SYMPOSIUM

AGRICULTURE AND FOOD SUSTAINABILITY

NEW CLIMATE CHANGE SCENARIOS

Onsite & Online Attendance

11-13 OCTOBER 2021

Madeira Island · Portugal

PROGRAM & ABSTRACT BOOK

ORGANIZATION

UNIVERSIDADE da MADEIRA

ISOPlexis
Centro de Agricultura Sustentável e Tecnologia Alimentar

CASBIO

IPNA CSIC

Parditi
agência regional para o desenvolvimento da investigação tecnologia e inovação

i3N
INSTITUTE FOR NANOSTRUCTURES, NANOMODELLING AND NANOFABRICATION

CITAB
Centre for the Research and Technology of Agro-Environment and Biological Sciences

ORDEM DOS ENGENHEIROS

2021 ANO E EFICIÊNCIA ENERGÉTICA ECONOMIA CIRCULAR

Região Autónoma da Madeira
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Secretaria Regional
de Agricultura
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Direção Regional de Agricultura
e Desenvolvimento Rural

PROJECTS

Ahidagro

APOGEO

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CO-FOUNDING

MADEIRA 14-20

REGIÃO AUTÓNOMA DA MADEIRA

PORTUGAL 2020

UNIÃO EUROPEIA
Fundo Europeu de Desenvolvimento Regional

MAC 2014-2020
Cooperación Territorial

Interreg
Fondo Europeo de Desarrollo Regional

Program & Abstract Book of the Symposium "Agriculture and Food Sustainability: New Climate Change Scenarios"
Editores: Miguel Ângelo A. P. de Carvalho; Anísia Martins; Carla Gouveia; Carla Ragonezi; Carolina Vieira; Énio Freitas; Ana Isabel Freitas; Maria João Carvalho; Sónia Alves; Andrés A. Borges Rodríguez; António Paulo Santos; Bernardo O. Melvill de Araújo; Sónia Costa; Elsa Ferreira; Teresa Gonçalves
Funchal, Portugal

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Welcome!

Dear colleagues,

On behalf of the Organizing Committee, it is my pleasure to welcome you to the **Symposium "Agriculture and Food Sustainability: New Climate Change Scenarios"**, with the support of the University of Madeira, through ISOPlexis – Centre for Sustainable Agriculture and Food Technology, and partners.

Climate change is a global concern and the main topic to be discussed at the Symposium. In the next 30 years, carbon dioxide and global temperatures are expected to rise, rainfall will decrease and, therefore, the frequency and intensity of extreme weather conditions are expected to have a significant impact on agriculture, agrosystems, and crop productivity. There is a clear demand for immediate action in this new climate scenario, which must involve global and local strategies.

Our main aim is to provide an opportunity for discussion and exchange of knowledge and experience between researchers and others who share an interest in Climate Change and Food Sustainability. Therefore, I am glad to welcome everyone, including students, researchers, industry members, and policy makers and look forward to hearing about your recent findings on this topic. I would also like to thank all the AFSS2021's partners, co-founders and sponsors for all the amazing efforts in to making this an event of excellence.

I really hope you enjoy your stay in Madeira!

Miguel Ângelo A. P. de Carvalho,

Chairman of AFSS2021

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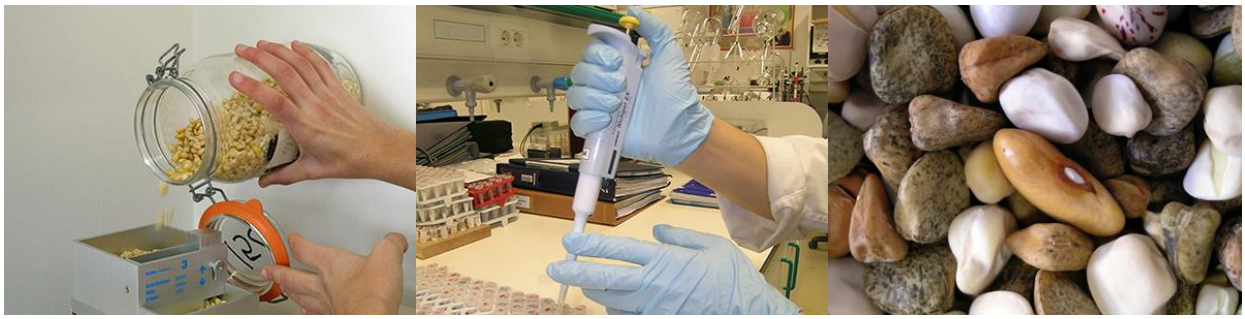
ISOPlexis – Centre for Sustainable Agriculture and Food Technology

ISOPlexis Centre is a research unit that develops activity in the thematic domains of Agriculture, Sustainability, Agrifood and Food Technology, with a focus on agrodiversity broad understanding, genetic resources, local crop varieties, food technology and food products.

