexopolysaccharides produced by biofilm-forming bacteria and on green chemistry (re-use of vegetable waste).



Prof. Dr. Khalil EL MABROUK, PhD in Chemical Engineering on 2005 at Laval University-Canada; Postdoctoral in both Queen's University-Canada and in Dow Chemical New Jersey-USA for more than one year. 2008-2013 Director in Moroccan Foundation for advanced Science Innovation and Research and in the meantime, Director of Technology Platform.Since 2013 Full Professor at Euromed University of Fes-Morocco. Author of 35 Indexed articles, Oral Communication: 15, Poster Communication of Students: more than 30, Achieved Ph.D., thesis: 7, Ongoing Ph.D., thesis: 6.

Bezdudny Andriy, Candidate of chemical sciences (Ph. Dr.), senior researcher. Engineer, Junior researcher, researcher at the Institute of Organic Chemistry, National Academy of Sciences of Ukraine (IOCh NASU) Kyiv (1998 –2014). He is senior researcher at the IOCh NASU since 2014 till now. Farmak JSC since 2016. Candidate of Sciences, "*Derivatives of N (trifluoromethylsulfonyl) imidosulfurous, trifluoromethanesulfinic- and sulfonic acids*" since 2007. His scientific interests are Organic synthesis, the chemistry of fluoroorganic compounds, organofluorine compound, medical and agrochemical chemistry, materials science. He participated in international projects and conferences, as a visiting researcher at the Laboratory of Inorganic Chemistry of the University of Helsinki (Finland), Institute for

Polymers, Composites and Biomaterials of the National Research Council, Naples (Italy). Author of 27 articles, 10 patents, more than 20 abstracts of conference.

Professor Serhii BOHZA obtained a B.S. in chemistry from the Donetsk Polytechnical Institute at Donetsk (1980). He than worked in the Institute of Physical Organic Chemistry NAS of Ukraine and was awarded his Ph.D. in the group of Prof. Vladimir Duilenko (1992), studying the synthesis and reactivity of functionalized benzo[c]pyrilium. In 2004 after doctorate studying he was awarded a Dr.Sci. degree in Kosygin textile state university " Development of new methods for the synthesis of polyannelated carbo- and heterocyclic compounds based on acid-catalyzed reactions ". Scientific area - a designe of new annelated nitrogen heterocycles including isoquinolines, β-carbolines, 2,3-benzodiazepines and other annelated nitrogen heterocycles.

Biomedical Potential of Nanotechnology

Prof. Dr Andriy Grafov

VAHVISTUS Coordinator (EOK-HY, Finland)
Materials Chemistry Division
Department of Chemistry
University of Helsinki

Nanoscience and nanotechnology will significantly benefit the society in many areas of industry and everyday life.
The lectures present a brief overview of the nanoscience history starting from the historical lecture by Prof. R. Feinman's"there is a plenty of room in the bottom". The students are introduced into the nanoscale and into particularities of size-dependent physical and chemical properties of materials. Different types of nanoparticles and some synthetic approaches to obtain them are discussed.
Particular focus is given to the benefits of nanomaterials to the areas of tissue engineering, medical imaging and diagnostics, pharmaceuticals and drug delivery.
Tissue engineering applications are presented by examples of osteoprostheses. Discussion on micro- and nanostructure of human bones transforms into the presentation of approaches to simulate them by hybrid inorgano-organic nanocomposites, based on natural biopolymers (collagen and glycans).
In the part dedicated to medical imaging and diagnostics, a popularised introduction into quantum materials is presented on an example of quantum dots, their unique size-dependent fluorescent properties and different biomedical applications. Examples of imaging of several living tissues, as well as living cell organelles are provided.
Nanoparticles may easily interact with cells by endocytosis thus, providing a variety of possibilities for drug development and drug delivery. Unique properties of nano-scaled materials enable a return of several old drugs into practice, even when the molecular drug form have lost the activity or encounter drug resistance problem. Cutaneous leishmaniasis treatment with nanoparticulated drugs is discussed on the examples of nanomaterials developed by VAHVISTUS Consortium.

Keywords: nanotechnology, natural biopolymers, tissue engineering, medical imaging and diagnostics, drug delivery, cutaneous leishmaniasis

Valorization of medicinal plants in Morocco: promising economic sector

Prof. El Khanchoufi Abdesslam

Ex Director of National Institute of Medicinal and Aromatic Plants, Taounate, Morocco

Le secteur des plantes aromatiques et médicinales (PAM) au Maroc est l'un des plus riches au monde, en raison de sa diversité (4200 espèces dont 800 endémiques), parmi lesquelles près de 400 espèces sont reconnues pour leur usage médicinal, aromatique et cosmétique.

Le retour au label ''naturel'' en pharmacie, en agro-alimentaire, en cosmétique et parfumerie a donné une poussée au développement des plantes aromatiques et médicinales (PAM). Ce retour vers les plantes a engendré une concurrence de plus en plus rude entre les producteurs à l'échelle mondiale. Chaque pays œuvre à ce que sa production soit plus attrayante et compétitive. Pour les industriels l'abondance de la matière première, la stabilité de la production, la traçabilité, la standardisation et la certification sont devenues indispensables. Par conséquent, le Maroc doit revoir sa politique en matière des PAM pour accompagner le passage d'un secteur fournisseur de matières premières à bas coût, à un véritable secteur industriel à forte valeur ajoutée.

Ce développement ne peut se faire qu'à travers une expertise et un savoir-faire technologique performants. les techniques de collecte pour éviter la dégradation, la conduite de pépinière, l'optimisation des techniques de séchage et de conditionnement, les procédés de distillation et les bonnes pratiques d'utilisation des PAM dans le domaine de la santé etc. La prise de conscience sur les possibilités de création des zones pilotes d'exploitation des PAM à l'échelle nationale dans le cadre des petites et moyennes entreprises et des petites et moyennes industries. Sur le terrain, les programmes nationaux de développement doivent (PMV, INDH…) encourager la mise en valeur des espèces à fort potentiel économique par leur domestication et culture. Cette domestication permettra d'assurer la production de matière première standardisée, en quantité suffisante et en qualité garantie et de faire face au danger de disparition de certaines plantes spontanées.

La filière PAM constitue un secteur à fort potentiel de création de richesse et d'emplois, mais cette filière a encore besoin d'un écosystème qui permettra d'assurer un service de proximité pour les utilisateurs de l'information technologique, cet écosystème sera formé essentiellement des entreprises innovantes, des chercheurs, des universités, des entrepreneurs, inventeurs, incubateurs, pépinières, technopôles...). La disponibilité de l'information va certainement permettre aux entreprises d'accroître leur compétitivité et trouver des débouchés sur les marchés internationaux.

Keywords: plantes aromatiques et médicinales, secteur industriel, domestication, écosystème

Moroccan experience in the industry of herbal food supplements: Bioexpert

Dr. Omar IDRISSI

Bioexpert lab, Fez

Le marché international des compléments alimentaires.
La situation au Maroc.
L'exemple Bioxpert (Formulation des produits, montage des dossiers pour le ministère de la santé, la promotion médicale et pharmaceutique, le marketing et la distribution).

Keywords: compléments alimentaires, pharmaceutique, Bioxpert

Herbal and traditional medicines now and future pharmacovigilance concern

Prof. Dr. Souad SKALLI

Microbiology and Molecular Biology Team, Center of Plant and Microbial Biotechnology, Biodiversity and Environment, Faculty of Sciences Mohammed V University in Rabat

Herbal medicines (HMs) include herbs, herbal materials, herbal preparations and finished or manufactured herbal products found in pharmaceutical dosage forms. Although there are few reliable estimates of the prevalence in use of HM, the market for these products continues to expand rapidly and has grown into a multibillion-dollar industry across the world. This suggests that large numbers of people are using HM.

As with all medicines, HMs have been shown to have the potential to cause adverse effects which are related to a variety of causes, including: inherent properties such as the presence of toxic constituents, adulteration, mistaken use of the wrong plant species, incorrect dosing, errors in use, and, contamination. Furthermore, HM can affect pharmacokinetic and pharmacodynamic properties of conventional drugs and thus can cause herb–drug interactions

The characteristics of HM and the ways in which these products are named, sourced and utilized constitute many challenges. Main of them will be discussed during this lecture: names and nomenclature; chemical composition; methods of processing; manufacturing; conditions

of herbal medicine Use; methods for pharmacovigilance of HMs; and traditional medicine contributions to primary health care.

On the other hand, the future for HMs and traditional medicines will be presented also with at least seven essential points: safety, efficacy and quality of HMs; herbal medicines regulatory framework; herb–drug Interactions; patient categories; awareness; communication and education; and scientific research.

Keywords: traditional medicines, HMs, pharmacovigilance, safety, efficacy

Modified Sb-based nanoparticles as potential antileishmania drugs: computational modelling of surface effects and reactions

Prof. Dr Alexander B. Rozhenko

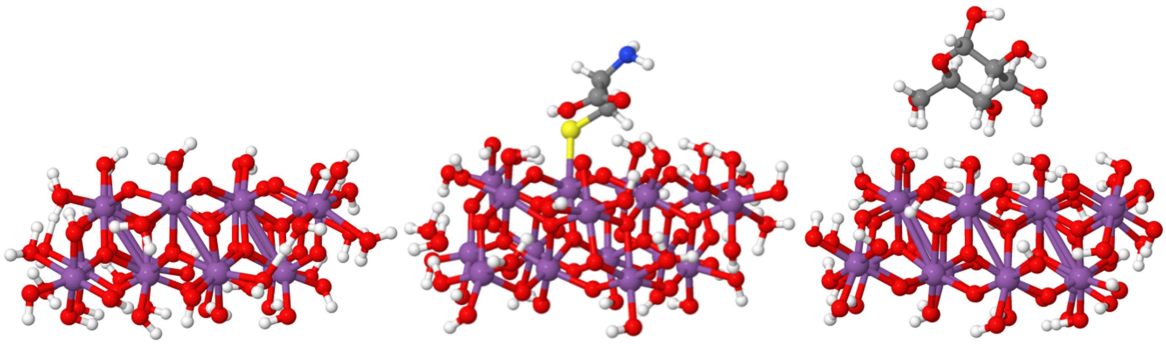
Institute of Organic Chemistry, National Academy of Sciences, Murmanska str. 5, Kyiv, 02094, Ukraine

Sb_2O_5 nanoparticles have recently been proposed as the efficient anti-leishmania drug [1]. The efficiency could be additionally reinforced by modifying the surface of the nanoparticles with the organic molecules having specific receptors on the cell membrane. The main aim of the current investigation is to study the modification ways of a Sb_2O_5 medium-size cluster using the quantum-chemical (DFT) approximation level.

Antimony (V) atoms in the experimental structure of Sb_2O_5 are surrounded by six oxygens. However, geometry optimization for small size clusters was accompanied by structure distortion, loss of the periodic structure and unnatural valences and/or oxidation states of atoms.

We proposed a medium-size Sb_2O_5cluster with the molecular formula $Sb_{16}O_{63}H_{39}$. It met all the requirements for the model cluster structure: by geometry optimization it retained the periodic structure of the parent crystal structure and Sb (V) atoms kept the six-coordination state. As the antimony oxide readily reacts with water, the surface of the crystal is usually formed by breaking the Sb-O bonds and forming the O-H bond. Unfortunately, the moiety was negatively charged (-7). In order to provide a zero total charge, seven protons were added to the oxygen atoms on the side edges of the cluster, transforming the OH groups into coordinated water molecules (A). While the modification is rather arbitrary, it made it

possible to retain the periodic structure and six-coordinated antimony atoms by geometry optimization of the neutral cluster structure with the molecular formula $Sb_{16}O_{63}H_{46}$.



A B C

Coordinative and covalent bonding of a number of organic molecules, such as glycine, cysteine (B), glucose (C) to the surface of the Sb_2O_5 cluster. The calculations predicted a weak coordination of the molecules to the surface of the cluster. In contrast, the covalent bonding of the molecules seemed in many cases favorable.

This work was supported by the EU-project H2020-MSCA-RISE-2016 #734759 (VAHVISTUS).

1. Grafov A., Grafova I., Pereira A.M.R.F., Leskelä M.A. Brazilian Patent BR 10 2013 029618 0.

Keywords: nanoparticles, Sb_2O_5, anti-leishmania, computational modelling

Marine Litter: impact, mitigation strategies and circular economy

Dr. Maurizio Avella

Istituto pe i Polimeri, Compositi e Biomateriali - Consiglio Nazionale delle Ricerche (IPCB-CNR), Italy

Marine litter, due to solid waste from human activities discarded on coast and marine environment, is a global environmental issue of increasing concern. A large amount of marine debris consists of plastic waste, which is stable and persistent in the marine environment. Recently, micro and nanoplastics, plastic fragments smaller than 5 mm, were identified as one of the main kind of marine pollutants. Their impact on the environment is quite dangerous

since they can absorb organic pollutants, be ingested by marine organisms and reach the food web.

