

# Short notes



Edna Cabecinha presenting the theme «Ecological integrity assessment in aquatic ecosystems» as part of the Science at Lunchtime initiative.

Location and contacts

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For more information about CITAB Research Center, tag this code





FIREGLOBULUS aimes to study fire effects in eucalypt plantations.

#### Bringing researchers together: Science at Lunchtime

At the "Science at Lunchtime" session held on September 14th, Professor Edna Cabecinha, gave a presentation on "Ecological integrity assessment in aquatic ecosystems: A multi-scale approach towards the definition of the ecological status of Mediterranean reservoirs". Professor Cabecinha explained how holistic Stochastic-Dynamic Methodology and Cellular Automata modelling can capture expected changes in land use (urbanization and agriculture) and how they will affect the physicochemical and ecological quality of reservoirs in the Douro region of northern Portugal. Future projects in this area will include climate change and greenhouse gas emissions data for modelling the ecological integrity of these water bodies. The ultimate goal of this research is to develop hands-on tools for resources managers and decision makers regarding future scenarios of change and compliance with the WFD.

#### **FIREGLOBULUS: Prescribed Burning in Eucalypt Forest**

A new project has been approved for funding under the QREN SI I&DT programme (National Strategic Reference Framework NSRF/QREN). The project is called "FIREGLOBULUS: Utilização de Fogo Controlado em Eucaliptal" (Prescribed Burning in Eucalypt Forest) and will be carried out in partnership with the company GiFF S.A. The 3 year long project had a total budget of approximately 460 k€: UTAD's allocated budget is 190 k€. The project will focus on the study of fire behaviour characteristics and fire effects in eucalypt plantations, thereby providing the scientific foundation needed to implement prescribed burning treatments and, assisting fuel treatment decision-making. FIREGLOBULUS will closely interact with the ongoing MIT-Portugal project "FIRE-ENGINE - Flexible Design of Forest Fire Management Systems".

#### 12<sup>th</sup> European Heathland Workshop

CITAB co-organized the 12th European Heathland Workshop with the University of Leon. The event took place from the 12th to the 18th of June in Spain and Portugal. Within the current patterns of global change, oceanic shrubland ecosystems are increasingly threatened by the abandonment of traditional management practices, higher fire incidence, nitrogen deposition in naturally nutrient-poor soils, and afforestation of habitats which are priority for nature conservation at the European level. The 2011 edition of the workshop focused on impending threats to heathland biodiversity, the discussion of ecological bases and management models for the future conservation of these unique landscapes in Europe.



# **Highlights and Editorial**

This second printed issue of our Newsletter is dedicated to the dissemination of CITAB's major activities (scientific and co-scientific) over the last 3 months. This will help us meet one of CITAB's key objectives and commitments, namely the effective dissemination of the centre's major scientific activities, which often do not reach our partners and colleagues.

Apart from a brief description of collective activities (seminars, congresses and seminars) the newsletter also includes a series of both more specific and more comprehensive articles, dedicated to ongoing scientific projects that might be of interest to our readers. CITAB's scientific events have been very successful, promoting dynamic interaction between researchers and attracting participants from the private sector. This enables them to not only to gain insight into CITAB's research capacities and results obtained but to provide us with positive feedback on private sector expectations and needs. CITAB will continue to develop this successful strategy for other key agricultural chains.

We would be pleased to hear from readers requiring further information regarding any of the presented events. We aim to improve interaction with other colleagues and institutions and continue to develop fruitful, productive and dynamic partnerships.

Thank you very much.

Eduardo Rosa, CITAB's Director

## CITAB seminar "From the olive tree to olive oil - New challenges"

Organized by CITAB's "Sustainable Agro-food Chains" (SAC) group, the event took place on October 12th at UTAD's Agrarian Sciences Auditorium and was attended by renowned national speakers from scientific, technical and business sectors and about 170 participants. During the morning session, invited speakers presented topics on climate change and the sustainability of olive grove production. The afternoon session addressed issues on marketing of olive products in an increasingly global context based on case-studies given by stakeholders and the "Cultivate your future" prize was awarded to undergraduate students by the Confederation of Portuguese Farmers.