It aims to contribute with to the development of knowledge and technology promoting the sustainability of agriculture and agrifood sectors, and cooperating in the development of the bioeconomy, with interested stakeholders.

The ISOPlexis Center participates in several national and international research programs and projects, contributes to the implementation of the National and European Plans for Genetic Resources, participates in the FAO Regional Network of Germplasm Banks and has as partners several national and international research centers. The unit participates in the advanced training and educational offer of the University of Madeira, promoting scientific knowledge and culture.

ISOPlexis is organized into 2 research groups: ISOPLab and QSALab; and 2 internal units: ISOPlexis Genebank and ISOP-Services.



The ISOPLab develops R&D applied promoting the innovation in the agriculture and biotechnology. The group activity has as focus to the monitoring and evaluation of agrodiversity in scenarios of global changes, the phenotyping and genotyping of genetic resources, and the evaluation and add value to biological resources and local productions. The group develops partnerships with agricultural, agrifood and biotechnology enterprises and farmers. These partnerships aim to solve and overcame, through the research, problems that stakeholders are facing.

The QSALab promotes R&D in the domains of food technology and related industrial processes, ensuring the production processes optimization and the characterization of local products, through advance analytical techniques and metabolomic approaches, using a diversified equipment platform. The group ensures several partnerships enterprises from wine and

beverages sector. These partnerships aim to solve and overcame, through the research, problems that stakeholders are facing.

The ISOPlexis Genebank (BG ISOPlexis or Germobanco) is a Genebank, which maintains and ensures the Documentation and Information System (DIS) for the Genetic Resources for Food and Agriculture (GRFA) relate to Madeira Region. The DIS holds the passport documentation of more than 5,000 accessions of GRFA and maintains germplasm collections local landraces and genetic resources, characterized with assistance of research work develop in the framework of project or through the research work of the ISOPLab and QSALab.

The ISOP-Services is an Unit for technological development and innovation, which provides consultancy and analytical services to the community in the several areas of Center intervention domains. The ISOP-Services have a long record of accomplishment of partnerships and provision of services to the companies and stakeholders.

Project CASBio

"Evaluation and monitoring of Agrobiodiversity and Agrosystem Sustainability in new climate scenarios"

CASBio is a project approved under the Madeira 14-20 Operational Program of the Autonomous Region of Madeira (Ref. M1420-01-0145-FEDER-000011) from 01 September 2017 to 31 December 2022. Within the scope of this project, the CASBio work is carried out to characterize and monitor agrosystems and indicator crops, under different agroecological conditions, to assess the adaptation of indicator crops and their genetic resources to environmental conditions and stress factors associated with climate change, and methodologies and technologies are being tested and developed aiming the use of bioresources to promote food security and sustainability and mitigate the impact of global changes on the regional agricultural sector. CASBio objectives are aligned and framed in the Regional Smart Specialization Strategy for the Autonomous Region of Madeira (RIS3-RAM), the respective Action Plan for Research and Development Technological and Innovation (PIDTI) which defined bio-sustainability as one of the strategic areas of intervention. CASBio aims to promote efficient management of the R&I resources existing in the region, the internationalization of research, the implementation of projects that contribute to research and increase the knowledge in relevant sectors of the CLIMA strategy, contributing to the transfer of knowledge and technology to the economic sector and the creation of scientific employment in the strategic domain of bio-sustainability. The operation is structured into 3 lines of investigation that respond to priorities already identified in the need to increase knowledge about the impact of climate change on agriculture (Agrobiodiversity and Agrosystems) in RAM.