Microplastics can be directly produced for a specific application, such as microparticles used in personal-care products, or they can derive from the degradation of larger plastic objects, due to degradation phenomena occurring in the marine environment. Among the several sources of microplastics, the washing processes of synthetic fabrics were identified as the main cause of microplastic pollution in marine environment. The mechanical and chemical stresses produced on the fabrics during a wash, causes the release of microfibers in the wastewater. Due to their size, some of them cannot be blocked by the sewage treatment plants, reaching seas and oceans and becoming a threat for marine species.

Several strategies have been developed to mitigate the impact of microplastics in the marine environment as well as new technologies and materials to improve a new circular economy for plastics recovered from marine environment.

Keywords: Marine Litter, impact, circular economy, nanoplastics

Immunomodulatory and anticancer pontential of pharmaceutically active compounds (PhACs)

INPA, Brazil

Cancer is a disease characterized by continuous and uncontrolled cell proliferation that results in the formation of malignant cell tumors with potential for metastasis. Current treatments include mainly chemotherapy and radiation therapy. However, most of them are expensive and usually result in intense side effects.

This scenario demands a constant search for new drugs and therapeutic approaches more efficient, safer and cost-effective. Our research group has been focusing on anticancer and immunomodulatory activities of PhACs. For this purpose, we have been carrying out *in vitro* assays with different cancer cell lines to determine the anti-tumor and immunomodulatory potential of several substances, including natural compounds. Our ultimate goal is to identify anticancer candidate compounds that may be prospectively used as a drug or functional food in therapeutic schemes of phase 1 and phase 2 studies.

Keywords: anticancer potential, pharmaceutically, active compounds, immunomodulatory

Synthesis and comparative study of biological activities of some heterocyclic compounds

Prof. Dr. Anouar ALAMI

Laboratory of Organic Chemistry, Faculty of Sciences Dhar El Mahraz,
Sidi Mohammed Ben Abdellah University, (Morocco)

The chemistry of the heterocycles constitutes one of the research themes very studied and developed in organic synthesis. Many heterocyclic derivatives are found to exhibit various biochemical, agro-chemical and electrochemical activities [1].

In continuation of our research interest in heterocyclic compounds and those precursors, we report in this conference the latest research conducted in our Laboratory of Organic Chemistry [2]. The research orientations chosen are the following :

- Development of some Spiro heterocyclic compounds, study and prediction of their pharmacological activities,
- Synthesis and evaluation of the antibacterial activity of some heterocycles derived from triazole, tetrazole, pyrazole and tryptophan

Keywords: Heterocycle, 1,3-dipolar cycloaddition, reaction of substitution, biological activity, POM Analyses

References

[**1**] *Eur. J. Med. Chem.*, **2016**, *113*, 34; *J. Fluo. Chem.*, **2016**, *184*, 36; J. *Chirality,* **2014**, 26, 811; *Bioorg. Med. Chem. Lett.*, **2013**, *23*, 6310; *Bioorg. Med. Chem.*, **2012**, *20*, 7214; *Bioorg. Med. Chem*., **2012**, *20*, 1175; *Chem. Pharm. Bull*., **2011**, *59*, 1149.

[**2**] ARKIVOC, **2007** (xvi) 19-40, ARKIVOC, **2008** (ii) 1-13, Molecules, 16(4), 3380-3390 (**2011**) ; Journal Marocain de Chimie Hétérocyclique, Vol. 10, No 1 (**2011**) ; Molbank, 3, M777, 1-4 (**2012**); Arabian Journal for Science and Engineering, 37, 1293-1303 (**2012**); International Journal of Electrochemical Science, 7, 5400 – 5419 (**2012**); Portugaliae Electrochimica Acta, 30(1), 53-65 (**2012**); Journal of Materials and Environmental Science, 3 (3) 543-550 (**2012**); Molbank, M792, 1-4 (**2013**); Med. Chem. Res., 22, 57 (**2013**), Med. Chem. Res., 22, 4798 (2013), Arabian Journal of Chemistry, 6, 93-96 (**2013**); Molbank, 1, M819 (2014); Journal Marocain de Chimie Hétérocyclique, Volume 13, N° 1, p.39, décembre **2014** ; Journal Marocain de Chimie Hétérocyclique, Volume 15, N°1, P12-17 (**2016**) ; Journal Marocain de Chimie Hétérocyclique, Volume 15, N°1, P57-61, (2016) ; International Journal of Education, Learning and Development, Vol.4, No.5, pp.48-76, **2016** ; Journal Marocain de Chimie Hétérocyclique, Volume 15, N°1, P12-17 (**2016**) ; International Journal of Experimental Spectroscopic Techniques, IJEST-1-008, (Volume 1, Issue 2) p1-6 (**2016**; IUCrData (**2017**), 2, x170860; IUCrData, (**2017**). 2, x171701; IUCrData (**2017**). 2, x171547; IUCrData (**2017**). 2, x171155; J. MAR. CHIM.HETEROCYCL. V 16, N° 1, 134-141 (**2017**); Molbank (**2017**), 4, M958;

Journal of Chemistry, Volume 16 (**2017**), Journal of Applied Pharmaceutical Science, Vol. 7 (04); 192-198 (**2017**), IUCrData (**2018**). 3, x180962, Mediterranean Journal of Chemistry 7(4), 267-271 (**2018)**, Journal of Medicinal and Chemical Sciences, pp.18-22 (**2018**), IUCrData (**2019**). 4, x181718,

Design and synthesis of analogues of biologically active compounds

Prof. Dr Oleksandr KOSTIUK

IOCh-NAS, Ukraine

Design and synthesis of pentamidine analogues will be discussed. A set of pentamidine derivatives with varying linkers was prepared in gram quantities. These compounds were tested against Leishimania amazonensis. While some derivatives have exhibited moderate activities, one compound has shown quite promising results. Its further modification and synthesis of analogues is underway. Design and synthesis of new derivatives of ellipticine will be discussed. Some derivatives were tested as anticancer agents. Its results and further progress in this area will be presented. Novel phosphine complexes with gold, and ruthenium as well as carbene complexes with palladium were synthesized and forwarded for biological activities.

Keywords: synthesis, analogues, active compounds, pentamidine

New bioactive heterocyclic systems with spiroindolone core

Prof. Dr Serhii Bohza

IOCh-NAS, Ukraine

A synthetic method for condensed nitrogen heterocycles with spiroindolone core on base of Pictet-Spengler modern protocol has been developed. The possibility for formation of six- and seven-membered nitrogen containing cycles is shown.

Ke ywords: bioactive heterocyclic, nitrogen, spiroindolone core, Pictet-Spengler

Chemical characterization and antibacterial activities of the essential oils of *Pelargonium graveolens* and *Myrtus communis* and their synergistic antibacterial effect

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[2] Laboratoire de chimie organique appliquée, Faculté des Sciences et Techniques, USMBA, Fès

Ce travail a pour but de contribuerà la valorisation de deux plantes aromatiques et médicinales du Maroc (*Pelargonium graveolens*et *Myrtus communis*). Pour celà, la composition chimique des deux huiles essentielles (HEs) testées a été analysée par chromatographie en phase gazeuse couplée à la spectrométrie de masse ; leur activité antimicrobienne, contre trois souches de *Staphylococcus epidermis, Acinetobacter baumannii*et *Salmonella enterica* a été évaluée par la technique de microdilution sur microplaque de 96 puits, avec révélation par la résazurine. L'étude de l'effet antibactérien des deux huiles essentielles combinées a été conduite en utilisant la méthode du damier.

L'analyse de la composition chimique des HEs testées a permis d'identifier61 composés représentant 99,96% de l'HE de *Pelargonium graveolens* dominée par le citronellol (26,98%) et le géraniol (14,12%) ainsi que18 composés avec un taux de reconnaissance de 99.96% de l'HE de *Myrtus communis*, caractérisée par la dominance du bornéol (27.15 %) et le 1,8-cinéole (21.33%). L'activité antibactérienne montre une importante efficacité vis-à-vis des souches testées. *S. epidermis* a montré sa haute sensibilité vis-à-vis les deux huiles étudiées (CMIs respectives de 0.031 % et 0.25 % pour les HEs de *P.graveolens* et *M. communis)*.

La sensibilité de *Salmonella enterica* et *A. baumannii*, a été légèrement faible par rapport à celle de *S. epidermis*. L'étude d'effet antibactérien combiné des deux HEs a généré quatre combinaisons et deux types d'interactions. Les mélanges ont montré une interaction synergique partielle et synergique, ainsi aucune interaction antagoniste entre les deux huiles essentielles contre la bactérie cible n'a été mise en évidence.

Donc, ces plantes peuvent être valorisées grâce à la formulation du mélange de leurs HEs et son utilisation comme alternative dans le traitement de certaines maladies.

Mots-clés: activité antimicrobienne; huile essentielle; application combinée; méthode de damier; interaction.

Modern view on the creation of drugs against protozoal parasitic infections

Dr. Iriyna GRAFOVA

EOK-HY, University of Helsinki, Finland

Neglected tropical diseases (NTDs) are a significant source of morbidity affecting the world's poorest populations. About 2.4 billion people living on less than $ 2 a day are at risk for NTDs in 149 coutries.

Only 1% of the new drugs registered are aimed at controlling neglected tropical diseases. The 2012 London Declaration pronounced to control, eliminate, or eradicate by 2020 12 of the 17 currently recognized NTDs, in particular, visceral leishmaniasis and Chagas disease. Risks related to the globalization exist also for the developed countries.

To replace the decades old traditional drugs new approaches should be applied. Such are old drug modification, hybrid drugs, drug repurposing, nanoformulation, and combination with plant based ethnomedical active substances.

Keywords: Neglected tropical diseases, protozoal parasitic infections, drugs

Synthesis of new Heterocyclic molecules with medicinal interests

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At the beginning of the 20th century, there was only about ten of synthetic drugs and a hundred of natural origin. Currently, we use hundreds of synthetic drugs and only very little drugs of natural origin remains. Heterocyclic compounds are present in most of these drugs and approximately two-thirds of publications in chemistry relate to near or far heterocycles.

Molecules with the 1,2,3-triazole motif are used for their therapeutic value [1], or as synthetic intermediates in the preparation of many drugs [2]. They have a wide variety of applications since they have shown antiviral [3], anti-tumor [4], antimicrobial [5], anti-proliferative [6], antiepileptic, antiallergic [1,2], and many applications in industrial chemistry [7].

One of the areas we are developing in our laboratory is the synthesis, characterization and evaluation of the biological activity of molecules based on 1,2,3-triazoles linked to sugars, amino acids or other heterocycles [8-12].One of the key reactions used to synthesize such molecules is the thermal or catalyzed cyloaddition reaction.

Keywords: synthesis, heterocyclic molecules, medicinal, triazole

References

[1]Y. S. Sanghvi, B. K.Bhattacharya, G. D. Kini, S. S. Matsumoto, S. B. Larson, W. B. Jolley, RK. Robins, G. R. Revankar, J. Med. Chem., 1990, 33, 336.
[2] H. C. Kolb, K. B. Sharpless, Drug Discovery Today, 2003, 8, 1128.
[3] (a) S. Velaquez, R. Alvarez, C. Perez, F. Gago, E. De Clercq, J. Balzarini, M.-J. Camarasa, Antivir. Chem. Chemother, 1998, 9, 481-489. (b) M. Yokoyama, E. Nakao, K. Sujino, S. Watanabe, H. Togo, Heterocycles, 1990, 31, 1669.
[4] (a) H. Dehne, In Methoden der Organischen Chemie, E. Schumann, Ed., Thiene : Stuttgart, 1994, 8, 305 (b) H. Wamho, in Comprehensive Heterocyclic Chemistry, A. R Katritzky, C. W. Rees, Eds., Pergamon : Oxford, 1984, 5, 669. (c) S. T. Abu-Orabi, M. A. Atfah, I. Jibril, F. M. Mari'I, J. Heterocyclic Chem., 1989, 26, 1461.
[5] M. D. Chen, S. J. Lu, G. P. Yuag, S. Y. Yang, X. L. Du, Heterocyclic Comm., 2000, 6, 421.
[6] S. S. Manfredini, C. B. Vicentini, M. Manfrini, N. Bianchi, C. Rutigliano, C. C. Mischiati R., Gambari ; Bioorg. Med. Chem., 2000, 8, 2343.
[7] (a) C. Peto, G. Batta, Z. Gyorgydeak, F. Sztaricskai, J. Carbohyd. Chem., 1996, 15, 465. (b) M. Kume, T. Kubota, Y. Kimura, H. Nakashimizu, K. Motokawa, M. Nakano, J. Antibiot., 1993, 46, 177.
[8] A. EL Moncef, E. M. El HadramiA. Ben-Tama,C. Ramírez de Arellano, E. Zaballos-Garcia, S-E. Stiriba, J. Mol. Structure, 2009, 929, 6-9
[9]A. Bentama, E.M. El Hadrami, A. El Hallaoui, A. Elachqar, J.-P. Lavergne, M.-L. Roumestant,Ph. Viallefont3Amino Acids. 2003, 24(4), 423-426
[10] M. Oukessou, Y. Génisson, D. El Arfaoui, A. Ben-Tama, E. M. El Hadrami, R. Chauvin, Tetrahedron Letters, 2013, 54, 4362-4364
[11] D. El Arfaoui,D. Listunov, I. Fabing,bM. Oukessou, C. Frongia,V. Lobjois, A. Samson, F. Ausseil,A. Ben-Tama, E. M. El Hadrami, R. Chauvin, Y. Génisson, ChemMedChem, 2013, 8, 1779-17786
[12]I. Fichtali, M. Chraibi, F. El Aroussi, A. Ben-Tama, E. M. El Hadrami, K. Fikri Benbrahim,S-E. Stiriba, DerPharma Chemica, 2016, 8(5):236-242

Valorization of some natural fractions derivatives from Maps and some synthetic molecules

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Vahvistus-Bio 2019, Fez

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The present lecture focused on the valorization of some natural fractions derivatives from Maps and some synthetic molecules. The present work highlighted the surveys that were conducted by our laboratory in different region in Morocco (mainly Fez- Meknes region), we chosen some medicinal plants because of their interesting traditional therapeutic effect (*Ammodaucus leucotrichus*, *Myrtus Communis* (Myrtle), *Linumusitatissimum* (linen), *Silene vulgaris* Garcke (common silene), *Petroselinum sativum* (parsely)). Their phytochemical screening and TLC technique were realized. On the other hand, we evaluated an anxiolytic-like profile, memory impairment effect and toxicity in Swiss mice of a new diazepine derivate (MPTD1): 4-(4Methoxyphenyl)-2, 3, 4, 5-tetrahydro-2, 3-benzodiazepin-1-one, was designed and synthesis by IOCH in Kiev (Ukraine).