Centre for the Technology of Agro-Environmental and Biological Sciences

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The small exhibition of high quality products provided by a group of olive oil producers.

Magnetic Issue hot topic





# **Research & Events**

FUZZY METHODS FOR KNOWLEDGE - BASED SYSTEMS

**CITAB Research Centre - UTAD University** 

21 - 23 SEPTEMBER 2011

Museu do Douro, Régua, Portuga

EUROFUSE WORKSHOP 2011

#### CITAB organized EUROFUSE 2011

Fuzzy Methods for Knowledge-Based Systems, held in the Museu do Douro, Régua - Portugal, in September 21-23, 2011. (http://www.citab.utad.pt/eurofuse2011)

EUROFUSE was established in 1998 as the EURO (the Association of European Operational Research Societies) Working Group on Fuzzy Sets, a successor of the former European Chapter of IFSA (the International Fuzzy Systems Association). The working group is coordinated by Bernard De Baets (KERMIT, Ghent University, Belgium) and János Fodor (Óbuda University, Hungary).

EUROFUSE 2011 was the last of a series of EUROFUSE workshops, including the successful EUROFUSE 1999 (Budapest, Hungary), EUROFUSE 2000 (Mons, Belgium), EUROFUSE 2001 (Granada, Spain), EUROFUSE 2002 (Varenna, Italy), EUROFUSE 2004 (Warsaw, Poland), EUROFUSE 2005 (Belgrade, Serbia), EUROFUSE 2007 (Jaen, Spain) and EUROFUSE 2009 (Pamplona, Spain).

This edition was organised by Pedro Melo-Pinto and Pedro Couto. The theme of the workshop was "Fuzzy Methods for Knowledgebased Systems". The aims of the workshop were to establish the New Trends in the field and to bring together researchers and practitioners in an informal atmosphere. For this reason, the number of participants was limited and all presentations were plenary.

Fuzzy logic play a key role in knowledge-based systems. Knowledgebased systems support decision making activities in an intelligent way. They account for inputs of different nature, such as symbolic and numerical data, and are expressed in various representation formats.

The workshop included contributions from fuzzy logic and knowledge-based systems such as preference representation and modelling, aggregation operators, knowledge extraction, decision making and extensions of fuzzy sets. At the same time, it addressed implementations of such systems in different areas, such as image processing and communication.

EUROFUSE 2011 had three distinguished keynote speakers: Francisco Herrera (Granada, Spain), Radko Mesiar (Bratislava, Slovakia) and José Luis Garcia Lapresta (Valladolid, Spain). The three day program consisted of a total of 37 lectures with 70 participants from 10 countries.



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EUROFUSE

Pedro Couto (CITAB-UTAD, Portugal)

Pedro Melo-Pinto (CITAB-UTAD, Portugal)

Bernard De Baets (Kermit-UGent, Belgium)

János Fodor (Obuda University – Hungary)

Rita Ribeiro (Uni-Nova-Univ. Nova de Lisboa, Portugal)

Carlos Serôdio (CITAB-UTAD, Portugal)

Pedro Mestre (CITAB-UTAD, Portugal)

João Matias (CM-UTAD, Portugal)

Promoters and Chairs

**Organizing Comittee** 



### CITAB organized the Workshop entitled "Data and Uncertainty" held in UTAD, in September 20, 2011

This event addressed various aspects of modelling processes, namely modeling the uncertainty inherent to all kinds of experimental data. Uncertainty is always present in any measurement, as a result of errors in experimental data. These errors are quantitatively estimated by uncertainty, a fundamental important concept that all scientists should take into consideration when reporting results from their scientific activity.

The Workshop had three distinguished invited speakers: Humberto Bustince from the Public University of Navarra, Pamplona, Spain, that gave the lecture entitled "Image Processing and Fuzzy Logic", Javier Montero from Complutense University of Madrid, Spain, with the lecture "Stop blaming Uncertainty" and João Paulo Carvalho from the IST, Technical University of Lisbon, Portugal with the lecture "Identification and classification based on approximate estimations of Top-K values in data streams".