In the development and implementation of this project, the promotor ISOPlexis Centre for Sustainable Agriculture and Food Technology has the partnership from the regional DRA, DROTA, LREC, UBQ, CDISA-Quinta Leonor, and ARM; the Macaronesian ULL, IPNA (Canaries), UA, and CE3C (Azores); the national ICAAM and UEvora; the international partners CIRAD (France) and InnoTech (Canada).

Entidades Promotoras

Entidades Parceiras

Cofinanciamento

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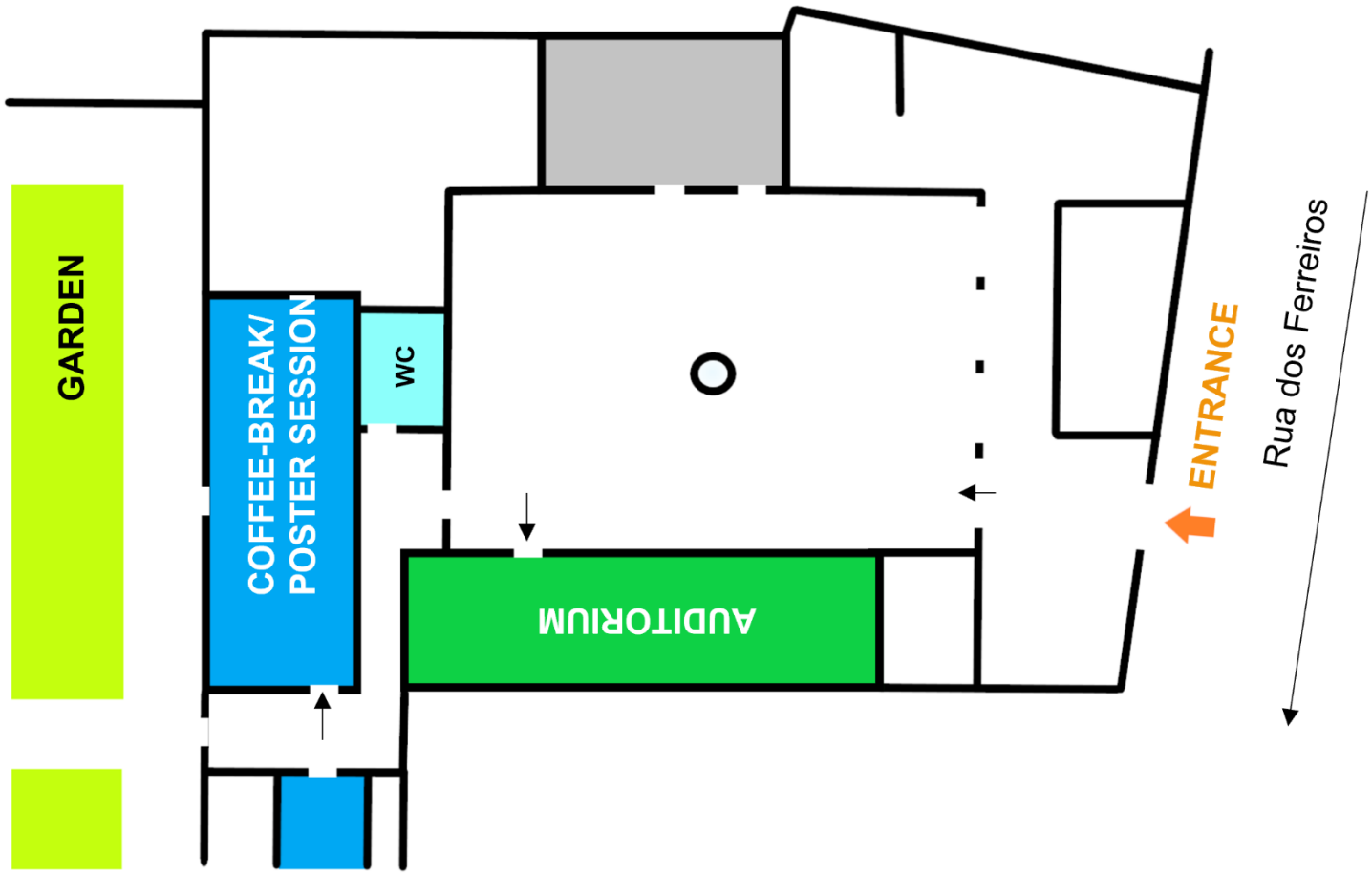
Topics