MPTD1 was evaluated in a screening test of the central nervous system including open field and light–dark box tests of oral administration (o.p.) (0.5mg/kg, 1 mg/kg and 10 mg/kg) for acute treatment and we used 1 mg/kg and 10 mg/kg for sub-acute treatment. Novel object recognition was used to assess memory at the dose 1 mg/kg and 10 mg/kg. We investigated the toxicity of MPTD1 in mice through determination of LD50 values and examination of the biochemical and histopathological parameters. MPTD1 induced sedation and anxiolytic effect at the dose of 10 mg/kg (p.o.). The dose of 1 mg/kg presented an anxiolytic like-profile in the open field test, light–dark box tests without any sedation effect.

Keywords: Anxiety, Memory, MPTD1, Light-dark test, Open field, Novel object recognition, toxicity, Maps, TLC

Essential oils in Therapy

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L'engouement de l'aromathérapie au sein du grand public n'est pas qu'un phénomène de mode. Des études ont démontré l'efficacité clinique des huiles essentielles. Comment ça marche? Quel est le lien entre la composition d'une huile essentielle et son action? Comment choisir une huile essentielle pour répondre à une demande particulière ?

Keywords: essential oil, aromathérapie, composition, efficacité clinique

Experience of implementing pharmaceutical technologies: Synthesis and characterization of metal complexes (aluminum, zinc, bismuth) with organic acids as a potential active pharmaceutical ingredient

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Farmak, Ukraine

The purpose of the work was to obtain nanomaterials based on complexes of bio-safe metals with bile acids. Mefenamic acid was used as a model compound for the study of factors that poured on the structure of such complexes during synthesis. The resulting compounds are expected to be tested for potential bioactivity.

A bismuth compound with choline acid was obtained as a stable gel. The analysis showed that the main component of the gel is nanoparticles of size 12 nm. Consequently, we obtained a stable nanomaterial with potential antimicrobial activity.

Keywords: implementing, synthesis, metal complexes pharmaceutical ingredient

Thermo-responsive polymers as nanovectors for controlled release

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Stimuli-responsive polymers are a class of "smart" materials that have the ability to respond to an external stimulus. Their behavior is basically given by the functional groups present within or on the polymer chain. Different functionalities respond to different stimuli, and the most commonly utilized stimuli are temperature, pH, light, ionic strength, electron transfer (redox) and host–guest interactions.

In the frame of the «VAHVISTUS» project, a special attention was focused on thermo responsive polymers, having an amphiphilic character enabling the formation of micelles, along with a thermally-triggered self-assembly behavior. The characterisation of the prepared amphiphilic copolymers was carried out along with the study of self-assembly properties of copolymers and strategies for nanoparticles preparation and stabilisation. Then, their ability to load active molecules was tested. In particular, Retro-2^{cycl} (R2), a member of a novel class of small retrograde pathway inhibitors, was encapsulated and the resulting loaded aggregates were employed for treatment of *Leishmania donovani*-infected Raw264.7 murine macrophages.

Keywords: Thermo-responsive, polymers, nanovectors, amphiphilic, nanoparticles

ROS-responsive materials based on porphyrin polymers

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Stimuli-responsive polymers or smart/intelligent polymers can be defined as materials capable of changing their physico-chemical properties upon exposure to small external stimuli. Indeed, a single or multiple stimuli (for example pH, temperature, electric or magnetic field, light wavelengths, redox conditions, small molecules, etc.), can induce macroscopic responses in the final material, such as swelling, sol-gel transitions or color changing, depending on the physical state of the macromolecules. Just about to these fascinating features, the interest of the scientific community in such type of materials has increased a lot over last years, starting the develop of a new and versatile class of polymers, whose applications ranging from biology, drug delivery and medicine fields to sensors and biosensors, for environmental remediation or for many other uses. Herein, among the above mentioned stimuli-responsive polymers, we will mainly focus on the Reactive Oxygen Species (ROS) materials obtained by Reversible Addition-Fragmentation chain Transfer polymerization (RAFT). RAFT polymers possess in fact low molar mass dispersity, uniform chemical composition and high end-group fidelity, that allow reproducible, reliable and uniform response. In light of this, the principal object of our work is related to the synthesis of RAFT responsive polymers by using porphyrins as ROS generator when irradiated by light.

Keywords: ROS-responsive materials, porphyrin polymers, physico-chemical

Tomato: A High Value Food In The Mediterranean Diet

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Tomatoes (*Lycopersicon esculentum L.*) are the second most widespread vegetable crops all over the world. Several studies showed that the consumption in daily diet of tomatoes, either as fresh fruits or in processed products (pulped, canned, sauces, etc.), decreases the risk for heart diseases, some kinds of cancer and other chronic diseases. The beneficial effects of tomatoes on the health are due to their high content in antioxidant metabolites such as polyphenols (flavonoids, hydroxycinnamic acids) and carotenoids (lycopene, β-carotene) in their peel, pulp and seeds. However, the richness in bioactive compounds of tomatoes depends on the kind of cultivar, cultivation conditions as soil fertilization, biotic and abiotic transformations, temperature, light and fruit ripeness.

The aim of our studies is to increase the knowledge about the biological properties of whole tomato fruit. For this purpose, the evaluation of the nutritional properties of different tomato cultivars and new tomato hybrids (as raw fruits and processed products) has been performed, with special attention to the chemical analysis (extraction and isolation of secondary metabolites) and the test for biological activities (antioxidant, antimicrobial, antitumor) of the extracted compounds.

Recently, our Research Group also carried out studies on Plant Growth Promotion, mainly focusing on sustainable crop production practices, in order to improve yields and nutritional quality of tomato fruits (Effective Microorganism/ EM technology; Rhizospheric and endophytic bacteria associated with tomato cultivars). The main results of our studies will be presented and new and future prospects will be discussed.

Keywords: Tomato, mediterranean diet, antioxidant, antimicrobial, antitumor, nutritional properties, chemical analysis

The most popular plants in Morocco: Current State and Prospects

Prof. Amina BARI

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Morocco is part of the Mediterranean biodiversity hotspot. This geographical, ecological and human forum hosts more than 4500 vascular plants, nearly 20% of which are endemic. Morocco is also a reservoir of plants with medicinal virtues, more than 800 medicinal and aromatic species, including polyvalent species with scientific validation of some of their medicinal properties. However, the over exploitation and destruction of natural ecosystems leads to the extinction of manyspecies or threatens their viability and sustainability.

On another side, Morocco's biodiversity has forged its cultural diversity, the plant cultural heritage has been nourished through the ages by knowledge of medicinal properties and uses in many fields, which has helped to forge Moroccan identity and originality. However, the most popular plants are sometimes overexploited, pirated or under-valued andthe genetic diversity of the plant heritage has been coveted in a unique way. The same applies to ancestral knowledge with no return for indigenous peoples. In the absence of a national application of the Nagoya Protocol, this heritage is threatened. Economic and biocultural losses are notable.

The current state according to our field investigations and surveys on some species confirms the continued pressure, under the economic constraints of local populations, on species currently in demand in national and international markets such as *Anacyclus pyrethrum* var *pyrethrum* and other species. All this constrains the future of these plant resources and the loss of their social, economic, ecological and cultural functions.

In the context of developing conservation biology, our research is focused on:

- Botanical systematic, physicochemical characterization and confirmation of medicinal properties and biological activities of indigenous flora.

- The knowledge of the state of conservation and the study of reproductive biology.

- Mastery of multiplication techniques with a view to their reintroduction into the natural environment and to ensure the durability of their uses and functions.

«Access and benefit-sharing», (ABS) «Access and benefit-sharing», (ABS)

Waiting for the application of the law project on Access and benefit-sharing ABS, these are crucial and even essential measures for the establishment of conservation mechanisms to gettargeted threatened species out of the extinctions spiral, in consultation and partnership with local populations for sustainable development.

Keywords: plants, Morocco, medicinal properties, ecosystems, botanical

When bioceramics science and 3D printing meet regenerative

Prof. Dr. Khalil EL MABROUK

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The development of a porous scaffold with ordered microporous/nanoporous structures is a pre-requisite material to be used in tissue regenerative medicine. An ideal scaffold ought to consist of an interconnected network with nanochannels/pores to enable tissue in growth and nutrient delivery to the regenerated tissue, with nanopores and/or micropores to promote cell adhesion, adsorption of biologic metabolites, and resorbability at controlled rates to match the process of tissue repairing. The choice of methods to produce a better scaffold is of paramount importance as it is expected to act as temporary extracellular matrix (ECM) to guide tissue formation while simultaneously degrading in concert with the creation of the new ECM. Thanks to additive manufacturing, it is currently possible to innovate, create and manufacture complex parts with a very large surface area ratio. Actually, several technologies have emerged as fused filament deposition (FDM), selective laser melting (SLM), selective laser sintering (SLS) and digital light processing using resin filled with ceramic or metal particles. Our presentation will be focused on manufacturing porous materials based on triply periodic minimal surface with very complex structures that could be used for bone replacements. Some physical properties will therefore also be discussed.

Keywords: Additive Manufacturing, Bioceramics, Bioglasses

Synthesis of new imidazole and thiotriazolone derivatives for the investigation of their antiparasitic activity

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Nitroimidazole derivatives (metronidazole, tinidazole) are widely used as antimicrobial agents. We have developed an original method employing ornidazole for the preparation of a "key compound" in this conversion - (2-methyl-5-nitro-1- (oxiran-2-ylmethyl) -1H-imidazole) and investigated its reactions with a series of amines.

We have introduced the method of synthesis of 4-difluoromethyl-1-phenyl-1H-imidazole - analogue of known antileishmanial agents. Also an analogue of thiotriazolones, containing the fragment of a zerumbone, was synthesized. In the scientific literature similar types of compounds are unavailable.

Keywords: imidazole, thiotriazolone derivatives, antiparasitic activity, antileishmanial

Poster communications

Optimization of Ultrasound-Assisted Extraction of Phenolic Compounds from *Ammi visnaga* using Response Surface Methodology

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In this study, response surface methodology (RSM) was used to optimize ultrasound-assisted extraction (UAE) conditions for obtaining the maximum yield and content of phenolic compounds of *Ammi visnaga* extracts *(EAV)*. Three independent variables including ethanol concentration (%), extraction time (time) and solvent-to-material ration (mL/g) were studied. The results showed that the optimal UAE condition was obtained with an ethanol concentration of 76%, an extraction time of 36 min and a solvent-to-material ratio of 13 mL/g for total phenols. Ethanol concentration, extraction time and solvent-to-material ratio were respectively 79%, 38 min and 11 mL/g for the maximum yield.

Keywords: *Ammi visnaga*, Optimization Ultrasound-assisted extraction, Phenolic compounds, Extraction yield, Response surface methodology.

Preservative Properties of *Origanum elongatum* Essential Oil in a Topically Applied Formulation under a Challenge Test

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The aim of this study is to evaluate the preservative efficacy of *Origanum elongatum* essential oil in topical cream under a challenge test that was performed following the standard procedure proposed by the European Pharmacopoeia, using standardized microorganisms. Essential oil was analyzed by GC–MS (Gas Chromatography–Mass Spectrometry). The antimicrobial activity of this essential oil was investigated by agar diffusion methods and

broth microdilution assay to determine the minimum inhibitory concentration of essential oil required for preservation. The results demonstrated that the preservation effect was effective at 2% (v/w) of *Origanum elongatum* essential oil in topical cream, satisfying criterion A against *Staphylococcus aureus*, *Escherichia coli* and *Aspergillus brasiliensis*. However, the essential oil was ineffective against *Pseudomonas aeruginosa* with a reduction of 10^2 within 7 days of challenge and no increase up to the 28th day and against *Candida albicans* in the challenge test. Carvacrol predominated (63.06%), followed by the two monoterpenes hydrocarbons: γ-terpinene (15.99%) and p-cymene (9.51%). Our study highlighted the preservative power of *Origanum elongatum* essential oil as an alternative solution to chemical preservatives.

