



Highlights and Editorial

Climate Change and its effects at the Agriculture and Environmental sectors are a strong topic at CITAB research priorities, and the centre's expertise at this subject has proved that we have and will keep on having an important role on finding innovative solutions to answer this urgent necessity.

With the eyes of the world recently converged at the Paris Climate Summit, CITAB wants to keep the subject on the agenda and we dedicated the scientific "Hot Topic" of this issue to the most recent and important research we have been conducting at our unit.

Moreover, as a part of our internationalization and cooperation strategy, CITAB has continued to envisage a number of partnerships and events that we are also highlighting, such as CITAB's development of an evaluation tool for measurement of efficiency of the compensatory measures for the Baixo Sabor Enterprise for EDP, the PIMA project, the 10th Iberian and 7th Iberoamerican Conference on Environmental Contamination and Toxicology (CICTA 2015), which was held at UTAD with the cooperation of CITAB, and the platform ModelVitiDouro that will model grape productivity in the Douro Valley.

Eduardo Rosa, CITAB's Director

CITAB develops an evaluation tool for measurement of efficiency of the compensatory measures for the Baixo Sabor Enterprise for EDP – The PIMA project



The PIMA project is coordinated by Professor João Cabral.

CITAB researchers are carrying out monitoring studies for EDP to assess the effectiveness of a range of compensatory measures implemented as a result of the environmental impacts resulting from the construction of the Lower Sabor Hydroelectric project owned and run by EDP.

Based on a contract between EDP Production and UTAD, the Integrated Programme of Environmental Monitoring (PIMA) of the Lower Sabor Hydroelectric Project started in January 2015.

The PIMA project is coordinated by Professor João Cabral and involves a multidisciplinary team of CITAB Eco-integrity researchers mainly from the Applied Ecology Laboratory and the Fluvial Ecology Laboratory who are working on aspects of climate, fauna and flora. The PIMA project is being

carried out in the geographic area where UTAD is situated and will offer a range of services to the community. PIMA is important in two key aspects: mid to long term it will help establish highly important strategic partnerships with private companies, promoting knowledge transfer, guaranteeing the sustainability of actions and activities. It will also provide a unique opportunity to gather real time data on the impacts of the construction of a large dam on an extensive area of immense conservation value, and allow mitigation measures to be evaluated in scientific-technical areas of great relevance for some of CITAB research lines.

The preliminary results of the PIMA project were presented on the 23rd October at the EDP headquarters in the City of Porto. UTAD coordinators were present together with members of the Environmental Supervisory Commission and the EDP environmental team. Presentations showed how the project had progressed in its first year, presenting preliminary results from several environmental descriptors.



In this edition



European Snow Vole identified for the first time in Portugal



CITAB researchers conduct a series of methods and analyses to monitor the water conditions.

A Team of CITAB and CIBIO-InBIO researchers has confirmed the presence of the European snow vole in the Montesinho Region of Bragança.

A research team that includes CITAB researcher Hélia Vale Gonçalves has confirmed the first record of the occurrence of the European snow vole (*Chionomys nivalis*) in the Montesinho Region of Bragança, Portugal.

The European snow vole's habitat is usually associated with mountain systems ranging from Southern Europe to Turkmenistan. The presence of this species in Portugal was confirmed through the analysis of morphological and genetic features of two individuals captured in October 2014. The results revealed that the Portuguese specimens were related to the other Iberian groups of voles.

The findings of this study, carried out at CITAB and at the Research Centre in Biodiversity and Genetic Resources (CIBIO-InBIO), were recently published by the Italian Journal of Zoology, available at <http://goo.gl/NI9UBS>, and made the news in national media.

CICTA 2015 - Environmental Sustainability: insights to the future



CITAB researchers conduct a series of methods and analyses to monitor the water conditions.

Growing levels of environmental pollution, originating from different sources, is considered an issue on par with climate change impacts that affects species conservation and natural habitats in the near to mid-term future. Investment in scientific research, risk analysis and technological innovation is crucial to support robust policy development and sustainable solutions. Such initiatives modify both societal perception and behaviour concerning the reduction of environmental threats. These issues were discussed at the "10th Iberian and 7th Iberoamerican Congress of Environmental Contamination and Toxicology" (CICTA 2015), held in July at UTAD. The meeting covered a wide range of research themes supporting sustainable development and management of environmental resources, from field and lab

experiments, to computational modelling approaches. Highlight topics included the development of novel environmental monitoring technologies such as the use of satellite images and the identification of new biomarkers for sub-lethal endpoints. Environmental rehabilitation addressed new techniques for soil decontamination and reducing eutrophication in aquatic ecosystems at different spatial levels in river basins. Xenobiotics were discussed, with special emphasis on emerging toxic compounds, such as pharmaceuticals, nanomaterials and microplastics and the need to identify chemical modifications and biological effects.

CICTA 2015 provided a forum to allow progress in knowledge on environmental contamination and toxicology including xenobiotics bioaccumulation and biomagnification processes, and the repercussion of these processes across the trophic chain, including effects on humans.

CITAB Researcher visits top USA University



Pedro Melo Pinto meets Professor Won Suk Lee and Professor Dábio Leandro Borges (University of Brasília) at the University of Florida.

CITAB Researcher Pedro Melo Pinto visited the Precision Agriculture Lab at the University of Florida (UF), in Gainesville, USA, to develop collaborative links between institutions. UF is, according to several ranking lists, one of the world top universities, especially on the agrarian sector.

CITAB researcher and CITAB Vice-Director Pedro Melo Pinto recently visited the Precision Agriculture Lab of University of Florida (UF), in Gainesville, USA. The lab has considerable expertise in the use of images (RGB, multi and hyperspectral) in agriculture, applied mainly to citrus production.

"The main objective of the visit was to get to know Professor Won Suk Lee from Agricultural & Biological Engineering Department of UF team work and to discuss future collaborations between CITAB and UF", explains Professor Pedro Melo Pinto. The solutions presented by the lab team, coordinated by Professor Won Suk Lee, are technologically advanced, regularly adopted by the industry and present obvious links with CITAB's 2016-2020 Strategy project.



Simone Varandas works on freshwater bivalves in Morocco and in European countries

Freshwater bivalve researchers Dr. Simone Varandas (CITAB/UTAD), Dr. Manuel Lopes-Lima (CIIMAR-LA/CIBIO), Dr. Ronaldo Sousa (CIIMAR-LA/UMinho) and Dr. Amílcar Teixeira (IPB/CIMO) carried out an extensive field sampling programme of freshwater bivalves in Morocco in 2014 and 2015. These investigators collaborated with Prof. Mohamed Ghamizi of the University of Cadi Ayyad, Faculty of Sciences, and Marrakech to discuss collaborations in future sampling of freshwater bivalves communities and sampling techniques used in aquatic ecosystems and joint contributions for upcoming international meetings. A formal collaboration agreement is being drawn up between the respective research institutions to enhance knowledge transfer and research output.

The team of researchers also visited Greece in September/October 2014 to collect tissue samples of Greek freshwater bivalves for genetic analysis and discuss future collaboration with researchers at the Hellenic Centre for Marine Research, Institute of Marine Biological Resources and Inland Waters, Greece. During the field expedition, the Greek team collaborated on freshwater bivalves sampling in freshwaters of continental Greece including Peloponnese, Central and North Greece.