- **Assessing and modelling the impacts of climate changes in agriculture: current status, advances, and challenges**
- **Biotic and abiotic stresses on agriculture and crops resilience**
- **Water management in agriculture**
- **Climate-smart agriculture**
- **Impacts on food security and diet**
- **Future challenges/perspectives**

Venue (map)


GARDEN
COFFEE-BREAK/
POSTER SESSION
WC
AUDITORIUM
ENTRANCE
Rua dos Ferreiros

General Program

Sunday, 10th of October	Monday, 11th of October		Tuesday, 12th of October		Wednesday, 13th of October	
15:00-17:00 Registration	08:30-09:00	Registration				
	09:00-09:40	Opening ceremony	08:30-09:00	Registration		
	09:40-10:40	**Keynote-speaker presentation 1**	9:00-10:00	**Keynote-speaker presentation 3**	9:00-10:00	**Keynote-speaker presentation 5**
	10:40-11:40	Coffee-break / Poster session	10:00-11:00	Coffee-break / Poster session	10:00-10:40	Coffee-break / Poster session
					10:40-11:40	**Keynote-speaker presentation 6**
	11:40-12:40	Oral presentations	11:00-12:30	Oral presentations	11:40-12:40	Round Table
					12:40-13:00	Awards
	12:40-14:00	Lunch	12:30-14:00	Lunch	13:00-14:30	Closing event & Lunch
	14:00-15:00	**Keynote-speaker presentation 2**	14:00-15:00	**Keynote-speaker presentation 4**		
	15:00-16:00	Coffee-break / Poster session	15:00-16:00	Coffee-break / Poster session		
	16:00-17:30	Oral presentations	16:00-17:30	Oral presentations	14:30	Social events
	17:30-18:30	Welcome event	20:00	Gala dinner		

Program

Sunday, 10th of October 2021

15:00 – 17:00	**Registration**

Monday, 11th of October 2021

08:30-09:00	**Registration**
09:00-09:40	**Opening ceremony**

Chairperson: David Horta Lopes *University of Azores*

09:40-10:40	KSC-01 **Assessing the impacts of climate changes in agriculture: Current status, advances, and challenges** **Cristina Branquinho** *University of Lisbon*
10:40-11:40	**Coffee-break & Poster session**
11:40-12:40	OC-01 **Assessing the anticipated climate changes impacts in Madeiran agriculture through characterization and monitoring case study agrosystems** **Miguel Ângelo A. Pinheiro de Carvalho** *ISOPlexis, University of Madeira* OC-02 **Floristic composition and biodiversity structure of Madeira Archipelago agro systems** **Humberto Nóbrega** *ISOPlexis, University of Madeira* OC-03 **Bacterial and Archaeal community's structure: the characterization and monitoring of a vine agrosystem from Madeira** **Carla Ragonezi** *ISOPlexis, University of Madeira* OC-04 **Seasonal dynamic of soil fungal communities in two distinct agroecosystems** **Cristina Oliveira** *ISOPlexis, University of Madeira*
12:40-14:00	**Lunch**

Chairperson: to be announced

14:00-15:00	KSC-02 **Climate resilient crops - a major challenge for improving global food security and safety** **Cristina Máguas** *University of Lisbon*
15:00-16:00	**Coffee-break & Poster session**
16:00-17:30	OC-05 **Modeling the potencial distribution of the Spotted Wing *Drosophila* (*Drosophila suzukii*) in Madeira Island** **Fábio Reis** *ISOPlexis, University of Madeira*

Monday, 11th of October 2021

OC-06 **Quality composition of Madeiran sweet potato grown under different agro-climatic conditions**
Carla Gouveia *ISOPlexis, University of Madeira*

OC-07 **Towards a sustainable and circular economy: Agrifood waste as a source of biomolecules for improving the global food system**
Ana C. Vieira *ISOPlexis, University of Madeira; Institute for Nanostructures, Nanomodelling and Nanofabrication, University of Aveiro*

OC-08 **Keeping up with grapevine summer stress: the kaolin case**
Sara Bernardo *CITAB, University of Trás-os-Montes and Alto Douro*

OC-09 **Potential of maize-cowpea intercropping system to reduce the climatic change impacts in Portugal**
Ana Maria Barata, *INIAV – Instituto Nacional de Investigação Agrária e Veterinária*