Keywords: *Origanum elongatum* essential oil, Preservative, Minimum inhibitory concentration, Formulation, Challenge test.

Synthesis of heterocycle hybrids bearing pyrazole pharmacophore from azaaurones derivatives

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For many years, our laboratory was interested in several research topics based in particular on the construction of new heterocyclic compounds containing pyrazole, pyrazoline, isoxazole and isoxazoline scaffolds with promising biological activities [1-6]. The synthetic methodologies we elaborate are generally simple and short based on 1,3-dipolar cycloaddition, cyclocondensation and alkylation reactions.

Several new pyrazole derivatives bearing amide and sulfonamide frameworks and pyrazole-containing heterocyclic systems have been synthesized using aza-aurones as starting materials. Different synthetic strategies leading to those heterocycles compounds will be presented and discussed in this work.

Keywords: Pyrazole, aza-aurones, 1,3-dipolar cycloaddition, hybrids, sulfonamide, amide.

References:

1) Boughaleb, A.; Zouihri, H.; Gmouh, S.; Kerbal, A.; El yazidi, M. *ActaCryst*. **2011**, e67, o2434.
2) Boughaleb, A.; Alhouari, G.; Bennani, B.; Daoudi, M.; Garrigues, B.; Kerbal, A.; El yazidi, M.; *J. Soc. Chim. Tunis.* **2010**, 12, 109-115.

3) Bakhouch, M.; Al Houari, G.; Daoudi, M.; Kerbal, A.; El Yazidi, M. *Med. J. Chem.* **2015**, 4(1), 9-17.
4) Bakhouch, M.; El Yazidi, M.; Kerbal, A.; Saadi, M.; El Ammari, L. *Acta Cryst*., **2015**, E71, o1043-o1044.
5) Boughaleb, A.; Akhazzane, M.; Al Houari, G.; Daoudi, M.; Garrigues, B.; Kerbal, A.; El Yazidi, M. *J. Soc. Chim. Tunis.* **2011**, 13, 117-122.
6) Bakhouch, M.; El Yazidi, M.; Al Houari, G.; Saadi, M.; El Ammari, L. *IUCrdata*. **2017**, 2, x 170677.
7) A. Mahfoud, G. Al Houari, M. El Yazidi, M. Saadi, L. El Ammari, *Acta Cryst*., **2015**, E71, o873-o874.

Medicinal plants frequently used in the Middle Atlas regions: Therapeutic virtues and risks of toxicity

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The population of Moroccan Middle Atlas has rich traditions and ancestral knowledge in the field of herbal medicine due to the pharmacological properties of plants and their expected effectiveness and safety. Unfortunately, many cases of intoxication are reported, emphasizing a serious health problem.

Thus, the present study carried out with some actors of the traditional medicine in the central Middle Atlas region revealed the occurrence of many toxic species among the medicinal plants frequently recommended in local traditional pharmacopoeia. They include *Aristolochia paucinervis* L., *Ruta montana* L., *Solanum sodomeaum* L., *Nerium oleander* L., *Atractylis gummifera* L., *Echinops spinosus* L., *Urginea maritima* L., *Atropa belladonna* L. which are prescribed in the treatment of various diseases, including dermatological, urogenital, gastric and pneumological. Their potential toxicity is related to toxic molecules such as aristolochic acid, furanocoumarins, solasodine, oleandrine and many others. In addition, the risk of intoxication is accentuated because these plants are often administered internally at random doses (pinch or spoonful), often for quite long periods.

Keywords: Medicinal plants, toxic plants, Middle Atlas.

An ethnopharmacological survey of medicinal plants traditionally used for cancer treatment in Fez-Meknes region, Morocco

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World Health Organization statistics shown that cancer is responsible for an estimated number of 9.6 million deaths in 2018, and 70% of deaths from cancer occur in developing countries. The aim of this survey is to make an inventory of plant species identified by Fez-Meknes community of Morocco for the treatment of cancer. Validated questionnaires were administered to 300 interviews (237 traditional health practitioners and 63 traditional healers) in three communities within Fez- Meknes region. The survey revealed 94 species, belonging to 47 families, Apiaceae and lamiaceae were reported as the most represented families. The current survey contribute to documented knowledge and usage of medicinal plants in the study area and to explore these data for future pharmacological potential.

***Keywords*:** Ethnopharmacology, cancer, Fez-Meknes, Morocco

Design and synthesis of novel spiroheterocycles compounds containing 2-isoxazoline frameworks

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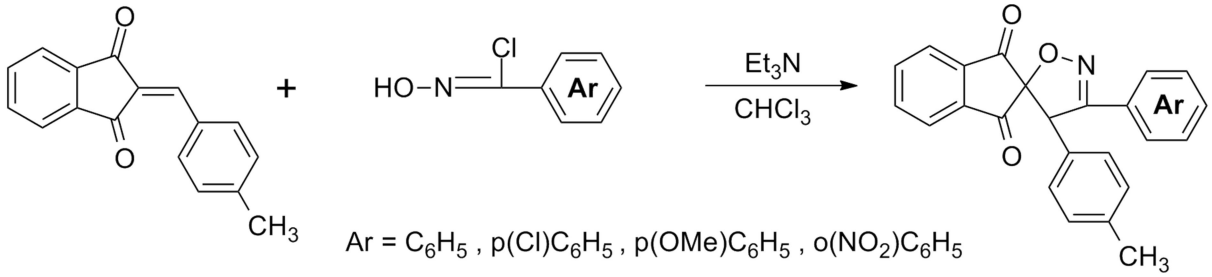
Spiroisoxazolines have attracted much attention for many years, due their use as herbicides [1,2], anti-tumor agents [3] and anti-HIV [4,5]. They are also used as precursors of β-aminoalcohols and β-hydroxyketones [6]. The 1,3-dipolar cycloaddition reactions of nitrile

oxides to olefins constitute an effective method to access to these heterocyclic systems in one pot. The regio and stereoselectivity of this reaction was the subject of several studies [7-9].

In this context, we report the synthesis of new spiroisoxazolines via 1,3-dipolar cycloaddition of 4-methoxybenzonitrile oxide with 2-(4-methoxybenzylidene)-1*H*-indene-1,3(2*H*)-dione as dipolarophile. The nitrile oxides were generated *in situ* by the action of triethylamine on the N-hydroxy-4-arylimidoyl chloride. The reaction carried out in regiospecific maner and lead to the formation of one regioisomer as evidenced by TLC and NMR spectrum of the resulting mixture (scheme).



Ar = C_6H_5 , p(Cl)C_6H_5 , p(OMe)C_6H_5 , o(NO_2)C_6H_5

Keywords: Spiroisoxazolines, 1,3-cycloaddition dipolar, arylnitriloxydes, regioselectivity.

References:

[1] R. K. Howe, B. R. Shelton, *J. Org. Chem.* **1990**, 55, 4603.
[2] M. De Amici, C. De Micheli, V. Misani, *Tetrahedron.,* **1990**, 46, 1975.
[3] M. Smietana, V. Gouverneur, C. Mioskowski, *Tetrahedron Lett.,* **1990**, 40, 1291.
[4] T. Ichiba, P.J. Scheuer, *J. Org. Chem.*, **1993**, 58, 4149.
[5] S. Liu, X.Fu, F.J. Scheuer, P.J. Kelly-Borges*, J. Nat. Prod.,* **1997**, 60, 614.
[6] A. P. Kozikowski, *Acc. Chem. Res.,* **1984**, 17, 410.
[7] A. Mahfoud, G. Al Houari, M. El Yazidi, M. Saadi, L. El Ammari, *Acta Cryst*., **2015**, E71, o873-o874.
[8] M. Bakhouch, M. El Yazidi, G. Al Houari, M. Saadi, L. El Ammari, *IUCrdata*, **2018**, 3, x 181019.
[9] M. Bakhouch, M. El Yazidi, G. Al Houari, M. Saadi, L. El Ammari, *IUCrdata*, **2017**, 2, x 170677.

Antifungal activity of five essential oils and their mixtures

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The use of essential oils (EO) as fungicides has recently attracted the interest of many researchers. The aim of this study is the chemical characterization and evaluation of the antifungal activity of EO and their mixtures extracted from five Moroccan aromatic and medicinal plants (*Cedrus atlantica*, *Origanum elongatum*, *Rosmarinus officinalis*, *Tetraclinis articulata* and *Thymus saturioides*). The extraction of EO from the different biomasses was carried out by hydrodistillation and the chemical analysis of the EO was performed by GC-MS. The EO mixtures were made in such a way to rebalance the chemical composition in oxygenated mono and sesquiterpenes by taking as reference EO of thuya burl. The biotest of the EO and mixtures was conducted on agar medium by the microatmosphere technique using fungal strains of *Alternaria alternata*, *Botrytis cinerea*, *Gloeophyllum trabeum* and *Poria placenta*. The strong antifungal activity of EO from the thuya burl, oregano, and mixtures of oregano/cedar and oregano/thyme revealed by the biotest, would be due to the inhibitory effect of their oxygenated fractions. These EO can substitute in many fields chemicals that are harmful on human health and environment. The high volatility of some EO, undesirable in some applications, could be limited by the incorporation of these compounds into nanostructures.

Keywords: Aromatic and medicinal plants, Mixtures of essential oils, Chemical composition, Antifungal activity.

Study of the physico-chemical quality of three vegetable oils and application in the formulation of soaps

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Vegetable oils are extracted from oleaginous plants, usually seeds, rich in lipids, and obtained by first cold pressing. They contain many vitamins and essential fatty acids for a rich and varied diet. In cosmetics, vegetable oils are also the ideal support for cosmetic formulations, especially for soaps and creams.

The purpose of this study is to evaluate the quality of three vegetable oils (olive oil, coconut oil and sweet almond oil) and formulate soaps from these vegetable oils. The methods used for physicochemical analyzes of vegetable oils are those of the International Union of Pure

and Applied Chemistry for the following determinations: the iodine, peroxide, acid, saponification. The results obtained made it possible to deduce that both oils meet the Codex Alimentarius standard.

Regarding the formulation of soaps, we have formulated four types of soap (hard soap, soft soap, transparent soap, liquid soap). These soaps have good stability and good feeling after use (softening effect, moisturizer ...) and no allergenic effect even after several hours of application.

Keywords: Vegetable oils, cosmetic formulations, physicochemical analyze, formulation of soaps.

In vitro antioxidant evaluation of *Ziziphus Lotus* and *Phoenix dactylifera*

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The present work focuses on the valorisation of two Moroccan dried fruits widely consumed in Morocco namely *Ziziphus Lotus L.* (jujube) and *Phoenix dactylifera L.* (Tarzawa variety). The purpose of this study is to evaluate the antioxidant power of aqueous extracts of the pulp by the total antioxidant capacity (CAT) technic. The extracts tested were prepared by three different techniques by Soxhlet, maceration and decoction. The results obtained show that the aqueous extract of the dates has a more remarkable antioxidant activity when compared to the other extracts. The suitable technique for extracting bioactive molecules responsible for antioxidant activity is that of maceration whether for dates or for jujube.

Keywords: *Ziziphus Lotus, Phoenix dactylifera, Total antioxidant capacity, Morocco*.

Etude capacitive de l'effet du solvant sur le pouvoir antioxydant des extraits de *Lawsonia inermis*

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Ce travail vise l'évaluation des propriétés antioxydantes par la technique de Test de la réduction du fer (FRAP), au niveau des extraits des feuilles de trois variétés de Henné (*Lawsonia inermis)*, procurées de trois régions différentes à savoir : Alnif, Tafraoute Sidi Ali et Tazzarine. Les extraits ont été préparé en se basant sur la polarité des solvants organiques tels que, l'eau distillée, l'éthanol et l'hexane. Les résultats obtenus montrent que l'extrait éthanolique de la variété du site Alnif a un pouvoir antioxydant plus important par rapport aux autres extraits.

Mot clés : *Lawsonia inermis, pouvoir antioxydant, Maroc*.

Protective Effect of aqueous extract from Cinnamon in Hydrogen Peroxide-Induced Biochemical Changes

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Oxidative stress is an important etiology of chronic diseases and many studies have shown that natural products might alleviate oxidative stress-induced pathogenesis. The study aims to evaluate the liver-protective and kidney-protective effects of aqueous extract of Cinnamon in male Wistar rats against hydrogen peroxide (H_2O_2). The animals dived into four groups and received daily by gavage, for 21 days, either distilled water, Cinnamon extract, H_2O_2 alone

and H_2O_2 with cinnamon extract. Blood samples were withdrawn on day 21 for the biochemical blood tests. The results showed that the group treated with Cinnamon aqueous extract remarkably prevented the elevation of plasma AST, ALT, while increased both plasma total protein and albumin. Also, this group showed significant decreased in kidney markers (urea and creatinine) compared to H_2O_2 treated group. It is concluded that the aqueous extract of Cinnamon can reduce the oxidative damage caused by H_2O_2, and this will pave the way to investigate the protective effects of this plant in the diseases attributed to the high oxidative stress.

