



Editorial



João Santos
CITAB's Director

2023... What a dynamic year at CITAB!

In 2023, CITAB made significant scientific contributions to the international scientific community and general society. This can be illustrated in terms of key performance indicators, such as the record-high number of peer-reviewed journal articles (approximately 300, more than 3 out of 4 published in top-cited journals), an unprecedented high number of communications in international and national scientific meetings (over 350), frequent invitations of our members as keynote speakers, conveners or session moderators. We have also organized several scientific events (e.g. Wasteless: CITAB's Effort to Minimize Food Waste in Europe, Coa Climate

Risk Symposium, New Approaches in the Wine Production Sector).

The participation in 16 European projects and 3 International projects, plus ca. 30 ongoing national projects is also a major milestone. The strengthening of our collaboration within international networks (e.g. co-organization of the International Viticulture and Enology Society meeting at UTAD) or with our stakeholders (CITAB Stakeholders Day) was deeply promoted in 2023. Two members from our stakeholders panel have contributed to this newsletter's Opinion and Hot Topic sections, emphasizing our commitment to engaging stakeholders in CITAB's daily life.

Numerous dissemination and outreach activities (e.g. with elementary schools, the European Researcher's Night, World Hand Hygiene Day) and capacity-building actions with local/regional actors (e.g. Invasive Species Week) were undertaken. Strong communication with the general public through mass media, as well as our increasing presence in social networks (with a sharp increase in the number of followers on Facebook or LinkedIn), is noteworthy.

All these contributions and outcomes of our research are a reason for us to be very proud of being members of this large and dynamic team, with more than 100 integrated PhD members, complemented by a vast number of collaborators and approximately 70 PhD students. This is particularly relevant taking into account that CITAB is hosted at a relatively small university and located in a low-density area of inner Portugal, which reinforces our commitment to local and regional development and to generate valuable knowledge for our stakeholders, supporting decisions and policies, but also enhancing awareness of the general population to environmental challenges while maintaining our agrarian systems competitive.

The **close collaboration between CITAB and GreenUPorto** (University of Porto), within the framework of the **Inov4Agro Associate Laboratory**, was also a major achievement in 2023. This included funding for the creation of five positions for associate researchers, the approval of a large Horizon Europe project prepared within this consortium, as well as the co-organization of the Inov4Agro Open Day, the Inov4Agro Scholarship's Day, a Cycle of Seminars for PhD Students, among others.

This wide range of activities decisively strengthened our internationalization, reputation and attractiveness.

This year played a key role in consolidating CITAB as an internationally leading R&D Unit focused on the sustainability and valorization of agrarian value chains!



Tiago Silva Pinto
CNCACSA

Together we are stronger!

Studies carried out indicate that Portugal and the Mediterranean region are among the European areas most vulnerable to the impacts of climate change. Rising temperatures, changes in precipitation patterns, increased climate variability and the greater frequency and magnitude of extreme hydrometeorological events are leading to an increase in potential risks and vulnerability in our agroforestry production systems.

According to existing forecasts, the changes observed in air temperature and in the regime and quantity of precipitation will increase in the future and will affect the distribution and availability of water resources.

In mainland Portugal, since the mid-1970s, the increase in average air temperature has predominated in all seasons, with a trend towards more and longer heat waves to occur, a decrease in the number of cold days and nights and an increase in hot and very hot days.

The average air temperature in mainland Portugal increased, between 1976 and 2017, at a rate of around 0.3 °C/decade. Of the 10 hottest years, 8 occurred after 1990, with 1997 being the hottest and 2017 being the second hottest.

In regard to precipitation, a decrease in annual values has been observed in our country, of around -20 to -25 mm/decade, with the last 4 decades being consecutively drier and the last 20 years having particularly little rain.

According to the Portuguese Institute of the Sea and Atmosphere (IPMA), despite the great interannual variability, the downward trend is notorious with 6 of the 10 driest years (since 1931) occurring after 2000. Adaptation to climate change thus directs agriculture and forestry towards the implementation of a set of good practices, particularly with regard to the preservation of water and soil resources and the necessary transfer of knowledge.