OC-10 **Responses to soil compaction stress among maize hybrids (*Zea mays* L.) - Selection approach**
Maciej T. Grzesiak *The Franciszek Górski Institute of Plant Physiology, Polish Academy of Sciences*

17:30-18:30 **Welcome Event – Madeira d' Honra**

Tuesday, 12th of October 2021

Chairperson: to be announced

09:00-10:00 KSC-03 **Scheduling irrigation for a digital, sustainable, and intensive agriculture**
José Enrique Fernández Luque *IRNAS – Instituto de Recursos Naturales y Agrobiología de Sevilla, CSIC – Consejo Superior de Investigaciones Científicas*

10:00-11:00 **Coffee-break & Poster session**

11:00-12:30 OC-11 **Soil nutrient estimation using machine learning and sentinel-2 earth observation data**
Manuel Pereira *ITI-LARSyS – Técnico Lisboa*

OC-12 **Antimicrobial peptides for crop protection against the fungal pathogen *Botrytis cinerea***
José Manuel Pérez de la Lastra *Instituto de Productos Naturales y Agrobiología – IPNA-CSIC*

OC-13 **The role of the Cuarentagri project in monitoring pests and issuing phytosanitary sheets as an embryo of the creation of an agricultural warning system in the Azores**
David Lopes *Ce3C – Centre for Ecology, Evolution and Environmental Changes, University of Azores*

OC-14 **Root treatment with menadione sodium bisulfite induces resistance against *Botrytis cinerea* in tomato plants: A promising eco-friendly fungicide alternative**
Andrés A. Borges *Instituto de Productos Naturales y Agrobiología – IPNA-CSIC*

OC-15 [Not presented]

Tuesday, 12th of October 2021

	OC-16 **Physiological performance of sweet cherry tree cv. Early Bigi with pre-harvest application of biostimulants** **Sílvia Afonso** *CITAB, University of Trás-os-Montes and Alto Douro*
12:30-14:00	**Lunch**

Chairperson: to be announced

14:00-15:00	KSC-04 **From climate change evidence to climate-smart agriculture** **João Carlos Andrade Santos** *University of Trás-os-Montes and Alto Douro*
15:00-16:00	**Coffee-break & Poster session**
16:00-17:30	OC-17 **Modifications on commercial drones por precision agriculture** **José Fco. López** *Institute for Applied Microelectronics, University Las Palmas de Gran Canaria* OC-18 **The Pervemac II project and its actions regarding a sustainable agriculture and food safety in Azores** **David Lopes** *Ce3C – Centre for Ecology, Evolution and Environmental Changes, University of Azores* OC-19 **Sensors in food safety – An overview** **Ana Isabel Freitas** *ISOPlexis, University of Madeira; Institute for Nanostructures, Nanomodelling and Nanofabrication, University of Aveiro* OC-20 **Sustainability case studies on Madeira wine production** **Anísia Martins** *ISOPlexis, University of Madeira; Institute for Nanostructures, Nanomodelling and Nanofabrication, University of Aveiro* OC-21 **Aiming for a sustainable beer production: creating opportunities with our by products** **Sofia Freitas** *Empresa de Cervejas da Madeira*
20:00	**Gala dinner**

Wednesday, 13th of October 2021

Chairperson: Elsa Fernandes *University of Madeira*

09:00-10:00	KSC-05 **Impacts on food security and diet** **Pedro Portugal Gaspar** *ASAE – Autoridade de Segurança Alimentar e Económica*
10:00-10:40	**Coffee-break & Poster session**

Wednesday, 13th of October 2021	
10:40-11:40	KSC-06 **Grape and winegrowing: The canary in the coal mine not only for agriculture - A perspective from a food microbiologist** **Manuel Malfeito Ferreira** *Instituto Superior de Agronomia, University of Lisbon*
11:40-12:40	**Round table**
12:40-13:00	**Awards**
13:00-14:30	**Closing event & Lunch**
14:30	**Social events with ASFF2021 partnerships**

Social Events Partnerships

For more information read the section dedicated to the social events, availiable in this book.

Keynote Speakers

Cristina Branquinho

Associate Professor at the Faculty of Sciences University of Lisbon. Centre for Ecology, Evolution and Environmental Change.