Keywords: H_2O_2, liver, oxidative stress, kidney

Evaluation de l'activite antibacterienne du *Rosmarinus officinalis*

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La résistance des bactéries aux antibiotiques pose un vrai problème de santé publique; dans le but de trouver des alternatifs naturelles qui ont un effet antimicrobien qui peuvent remplacent les antibiotiques synthétiques pour lutte contre cette résistance. L'objectif de ce travail est d'évaluer l'effet inhibiteur de HE de *Rosmarinus officinalis* sur des souches responsables d'infections alimentaires isolées au CHU de Fès.Dans un premier volet, nous avons procédé à l'extraction d'huile essentielle par vapeur d'eau de la partie aérienne de plante, le rendement est de 1.65 ml/100g après L'analyse de HE par GPC/MS a permis d'identifier 11 composants chimiques. L'évaluation de l'activité antibactérienne des HE in vitro vis-à-vis des microorganismes est effectuée par deux méthodes : la diffusion sur disque et la microdillution.

Les résultats des HE testes montrent un effet inhibiteur très sensible (diamètre d'inhibition entre 11 et28 mm, la plus petite CMI obtenu est de 0.0625 %) sur l'ensemble des souches testées. La comparaison du diamètre d'inhibition d'HE avec les antibiotiques (Ampicilline ; la Streptomycine et la Tétracycline…) a montré que notre échantillon est plus efficace par rapport à l'antibiotique utilisé contre les souches étudiées, alors l'utilisation des huiles essentielles à la place des antibiotiques peut être envisagée pour résoudre le problème de la résistance aux antibiotiques.

Mots clés : *Rosmarinus officinalis*, CMI, HE, antibiotique

QSAR study of anticancer activity for heterocyclic derivatives using DFT and molecular descriptors

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Much of the in silico research in the world has been directed towards rational drug discovery, property prediction, toxicity and risk assessment of new drug molecules, as well as chemicals. The quantitative structure-activity relationship (QSAR) has gained great popularity because of its ability to obtain high-performance predictive models. The aim of this research is to build a 2D-QSAR for the cytotoxic effects of a cell line by studying a series of heterocyclic molecules acting as antitumor agents by using the density functional theory (DFT),with the basis set 6-31G (d) to calculate quantum chemical descriptors by principal components analysis (PCA), a multiple regression analysis (MLR), nonlinear regression (MNLR) and partial least squares (PLS). In order to obtain robust and reliable QSAR model, the original dataset was randomly divided into training and test set, the external validation of multiple correlation coefficients were show the same value of regression coefficient R which is 0.84, as well as the determination coefficient R^2 were 0.7, 0.7 and 0.71 respectively. The prediction model obtained was confirmed by two methods of LOO cross-validation and scrambling (or Y-randomization). The high correlation between experimental and predicted activity values was observed, indicating the validation and the good quality of the derived QSAR model.

Keywords: DFT, QSAR, MLR, PLS, MNLR, cross-validation, scrambling.

Moroccan research about the aromatic and medicinal plants of the genus Mentha

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Morocco is known worldwide with the Moroccan tea prepared with mint. This aromatic and medicinal plant is consumed daily by Moroccans and is an integral part of their diet. This work is a summary of the Moroccan research about the aromatic and medicinal plants belonging to the genus Mentha. Research highlights the effect of growth parameters on the yield of the plant, these parameters are: fertilization, drying conditions, mechanical stress, salt stress (Nacl) and irradiation. Other studies characterize the essential oils and extracts of the plant and determine their antioxidant, allelopathic and antiviral activities. The most studied species of Mentha genus in Morocco are *Mentha spicata*, *Mentha suaveolens*, *Mentha longifolia* and *Mentha pulegium*. Ethno-pharmacological surveys are collected in Ouezzane, the large Atlas, the Rabat region, Taounate, Tafilelt and the eastern Morocco. They show the wide use of these plants especially for respiratory and skin disorders, diabetes, hypertension, heart diseases, digestive disorders, allergies and depression. Adverse effects include hyperurination, abdominal convulsions, and degeneration of lung cells. Other studies demonstrate that *Mentha pulegium* essential oil is a natural anti-corrosive agent.

Keywords: Genus Mentha, Growth parameters, ethno-pharmacological survey, essential oil

Design, synthesis and biological screening of new heterocyclic Carboxylic α,α -diaminoesters

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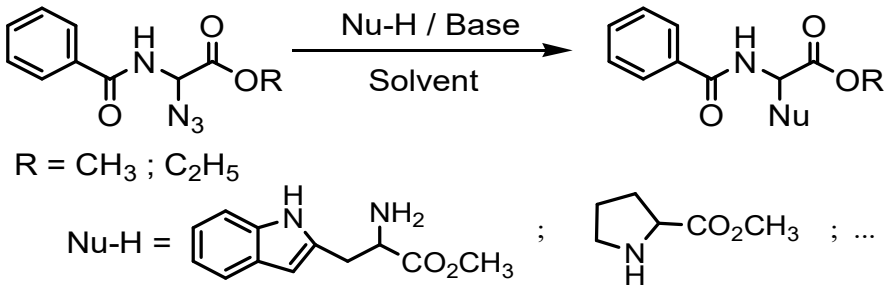
Due to their important biological activities, the synthetic heterocyclic α-amino acids are widely studied and they have found interest and applications in many fields of chemistry, biochemistry and Pharmacy [1]. Continuing our research concerning heterocyclic α-amino acids which

present interesting biological activity[2], we present here the synthesis of new carboxylic α,α-diaminoesters derivatives. Our strategy is based on the nucleophilic substitution of methyl α-azidoglycinate N-benzoyl- ated with different functionalized amines (scheme).



The structures of obtained compounds were confirmed by ^{1}H, ^{13}C NMR, IR, Mass spectrometry, Elemental analysis and X-ray analysis.In addition to MS data it was also tested *in vitro* for its antibacterial activity against Gram-positive and Gram-negative bacteria.

Keywords: Aminoacid; Heterocyclic compound; Amine; Nucleophilic substitution; Methyl α-azidoglycinate.

Antioxidant activities, total phenolic and flavonoids content variation of buds extracts of *Syzygium aromaticum* L.

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The oxidative stress is mainly generated to the disequilibrium between the production of the reactive species and the organism defense. The excessive production of reactive species causes usually DNA and protein denaturation, lipid peroxidation, wich induces chronic diseases such as cancer, diabetes as well as neurodegenerative and cardiovascular diseases. In this study, we focused on the identification of *S.aromaticum* antioxidant properties. Thus, the major aim was to determine the different amounts of phenols and flavonoids in different extracts to select the best extracted solvent, which has an antioxidant activity compared to the standard antioxidants. Antioxidant properties were measured using three tests: Free radical scavenging activity against 2, 2-diphenyl picrylhydrazyl (DPPH), reduction of molybdate, and reducing ($Fe^{3+/}Fe^{2+}$) power. Total phenolic and flavonoid content was measured by Folin-Ciocalteu and Rutin reagent,

respectively. The results showed that both the ethanol and water extracts had greater antioxidant activity. Aqueous extract exhibited a higher DPPH radical scavenging and reducing molybdate 550.4±5.7 mg equivalent to ascorbic acid/g dry extract. The strong antioxidant activity of water extract was probably due to its high content of phenols. Furthermore, water extracts showed higher total flavonoids content with values: 140.3±3.4 mg Equivalent Rutin/g dry extract. Our results suggested a potent and excellent antioxidant activity of *S.aromaticum* extract. It could be considered as a potential source of biomolecules for pharmaceutical and food industry.

Keywords: *Syzygium aromaticum*, antioxidant, flavonoids, phenols

Valorization of phytochemical compounds and antioxidant activity of *Withania frutescens* extract

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In this study, we were interested in the qualitative and quantitative phytochemical characterization and the evaluation of the antioxidant capacity of the total extracts of a Northern Moroccan plant. Screening results show that the plant contains alkaloids, saponins, tannins, mucilages and coumarins. The determination of phenolic compounds shows that it has a relatively high content of total polyphenols and tannins of the order of 19.53 µg EAG/mg MS and 6.258 µg Eqcat/mg MS, respectively. The analysis of mineral elements by ICP-AES shows that our species is rich in mineral elements which are Calcium, Magnesium and Sodium, and it is devoid of metallic elements such as Nickel, Lead, Cadmium and Cobalt. The IC-50 values of the DPPH test of the studied parts are of the order of 0.36 µg/ml and 6.63 µg/ml, which showed a lower anti-free radical activity than that of BHT (0.12 µg/ml). The results obtained by the FRAP method revealed a low reducing power of iron for two extracts (EC-50 of 0.45%) compared to Quercitine (EC-50 of 0.03%). The compounds of root and leaf extracts have a significant total antioxidant capacity, respectively 477.65±37.60 and 317.03± 46.64 mg EAA/g Extract. In the β-carotene discoloration test, extracts from the aerial and underground parts showed antioxidant activity of 57% followed by (36%), respectively.

Keywords: phytochemical screening, ICP-AES analysis, DPPH, Reducing power.

Phytochemical and biological studies of *Anacyclus pyrethrum L.*

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Exploitation of new bioactive molecules with antioxydant, antibacterial and antifungal effects, as well as their adoption as therapeutic alternative to synthetic molecules have become a priority for researchers and for pharmaceutical industries. In this context, and in order to contribute to the valorization of Moroccan aromatic and medicinal plants, a phytochemical and biological study of an endemic species from Ifrane-Morocco was carried out. Male and female roots of *Anacyclus pyrethrum;* commonly called Tigendest; were used to determinate their extracts and essential oils' chemical composition. Antioxydant and antimicrobial activities were realized, as well as the insecticidal power, which was evaluated on the main pest of stored legumes: *Callosobruchus maculatus*. The phytochemical screening revealed the presence of alkaloids, polyphenols, flavonoids, sterols and triterpenes (very abundant in male roots). The extraction by maceration (MeOH/water) yielded better than the extraction by Soxhlet (MeOH / water). The total phenolic content of the extract was determined by the Folin–Ciocalteu method. The results revealed that the macerations of male and female roots of *A. pyrethrum* contain more polyphenols (11.12 mg EAG / g and 8.30 mg EAG / g respectively) compared to the extracts obtained by soxhlet. The total flavonoid content of the crude extract was determined by the aluminium chloride colorimetric method. Male (2.05 mg quercetin/g) and female (1.95 mg quercetin/g) roots extracts are richer in flavonoids when they are obtained by maceration than when they are obtained by soxhlet. Hydrodistillation of female roots from *A. pyrethrum* yielded 0.07% of essential oil. The latter was analyzed by GC-MS and its chemical composition was determined. It consists mainly of Spathulenol (16.9%), Germacra-4 (15%), 5.10 (14) -trien-1-α-ol (12.28%), Selina-3,11-dien-6-α-ol (9.24%) and Caryophyllene oxide (7.11%). The antioxidant effect of the methanolic extracts was evaluated by DPPH*. Antimicrobial activity of hydromethanolic extracts [8:2] was carried out on different strains. The insecticidal power of *A. Pyrethrum* extract used in different doses showed a significant insecticidal effect on *C. maculatus*. This indicates that long-lasting/low-cost protection against this pest is possible by using *A. pyrethrum* root extracts, which may represent an interesting alternative to chemical insecticides.

Keywords: *Anacyclus pyrethrum* L., Chemical composition, Essential oil, antioxidant activity, antimicrobial activity, insecticidal power.

Comparison of the inhibitory effect of calcium oxalate monohydrate's crystallization by two drugs: Citrate and Cystone

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Urolithiasis is a recurrent disease that results from a succession of several physicochemical events including supersaturation, nucleation, growth, aggregation and retention within the kidneys, calcium oxalate has been shown to be the main component of the majority of stones formed in the urinary system of the patients. The aim of this work is to compare the inhibitory effect of calcium oxalate monohydrate's crystallization by two anti-urolithiasic drugs : Citrate and Cystone, synthetic drug and polyherbal drug respectively, The inhibition of crystallization has been studied in vitro both the absence and the presence of the different concentrations of the two drugs, this study consists in measurement of turbidity with the UV-visible spectrophotometer, the temporal evolution of the topical density at λ equal to 620 nm corresponding to the formation of the crystals due to the mixing of metastable solutions of calcium and oxalate in artificiel urine solution. The microscopic observation of crystals was carried out using a polarized optical microscope equipped with digital camera and connected to a computer. *In vitro* calcium oxalate crystal nucleation and aggregation was inhibited in artificiel urine solution especially for Cystone with 97.8 ± 0.1 and 83.46 ± 1.32% compared to Citrate with 73.25 ± 0.78 and 58.34 ± 3.3%. Treatement of uro-lithiasis with synthetic drugs is hard for patients with many side effects, while herbal drugs that have fewer side effects can be more effective.

Keywords: Urolithiasis, Calcium oxalate, Inhibition of crystallization, Cystone, Citrate, Nucleation, Aggregation.