#### 2<sup>nd</sup> Seminar on Biological Olive Culture

The 2<sup>nd</sup> two day Seminar on Biological Olive Culture took place at the Figuera de Castelo Rodrigo Cultural Centre, between the 9th and 10th of September 2011. The event was organized by CITAB – UTAD, the Institute for Mediterranean Agricultural and Environmental Sciences of the University of Évora (ICAM / EU), the Mountain Research Center of the Bragança School of Agriculture (CIMO / ESAB), the Farmers Association for Integrated Production of Mountain Fruits (AAPIM), the Oil Producers Association of the Beira Interior Region (APAB) and the Transumância and Nature Association (ATN).

The theme of the seminar, "Olives: goods and ecosystem services", formed part of the project "Increasing the functional biodiversity of the olive groves in the development of biological protection against pests" funded by the Operational Programme for Competitiveness Factors - COMPETE (Reference FCOMP-01-FEDER-0124-008685) and National Funds through - Foundation for Science and Technology (FCT; Reference PTDC/AGR-AAM/100979/2008). The aim of this event was to promote the exchange of experiences between different sectors related to olive grove ecosystems (technicians, researchers, entrepreneurs, territorial managers).



# **Research & Events**





Workshop Data and Uncertainty session.







Major achievements of António's work include digital image correlation to styde mechanical deformation over a wide range of materials.

#### Measurement of displacement fields based on digital image correlation and differential techniques

CITAB's integrated member António M. R. Sousa defended his PhD thesis "Measurement of Displacement Fields Based on Digital Image Correlation and Differential Techniques" in public sessions that took place on the July 25th of 2011. The international jury included Dr. Hubert Maigre, Equipe Mécanique des Solides et des Endommagements from France. The main focus of António's work was the development of a new method to measure displacement fields based on digital image correlation and differential techniques along a sequence of images on the surface of an object submitted to a deformation. Results obtained from both numerical and experimental tests will enable future refinement in the characterization of a wide range of materials and their behavior.

#### CITAB at 2011 Novi Sad International Agriculture Fair, Serbia

CITAB is developing studies on the potential effects of climate change on the quality and anti-oxidant effect of cherries, chestnuts, apples and vegetables. Physiological studies are underway to better understand how to overcome the effect of climate changes in fruits and vegetables. The functional biodiversity of Portuguese vines and olive groves is also under study and presented .Another major project is focusing on promoting added value to agri-food co-products either by finding new phytochemicals that can be used as biopesticides or as ingredients in functional foods. CITAB specialiases in the agro-industries of wine, fruit, vegetable and bread agro-industries. These studies are linked to the use of regional crop varieties, their quality and performance, the Controlled Origin of Denomination and traceability of wine and olive oil.

## **CITAB** forges international collaborative links in Brazil



Dr Hughes participated in fieldwork organized by Tyanan Henrique Tupinambás as part of his doctoral studies. Fieldwork involved the collection of macroinvertebrae and physicochemical samples and habitat data on the the Itutinga and Camargo reservoirs and the Rio Grande, in the Rio Grande catchment in the Minas Gerais Region.

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Professor Marco Callisto of the Universidade Federal de Minas Gerais (UFMG), Brazil invited Dr Samantha Hughes, assistant researcher in CITAB's EcoIntegrity research line, for a two week visit to Brazil in August 2011, to participate in a series of events held at the UFMG campus and join researchers in fieldwork.

During the first week, Dr Hughes participated in a series of meetings and a workshop at the UFMG campus in Belo Horizonte. The meetings involved lecturers and researchers from Brazilian and Portuguese universities and were held to (i) develop collaborative actions and (ii) promote mobility of university researchers. Suggestions for several advanced courses were also forwarded by participants. Dr Hughes was an invited speaker at the 2 day workshop "Gestão de Bacias Hidrográficas: Workshop sobre suas bases teóricas, política pública e ações transdisciplinares" organized by UFMG. Dr Hughes gave a 30 minute talk on "River restoration: principles, concepts and methods".