The team of researchers also visited the El Palmar del Experimental Aquaculture Centre (CAE) in Spain. CAE is a non-profit organization, dedicated to the study of vulnerable or endangered aquatic species, wildlife and vegetation and their reintroduction into the wild. Various ongoing CAE projects on the recovery and restocking of endemic species were discussed such as saramugo, European eel, among others, as well as the possibility of future collaboration on projects on freshwater bivalve species.

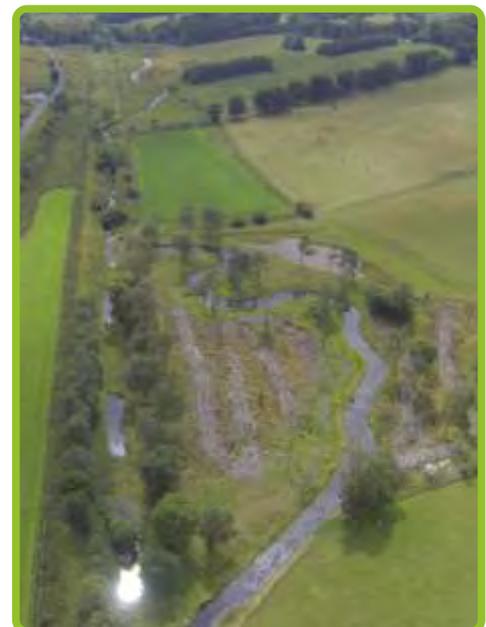


Simone Varandas collecting mussels tissue for genetic analysis.

CITAB Researcher visits river restoration project in Scotland

Dr. Samantha Jane Hughes made a brief working visit to the Tweed Forum in Scotland in August this year to gain hands on experience and knowledge on the role of this prize winning organisation and some of its partners in integrated catchment management issues. Situated in the Borders area of Scotland and England, the River Tweed is one of the most prolific salmon rivers in the UK. Established in 1991, the Tweed Forum - a registered non-profit making company - comprises state, private and public organisations and individuals that represent different interests in the River Tweed catchment. They work together, through holistic and integrated management and planning, to promote sustainable catchment use to provide multiple benefits. The Tweed Forum, a member of the UNESCO HELP (Hydrology for the Environment, Life and Policy) programme, was awarded the 2015 UK River Prize & Nigel Holmes Trophy by the UK River Restoration Centre as a result of its continued outstanding work in integrated catchment issues.

During her brief visit, Samantha accompanied Dr Derek Robeson, responsible for the Tweed Forum Land Use Strategy pilot, to carry out land surveys to regreen a small farm property in the Tweed catchment. The Land Use Strategy pilot promotes natural flood management techniques and raise awareness of integrated catchment management and environmentally responsible farming practices. She also collaborated with key Tweed Forum partners – Scottish Environment Protection Agency and the Centre for Water Law, Policy & Science (University of Dundee) on the Eddleston Water restoration project. During her visit to Eddleston Water, Dr Hughes collaborated in the quantitative surveys of river substrates and carried out qualitative surveys of newpond habitats created from the remeandering of a previously channelized river section of the Eddleston. Samantha also gave a presentation on possible collaboration between CITAB researchers, the Tweed Forum and the University of Dundee focusing on the use of dynamic modelling to assess the multiple benefits of river restoration measures.



The Eddleston Water restoration project in Scotland where Dr. Samantha Hughes collaborated with the Tweed Forum and the University of Dundee.



CITAB participates in the "Alien Challenge" Cost Action (Action TD1209)



The Cost Action "ALIEN CHALLENGE (ACTION TD1209)" team.

The CITAB Applied Ecology Laboratory took part in the "Models in Invasion Ecology: Challenges and Applications" Training School organized by CIBIO/InBIO (University of Porto) as part of the COST Action TD1209 Alien Challenge. This COST Action aimed to provide insights on modelling techniques, concepts and approaches to assess the impact of invasive species on biodiversity and ecosystems. Improving links the use of scientific output and socio-economic applications were also addressed such as the development of decision-making tools for mitigating the impact of invasive alien species. The Training School brought together expert researchers from Portugal, Spain, Switzerland, Germany and Norway, to facilitate knowledge transfer between young researchers from all over Europe.

IND_CHANGE PROJECT - INDicator-based modelling tools to predict landscape CHANGE and to improve the application of social-ecological research in adaptive land management



João Cabral is the project coordinator at CITAB.

The IND_CHANGE project brought together 20 researchers from five research institutions to carry out multi-disciplinary research on the development of management tools to support biodiversity conservation, provision of ecosystem services and infrastructure risk assessments for land use and environmental planning issues. Funded by FCT and FEDER/COMPETE, the project focused on the Vez and Sabor river basins as pilot study areas. Several modeling tools were developed and tested in the pilot areas and then placed on an interactive platform developed specifically to support decision making for sustainable territorial management. The CITAB Applied Ecology Laboratory team took part in the project's final workshop which was organized to share and discuss modelling outputs with

invited potential stakeholders, the eventual end users of the tools developed throughout the project, which officially ended in September 2015.

Visiting researcher Ana Poveda is staying for three weeks at CITAB-UMinho laboratory for a collaboration work



Professor Ana Poveda and Professor Rui Oliveira working at CITAB-UMinho Lab.

Ana Poveda is an Associate Professor of the Central University of Ecuador and a researcher at the International Center of Zoonosis, Quito, Ecuador. Her research interests include the study of DNA replication and the interactions of the replication protein mechanisms. Ana uses baker's yeast as an experimental model in experiments of exposure to replicative stress agents. Mutant strains are affected in genes encoding specific proteins of replication. For the analysis of genes involved in replication with unknown specific function Ana Poveda and Rui Oliveira (CITAB-UMinho researcher) are collaborating in the assessment of DNA damage in these mutants using the yeast comet assay, a protocol that Rui Oliveira and Bjorn Johansson (CBMA) have optimized for yeast cells.

This collaboration is included in Rui Oliveira's research activity in the screening and analysis of compounds with potential health benefits obtained from natural sources such as plants and plant extracts. Many products have antioxidant, antigenotoxic bioactivities, or interact with drugs that could be used as nutraceuticals and cosmeceutics to prevent degenerative diseases, offset ageing or can be combined with anticancer drugs to

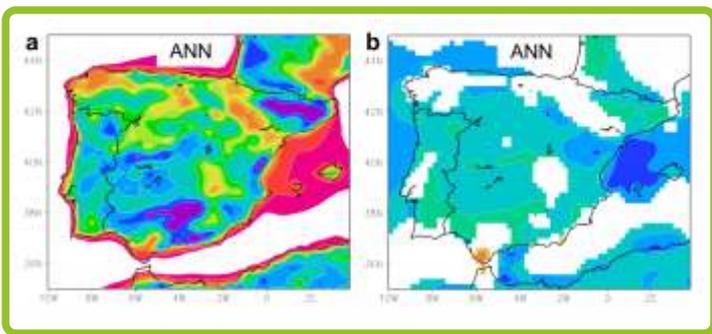
decrease side effects in new chemotherapy treatments.