New analogues of ethacrynic acid analogues as potential antitumor agents: synthesis and biological activity

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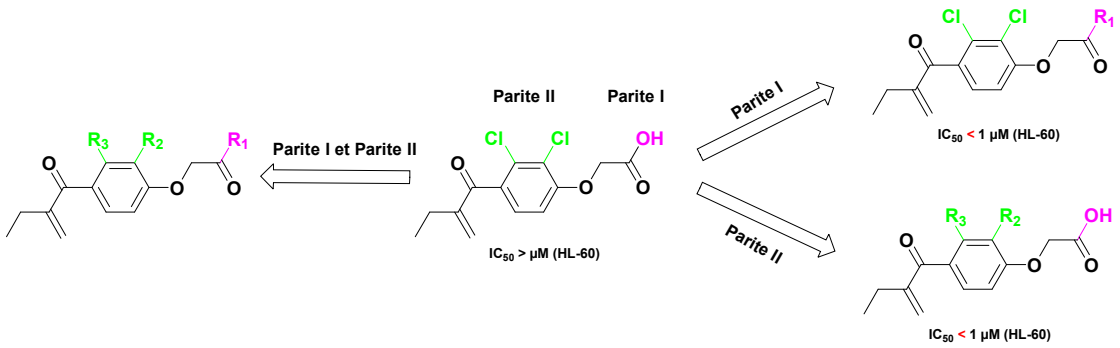
Ethacrynic acid (symbolized by the letters **EA**) ($C_{13}H_{12}Cl_2O_4$) is a well-known reactive diuretic used in the treatment of acute pulmonary edema, edema associated with congestive heart failure and certain kidney diseases. Very recently, our team has synthesized a series of EA analogues, with strong antiproliferative activities against solid and liquid tumors.

In this communication we wish to present the synthesis of new EA derivatives as well as the results of the in vitro tests on different cancer cell lines.



Keywords: Ethacrynic acid, glutathione S-transferase P1-1 GSTP1-1, cancer

GC/MS analysis and antifungal property of essential oils and their constituents from *Laurus nobilis* flowers against seven pathogenic fungi

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Aromatic and medicinal plants were used for centuries as remedies for human diseases because they contain chemical components of therapeutic value. In the last few years, plant products and their modified derivatives have been rich sources for clinically useful drugs. According to the World Health Organization, more than 80% of the world's population relies on traditional medicine for their primary health care needs. *Laurus nobilis*. is a plant belonging to the Lauraceae family, which comprises approximately 2500 species.

The present study was performed to evaluate antifungal activity of flowers essential oils from *Laurus nobilis*. originating from Morocco, a mountainous region where people frequently use this plant in traditional medicine against seven fungal strains: *Aspergillus niger, Trichoderma viride, Penicillium citrinum, Chaetomium globosum, Cladosporium cladosporioides, Myrothecium verrucaria* and *Aspergillus clavatus*. The essential oil had been extracted by steam distillation in a modified Clevenger-type apparatus from flowers of *Laurus nobilis* and their chemical composition characterized by gas chromatography coupled with mass spectrometry (GC/MS) and gas chromatography with flame ionization detection (GC-FID) for determining of their chemotypes. The essential oil yields of the studies were 1.06% and the most abundant compounds identified were: 1.8-cineole (52.43%), α-caryophyllène (8.96%), germacradiénol (6.13%), limonene (5.25%), α-pinene (3.72%) and germacrène D (3.14%). The fungal strains tested were found to be sensitive to essential oils studied and showed a very effective fungicidal activity with minimum inhibitory concentrations (MIC) ranging from 0.05 to 0.46mg/mL. These findings confirm the fungicidal activities of *Laurus nobilis* essential oils as possible alternatives to synthetic fungicides.

Keywords*: Laurus nobilis,* essential oil, antifungal activity, 1.8-cineole.

In vitro insecticidal activity and chemical characterization of essential oil from leaves of *Nerium oleander* Grown in Morocco

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The objective of this work was to study the chemical composition and in vitro insecticidal activity from leaves of *Nerium oleander* growing in Morocco. The essential oil extracted from leaves of *Nerium oleander* was determined by hydro-distillation and analysed by GC/MS and GC-FID. The insecticidal activity was tested by methods of classic biological tests.Their insecticide power was studied in vitro on *Acanthoscelides obtectus,* responsible for green bean rot.

The analyses for leaves part resulted in the identification of 34 compounds, representing 93.21% of the total oil and the yield was 1.76%. The major component was nériine (22.56%), other predominant components were digitoxigénine (11.25%), amorphane (8.11%), 1.8-cineole (6.58%), α-pinene (5.54%), calarene (5.12%), limonene (5.01%), β-phellandrene (4.84%), terpinene-4-ol (3.98%), sabinene (3.22%), isoledene (2.94%), 3-carene (2.56%), humulene (2.29%), β-pinene (2.01 %) and cymen-8-ol (1.67%).

The chemical composition revealed in this study is relatively similar to those of other *Nerium oleander* essential oils analyzed in other countries. All the tested insects were sensitive to the essential oils of *Nerium oleander* showed a very efficient insecticidal activity, confirmed by the poor amount of DL50 obtained at 5.9 and 8.4 mg/g, respectively.
These results showed that extracts could be considered suitable alternative to chemical additives for the control of insects diseases in plants and these oils can be exploited for industrial purposes.

Keywords: Nerium oleander, essential oils, Acanthoscelides obtectus

Nutritional characteristic, biochemical composition of Moroccan dates fruit varieties

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Date fruit has been recognized as a healthy food for a long time. In this study, physicochemical analysis including Moisture, pH, Ash, content, Proteins, Sugars, Lipids, Phenolic, Vitamins and Mineral content of thirteen dates varieties) were investigated. Additionally, morphology character has been described. Results from this investigation demonstrated that Moroccan dates varieties constitute an interesting supplement of natural antioxidants, especially phenolic compounds. Moreover, potassium was the main mineral in date fruit (713.03–784.97mg/100g). In addition, the Moroccan dates constitute a source of carbohydrate, which allows them to be a good source of energy, rich of vitamins, lipid and proteins content. Those results highlight the possible contributions of date fruit to nutritional therapy.

Keywords: Moroccan dates varieties, Vitamins, Phenolics content, Minerals.

Flavonoids content and antibacterial activity in medicinal plants are affected by atmospheric and climate change regulations

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Given the long-term challenge of climate changes and in order to limit the contribution of greenhouse gas (SOx and NOx) emissions to global warming, the international community has implemented numerous regulations to improve air quality, like Framework Convention on

Climate Change (FCCC) and Kyoto or Gothenburg Protocols. These legal agreements caused a drastic decrease of atmospheric sulfur deposition and sulfur content in soil and surface water streams. This adverse situation has been showed by several studies to be damaging factor for crop production. Cultivated medicinal and aromatic plants (PMA) can be equally affected by the poor sulfur nutrition. The aim of our investigations is to highlight the impact of sulfur deficiency on the medicinal quality of two cultivated PMA with high economic value: *Trigonella foenum-graecum* and *Foeniculum vulgare*. Both of *Trigonella* and *Foeniculum* were cultivated under sulfur starvation conditions (0.05mM of S) and optimal conditions (1mM of S). Seeds of both plants were harvested at the end of vegetative cycle. The analysis of flavonoids content in methanolic extract of the studied plants seeds showed that S-starvation decreases the content of flavonoids by 50% and 42% in *Trigonella foenum-graecum* and *Foeniculum vulgare* respectively. Therapeutic value of *Trigonella* and*Foeniculum* seeds was assessed by measuring the antibacterial activity of methanolic extracts against *Escherichia coli*, *Pseudomonas aeruginosa*, *Enterococcus faecalis* sand *Staphylococcus aureus*. The analysis of the data showed that S-deficiency decreases significantly the antibacterial activity of both of *Trigonella* and *Foeniculum* seeds by increasing the MIC (Minimum Inhibitory Concentration).

Keywords: Sulfur deficiency, Antibacterial activity, Flavonoid, therapeutic quality, climate changes

Phytochemical components, antioxidant and antibacterial activity of leaves and fruits of *Vitex agnus castus* from Morocco

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Objective: The aim of the current study is to determine the chemical composition, evaluate in vitro antioxidant and antibacterial activity of *Vitex agnus-castus L.* essential oils. **Methods:** The phytochemical screening of essential oils was determined using gas chromatography (GC) and GC-mass spectrometry analysis. Antioxidant activity of the *Vitex agnus-castus* EOs was examined by the 1, 1-Diphenyl-2-picrylhydrazyl (DPPH) assay. The antibacterial test was evaluated against Gram-positive bacteria *Staphylococcus aureus* and Gram-negative bacteria species (*Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa,* and *Proteus mirabilis*) using disc diffusion method. **Results:** Twenty-nine components were identified in the fruits'oil representing 93.1% of total oil. The major components in the fruits oil are 1,8-cineole (11.6%), α-thujene (9.3%).

Furthermore, 28 components were identified in the leaf essential oil. The main component was caryophyllene (9.5%), followed by 1, 8-cineole (8.7%). A low antioxidant activity was found. Antibacterial activity of both oils showed a strong activity against nosocomial bacteria tested. **Conclusion**: Essential oils of Moroccan VAC could be exploited as natural drugs for bacteria, especially those who have acquired resistance to conventional antibiotics.

Keywords: Gas chromatography (GC), 1,8-cineole, *Vitex agnus-castus L,* essential oils.

Ethnobotanical survey of medicinal plants used for Disinfection of premises and surfaces in the Fez-Meknes Cities (Centre of Morocco)

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Background: The effectiveness of disinfectants remains variable from application to another. Indeed, the irrational and repetitive use of chemical disinfectants in the hospital environment can contribute to the emergence of resistant strains. Objective: The aim of this first innovant study is looking for plants with disinfecting power. Method: In this work, an ethnobotanical study was conducted among herbalists in Fez and Meknes cities located in the center of Morocco. Information covered includes the vernacular and scientific name of plants, used part, mode of preparation and administration. Result: A total of 13 species belonging to 8 families has been described. Lamiaceae and Asteracea was the most representative families with three species every one, followed by the Myrtaceaes with two species. The others families (Cupressaceae, Caryophyllaceae, Rosaceae, Rutaceae and Brassicaceae), were represented with the same percentage, a specie for each family. According to the calculated frequency index, the most recommended species are *Lavandula* spp., *Origanum elongatum*, *Arteminisia herba-alba*, *Rosmarinus officinalis*, *Eucalyptus* spp, *Atractylis gummifera L*, *Citrus limon*, *Anastatica hierochuntica*, *Myrtus communis* L and *Rosa centifolia* (5 % for each), *Artemisia absinthium* L

and *Corrigiola telephiifolia* (2 % for each) *Tetraclinis articulata* (3 %). Leaves and flowers establish the most used parts. The incense was the most quoted mode of preparation. The disinfection by air contact was the recommended mode .Conclusion: This work would be of great interest to health professionals to solve the problem of resistant strains and for the pharmaceutical industry to develop effective biological disinfectants that respect the environment.

Keywords: Ethnobotanical survey, Medicinal plants, Bio-disifectants, Meknes, Fez, Center of Morocco.

Complexation of Hg^{2+} with PheAla and AlaPhe: A DFT study

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The complexation of divalent metal cations and amino acids and dipeptides can be of great importance in the understanding of some biological processes. The present work report the results of the theoretical study of the binding patterns of metal cation Hg2+ with the dipeptide phenylalanyl-alanine (PheAla) and alanyl-phenylalanine at B3LYP level of theory in gas phase. In order to determine the most favourable complexes structural and electronic properties were determined. The calculated values of the relative energies of the founded complexes indicate that the cation-π tetradentate is the most stable complex in comparison with the other ring coordinated and ring uncoordinated complexes. The energetic results showed that the metal ion is always coordinated through bonds with the amide carbonyl oxygen.

Keywords: PheAla, AlaPhe, Hg^{2+}, Complexation

Antimicrobial activity of a new quinolins carboxamids opticlly pur

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The chemical synthesis of new antibacterial molecules is essential to fight against the phenomena of bacterial resistance. In recent years, many teams of researchers have been interested in the synthesis and study of new heterocyclic compounds. Quinolins constitute an important class of these compounds that have received a lot of interest through their various biological activities in particular: the activity antibacterial. New quinolins-carboxamids synthesized are obtained in good yield and they have been purified by column chromatography, after which we have characterized and identified them by proton and carbon NMR spectrometric analysis. The antibacterial activity of the synthesized compounds was tested against bacteria Escherichia coli (resistant), Escherichia coli (susceptible), Staphylococcus *Aurus, Staphylococcus saprofiticus*, *Aremonas acineterbacter*, *Vibrio cholerae*, Kliebsella, Aspergullusen using MH medium (Muller-Hinton).