Aware of the enormous challenges that the agroforestry sector faces, ANPROMIS, ANPOC, ADVID, FENAREG, FNOP and UNAC decided to move forward with the creation of the National Competence Center for Climate Change in the Agroforestry Sector (CNCACSA), which was established on September 11, 2019, in Elvas.

CNCACSA currently has 70 partners from across the country, including Farmers and Forestry Producer's Organizations, Universities and Research Centres, Institutions under the supervision of the Ministries of Agriculture and Environment and other private non-profit entities, including autonomous regions, which make this Competence Center the largest scientific consortium in our country on Climate Change. Our mission is to promote and establish information networks that allow and enhance the sharing of knowledge between the national and international actors working on the topic of adaptation and mitigation to Climate Change.

The actions of this Center include promoting conferences, demonstration and training actions, promoting knowledge sharing groups, among others.

The motto of this Centre which we have believed in, since day one, is "together we are stronger!", as only in this way we will be able to minimize the effects of this scourge whose effects are becoming increasingly evident and limiting.



Exploring Science: CITAB Researchers Leave a Lasting Impact on European Researchers Night

This year's edition of European Researchers Night was memorable. Coimbra, Évora, and Armamar were the locations that hosted the multiple activities brought by CITAB's researchers to young scientists. An event that allowed the younger ones to explore the world of scientific discoveries and store numerous learnings in their memories.



LEFT-CITAB Researchers Lead Water-themed Initiative for Chaves Elementary Students

Researchers from the Laboratory of Fluvial and Terrestrial Ecology (LEFT-CITAB) were in Chaves, in July, for an ecological and environmental awareness initiative. This initiative, aimed at elementary school students in the municipality, focused on the theme of water and was promoted by the Municipality of Chaves and Iberdrola.



Field Actions and Training for Invasive Species Week

CITAB researcher Cristina Morais participated in #SEI2023 - Invasive Species Week through training sessions and field actions. The activities took place on the 18th of May, in the Alvão Natural Park, and were organized by CITAB, the University of Trás-os-Montes and Alto Douro, and the Institute for Nature Conservation and Forests.





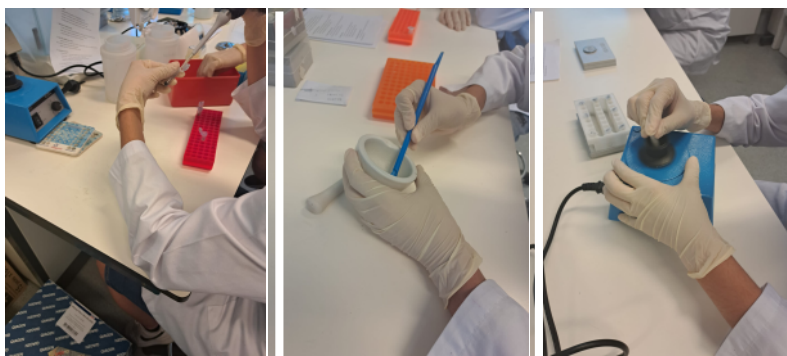
CITAB Researcher Inspires Young Minds

On the 11th of February, CITAB researcher Sílvia Afonso led an exciting event at the “Associação 31 - Infântário e Lar de Vila Real”, commemorating the International Day of Women and Girls in Science. Through hands-on activities and discussions, the initiative aimed to ignite curiosity among children while championing gender equality in STEM fields.



Young Scientists Explore Ancient DNA Varieties During Summer Break 2023

Two students from Leiria and Vila Real participated in a scientific activity led by CITAB researchers Isaura Castro and Márcia Carvalho. Activities included a visit to UTAD's laboratories and germplasm bank, where students conducted experiments involving cereal seed germination, DNA extraction and quantification, as well as PCR with the ISSR molecular marker and visualization of results by agarose gel electrophoresis. At the end, there was an analysis of the obtained results.