Climate Change

Observed changes in climate have caused impacts on natural and human systems, disclosing the high sensitivity of these systems to climate variability and change. On the other hand, continued emission of greenhouse gases will cause further warming and increase the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. CITAB climatologists and other related researchers are continuously and extensively assessing observed and projected climate changes as well as their risks and impacts.

Global general circulation models (GCMs) are the most important tool for climate change assessments. However, for a better regional-scale representation, regional climate models (RCMs) are used, since they have a much higher horizontal resolution (dynamical downscaling). RCMs have been applied in studies concerning the impacts of climate change. Furthermore, model biases towards the real climate conditions must be adequately assessed, interpreted and corrected before applications can be performed.



(a) Annual mean wind energy potentials (in MWh/day) for the period of 2041-2070 (A1B SRES scenario) over the Iberian Peninsula. (b) Corresponding differences between future (2041-2070) and recent-past (1961-2000) wind energy potentials (in MWh/day). Only statistically significant differences at 95% confidence level are plotted.

Impacts on wind energy potentials in the Iberian Peninsula

The impacts of climate change on wind energy potentials (WEP) over the Iberian Peninsula were recently assessed by João Santos (CITAB researcher), Carlos Rochinha (CITAB scholarship), Margarida Liberato (researcher from UTAD and from Instituto Dom Luiz, University of Lisbon), with the international collaboration of Mark Reyers (University of Cologne) and Joaquim Pinto (University of Reading)*.

Energy is vital to socioeconomic development but this sector is a key contributor to greenhouse gas emissions. The requirement to reduce these emissions by 50% to

80% until 2050 encourage the replacement of fossil fuel burning by renewable sources. Nonetheless, the renewable energy sector is currently facing major challenges in terms of its future potential growth and sustainability as well as climate change since most of the renewable sources are strongly dependent on climate.

Wind power is the second leading renewable energy source worldwide, only exceeded by hydropower. Over the last decade the installed capacity rose from 18 GW (2000) to 282 GW (2012) and it was estimated that could reach 718 GW by 2017. In 2012, the installed capacity generated 459.9 TWh, which accounts for more than 2.1% of global energy production and 10% of global renewable production. In addition, only 3% of its operating life is required to make up for the carbon emissions during its manufacture, construction, operation and disabling. Several recent studies have highlighted the impact of climate variability on wind power generation over Iberia. Further, wind turbines are only able to extract energy over a limited band of wind speeds (usually 3–26 m.s⁻¹). Therefore, wind power generation is critically dependent on regional-to-local wind speeds. Further, its temporal variability, from intra-day to inter-annual scales, may imply significant fluctuations in power generation, distribution and supply. Therefore, the goals of the present study were two-fold: 1) to quantify the characteristics of WEP over the Iberian Peninsula for the past decades; 2) to assess the corresponding future climate change projections.

WEP in Iberia was assessed for recent-past (1961–2000) and future (2041–2070) climates simulated by the COSMO-CLM RCM following the A1B emission scenario. Main results reveal that for recent-past conditions, the highest daily mean potentials are found in winter over northern and eastern Iberia, particularly on high-elevation or coastal regions. In northwestern Iberia, daily potentials frequently reach maximum wind energy output (50 MWh.day⁻¹), particularly in winter. Southern Andalucía reveals high potentials throughout the year, whereas the Ebro valley and central-western coast show high potentials in summer. The irregularity in annual potentials is moderate (<15% of mean output), but exacerbated in winter (40%). Climate change projections (Figure 1) show significant decreases over most of Iberia (<2 MWh.day⁻¹). The strong enhancement of autumn potentials in Southern Andalucía is noteworthy (>2 MWh.day⁻¹). The northward displacement of North Atlantic westerly winds (autumn–spring) and the strengthening of easterly flows (summer) are key drivers of future projections.

* Santos, J. A.; Rochinha, C.; Liberato, M. L. R.; Reyers, M.; Pinto, J. G. (2015). Projected changes in wind energy potentials over Iberia. *Renewable Energy*, 75, 68-80 (doi: 10.1016/j.renene.2014.09.026).



Impacts on wind energy potentials in the Iberian Peninsula



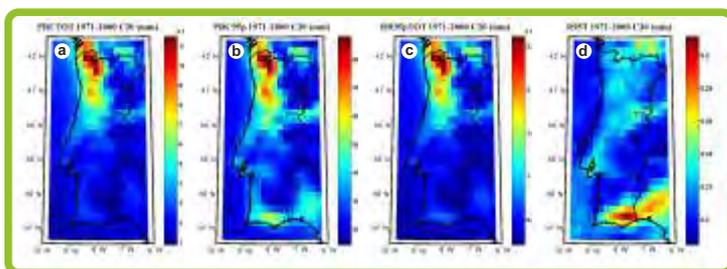
Example of an undersized gutter.

The change in the precipitation regime and its impacts in the design of drainage systems in Portugal were assessed by Mário Gonzalez Pereira, Luís Filipe Sanches Fernandes; Eduarda Macário e Sónia Gaspar (CITAB researchers) and Joaquim Pinto (University of Reading)*. From the civil engineering perspective, the design of storm-water drainage systems is based on Intensity-Duration-Frequency (IDF) curves defined in the Portuguese law (DR 1995). The IDF curves are empirical

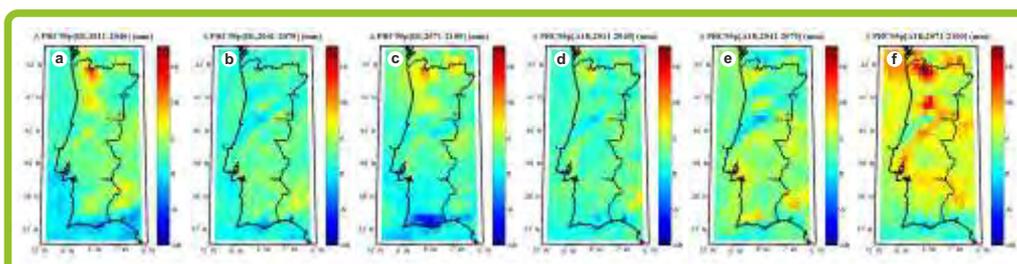
approaches linking precipitation extremes with physical structures representing key information for the design of urban and building storm-water drainage systems, as they provide maximum precipitation intensity related to a given length and return period. The IDF curves were developed by Matos and Silva (1986) for the three rainfall regions which compose the territory of Portugal and their use is based on the assumption of stationarity of the precipitation regime.

However, the IPCC Special Report on Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation have recently provided evidence that the intensity of extreme precipitation may increase even in areas where total precipitation decreases. This implies shorter return periods for extreme rainfall. In particular, the changes in the water cycle are likely change the frequency and intensity of floods and droughts for many parts of the world. Hence, the knowledge of the regime of heavy precipitation in regional terms both under recent and future climate conditions is critical.