Keywords: quinoléine, peptidic coupling, N-alkylation, Antibacterial activity

Antidiabetic activity of flavonoid from *linum usitatissimum* seeds in alloxan induced diabetic mice

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Linumusitatissimum Seeds have been traditionally used to treat diabetes mellitus and its complications in Morocco and several countries. The aim of the present study was to investigate the antidiabetic effects of the Flavonoid fraction of *linum usitatissimum* in alloxan induced diabetic mice. Experimental diabetes was induced in overnight fasted mice by

intraperitoneal injection of alloxan. Diabetic mice were orally administered with flavonoid extract of *linum usitatissimum* for 21 days. Glibenclamide, a standard antidiabetic drug, was used as a positive control drug. Body weight and fasting blood glucose (FGB) were measured every week. Oral glucose tolerance, lipid parameters, the Relative and Absolute Organ Weight, urea, creatinine, aspartate aminotransferase (ASAT) and alanine aminotransferase (ALAT) levels of diabetic mice were evaluated. Administration of *Linum usitatissimum* flavonoid extract to diabetic mice for 21 days reduced their fasting blood glucose levels. The extract improved body weight and glucose tolerance in diabetic mice. Furthermore, the biochemical liver and kidney functional tests have shown that serum biomarkers of liver and renal dysfunction were significantly reduced in treated diabetic mices. The present findings suggest that the flavonoid fractions of *linumusitatissimum* extract have a powerful antidiabetic and antihyperlipidemic effects in experimental diabetic mice, which can be beneficial in the management of diabetes and its complications.

Keywords: *Linumusitatissimum*, Diabetesmellitus, Alloxan monohydrate, Antidiabeticactivity, Flavonoids, Glucose tolerance

Evaluation of Acute And Subacute Toxicity Induced By Ethanolic Extract Of Pimpinella *Anisum* Seeds In Experimental Mice

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Pimpinella anisum seeds have been traditionally used in both medical and culinary field in several countries. The aim of the present study was to evaluate the toxicity of their ethanolic extract in experimental mice. The acute toxicity was performed where the limit dose of 2000 mg/kg body weight used. Observations were made and recorded for 24 h, and once daily further for a period of 14 days. The mice were weighed and various observations, like mortality, behavior, injury, or any signs of illness were conducted once daily during the period. For subacute study, groups of 5 animals each received, distilled water (control), 300 and 600 mg/kg of freshly-prepared extracts, respectively, every 24 h orally for 28 days. At the end of each study, biochemical parameters were evaluated. The acute toxicity for *Pimpinella anisum* Seeds 2000 mg/kg. Therefore, analysis of results may lead to the conclusion that the medium-term oral administration of the plants in both 300 and 600 mg/kg for 28 days does not cause toxicity.

Keywords: *acute toxicity*, sub-acute toxicity, *Pimpinella anisum*, Ethanolic extract

Study of the antimicrobial activity of some tetrazolic compound

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The family of tetrazole has been the subject of various studies by several scientists in previous years because of their importance in the application in human and veterinary medicine [1-2].

The almost universal resistance of pathogenic microorganisms to the various antibiotics on the market, creates an emergency situation to find as quickly as possible, other molecules that will be able to fight against these pathogenic microorganisms [3].

Thus, we conducted a study of the antimicrobial activity of some tetrazolic compound. The results obtained prove the effectiveness of these products against the proliferation of some pathogenic micro-organisms, but also make it possible to demonstrate a very important property in stereochemistry which is the difference between two isomers of position with respect to their effectiveness against the strains pathogens.

Keywords : Tetrazole; aminoalkyl; α-amino acid; *N*-alkylation; NMR 2D.

References:

[1] : R. N. Butler, in Comprehensive Heterocyclic Chemistry II ; A. R. Katritzky, C. W. Rees, Eds., Pergamon Press : Oxford, 1984,5, 791.
[2] : D. Kundu et al./ Tetrahedron Letters2009,50,2668-2670
[3] : Rauter A.P., Branco I., Tostao Z., Pais M.S., Gonzalez A.G et Bermejo J.B. 1989. Flavonoids from *Artemisia campestris Subsp Maritima. Phytochemistry.* 28 (8): 2173-2175.

Preparation and Antibacterial Activity of (2-phenyl-4,5-dihydrooxazole-4,4-diyl)dimethanol

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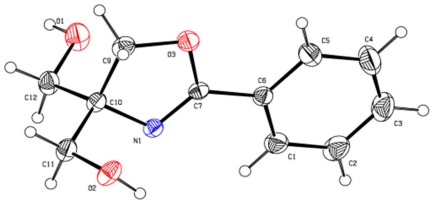
Oxazolines are heterocyclic compounds having an endo-imino ether (-N=C-O-) group [1], which have been found in several bioactive natural products [2–4]. They are used as synthetic intermediates or protective groups for carboxylic acid [5,6] and are also widely used as linkers in asymmetric catalysis [7].

We described in this communication, the preparation of (2-phenyl-4,5-dihydrooxazole-4,4-diyl)dimethanol, a precursor of new biheterocyclic α-amino aldehydes and α-amino acids.



The synthesized product was characterized by spectroscopic techniques, such as 1D and 2D NMR spectroscopy, mass spectrometry (MS), and X-ray crystallography. In addition it was evaluated for its antibacterial activity in vitro against *Escherichia coli* ATCC 25922 *(E. coli)* and *Staphylococcus aureus* ATCC 29213 *(S. aureus)*.

Keywords: Oxazoline ring, Antibacterial activity, 1D and 2D NMR spectroscopy.

References:

[1] Frump, J.A., *Chem. Rev.* (1971), 71, 483.
[2] Haefely, W., Kulcsár, A., Möhler, H., *et al*. *Adv. Biochem. Psychopharmacol*. (1975). 14, 131.
[3] Sakakura, A., Umemura, A., Kondo, R., Ishiharaa, K., *Adv. Synth. Catal*. (2007), 349, 551.
[4] Tsuda, M., Yamakawa, M., Oka, S., Tanaka, Y. *et al*. *J. Nat. Prod*. (2005), 68, 462.
[5] Meyers, A.I., Mihelich, E.D., *Angew. Chem. Int. Ed*. (1976), 15, 270.
[6] Gomez, M., Muller, G., Rocamora, M., *Coord. Chem. Rev*. (1999), 193.

Ethnobotanical study of medicinal plants used in the treatment of cancers in the city of Casablanca (West-central of Morocco)

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An ethnobotanical and ethnopharmacological study was carried out among the population of Casablanca, the objectives of which were the evaluation of the potential as well as the different modes of use and exploitation of medicinal plants by the population of this city (Western Morocco). In the traditional treatment of different types of cancers. The questionnaire used has two parts; the first concerns the informant and the second concerns medicinal plants used in the care of different types of cancer. The survey results made it possible to inventory 352 species of plants divided into 49 botanical families with a significant representativity of the following botanical families: Lamiaceae, Asteraceae and Myrtaceae. The species of the most used plants are *Syzygium aromaticum*, *Ajuga Iva*, *Marrubium vulgare* and *Inula viscosa* whose frequently used parts are: the leaves with a percentage of 26.38%, the aerial parts 25.55%. The recipes are prepared mainly by decoction and are mostly administered orally.

Keywords: ethnobotanical, ethnopharmacological, Casablanca, medicinal plants, cancer

Phytochemical screening and mineralogical study of extracts from the different parts "root, seeds, leaves, capitulas" of *Anacyclus pyrethrum var pyrethrum* and *Anacyclus pyrethrum var depressus*

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Medicinal plants have a long history of use from antiquity, are considered as an important source of bioactive molecules that have pharmaceutical interests. Within the framework of the valorization of medicinal plants of the Moroccan and Mediterranean flora, the study was interested in an endemic species, *Anacyclus pyrethrum* with its two varieties "*var depressus* and *var pyrethrum*". The purpose of this study is to proceed a phytochemical analysis with a

dosage of phenolic composition and flavonoids as well to a mineralogical analysis of the different parts "roots; leaves; seeds; capitulas" of *Anacyclus pyrethrum var depressus* and *Anacyclus pyrethrum var pyrethrum.* Phytochemical screening reveals the presence of several chemical compounds such as flavonoids, alkaloids, tannins, sterols and triterpenes, the oses and the holosides. The quantitative estimation of total phenols and flavonoids has shown that the extracts are rich in these compounds. The mineralogical analysis shows that its plants constitute an important resource of oligo-elements.

Keywords: *Anacyclus pyrethrum*, phytochemical analysis, mineralogical analysis, oligo-elements.

1,3-DIPOLAR CYCLOADDITION AS A VERSATILE TOOLS TOWARDS SPIROISOXAZOLINES

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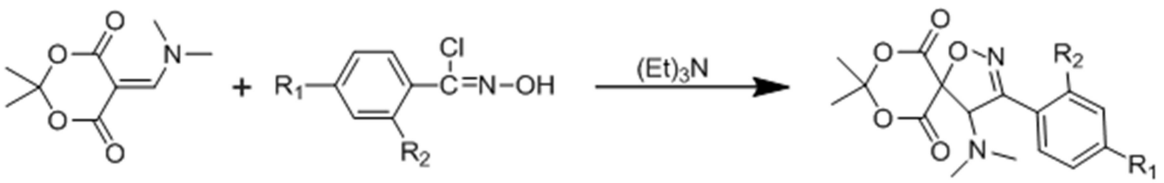
Spiroisoxazolines have various biological properties such as herbicidal [1], plant-growth regulatory activities [2] and have applications as antitumor agents [3], anti-HIVagents [4]. In addition, they are used as synthons to synthesis a several number of complex compounds [5]. Owing to their vast array of application they have attracted much interest for many years. To pursue our ongoing research which aims to synthesize heterocyclic compounds with biological interest [6-8], we describe in this work the regioselective synthesis of spiroisoxazolines obtained by the 1,3-dipolar cycloaddition of 5-((dimethylamino) methylene)-2,2-dimethyl-1,3-dioxane-4,6-dione and arylnitrile oxides. This concerted reaction affords a single regioisomer as evidenced by TLC. The regiochemistry and the structure of the obtained cycloadducts were established by spectroscopic techniques.



Keywords: Spiroisoxazolines, heterocyclic, 1,3-dipolar cycloaddition.

References:

[1] M. De Amici, C. De Micheli, V. Misani, *Tetrahedron.,* **1990**, 46, 1975.
[2] R. K. Howe, B. R. Shelton, *J. Org. Chem.* **1990**, 55, 4603.
[3] M. Smietana, V. Gouverneur, C. Mioskowski, *Tetrahedron Lett.,* **1990**, 40, 1291.
[4] S. Liu, X. Fu, F.J. Scheuer, P.J. Kelly-Borges*, J. Nat. Prod.,* **1997**, 60, 614.
[5] A. P. Kozikowski, *Acc. Chem. Res.,* **1984**, 17, 410.
[6] A. Mahfoud, G. Al Houari, M. El Yazidi, M. Saadi, L. El Ammari, *Acta Cryst*., **2015**, E71, o873-o874.
[7] M. Bakhouch, M. El Yazidi, G. Al Houari, M. Saadi, L. El Ammari, *IUCrdata*, **2018**, 3, x 181019.
[8] M. Bakhouch, M. El Yazidi, G. Al Houari, M. Saadi, L. El Ammari, *IUCrdata*, **2017**, 2, x 170677.

Effet de l'âge de feuilles de Sauge sur la teneur en métabolites et sur son activité antioxydante

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Le présent travail porte sur *Salvia Officinalis*, recensé parmi les Lamiaceae médicinales à usage traditionnel, lors d'une enquête ethnobotanique menée auprès d'un échantillon représentatif des habitants de Fès. Soixante-quinze espèces regroupées en 41 familles ont été recensées pour traiter 34 maladies. Les Lamiaceae constituent la famille la plus citée et elle est représentée par 14 plantes médicinales dont *Salvia officinalis.* Les différentes espèces citées connaissent un usage général contre les douleurs des voies digestives et des voies respiratoires ; elles sont également employées comme désinfectantes, calmantes ou immunostimulantes.

L'étude sur *Salvia Officinalis,* vise la recherche de l'activité antioxydante et la quantification desmétabolites en rapport avec l'âge de la feuille, cette étude a été menée sur des feuilles de sauge jeunes et d'autres feuilles matures. Les métabolites dosés sont, les polyphénols totaux, les taninset les flavonoïdes. Quelque soit le métabolite dosé, ce sont les feuilles jeunes qui se traduisent par une élévation en teneurs de ces différents métabolites. L'évaluation de l'activité antiradicalaire (par le test au DPPH) a montré que ce sont les feuilles à l'âge jeunes qui possèdent l'activité la plus importante (CI50=180µg/ml) par rapport aux feuilles matures (CI50=350µg/ml). Les résultats obtenus montrent que la sauge renferme des composés actifs différemment répartis en fonction de la maturité des feuilles.Ces composés actifs attribuent à cette planteune activité antioxydante plus au moins importante sous l'effet d'âge des feuilles.

Mots clés : *Salvia Officinalis*, métabolites, âge des feuilles, activité antioxydante

Ethnopharmacological survey of medicinal plants used in the traditional treatment of female infertility in Fez Region, Morocco

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An ethnopharmacological survey was carried out among 224 informants to collect the information on medicinal plants used for the traditional treatment of female infertility in the Fes, Meknes and Boulemane region. In total, 63 plant species belonging to 29 families were used against female infertility. The most frequently cited plants were *Lavandula officinalis* (26.33%), *Mentha pulegium* (13.83%), *Mentha suaveolens* (11.16%), *Rosmarinus officinalis* (10.71%) and *Petroselinum sativum* (8.03%). Furthermore, the present study represents a useful documentation for the preservation of this knowledge about medicinal plants and for the amelioration of women reproductive health.