World Hand Hygiene Day

Maria José Saavedra, a researcher from CITAB, went to the Pedrouços School Group to promote an activity related to the World Hand Hygiene Day (5th of May). This year, the World Health Organization has defined the slogan “Accelerate action together. SAVE LIVES - Clean Your Hands.” This campaign, often referred to as the "Clean Care is Safer Care" initiative, aims to raise awareness about the significance of hand hygiene practices, particularly in healthcare settings but also in everyday life.





CITAB Stakeholders Day

The "CITAB Stakeholders Day" was an opportunity for businesses, associations, and other strategic partners to explain and share their expectations regarding the science and research produced at CITAB. António Graça (ADVID), Braz Costa (CITEVE - Technological Center for Textiles and Clothing), Carlos Ribeiro (Laboratório da Paisagem), Gonçalo Andrade (Portugal FRESH), Luís Rochartre (Greenlab), Nuno Calado (SONAE), and Tiago Pinto (Anpromis) were the stakeholders present at UTAD with the mission of representing a wide number of partners and explaining how CITAB has been useful to them over the past years.



Wasteless: CITAB's Effort to Minimize Food Waste in Europe

Minimizing food waste is one of the main objectives of Wasteless, a European project coordinated by CITAB's researcher Ana Novo Barros. Funded with approximately €5.5 million, this project aims to develop and test innovative tools and methodologies for measuring and monitoring food waste. Annually, each inhabitant of the European Union wastes around 179 kg of food. Wasteless joins partners from 13 countries and brought near 50 members to the kick-off meeting held in Vila Real at the University of Trás-os-Montes e Alto Douro.



Coa Climate Risk Symposium

The impact of climate change and adaptation measures for the main agricultural crops in the Vale do Côa region were discussed in May at the Côa Museum. Those who had the opportunity to participate in this symposium learned about the research that CITAB is conducting in Côa area, which holds dual UNESCO World Heritage status (Alto Douro Vinhateiro and Vale do Côa).



Sustainable Development in Trás-os-Montes and Alto Douro Seminar

The Seminar "Sustainable Development in Trás-os-Montes and Alto Douro," organized by CITAB and CETRAD, took place on October 28th. During this event, a Protocol of Scientific and Technological Cooperation was signed between UTAD and the "Caixa de Crédito Agrícola Mútuo de Trás-os-Montes e Alto Douro". This protocol aims to award students who have successfully completed their master's dissertations or doctoral theses at UTAD, particularly those related to agricultural sciences, economics, management, and regional development.



New approaches in the wine production sector

The lecture on the adaptation of viticulture to climate change, presented by Lia-Tânia Dinis from CITAB, was one of the various highlights of the seminar "New approaches in the wine production sector", which took place at the University of Trás-os-Montes e Alto Douro. The event was co-organized by CITAB and Mérieux NutriSciences - Portugal.



IVES - International Viticulture & Enology Society gathers in Douro Region

"Understanding vine response to Mediterranean summer stress for the development of adaptation strategies - the kaolin case" was the topic of the presentation that researcher Sara Bernardo from CITAB shared with members of the IVES - International Viticulture & Enology Society. This international society of experts gathered in the Douro region.





Challenges in the Sustainability of Agrarian Value Chains

Today we are facing growing challenges that mean we must substantially transform the way we look at food production to cater for the growing number of inhabitants on our planet. In addition to, and because of, population growth, we must find solutions to the climate crisis, the enormous impacts on nature and social inequalities, which have unfortunately also grown.

The Agri-chains are therefore under great pressure to contribute to mitigating the harmful effects of the current agrarian model, but without jeopardizing the availability of food.

The first component is the development of an intelligent agricultural model, not only using the most appropriate technologies, but also technologies with fewer negative impacts and which maximize positive impacts. However, we're not just talking about new technologies, especially digital ones, which have been getting the most attention, but also the recovery of ancient technologies that may today be the most suitable for overcoming many of the challenges we face.