Therefore, this study aimed to assess the necessity of updating the Intensity-Duration-Frequency (IDF) curves used in Portugal to design building storm-water drainage systems. A comparative analysis of the design was performed for the three pre-defined rainfall regions in Portugal using the IDF curves currently in use and estimated for future decades. Data for recent and future climate conditions simulated by a global/regional climate model chain (ECHAM5/MPI-OM1/COSMO-CLM) were used to estimate possible changes of rainfall extremes and its implications for the drainage systems. The methodology includes the disaggregation of precipitation up to sub-hourly scales, the robust development of IDF curves and the correction of model bias. Patterns of spatial distribution of annual maximum daily rainfall and extreme precipitation indices, obtained from both observed and simulated data for recent past conditions, exhibit considerable variability and suggest the necessity to revise the results of Matos and Silva (1986) included in the legislation (DR 1995). Obtained results also indicate that projected changes are largest for the plains in Southern Portugal (5 – 33%) than for mountainous regions (3 – 9%) and that these trends are consistent with projected changes in the long term 95th-percentile of the daily precipitation throughout the 21st century. We conclude that there is a need to review the current precipitation regime classification and change the new drainage systems towards larger dimensions to mitigate the projected changes in extreme precipitation.



Extreme Precipitation indices for Continental Portugal. Values of the (a) long-term 95th percentile (PRC95p), (b) total precipitation (PRCTOT), (c) total precipitation falling in days with daily precipitation amounts greater than the corresponding PRC95p (RR95pTOT) and (d) the ratio between RR95pTOT and PRCTOT (R95T) evaluated for daily precipitation simulated by the COSMO-CLM model, for recent-past climate conditions (C20 scenario, 1971 – 2000).



Trends in long-term 95th percentile PRC95p over continental Portugal. Differences between of the long-term 95th percentile (PRC95p) evaluated for future climate conditions under the B1 and A1B SRES scenarios and three 30-year periods 2011 – 2040 (a and c), 2041 – 2070 (b and d) and 2071 – 2100 (c and e) in relation to recent-past climate conditions (C20 scenario, 1971 – 2000).

* Pereira, M. J. M. G., Fernandes, L. F. S., Macário, E. M. B., Gaspar, S. M., & Pinto, J. G. (2014). Climate Change Impacts in the Design of Drainage Systems: Case Study of Portugal. *Journal of Irrigation and Drainage Engineering*.



Integrated strategies for increasing almond tree productivity in Trás-os-Montes

The almond tree is one of the most important nut crops in Portugal and an attractive investment for producers. The Trás-os-Montes region represents 67% of the national total area for almond production. As a result of the Rural Development Programme (PRODER, 2013) the area planted with almond increased by 15% in this region as part of the total national area. However, low productivity occurs as a result of poor choices regarding areas for planting almond orchards in appropriate agricultural practices.

Order to minimize those impacts and promote this promising crop, the producers' association "Cooperativa Agrícola de Alfândega da Fé, CRL", together with UTAD and CITAB, IPB and AmendoaCoop - Cooperativa de Produtores de Amêndoa de Torre de Moncorvo, launched the project "PRODER 54610 - Estratégias integradas para o aumento da produtividade da amendoeira em Trás-os-Montes".

This project intends to increase the productivity and quality of almond, promote the planting of new orchards, promote best modern agricultural practices and carry out comprehensive studies using an integrated approach to study rootstocks, cultivars and training systems; soil management and fertilization; monitoring and control of pests and diseases; deficit irrigation; and frost mitigation strategies. The project will also organise several outreach activities (one already taken place - A Amendoeira: instalação da cultura, 16th July 2015, Alfândega da Fé) to disseminate information and results to all those involved in the production chain. The results of this project are expected to reach as many as 2000 almond growers. Strategic information resulting from project activities will provide a much needed steppingstone to improve production chain sustainability and the quality of almond.



The almond is one of the most important nut crops in Portugal and represents, in Trás-os-Montes region which houses 67% of the national total area for this culture.

CITAB ModelVitiDouro project will model grape productivity in the Douro Valley

A multidisciplinary team from CITAB will develop the project ModelVitiDouro, a platform that will allow the timely prediction of wine production parameters in the Douro Region, along with the wineries of Mesão-Frio, Favaios and Freixo de Espada à Cinta.

The main focus of the project is to develop a statistical-dynamical model which integrates weather and soil data, satellite images and network of pollen records of the "Instituto dos Vinhos do Douro e Porto". A platform will be developed by a CITAB multidisciplinary team composed by climate, soils, plant physiology, agronomy and enology experts. The ModelVitiDouro will also use meteorological data collected at stations installed in the three wineries involved in the project, corresponding to the three major climatic zones of the Douro.

The model will forecast wine production in the region the Douro "ModelVitiDouro" - PA 53774, is funded by the Agricultural and Rural Development Fund (EAFRD) and the Portuguese Government by Measure 4.1 - Cooperation for Innovation PRODER program - Rural Development Programme.



ModelVitiDouro consists on a statistical-dynamical model which integrates weather and soil data, satellite images and network of pollen records. (Photo: J.P. Santos)

Climate change and winemaking: Portugal vs. United Kingdom

In May, students from the Enology course of the University of East Anglia (UK) visited UTAD and meet with CITAB researchers, Hélder Fraga, Aureliano Malheiro and João Santos. The aim of the visit was to better understand the key impacts of climate change on winegrowing regions in Portugal and also focus on adaptation and mitigation strategies for grapevines.

Hélder Fraga gave a presentation of the most relevant aspects on this issue to the British students. The UK students were then invited to visit some important winemakers in the Douro Wine Region, such as the "Quinta das Carvalhas" at Pinhão.

Alistair Nesbitt, a Professor at the British institution, also gave a lecture to the UTAD Enology and Agronomy students on new opportunities for winemaking in Southern England in the context of climate change.



Photo group of the visitors from the University of East Anglia and CITAB researchers.



IrrigOlive project promises to optimize productivity and quality of olive oil



Studies were carried out in this olive grove. The photos show the grove in the summer (left) and in the winter (right).

The IrrigOlive project, "Deficit irrigation in olive (*Olea europaea* L.), in the region of Terra Quente Transmontana to optimize water resources, productivity and quality of olive oil" was a multi university partnership including UTAD, Polytechnic Institute of Bragança, University of Porto (ICETA), and the University of Évora working direct collaboration with a farmer located on the Vilariça Valley, in the region of Terra Quente Transmontana.

The project evaluated the effect of different deficit irrigation strategies in olive groves, aiming to optimize water resources, productivity and quality of olive oil. Factors controlling the efficiency of olive mechanical harvesting using vibrator trunks and trim fruit drizzled were also evaluated.

Project results showed that dry olive mass fat content, an indicator of oil yield, was influenced by irrigation treatment. Higher values ($\gg 40\%$) of dry olive mass fat content were observed in treatments with increased water deficit, i.e. deficit irrigation with either continuous or with interrupted irrigation in the pit hardening phase with only 40% olive evapotranspiration (40% ETc). A lower oil yield of close to 30% was obtained from well-irrigated samples (100% ETc).

Analysis of olive oil quality parameters (free acidity, peroxide value and absorptions characteristic in the UV region at 270 nm and 232 nm) revealed that all olive oil samples fell within limits imposed by the EU to meet the extra virgin olive oil category. However, total polyphenols and ortho-diphenols content and antioxidant activity were higher in olive oils from treatments with lower level irrigation regimes. Polyphenols and tocopherols are substances with natural antioxidant properties. Their presence in olive oils has been positively associated with general quality by improving stability, nutritional value and sensorial properties.