Cristina Branquinho is an Associate Professor of Ecology at the Faculty of Sciences, University of Lisbon and received a PhD in Biology, Ecology in 1997. At cE3c she is currently leading the H2020 project SustaInAfrica where she is responsible for evaluating the ecosystem services provided by different types of Agricultural systems in Africa. Her research focuses on understanding ecological patterns at the ecosystem level in response to environmental changes, by: i) evaluating and modelling the structure and functioning of ecosystems for different scenarios (eutrophication, climate change and pollution); ii) developing, testing and tracking ecological indicators to be applied at different spatial and temporal scales; iv) restoring ecosystem structure and functioning submitted to different disturbances; iii) understanding the role of biodiversity on ecosystem functioning and ecosystem services delivery. She has 140 publications, 2800 citations and H-index=34 on Scopus. She participated in 70 projects of which 30 as coordinator. She has supervised 15 PhDs and 20 Msc students.

Cristina Máguas

Associate Professor of Ecology and Plant physiology. Faculty of Sciences, Universidade de Lisboa.

Cristina Máguas has a PhD in Biology, Plant Ecology and Systematics, from the University of Lisbon in 1997, is an Associate Professor of Ecology and Plant physiology at the Faculty of Sciences, Universidade de Lisboa (ULisboa), and an invited Professor at Campinas and São Paulo Universities (Brazil) and in Mozambique Gorongosa Park education program. At present time she is the Present Coordinator of the Executive Committee of Research Centre for Ecology, Evolution and Environmental Changes (cE3c), President of the European Ecological Federation (EEF), president of the scientific Council of the SmartFarm Colab and Vice-Director of the Tropical College of ULisboa (CTROP). Research focuses on: i) adaptation of Mediterranean and Tropical vegetation (ecophysiological responses and ecological approaches); ii) carbon and water fluxes from leaf to ecosystem level; iil) the application of Stable Isotope Mass Spectrometry to plant functioning, and geographic origin determination; iv) the ecological impact of invasive alien plants and development of control methods. Participation on 55 and coordinated 28 projects and networks at national and international levels; 114 publications, in Scientific International Journals with peerreviewing, several in journals with high impact factor such as the Ecology Letters, Land Degradation and Development, Global Change Biology, reviewed materials for 30 Scientific International Journals, 3414 citations, and H-index=38 on Scopus. She has supervised 12 PhDs and 32 Msc students.

José Enrique Fernández Luque

Instituto de Recursos Naturales y Agrobiología de Sevilla (IRNAS). Consejo Superior de Investigaciones Científicas (CSIC).

Dr. Fernández is specialised in the study of crop water relationships, mainly for crops of arid and semi-arid areas. He works mainly on precision irrigation, deficit irrigation and irrigation scheduling of woody crops. He tries to establish the basis for a more rational irrigation management, focused on reducing water consumption, achieving an optimum balance between yield production and quality and reducing the environmental impact of the use of water in agriculture. Currently, Dr. Fernández is the Director of the Institute of Natural Resources and Agrobiology (IRNAS, CSIC), and Head of the Irrigation and Crop Ecophysiology Group. He is Editor-in-Chief of Agricultural Water Management since 2013. Since April 2015 to June 2018, he was Coordinator of Agriculture of the Spanish National Evaluation Agency.

João Carlos Andrade Santos

Physics Department, School of Sciences and Technology. Universidade de Trás-os-Montes e Alto Douro (UTAD).

João Carlos Andrade Santos is currently Associate Professor at the Physics Department – School of Sciences and Technology of the University of Trás-os-Montes e Alto Douro (UTAD), Vila Real – Portugal (http://www.utad.pt/). Academic degrees: Habilitation in Physics at the UTAD in 2012; PhD in Climatology/Meteorology at the University of Lisbon in 2005; MSc at the UTAD in 1999; Graduation in Physics/Geophysics at the University of Lisbon in 1995. Area of expertise: Atmospheric Sciences, Climatology, Climate Change and its impacts, particularly in agroforestry systems and viticulture in particular. Current R&D Centre: Centre for the Research and Technology of Agro-Environmental and Biological Sciences (CITAB) (http://www.citab.utad.pt/). Projects: Member of 28 research projects, 8 of them international. He is currently the coordinator of the H2020 project "Clim4Vitis - Climate change impact mitigation for European viticulture: knowledge transfer for an integrated approach". Authorship: >100 SCOPUS-indexed papers (h-index: 29), 9 books/book chapters, about than 250 publications/proceedings in scientific meetings and invited-speaker in about 70 meetings. Teaching experience: lecturing of over than 60 curricular units/specialized courses. Past & current supervision: 6 PhD, 17 MSc and 28 scholarships. Other relevant activities: a member of about 50 academic referees, editor/guest editor in 6 journals and reviewer in about 40 JCR-index journals, organization of over than 20 scientific meetings. Principal Investigator of the CITAB's group "Integrated monitoring of climate and environmental impacts: adaptation and mitigation strategies".