Most of the negative impacts we face today are caused by the great complexity of the sector's value chains. This sophistication has mainly been due to major impacts generated by not accounting for such important factors as greenhouse gas emissions and their effects, or the reduction of biodiversity and the degradation of the soil's ability to function without fertilization or pesticides. Another fundamental component has to do with the profile of the diet we have, which has become more standardized as countries improve their economic performance. Intensive livestock farming, whether for meat or milk production, is increasingly standardized as a source of protein. This intensification is also having an increasingly negative impact on nature, as well as increasing regional inequalities. Once again, not only cutting-edge technologies are at issue here, but also the recovery of old technologies. This path also involves the recovery of neglected or abandoned species or cultivars, as well as new sources that have not yet been explored.



Luís Rochartre
Greenlab

Increasingly, chains will have to be shorter and more efficient. The protection of biodiversity and the reduction of greenhouse gas emissions will be the two biggest objectives and success factors. Another central concern in the sector is efficient water management. The availability of water for food production will be increasingly greater and there will be pressure from competition for other uses, so once again the reduction and optimization of water use will be key to success.

Social issues are also of great importance, especially in the Portuguese case due to their scarcity, mainly due to negative demographics in rural areas, due to the reduction in the number of births and migration to cities. Associated with demographic issues, there is also a lack of interest in rural activities, mainly related to low work income and harsh conditions. It is increasingly difficult to interest young people in professional careers linked to rural activities.

It is also required that appropriate regulatory incentives be developed, supported by the most advanced knowledge available.

In conclusion, the sustainability of agrarian value chains is a pressing global concern that demands immediate attention and concerted efforts. By tackling these challenges, the agriculture sector can transform into a model of environmental stewardship, social equity, economic resilience, and regenerative drive.



Strengthening Bonds to Reinforce Inov4Agro

On February 16th, UTAD (University of Trás-os-Montes e Alto Douro) hosted the workshop “Innovation towards a more sustainable agri-food production” This event brought together members of Inov4Agro, the Associated Laboratory that combines CITAB (UTAD) and GreenUPorto (University of Porto).



Empowering Agricultural Value Chains: Insights from the Inov4Agro Open Day

The Associated Laboratory Inov4Agro, which brings together the R&D units CITAB and GreenUPorto, has fostered close dialogue with stakeholders from the main agricultural value chains in the Portugal Northern region. The goal has been to identify the main challenges and opportunities for research and collaboration, aiming to strengthen knowledge transfer and training of the respective socio-economic agents. As a result of this interaction, seven value chains were already identified for which there is recognized scientific and technical competence within the scope of the Associated Laboratory. At the Inov4Agro Open Day, different working groups outcomes were presented, complemented by extensive discussions involving all interested researchers, stakeholders, and decision-makers. This was also an opportunity to identify synergies between Inov4Agro and stakeholders, enhancing the medium and long-term sustainability of the research activities of the Associated Laboratory in the service of valorising and sustaining agricultural value chains and the national economy. This event is the result of work that has focused on identifying the main challenges and opportunities for research and collaboration in the areas of vineyards and wine, olive groves and olive oil, chestnuts and chestnut trees, fruit cultivation, horticulture and small fruits, aromatic and medicinal plants, bee products, mushrooms, natural areas, biodiversity, and forests.





The Inov4Agro Scholarship Researchers' Day: A Triumph in Academic Exchange

The "Inov4Agro Scholarship Researcher's Day" was a resounding success, an event endorsed by the Inov4Agro Associated Laboratory, providing scholars from CITAB and GreenUPorto the opportunity to share their research endeavours. The event received a total of 54 abstract submissions, which were organized into 12 oral presentations, 24 pitches, and 18 posters, covering the four thematic lines of Inov4Agro.



Half-Year Journey: Sustainable Agrifood Seminar Series for Doctoral Scholars

In December 2023, the "Sustainable Agrifood Production" Seminar kicked off. This series will extend over 6 months, and to participate, one must be a doctoral student affiliated either to CITAB or GreenUPorto. This serves as an excellent platform for presenting research, honing communication and science dissemination skills. The speakers, PhD students, are competing for awards that will finance the dissemination and development of their works!