Harvest efficiency is defined as the percentage of fruits harvested by total production. It is important to increase the percentage of fruits harvested in order to boost olive farmers profits. This can be achieved by knowing the evolution and ration of factors affecting fruit detachment such as fruit removal force (FRF), fruit weight (P). The FRF/P ratio can be used during the ripening period to measure ease of olive detachment. Project results show that FRF/P ratio values fall from 140 to 80 in the weeks before harvest as a result of a downward trend in FRF values and an upward trend in P values. The FRF/P ratio stabilizes in the last week of November just before harvesting. In some cases there is a slight increase as FRF values increase faster than P increase (contrary to the tendency of previous weeks). In the future, more field trials will be carried out to better understand the evolution of the FRF/P ratio.

Outreach: CITAB Researchers collaborate to promote public participation in river monitoring

CITAB researchers from the Fluvial Ecology Laboratory are collaborating with regional, national and international experts on aspects of the Water Framework Directive for over a decade. They are now collaborating in the national outreach project "WFD -citizenship in public water policies". Coordinated by Quercus, Portugal's foremost non-governmental environmental organisation, this 2 year project is funded by the Calouste Gulbenkian Foundation's "Active Citizenship Programme" and will be developed in partnership with the Portuguese Environment Agency (APA) and the Regulatory Authority for Water and Waste Services (ERSAR). Coordinated in CITAB by Dr. Samantha Jane Hughes, outreach activities within this project have provided teaching and training of volunteers in Water Framework Directive (WFD) field and lab protocols. CITAB researchers also provide background on the history, timing and demands of the WFD to volunteers and insight on aspects of water policy to Quercus project coordinators. The first volunteer training session took place on the 10th January 2015 at the Alviela "Ciencia Viva" environmental interpretation and exhibition centre located in central Portugal. Over 20 volunteers from all walks of life, but with a passion for nature, attended an intensive 1 day workshop. The session opened with a talk by the Vice President of Quercus on the project content and aims, followed by a talk on fluvial ecology by Dr Joaquim Reis. The afternoon lectures were given by Dr Samantha Jane Hughes on the history, concepts and demands of the WFD followed by an explanation of some of the WFD field protocols that the volunteers will be using. A second, 2 day, training session took place in Ourém in April 2015, where Dr Hughes and Professor Simone Varandas provided volunteers with theoretical and hands one practical field based training in benthic macroinvertebrate sampling and River Habitat Survey.



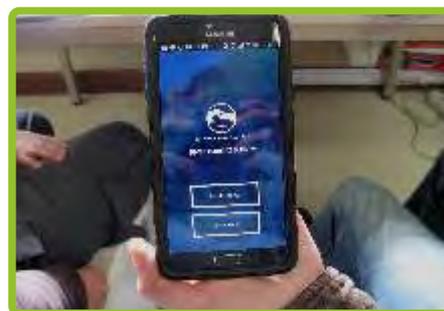
CITAB Researcher is developing an app to make fieldwork on rivers easier

Originally developed in the United Kingdom, River Habitat Survey (RHS) is a highly popular field protocol now is widely across Europe and beyond to assess the quality of river habitats. Researchers from CITAB's Fluvial Ecology Laboratory (LEF) have considerable experience in RHS and have collaborated with the Portuguese Environment Agency (APA) over the years in the implementation and adaptation of RHS to Portugal, where an official Water Framework Directive protocol.

The RHS field methodology requires surveyors to fill in a detailed field sheet and take GPS readings and photographs of the survey site which stretches along a 500m stretch of the river bank. This requires the surveyor to take several items of equipment such as a GPS, camera, clipboard and field sheets to the field, which can be heavy and time consuming. Protocols printed in paper can also be difficult to complete under bad weather conditions.

In order to make RHS field workers life a little bit easier, CITAB-LEF researcher Samantha Jane Hughes and Professor António Cunha of UTAD's Electronics and Informatics Department are developing RHS Mobile, an RHS app that can be used on smart phones and tablets. Once RHS Mobile is finished, users will be able to automatically record complex field data, take high resolution digital photographs and map their trajectory in the field from their smart phone or tablet. All recorded data will be downloadable and used to compile reports and calculate important indices used to provide information on habitat quality and impacts. RHS Mobile is being developed by students under the supervision of Dr. Hughes and Professor Cunha.

A demonstration prototype of the RHS app was sent out for an international beta testing exercise in October 2015. RHS experts and routine RHS user who took part in the exercise were LEF-CITAB in Portugal, the Environmental Hydraulics Institute of the University of Cantabria (Spain) the Scottish Fisheries Co-ordination Centre, Scottish River Trusts and the Centre for Ecology and Hydrology in the UK. Dr. Hughes and Professor Cunha will be going over comments and suggestions from the international beta testing exercise to improve the app and hope to demonstrate it to a statutory environment agency in 2016.



Users will be able to automatically record complex field data, take high resolution digital photographs and map their filed trajectory from their smart phone or tablet.

Water management in Mediterranean Countries

CITAB received Professor Núria Pascual Seva, from Polytechnic University of València Spain, who gave a short lecture on Water management in Mediterranean Countries. Professor Seva highlighted that agriculture uses large amounts of water, around 70% of total consumption of fresh water in developed countries. Water consumption for accounts for 68% of total water use in Spain, which is exceedingly high relative to other sectors, particularly as water supply is becoming a major problem. Professor Núria stressed the importance of improving irrigation efficiency is essential to help meet demands.

Chufa (*Cyperus esculentus L. var. sativus*), also known as tiger nut or nutsedge, is a common crop in the Valencia Region of Spain where its tubers are used to produce a typical beverage called "horchata" or "horchata de chufas". Chufa is also an abundant weed in temperate and tropical zones. Studies exist on *C. esculentus* morphology, physiology, and control strategies when it is seen as a weed, but little research has been performed concerning its cultivation. In the region where chufa is grown, water is readily available and inexpensive. The cost of water is calculated in terms of the farm surface area rather than the actual volume of water used. However, due to extended periods of drought and the shift of water usage from irrigation to environmental, industrial and municipal applications, use of irrigation water may soon become subject to regulation. That was the driver behind developing research to identify best practices for the irrigation management of chufa crops.

Traditionally, chufa has been furrow irrigated, although no data on the volumes of water used for irrigation were available. Performance of the traditional irrigation systems such as infiltration rate, the incoming water flow, advance and recession times and corresponding wetted perimeters were analysed. Average application efficiency was estimated at 30%. Each irrigation event was modeled and optimized, to obtain an expression that related the application time with the available water flow. The use of the expression increased application efficiency up to 75%, resulting in important water savings.

Drip irrigation systems, which are not commonly used in the area, were also assessed in increasing irrigation efficiency for chufa crops. Different irrigation strategies were analyzed, based on the soil moisture at the start of each irrigation event. Drip irrigation systems lead to 44% higher yields compared to traditional furrow irrigation and up to 300% greater irrigation efficiency.

Planting configuration plays an important role in crop production levels and water use. A comparison of traditional planting system in ridges with different flat-raised-beds, found that greater yields were obtained in beds. Water use efficiency doubled in beds cultivated with furrow irrigation compared to crops planted in ridges. The use of the flat-raised-beds with drip irrigation is still under study to determine the best management practice.