During the second week Dr Hughes carried out fieldwork on selected reservoirs in the Minas Gerais region with Taynan Henriques, a doctoral student at UFMG who is working on the development of macroinvertebrate based environmental flow models for the Rio Grande, a highly regulated river. As part of his doctoral sandwich course, Taynan will be spending 8-10 months working on his thesis with CITAB researchers in Portugal during 2012.

## II Chestnut European Meeting **Production and Marketing**

The meeting, held in Bragança from the 16th – 17th June 2011, was organized by CITAB members José Gomes Laranjo and Teresa Pinto in collaboration with colleagues from Polytechnic Institute of Bragança (Albino Bento, Anabela Martins and Eugénia Gouveia) and CITAB stakeholders Arborea (António Borges) and Sortegel (Vasco Veiga and Letícia Pereira). Presentations were given by Paula Oliveira and João Paulo Moura. There were 250 participants from Portugal, Spain, France, Italy, Greece, Hungary, Croatia, Macedonia and Brazil.

During the meeting, Jacques Dasque (AREFLH) stated that the Production and Marketing sectors need to be better organized in order to increase capacity to discuss the pressing issues concerning the new PAC 2020 and global trade.

Presentations were given outlining chestnut production and PAC reform and the fruit and vegetable Common Market Organization (CMO); the main goals of the future European Association were also presented. Each national delegate made a presentation providing an overview of production issues (management, pest and diseases and plant certification) in their own country's sector. Industry, trade and marketing questions were addressed during the 2nd day of the meeting.

### MARCADUERO Project starts

The approved European Project MARCADUERO: "MARCA DUERO DURADERO: Sostenibilidad, Calidad y Promoción" da INICIATIVA INTERREG IVA, POCTEP began on July 21st this year. This project is a collaborative initiative bringing together activities of the Biosystems Engineering group and the EcoIntegrity group. The project will focus on developing a Quality Label award system for Outdoor Active Tourism Companies and Services to Research. Based on the most advanced technology currently available, the award system will endorse practices that promote wealth and well-being and that develop a more enlightened environmental and cultural conscience.

## Natural Gas Utilization Workshop

The "Natural Gas Utilization" workshop, jointly organized by CITAB (Prof. Nuno Moreira) and Sonorgás - Sociedade de Gás do Norte, S A, took place on the 12th September in the Auditorium of the Forestry Sciences Department at UTAD. The workshop focused on the exchange of information on the use of natural gas, the characteristics and advantages of this commodity and the dissemination of new technologies. With approximately 40 participants, mostly from the national private sector, the workshop also focused on preparing specialized work for the World Gas Conference which will take place in June 2012 in Kuala Lumpur, Malaysia. Organized by the International Gas Union (IGU), the World Gas Conference is the most important event in the sector's calendar, with more than 5,000 participating academics and professionals

# **Research & Events**





The meeting (www.utad.pt/IIibercast) also provided an opportunity to present the main goals of the Portuguese Chestnut Network - RefCast, and to promote the public signature of its statutes.



MARCADUERO Press conference in Zamora, Spain.





## Grapevine research at CITAB-UM

#### Alberto Dias, Ana Cunha, Hernâni Gerós, University of Minho - SAC subgroup

Our group uses a complementary approach in the study of the ecophysiological, physiological, biochemical and molecular aspects of grapevine development, yield and fruit quality. We are particularly interested in the development and maturation processes of the grape berry, how these processes are affected by drought and heat, and how to apply these findings to improving fruit quality in the face of new climate scenarios. We also study aspects of grapevine defence against Esca disease, a major problem for Portuguese (and EU) viticulture.

Phloem transport provides the materials needed for growth and development of reproductive structures, storage and developing organs, and has long been recognised as a major determinant in crop yield. The grapevine is a good example of a crop where fruit sugar accumulation has an important economic impact. Massive sugar accumulation into the grape berry flesh cells starts at véraison (the onset of ripening) and continues until harvesting, figure 1.



Figure 1 - Speculative model for phloem unloading of sugars in grape berries (Adapted from Agasse et al. 2007 in In: Macromolecules and Secondary Metabolites of Grapevine and Wine, P. Jeandet, C. Clément and A. Conreux (eds), Intercept, Lavoisier (Paris, London, New York), pp 12-22).