Ana Sofia Freitas

Towards valorization of beehive natural products: unraveling Portuguese propolis bioactivities and potential

On June 2023, the CITAB researcher Ana Sofia Freitas successfully defended her doctoral thesis entitled “Towards valorization of beehive natural products: unraveling Portuguese propolis bioactivities and potential”. This work aimed to improve propolis production, value propolis through chemical and biological characterization and to exploit its application in the design of functional products. The use of grids and/ or the manipulation of

the grids pore size could help to increase propolis production. Chemical and biological characterization of propolis extracted with different solvents, on the path towards more ecological and sustainable alternatives, and used in combination with other antimicrobial agents showed promisingly high antioxidant capacity and antimicrobial properties, presenting great potential to fight fungal infections and resistant bacteria, revealing to be interesting for further investigations and use in different industries, alone or combined with antibiotics or even other beehive products. Cotton textile functionalized with a mixture of propolis and honey, exhibited great antioxidant potential and promising activity against *Propionibacterium acnes*. The obtained results showing propolis potential for several applications, support the importance of its use/ exploitation to reach its standardization and consequent acceptance and commercialization. This doctoral thesis was supervised by Prof. Dr. Cristina Aguiar (CBMA-UM) and Prof. Dr. Rui Oliveira (CBMA-UM) and was funded by national funds through FCT - Portuguese Foundation for Science and Technology (PD/BD/128276/2017), under the Doctoral Programme “Agricultural Production Chains – from fork to farm” (PD/00122/2012).



Daniel Sousa

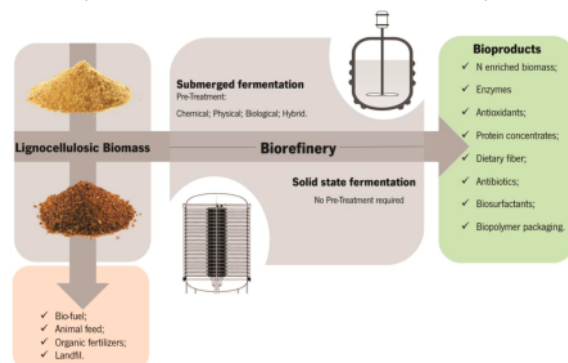
Agro-industrial wastes up-grading by solid-state fermentation for bioactive compounds production

CITAB researcher Daniel Sousa, defended his doctoral thesis entitled “Agro-industrial wastes up-grading by solid-state fermentation for bioactive compounds production” in July 2023. His work aims to develop strategies for the valorisation of agro-industrial by-products.

The vegetable oils industry plays a leading role in world markets due to its importance in human nutrition and bioenergy and generates large amounts of by-products, oilseed cakes (OC). OC are mainly used in animal feed and have several characteristics that make them suitable substrates to be used in biotechnological processes to obtain value-added compounds. This work proven that the OC in study have a suitable chemical composition for being used as substrate in solid-state fermentation (SSF) without the need of pre-treatments or external supplementation. The use of microbial consortiums has proven to be a suitable approach to apply in SSF of OC. The SSF process was optimized through an experimental design where the mixture of substrates was evaluated demonstrating the importance of substrates mixture to respond to microorganisms' nutritional requirements. The effect of fermentation on the nutritional properties of OC was evaluated through an in vitro poultry digestive system. Finally, the effect of fermentation was again in evidence considering the bioactive potential of extracts that showed promising results that should be explored in future works.

Globally, it demonstrated the potential of a simple and eco-friendly strategy, for the valorisation of OC, by OC biomodification, either by the simultaneous production of value-added compounds with applications in several industries, including in animal feed.

This work was supervised by Isabel Belo (CEB, UM), María Cambra-López (UPV) and Alberto Dias (CITAB). The thesis was funded by FCT (PD/BD/135328/2017), under the Doctoral Programme “Agricultural Production Chains – from fork to farm”.