Professor Núria Pascual during the short lecture at UTAD.



Sustainsys: a global and sustainable challenge



Sustainsys Project was coordinated by CITAB's researcher and Vice Director Rui Cortes.

The SUSTAINSYS project, funded by CCDRN-ON2, integrated research on agricultural and forestry-based land-uses to provide trees and other crop products and protect, conserve, diversify, and sustain vital economic, environmental, human, and natural resources.

The initiative focused on the development of sustainable agricultural and the sustainable exploitation of natural resource systems, including the rehabilitation of impacted areas.

SUSTAINSYS research aimed to create tools to enhance landscape biodiversity by restoring and maintaining connectivity and complexity thereby increasing, diversifying and sustaining rural incomes, using ecologically-based land management procedures.

The project had a dynamic character using climate, environmental and land use change scenarios to model consequences on agroforestry practices and impacts on social-economic activity. Results contribute towards the evaluation of mitigation or adaptation measures to improve environmental quality, define disturbance indicators or establish threshold values/levels necessary for qualitative and quantitative evaluation of ecosystem health. These assessment systems were developed for use by key stakeholders by allowing them to develop and implement appropriate management plans.

The SUSTAINSYS project was mainly carried out in the Douro basin in Northern Portugal, a strategically critical area for national plans concerning future water supply, agroforestry landscape and hydroelectric energy production.

The SUSTAINSYS project structure was based on two actions that each contained 2 tasks. Each task comprised several specific research projects in each scientific domain. SUSTAINSYS researchers worked to link the different activities and to share the results between the projects and tasks.

Innofood: a well succeed project

Following the call for proposals - SAESCTN PIIC & DT/1/2011- financed by CCDRN in the domain of ON.2 and inserted through the Eixo Prioritário I – Competitividade, Inovação e Conhecimento – Programas Integrados of IC&DT, UTAD, together with CITAB and Centro de Química-Vila Real (CQVR) aiming the achievement of its strategic research objectives, presented this project, "INNOFOOD - Innovation in the FOOD sector through the valorisation of food and agro-food by-products", that is inserted in the PAFE - Program for Agro-Food-Environment.

The research line (INNOFOOD - INNOvation in the FOOD sector through the valorization of food and agro-food by-products) was allocated in three main research lines that can impact positively in the competitiveness of the agro-food sector:

1. Preharvest factors affecting quality products;
2. Food Quality and Health;
3. Genomic and Biotechnological approaches for food and health

The INNOFOOD project (in line with the mission and objectives of the research centers involved) was a coherent and a strategic project focus on different aspects of the Food quality, from production, to nutritional and functional quality, certification and also environmental aspects of the food production, aiming the increase of the Quality and Innovation if the Food sector.

This project allowed the hiring of eight master and six PhD researchers, and a total of nine papers were published, eighteen communications presented in international scientific meetings and twelve in national scientific meetings.

The steering committee was composed by the professors Carlos Costa, José Matos and António Ramos.



INNOFOOD fellows working at UTAD.
(Photo: José Paulo Santos)



Enoexel: From vineyard to wine: targeting grape and wine excellency

"ENOEXEL project – From vineyard to wine: targeting grape and wine excellency" developed research activities on viticulture and counted with a multidisciplinary team of more than 30 researchers, including several members of CITAB.

This initiative intended to approach all the wine production chain from the plant to the final product, with the intention of contribute for the increase of the sector competitiveness.

Among the obtained results, we highlight:

1. The outgrowth of mitigation strategies, with the aim of reducing the global climate changes on viticulture;
2. The development of precision systems, non-invasive, to determine grape maturation parameters, using hyperspectral images.
3. The creation of a DNA biosensor to control wine authenticity;
4. The development of management strategies of alcohol fermentation that maximize quality, aligned with the increasing demands of consumers for a bigger diversity and superior quality of wines.



Pedro Melo Pinto and Veronique Gomes are two of CITAB researchers who conducted research on behalf of Enoexcel.

The project also contributed for the hiring and training of human resources, with the elaboration of 5 Master and 2 Doctoral thesis, one of them already finished.

New Challenges to Cherry Tree Production



Professor Berta Gonçalves participates in several studies concerning cherry and berries.

The Seminar "New Challenges to Cherry", which took place on June 7 in Alfândega da Fé, had the intervention of CITAB researcher Berta Gonçalves.

In Portugal, the area of sweet cherry orchards has increased, mainly since the 90's decade, and in 2012 to 2013, from 5744 ha to 6020 ha, with the production following the same trend, from 10416 t in 2012 to 10776 t in 2013. Although most of the area is located in central Portugal (6517 ha), production is higher in Northern region (3391 t) with the regions of Trás-os-Montes and Resende representing 50% of the Portuguese production. However, Portugal is still very dependent of imports, which reached, in 2013, 2441t and 5.191.000€ with only 29t and 116.000€ of exports. In order to reduce this negative tendency, the Portuguese sweet cherry production must be improved, trying to increase plant yield while reducing losses. Moreover, consumers are increasingly demanding regarding sweet cherry, expecting fruits with good size, firmness and flavour. Our work group has been studying sweet cherry for over 20 years, with the research covering scion-rootstock interactions, productivity and fruit quality, being able to gather a considerable knowhow regarding this

crop. Furthermore, a recent approved Proder project (GoldCherry - PA 53626) is focus on the enhancement of cherry quality by innovative management strategies to reduce fruit cracking. In the light of this Proder project, the interaction with the producers' associations pointed out sweet cherry fruit cracking as the research line that should be pursued, to reduce the economical losses caused by this important phenomenon. The preliminary results point out to a significant decrease in fruit cracking. The expectations are very high, so our main aim is to go deep in understanding the metabolomics of cracking, choose the best mitigation strategy and solve this big producers' problem.



National Festival of Biotechnology in Lisbon received CITAB Researchers



The team presented the EUROLEGUME and the MICOPROJECT initiatives.

On 10th and 11th April 2015 it was held a festival, at Pavilhão do Conhecimento, Lisbon, of national level, to understand the biotechnological advances happening in Portugal. This festival was an initiative under World Tour Biotech, which is an international project aiming to promote scientific literacy in Biotechnology.

During the festival, academics and researchers from several universities of Portugal came to represent their work in the area of Biotechnology. This included poster presentations and individual discussions on the current research works as well as mini demonstrations of the laboratory procedures applied in respective laboratories, in the space provided for every team.

The first day of the event was allocated for schools. During this event children could quench their curiosities regarding science while performing different activities with the laboratory equipment put for demonstrations. The second day was designed for families to understand the knowhow regarding Biotechnology in a greater detail.

CITAB's researchers Sandra Pereira and Lav Sharma, and UTAD's researcher Angela Mucha, represented two different projects, i.e., EUROLEGUME and MICOPROJECT, in the festival. Both the projects aim to use microorganisms to enhance plant growth, reducing the input of chemical fertilizers and pesticides. The work of CITAB members was demonstrated using a video of plant and microbial inoculation, microscopic visualisation of different bacteria and fungi and observation of different plants.

This unique kind of event was also useful for the researchers as they could display their work to the people in general, in layman terms, as well as, share experiences and exchange ideas among themselves.