Thus, the understanding of sugar transport mechanisms and regulation into grapevine sink tissues is of fundamental importance. Many research groups, including our own, have made significant inroads in this research area, aiming to improve wine quality as a result of better grape growing practices.

However, successfully unlocking of the secrets behind grape berry development and ripening still remains a major scientific challenge. For instance, our group has found that the sugar transporter VvHT1 (Vitis vinifera hexose transporter 1) mediates glucose import in young berries and that its expression is modulated by the sugar status of berry and by extreme temperatures. There is evidence that fruit photosynthesis may also contribute to the fruit carbon budget.

We have developed fluorescence imaging techniques to study the relationship of this photosyntheticallyassimilated carbon with fruit growth and sugars and malic acid metabolism. Sugar, acid, phenolic and water status of the fruits is affected by water availability, particularly in grapevines subject to severe drought conditions and high temperatures (4 FCT research projects - see national FCT projects box).



Protoplasts from grape berry mesocarp observed under the light microscope in a Malassez chamber for visual purity checking and counting (A). Inset: intact protoplast labelled with Neutral Red showing the acidic nature and integrity of the vacuolar apparatus. Protoplasts observed under UV light (epifluorescence) after staining with fluorescein diacetate (FDA) to measure viability (B). Inset: a close-up view of an intact protoplast highlighting the integrity of both the plasma membrane and tonoplast (Fontes et al. 2010. Recent Patents on Biotechnology 4: 125-129).

Esca is a destructive disease that affects grapevines worldwide. In Portugal this disease became a major concern due to a dramatic increase in its incidence, particularly in the Vinho Verde region. The study of the defense mechanisms of V. vinifera cv. Alvarinho against Esca (see disease symptoms in figures 2 and 3) started some years ago via FCT funded projects.

Statistical analysis of NMR spectra obtained from diseased, asymptomatic and healthy leaves revealed that Esca induced significant metabolic alterations that could be detected in an early asymptomatic stage. Diseased leaves were found to have higher contents in phenolic compounds and lower carbohydrate levels, suggesting a rerouting of carbon from primary to secondary metabolism. Increased levels of other specific metabolites also suggested the activation of other defense mechanisms.

We have also used cell suspension cultures of V. vinifera cv. Vinhão (Vv) to study the putative response of V. vinifera to Phaeomoniella chlamydospora (Pc), a fungus frequently associated with esca and grapevine decline. Pc extract induces an oxidative burst with a biphasic pattern and increases the phenolic production of stilbenes in Vv cells. Induction of defence-related genes expression in Vv cell cultures upon Pc extract elicitation was investigated by RT-PCR. Elicitation increased the expression of class 6 and class 10 pathogenesis- related proteins, β-1,3-glucanase, class III chitinase, lipoxygenase, pheny lalanine ammonia lyase and stilbene synthase. Our findings indicate that Vv in vitro cell cultures could be an important tool in the study of esca disease, offering a simple, rapid and selective method of evaluating plant/ escaassociated fungi interactions.

#### National FCT projects and grants associated

PTDC/AGR-ALI/100636/2008 - "GrapeBerryFactory - Sugars, acids, phenolics and water on grape berry development and ripening".

SFRH/BD/17944/2004 - "Contributions to the study of Vitis vinifera defence mechanisms against esca"

SFRH/BD/23169/2005 - "Tonoplast transporters mediating sugar accumulation in the vacuole of grape berry cells".

SFRH/BD/32159/2006 - "Evaluation of morpho-physiological responses and defense mechanisms induced by BCAs applications in grapevines (cv. Alvarinho) infected with Phaeomoniella chamydospora (and in general Esca-disease)"

SFRH/BD/64587/2009 – "Biotechnological, biochemical and molecular approaches towards the study of solutes accumulation -mineral and organic compounds - in the vacuole of grape berry cells".

SFRH/BD/75257/2010 – "How do high temperature and temperature fluctuations affect grape berry sugar status? A biochemical and molecular approach".







Figure 2 - Foliar symptoms of Esca in cv. Alvarinho leaves.



Figure 3 - Longitudinal section of a trunk of a 25-year-old grape vine cv. Alvarinho affected by Esca.