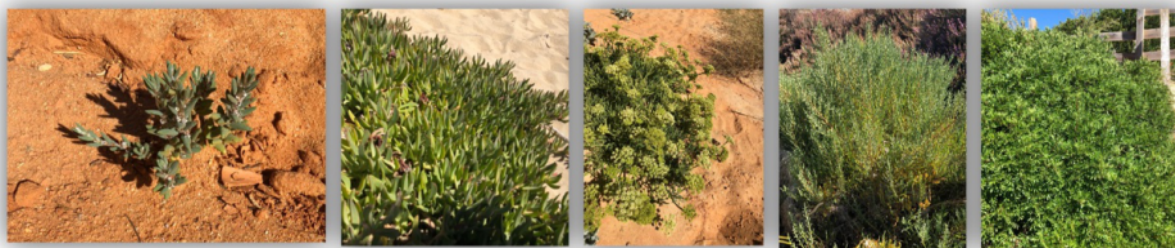




Daniela Oliveira

Valorisation of halophyte plants present in Portuguese territory through the investigation of their protective effects against food toxicants

CITAB researcher Daniela Oliveira successfully defended her doctoral thesis entitled “Valorisation of halophyte plants present in Portuguese territory through the investigation of their protective effects against food toxicants” in December 2023. This work focused on the investigation of protective properties of extracts of halophytes towards the toxicity induced by food contaminants considering the impact of digestion on these properties to contribute to the creation of functional food ingredients. From the several halophyte species tested, *Polygonum maritimum* L. extract exhibited the most promising potential to counteract food contaminants-related toxicity, revealing in vitro antioxidant, antigenotoxic, and antimutagenic properties, which persisted after in vitro simulated digestion, and in vivo protective effects in zebrafish. This work contributed to the recognition of halophytes as a highly promising source of biofunctional compounds and products for human health, and particularly suggested that *P. maritimum* may have a potential role as a functional food ingredient likely to induce benefits in the gastrointestinal tract. This doctoral thesis was supervised by Prof. Dr. Rui Oliveira (CBMA) and Dr. Luísa Custódio (CCMAR), and resulted from work performed at the Department of Biology of the University of Minho (CITAB/CBMA, Portugal), CCMAR (University of Algarve, Portugal), CIIMAR (University of Porto, Portugal), CIMO (Polytechnic Institute of Bragança, Portugal), AgroSup Dijon (University of Burgundy, France), and Department of Biochemistry of the State University of Maringá (Brazil). This work was funded by FCT – Portuguese Foundation for Science and Technology (PD/BD/135329/2017), under the Doctoral Programme “Agricultural Production Chains – From Fork to Farm” (PD/00122/2012).



Sandra Martins

Valorisation of halophyte plants present in Portuguese territory through the investigation of their protective effects against food toxicants

CITAB researcher Sandra Martins, successfully defended her doctoral thesis entitled “Unravelling sustainable agronomic practices effects on olive tree physiology and olive oil quality” in December 2023.

The sustainability of mediterranean olive orchards has been threatened by climate change and soil degradation processes. On the other hand, agronomic practices traditionally used, such as conventional soil tillage have negative environmental impacts. Hence, this PhD study aimed to explore the effects of sustainable soil management practices on soil quality, olive tree performance and olive fruits and oil quality, under rainfed conditions. The implemented sustainable soil management practices include the use of a leguminous cover crop and the application of soil amendments, such as zeolites and biochar. Results generally showed that the sustainable practices significantly contributed to increase olive yield and photosynthetic performance, which was accompanied by an increase of olive fruit and oil quality. The polyphenolic and fatty acid composition of olive fruits and oils was clearly modulated by soil treatments. Regarding the effects on soil properties, zeolites soil amendment was clearly more efficient by improving several soil quality indicators. Overall, the results obtained with this PhD thesis suggest that the implemented practices contribute to improve the sustainability and competitiveness of olive sector, and to adapt and mitigate climate change simultaneously. This work was supervised by Carlos Manuel Correia (CITAB), Fernando Nunes (CQ-VR) and Alexandre Gonçalves (MORE). The thesis was funded by FCT (PD/BD/135327/2017), under the Doctoral Programme “Agricultural Production Chains – from fork to farm”.