CITAB Researchers transform students in scientist-chefs for one day

Pineapple, Tangerine and honey Lollipops, Mango Explosion en fil, Colored Caviar, Chocolate Surprise Madame Curie and coca-cola and seven-up shots were the menu served by CITAB and UTAD researchers to the students of Felgueiras Highschool.

It was the first time CITAB researchers organized such an event outside the university doors and the expectations were high.

"We wanted to show that food Science is fun and, in this case, it is also eatable. The challenge was proposed by the school and we hope that the students had appreciate it and that they will try the results of this molecular gastronomy initiative, at home. This way, they will merge the know-how of the chefs with the know-why of the scientists", explains Ana Barros, teacher and CITAB researcher.

More than 150 students, including high-school pupils from the Restaurant Course, attended to the event.



It was the first time CITAB organised a Molecular Gastronomy session outside UTAD. The event surprised students and teachers of Felgueiras Highschool.

Photo Vitis – the life of Douro´s Vineyards



Some moments of the exhibition opening.

CITAB/UTAD, with the support of Vila Real Municipality, have organized a photography exhibition entitled "Photo Vitis – the life of Douro´s Vineyards". The exhibition displayed photographs taken by 17 members and collaborators of project "EcoVitis: maximizing of ecosystem services provided by Douro´s vineyards", accompanied by informational text. It took place between 13 March and 10 April 2015, at the Centro de Ciência de Vila Real, located in Corgo Park.

This exhibition, that included 83 images, featured some of the most striking views of the unique landscape and vineyard architecture of Douro Demarcated Region, as well as of its rich fauna and flora, attracted 120 visitors. The main objective was to contribute to public awareness of biological diversity Douro vineyard´s Quintas, a natural heritage for many still largely unknown and sometimes neglected.



CITAB organizes Obesity Lecture with Dr. José Maria Tallon

The lecture entitled "Obesity" was conducted by Dr. José Maria Tallon, focused in its prevalence, consequences, prevention and treatment, on behalf of his doctoral thesis that has professor and CITAB's researcher Ana Barros as main supervisor.

According to the specialist, the main causes for the disease are the genetic factors; food and environmental factors and the sedentary lifestyle, being the latest his main concern.

According to Dr. Tallon it's urgent to change the attitude towards healthy food, and this change should start at schools since they are compulsory passage points and a place of choice to develop learning strategies and new lifestyles. In this regard Dr. Tallon developed an interactive program in which the child / adolescent takes an active role, especially using the new information and communication technologies.

The majority (more than 70%) of target population (adolescents) in Dr. Tallon case study considered that the interactive multimedia platform is the ideal mean to access the knowledge about healthy eating. Based on those preliminary conclusions, Dr. Tallon developed the interactive multimedia platform in order to be able to stimulate meaningful learning for the prevention of health problems about what regards to food.

This platform is based on learning certain food concepts (such as BMI, Concept of food and nutrients, eating bugs, etc.) and conducting knowledge questionnaires previous and after the contact with the interactive platform.

With regard to the obesity treatment itself, the specialist believes that it must be based on motivation; a suitable specific diet plan for each individual; daily physical exercise for at least 1h and medical supervision. Dr. Tallon considers that there are no forbidden foods to combat obesity, but wrong habits, so the key lies in lifestyle changing.

When it comes to obesity pharmacological treatment the expert is apologist of its use in specific cases (BMI + 30, BMI + 27 with associated complications, BMI + 25 with no result in a 3 month diet). The doctor points out that drugs should be used in a responsible manner and with full knowledge of the facts and that should never replace the habits change.



Dr. José Maria Tallon is developing his doctoral thesis under the supervision of professor and CITAB's researcher Ana Barros.

Growth and productivity of mixed species in forest stands in northern Portugal



Leónia Nunes thesis was classified as "Outstanding" by the jury and financed by FCT.

CITAB researcher Dr. Leónia Nunes successfully defended her doctoral thesis "Growth and productivity of mixed species in forest stands in northern Portugal" in April of 2014. Classified as "Outstanding" by the jury, the study was financed by the FCT Mixed Forests project (ref: PTDC/AGR-CF/68186/2006) and FCT Program SFRH/PROTEC/50127/2009. Leónia's supervisors were Professor Domingos Lopes (CITAB/UTAD) and Professor Francisco Castro Rego (CEABN/ISA). Mixed-species forests are complex systems in which individual trees of different species interact with each other and with the environment. These systems have gradually become the focus of forest research. The need to better understand their performance and productivity is highly relevant to forestry practices. The main objectives of this study was to analyse if mixed-species can provide greater yields and more benefits than monocultures of the component species and to prepare work on future methodologies to quantify productivity under scenarios of climate change.

Growth dynamics and productivity were estimated for mixed and pure stands in uneven-aged and naturally regenerated forests, and in mixed and pure stands in an experimental planted design. There is firm evidence that mixed-species have greater levels of productivity and increment in biomass compared to pure stands of component species. This thesis provides a comprehensive understanding of mixed forests growth dynamics in northern Portugal and shows that mixed-species are an attractive silviculture option.



Study area in Vila Real with *Quercus pyrenaica* and *Pinus pinaster* species.



Study area in Bragança with *Castanea sativa* and *Pseudotsuga menziesii* species.



CITAB Doctorate in Copper impacts in grape berry (*Vitis vinifera* L.) and wine



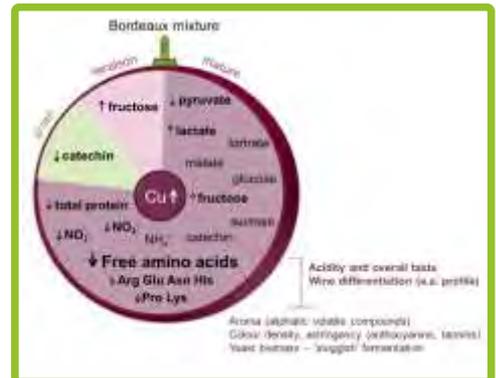
Dr. Viviana Martins successfully defended her PhD thesis.

CITAB researcher Dr. Viviana Martins successfully defended her doctoral thesis "Copper impacts in grapevine (*Vitis vinifera* L.) - molecular, biochemical and biotechnological approaches" in May of 2014. The study was supported by the FCT (PhD grant SFRH/BD/64587/2009, projects FCOMP-01-0124-FEDER-008760, PTDC/AGR-ALI/100636/2008, FCT/5955/27/5/2013/S, FCOMP-01-0124-FEDER-022692) and the European projects INNOVINE (FP7-KBBE-2012-6-311775) and COST Actions (FA1106, FA1003). The supervisors were Professor Hernâni Gerós (CITAB - Universidade do Minho, Portugal), Professor Eduardo Blumwald (University of California - Davis, USA), and Professor Mohsen Hanana (Center of Biotechnology of Borj-Cedria, Tunisia).

Since the development of Bordeaux mixture in the late 1800's, copper-based fungicides have been widely used against grapevine (*Vitis vinifera* L.) disease, mainly in organic but also in conventional viticulture. Despite this, the effects of plant exposure to copper remained largely unexplored at grape berry level. In the present study molecular, biochemical and biotechnological methods were combined to investigate copper accumulation mechanisms and tolerance in grape cells, the transporters involved in such processes, and the effects of copper in grape berry composition and wine aromatic profile.