Keywords: Ethnopharmacological survey, Medicinal plants, Female infertility, Traditional recipes.

Phase transfer catalysis (CTP) method in the synthesis of new bio active molecules derived from imidazo (4,5b) pyridines with high biological properties and their characterization

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Substituted heterocyclic compounds can offer a high degree of structural diversity and have a broad therapeutic effect. Among the various heterocyclic frameworks, indazole derivatives have been widely used in medicinal chemistry[1]. Imidazot[4,5-b]pyridine derived structures are of growing interest due their ability to l function as biological mimics of the well-explored and

highly developed benzimidazole core structure.[2] Imidazo[4,5-b]pyridine derived molecules possess diverse pharmacological properties,[3] including anticancer[4], antiviral,[5] and other important biological activities.[6] Despite the importance of these structures, imidazo-[4,5-b]pyridine are difficult to prepare in a regioselective manner. In order to obtain novel heterocyclic compounds having the imidazo[4,5-b]-pyridine nucleus, we were interested in the condensation of imidazo [4,5-b] pyridine derivatives with dibromed chains, under the conditions of phase transfer catalysis (CTP). The products structures were confirmed by NMR (1H, 13C).

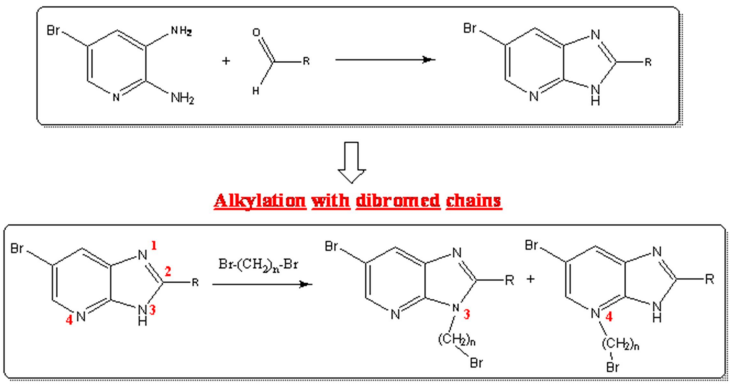

Schéma 1

Keywords: Imidazo[4,5-b]pyridine, biological activities, condensation, CTP, NMR (1H, 13C).

References:

(1) (a) Cerecetto, H.; Gerpe, A.; Gonzalez, M.; Aran, V. J.; deOcariz, C. O. Mini RevMed Chem 2005, 5, 869–878; (b) Gaikwad, D. D.; Chapolikar, A. D.; Devkate, C. G.; Warad, K. D.; Tayade, A. P.; Pawar, R. P.; Domb, A.J. Eur J Med Chem 2015, 90, 707–731.
(2) Carvalho, L. C. R.; Fernandes, E.; Marques, M. M. B. Chem.; Eur. J **2011**, 17, 12544–12555.
(3) Fuwa, H.; Kobayashi, T.; Tokitoh, T.; Torii, Y.; Natsugari, H.Tetrahedron **2005**, 61, 4297–4312.
(4) Temple, C.; Rose, J. D.; Comber, R. N.; Rener, G. A. J. Med. Chem. **1987**, 30, 1746–1751.
(5) Cundy, D. J.; Holan, G.; Otaegui, M.; Simpson, G. W. Bioorg. Med. Chem. Lett. 1**997**, 7, 669–674.
(6) Bavetsias, V.; Sun, C.; Bouloc, N.; Reynisson, J.; Workman, P.; Linardopoulos, S.; McDonald, E. Bioorg. Med. Chem. Lett. **2007**, 17, 6567–6571.

Antibacterial activity of Eucalyptus globulus essential oils

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In this study, we tried to evaluate in vitro the antibacterial activity of the essential oil extracted from the leaves and grains of the eucalyptus plant (Eucalyptus globulus). The extraction of the essential oils was carried out by hydrodistillation with a Clevenger type device. Yield rotates around 0.8% in the leaves and 1,8% in the seeds. The antibacterial effect of these two types of essential oils on strains of Escherichia coli, Staphylococcus aureus and Bacillus subtilis were evaluated in vitro by the dilution method. The antibacterial activity is differential on the species tested at different concentrations.

Keywords: Essential oils; Antibacterial activity; Eucalyptus; *Escherichia coli; Staphylococcus aureus ; Bacillus subtilis.*

QSAR study of ant-inflammatory activity for pyridine-based heterocyclic derivatives on using dft and molecular descriptors

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Quantitative structure-activity relationship modeling (QSAR) has now evolved as a well-recognized application tool in chemistry when a biological activity, or property, or toxicity is the end point of the study ofa series of chemical products representing a certain degree of structural similarity. QSAR increases the probability of finding new drug candidates, thus avoiding the synthesis and biological screening of fewer potential molecules, in addition to saving time and money. It also helps in screening thechemical properties or the toxicity of chemical products; therefore, serving in the prioritization of experimental testing and theprovision of excellent statistical filtering tools.

The aim of this work is to study the quantitative structure-activity relationship (QSAR) of a series of pyridine-based heterocyclic molecules for their anti-inflammatory effect and treatment of neuropathic pain using the functional theory ofdensity DFT (base 63-G (d)) to calculate the electronic and quantum chemical parameters. A variety of molecular descriptors are computed with the programs Gaussian, ACD/ChemSketch, Marvin Sketch, and ChemOffice. The datasets are subject to multivariate statistical analyses: principal components analysis PCA, multiple linear regression MLR, multiple nonlinear regression MNLR, partial least squares PLS,Y-randomization and artificial neural network ANN.

Both the obtained linear and non-linear models were validated. The statistical results also indicate that the predicted values were consistent with the experimental results (r = 0,957 and r = 0.968 for MLR and MNLR, respectively). To validate the predictive power of the resulting models, the external validation multiple correlation coefficients were 0.906 and 0.994 for the

MLR and the MNLR, respectively. These results show that both models possess a favorablestability of estimation and a strong power of prediction.

Keywords: DFT, QSAR, MLR, PLS, MNLR, cross-validation.

Structural study of different systems for organic solar cells in DSSC

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Novel four organic molecules used for dye-sensitized solar cell, these molecules based on indole as donor, were studied bay density functional theory (DFT) and time dependent DFT (TD-DFT) approaches, to shed light on how the different systems influence the performance of the solar cells. This study includes the predicting of the energy of HOMO and LUMO level, the gap energy, the Voc (open circuit voltage) and λ_{max} of absorption. The result shows that the system D-P-A performance of solar cells is the better.

Keywords: Indole, organic solar cells, TD-DFT, UV, optoelectronic properties, Voc (open circuit)

Ethnobotanicalsurvey, phytochemical and antibacterialactivity of essential oil of *Thymus algeriensis*, *Ammi visnaga* and *Myrtus communis*

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The aim of this study is to evaluate the ethnobotanical study, the chemical composition and the antibacterial activity of the essential oil of *Thymus algeriensis* from Imouzzer, the *Ammivisnaga* and the *Myrtuscommunis* from Taounate. The samples of *Thymus algeriensis*, *Ammivisnaga* and *Myrtuscommunis* give a yield of 2.25%, 0.61% and 0.47% in essential oil respectively.

Thymus algeriensis is dominated by Carvacrol (34.34%), δ-3-carene (20.18%), γ-Terpinolene (15.09%), cis-Sabinene (10.35%), germacrene D (5.15%) and Camphene (4.14%).) and α-pinene (2.98%). Terminalol (43.35%), linalool butyrate (37.86%), limonene (5.49%), isoamyl methyl-2-butyrate (5.12%) are the major constituents of the essential oil of *Ammivisnaga*. *Myrtuscommunis* is dominated by δ-Carene (32.9%), α-Pinene (23.92%), Neryl butyrate (9.95%), linalyl acetate (9.38%), α-Terpineol (4.71%), Methyl eugenol (4.54%), 1,8-cineole (2.41%), α-Guaiene(2.22%).

The antimicrobial activity was studied on four strains; *Bacillus cereus*, *Staphylococcus aureus*, *Escherichia coli* and *Salmonella typhi*. The essential oil of *Thymus algeriensis* shows strong inhibitory activity against Gram-positive and Gram-negative bacteria, followed by *Ammivisnaga* and *Myrtuscommunis* respectively. This bioactivity is mainly due to the presence of linalool and its derivatives which are known for their effectiveness against microbial agents.

Keywords: Ethnobotanical study, essential oil, phytochemistry, antibacterial activity, GC/MS, yield, *Thymus algeriensis*, *Ammivisnaga*, *Myrtuscommunis*.

Effect of *Origanum Majorana* L. leaves on anxiety in mice

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The aim of the present work is to evaluate the anxiolytic effect of a hydro-ethanolic extract of *Origanum Majorana* L. leaves in mice. The open field test, and light/dark test were used to assess the anxiolytic activity of the hydro-ethanolic extract of *Origanum majorana* L. extract (250 and 500 mg/kg, o.p.) and bromazepam (1 mg/kg, o.p.) were administered 60 min before the tests. The results showed that the hydro-ethanolic extract of *Origanum majorana* L. significantly increased the number of transition and the time spends in the light area compared to vehicle. Further, in the open field test, the extract significantly increased rearing, the time spend in the center assisted rearing, and number of squares traversed, all of which are demonstrations of exploratory behavior. The results of the present study suggest that a hydro-ethanolic extract of *Origanum majorana* L., leaves may possess an anxiolytic effect.

Keywords: Anxiolytic, mice, *Origanum majorana*, extract, light/dark test, open field test, Bromazepam

Etude Phytochimique et évaluation de l'activité antibactérienne des feuilles du *Juniperus phoenicea*

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Depuis quelques années, les plantes médicinales suscitent, dans le monde entier, un intérêt nouveau et persistant. Une grande partie de l'intérêt des recherches actuelles porte sur l'étude des molécules antibactériennes naturelles qui peuvent agir contre des bactéries résistantes. Notre étude a concerné l'identification phytochimique et l'évaluation des propriétés antibactériennes del'huile essentielledes feuilles du *Juniperus phoenicea*.

L'identification des différents composés chimiques de l'huile essentielle a été réalisée par la chromatographie en phase gazeuse (Ultra GPC Trace), couplée à un spectromètre de masse de type (PolarisQ). L'évaluation de l'activité antibactérienne a été réalisée selon la technique de diffusion sur gélose, HE de feuille du genévrier a été testé sur cinq souches bactériennes.

L'étude phytochimique a révélé la présence de α-pinène (60,21 %), Caryophyllene (11,63%), □- phellandrene (4,48 %) et autres composés. L'évaluation de l'activité antibactérienne a montré une efficacité modérée de l'huile essentielle des feuilles du *Juniperus phoenicea* contre les bactéries testées, avec des zones d'inhibition allant de 6 mm à 12 mm.

Mots clés : *Juniperus phoenicea*, Phytochimie, Activité antibactérienne

Synthesis and anticorrosion properties of new pyrazole against mild steel in hcl (1 M)

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Pyrazole derivatives are present in various natural and synthetic compounds with bilogical interest [1]. In addition, the presence of nitrogen atoms in the skeleton of these compounds make them good candidates for inhibiting corrosion of steels in acidic medium. In this context, the study of the inhibitory properties of nitrogenous and oxygenated heterocycles as well as their mode of action has been the subject of several studies [2,3]. Furthermore, the development of simple processes to access to these kind of compounds has received great attention [4,5]. In fact, the most preferred strategy is the aza-Michael addition of nucleophiles containing NH to α,β-unsaturated ketones [6,7].

The present work describes the preparation and the characterization of heterocyclic compounds containing pyrazole frameworks. We also performed electrochemical studies to show the anti-corrosion behavior of these compounds in acidic medium (HCl, 1M).

Keywords: Pyrazole, aza-Michael, anti-corrosion, elechrotchemistry

References:

[1] P. M. Dewick, Medicinal Natural Products: A Biosynthetic Approach, John Wiley & Sons Ltd, Chichester, 3rdedn, **(2009).**

[2] Tebbji, H. Ouddad, B. Hammouti et al, Applied Surface Science, 241, 326, **(2005)**.

[3] M. Benabdellah, R. Touzani et al, Materials Chemistry and Physics, 105 **(2007)**.

[4] T. B. Poulsen, K. A. Jørgensen, Chem. Rev., 108, 2903, **(2008)**.

[5] S. Bayindir, E. Erdogen, H. Kilic, N. Saracoglu, Synlett, 1455, **(2010)**.

[6] M. Bandini, A. Eichholzer, M. Monari, F. Piccinelli and A. Umani-Ronchi, Eur. J. Org. Chem., 2917, **(2007)**.

[7] M. Gandelman, E. N. Jacobsen, Angew. Chem., Int. Ed., 44, 2393, **(2005)**.