Short notes & Upcoming events

Success in FCT's CEEC: José Guisuraga Secures Junior Researcher Position

José Guisuraga, an integrated member of CITAB, is one of the researchers who successfully secured a scientific position, in the Junior Researcher category, in the latest edition of the Individual Scientific Employment Stimulus Competition (CEEC) by the Foundation for Science and Technology (FCT).

CITAB had already obtained approval in all previous editions of the CEEC, always in the Junior Researcher category, with the exception of the 5th edition, where researchers Irene Gouvinhas and Hélder Fraga were also selected, but for contracts as Assistant Researchers.

In this 6th edition, there is also noteworthy mention of researcher Tatiana Andreani, a PhD Collaborator at CITAB, who also secured a research contract as an Assistant Researcher.

Concurso Estímulo
ao Emprego Científico
Individual - 6ª Edição

 CITAB



José Guisuraga

Upcoming Events

SUSTAINABLE AGRIFOOD PRODUCTION SEMINARS

GET TO KNOW OUR RESEARCH WITH CERTIFICATE & AWARDS!

JANUARY 17 Campo Alegre/FCUP, FCA, Room 2.7B Zoom CITAB, UTAD

MARIA JOÃO COSTA 14h30
GreenUPorto PhD Student in Food Consumption and Nutrition Sciences
FOOD FRAUD: CONCEPTUALIZATION IN THE PORTUGUESE CONSUMER: AN EXPLORATORY STUDY

TERESA FREITAS 14h45
CITAB PhD Student in Agriculture and Forestry Sciences
STUDY OF CLIMATE CHANGE IMPACTS AND THE ADAPTATION MEASURES IN AGRICULTURAL, CHESTNUT AND ALMOND SPECIES, IN PORTUGUESE TERRITORY



SUSTAINABLE AGRIFOOD PRODUCTION SEMINARS

GET TO KNOW OUR RESEARCH WITH CERTIFICATE & AWARDS!

FEBRUARY 21 GreenUPorto, Vila Real, Room 11 Zoom CITAB, UTAD

BEATRIZ FERNANDES 14h00
GreenUPorto PhD student in Agricultural Sciences
INTEGRATED APPROACHES FOR REDUCING THE RISK OF VINEYARD SOILS POLLUTION WITH COPPER

NATHALIE GUIMARÃES 14h45
CITAB PhD Student in AgriChains - Agricultural Production Chains - From Fork to Farm
COMPARATIVE EVALUATION OF REMOTE SENSING PLATFORMS FOR ALMOND YIELD PREDICTION



LUÍS FÉLIX

Monoterpenes as sedatives and stress-reducing agents in zebrafish

2nd february 2024 | 2:30 PM

 ZOOM



TERESA FREITAS

Understanding climate change's impacts on crops from the recent-past to future

1st march 2024 | 2:30 PM

 ZOOM



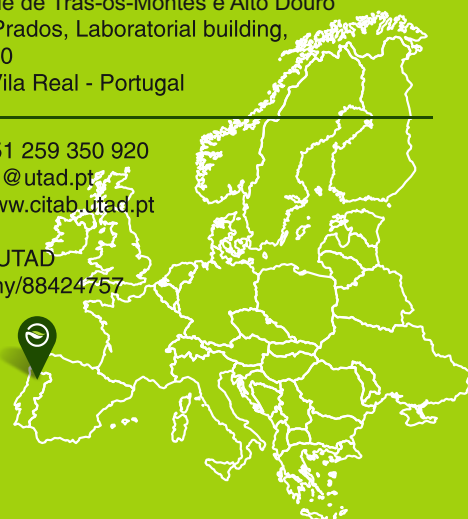
Location and contacts

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e a Tecnologia

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