The study showed that grape cells actively respond to copper applications at gene expression and protein activity levels. This has implications in the copper status of the berry, affecting the fermentation process indirectly by changing the berry metabolite profile, and directly by controlling yeast growth and fermentation kinetics. These processes ultimately modulate wine organoleptic properties.

The study resulted in the publication of several articles including Martins et al. 2012 (DOI: doi:10.1093/pcp/pcs125), Martins et al. 2014 (DOI: 10.1007/s00425-014-2067-5, DOI: 10.1016/j.plaphy.2014.06.016, DOI: 10.1111/ajgw.12096).



Effect of Bordeaux mixture application in grape berry metabolic composition (arrows indicate variations in solute levels), and parameters affected by excess copper in must and wine.

Silica nanoparticles in oral peptide delivery for diabetes control and treatment



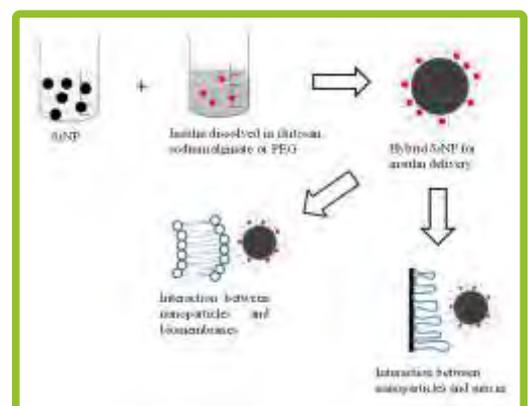
Dr. Tatiana Andreani studied diabetes control and treatment.

Patients suffering from type 1 Diabetes mellitus do not synthesize enough insulin to sustain life. As a result they depend on exogenous insulin for survival. Among the numerous advances in biotechnology, oral delivery is considered the most convenient routes for insulin administration because it can overcome the difficulties associated with the subcutaneous route, such as, daily injections, pain, risk of infection, edema, and fat deposition on the local of injection. Effective oral delivery has the great advantage of mimicking the natural insulin secretion pathway thereby avoiding the hypoglycemic effect.

CITAB researcher Dr. Tatiana Andreani has defended her doctoral thesis "Silica nanoparticles in oral peptide delivery for diabetes control and treatment" in July 2014. Tatiana's research was conducted under the supervision of Professor Eliana Souto (FFUC) and Professor Amélia M. Silva (CITAB/UTAD). In this study, the properties of silica nanoparticles were modified by coating nanoparticle surface with mucoadhesive polymers, such as chitosan, sodium alginate and PEG in order to prolong and/or to intensify the contact between the system and the gut mucosa.

Results demonstrated that the mucoadhesive polymers can provide higher insulin association efficiency, as well as better interaction with mucin. In addition, the coating of nanoparticles showed low toxicity in the human cell cultures HepG2 and Caco-2, indicating appropriate systems for oral delivery of peptides. The information resulting from this study can be applied to other peptides and to poorly soluble or easily degraded molecules (such as several plant bioactives) in order to obtain a better yield as drugs or nutraceuticals.

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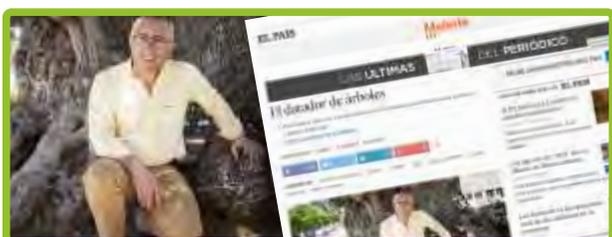
Did you know that?



CITAB is increasing Outreach Activities? A total of 50 activities were organised over 2015 from North to South of Portugal for a highly diverse range of target audiences.



CITAB is intensifying research and teaching cooperation with foreign universities and has received during the last months more than 20 researchers and students from several countries such as Italy, Spain, Brazil, Poland, The Netherlands and Algeria, among others?



The work of CITAB researcher José Luís Louzada was highlighted in one of the most influential newspapers of the world, El País, from Spain?



Several news items on CITAB research were divulged in Spain this year?



CITAB received two scientific merit awards from UTAD? CITAB researchers Rui Cortes (Vice-President of CITAB) and Regina Arantes were distinguished, respectively, with the Senior Scientific Prize, and the young Scientific Merit Prize, on behalf of UTAD 29th anniversary.



Professor and CITAB researcher Pedro Mestre was awarded Best Paper Award of the 2015 International Conference of Wireless Networks, with the paper titled "Multi Fingerprint Map for Indoor Localisation"? The conference took place in London, last July.



Professor and CITAB researcher Felisbina Queiroga was part of a team that won the Best Paper Communication Award of the European Society of Veterinary Oncology, on behalf of the 25th European Congress of Veterinary Internal Medicine - Companion Animals, that occurred between 10th and 12th September, in Lisbon. The poster was intitled "Intratumoral FoxP3 expression in malignant canine mammary tumors: its association with clinicopathological parameters, angiogenesis and prognosis".



Short notes & Upcoming events

CITAB visitors talk about their experience

Sidi Mohammed BOUDIA; Centre de Développement des Energies Renouvelables, Algeria



Sidi Mohammed Boudia did a two-month internship with CITAB Researcher João Santos.

My research is on wind resource assessment in Algeria. The Algerian government program plans aim to install 22GW of power generated from renewable sources by 2030. Wind energy constitutes the second development axis, with a projected share in electricity production expected to reach about 3%. There is a clear need to develop new methodologies and approaches to improve wind resource assessment in Algeria.

The purpose of my two weeks internship was to assess a new area, a really windy one, to reach this projected electricity production target. The results will help us to assess new windy areas in Algeria. With the help of Professor João Santos, I learnt techniques and approaches. We used a new database from ERA-Interim database, which is a new tool continuously updated in real time.

Results were close to those we were achieving in my research centre. Now, we can compare and revalidate the data from this database. I believe it will not be so different from the information in our previous database in Algeria.

Sincerely, before I came in Portugal, I did not know if the trip was going match my expectations, but, as I said to Professor Santos, I really enjoyed it. I liked the city, the weather and also the new methodology and the approach of Professor João Santos. Time permitting I would like to apply for a second internship to improve the results, since we didn't have much time to do all we intended.

Once I return to Algeria, I will disseminate what I learned at CITAB to my colleagues at CDER. With the help of our team, we will do our best to continue what I have begun at CITAB/UTAD and I think they will really appreciate this new methodology.

Upcoming events



IX Ornithology Congress of the Portuguese Society for the Study of Birds (SPEA) and VI Iberian Ornithology Congress; 23-25 April 2016, UTAD, organized with the collaboration of CITAB.

Abstracts submission now open. More information available at <http://congresso.spea.pt/pt/>.



III Seminar about Food and Tradicional Cultural Representation and II International Symposium "Food and Culture: Tradition and Innovation on Food Production and Consumption", 24-27 May 2016, UTAD, with CITAB collaboration.

Abstracts and Articles submission until 20th January . More information available at <http://goo.gl/shCmZ5>.

Location and contacts



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