Pedro Portugal Gaspar

ASAE General Inspector.

Pedro Portugal Gaspar has been the Inspector General of ASAE since 2013, a period during which ASAE has grown in its competences and strengthened its capabilities in ensuring food and economic security, with a view to safeguarding the interests of consumers. Graduated in Law from the Universidade Católica Portuguesa, Master in Administrative Law from the Faculdade de Direito de Lisboa and PhD in Administrative Law from the Faculdade de Direito de Lisboa, the Inspector General of ASAE has been performing numerous functions in the Portuguese Public Administration, in entities such as the Portuguese Environment Agency, Directorate-General for Energy, in addition to his duties as Deputy Director-General of the Directorate-General for Public Administration, Director-General of the Department of Modernization and Health Resources and Inspector-General of the Inspection-General for Agriculture, Sea of the Environment and Spatial Planning (2012), before starting the position of top director of ASAE. During his period of service to the Portuguese State, he received two accolades for his work in the public interest, attributed by the members of the Government responsible for the areas in which he performed his duties.

Manuel Malfeito Ferreira

Instituto Superior de Agronomia.

Manuel is an Assistant Professor at the Instituto Superior de Agronomia (ISA), University of Lisbon, teaching classes related with Food and Wine Microbiology since 1987. His research is mainly related with food and wine spoilage yeasts especially concerning volatile phenol production by Brettanomyces bruxellensis. Recently he has begun to study the microbial ecology of the vineyard environment, aiming at understanding the dissemination of spoilage species by analysing the microbiota of damaged grapes. His work is published regularly in peer-reviewed journals and is co-author of several book chapters. He is frequently invited to speak in technical seminars about wine microbial stability all over the world. Since his first work in the production of sparkling wine by the continuous method, in 1986, he is winemaker for several Portuguese wineries and organizes cultural and tasting events.

Special Issue

The oral and poster presentations submitted to the Symposium will be invited to prepare and submit an extended paper version in English for publication in a Special Issue in Agronomy (ISSN 2073-4395; CODEN: ABSGGL) – an international, scientific, peer-reviewed, open-access journal by MDPI – after further peer review. This journal is indexed in Web of Science, with an impact factor of JCR2019 = 2.603 (Q1, 18/91 in the "Agronomy" category), and in the Scopus database (Q1 in the "Agronomy and Crop Science" category). The special issue belongs to the section "Farming Sustainability" and the deadline for manuscript submissions is 10th December 2021. Since it is an open-access journal, this publication has a cost (APC) of 1800 CHF (Swiss Francs) for the papers accepted after peer review, although discounts are available for institutions participating in the institutional open access MDPI program and for authors who participate as reviewers.

Journal Webpage: https://www.mdpi.com/journal/agronomy

Special Issue Webpage:
https://www.mdpi.com/journal/agronomy/special_issues/Agriculture_Food_Sustainability

Abstracts – Keynote Speakers

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[KSC-01]
ABS-063

Assessing the impacts of climate changes in agriculture: Current status, advances, and challenges

Branquinho, Cristina - Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências da Universidade de Lisboa, Portugal

Agriculture is the major land use across the globe and any factor that will impact agriculture will affect the whole planet. This activity is highly dependent on climate conditions, especially in semiarid areas of the planet, where water is the main limiting factor to productivity. The semiarid and subhumid zones of the world are often considered dryland farming regions where agriculture is dominated by grazing by livestock and forestry. In areas where water can be stored there has been a transition from rainfed agriculture to irrigation agriculture. Changing environmental conditions such as rising temperatures, changing precipitation patterns and an increase of extreme weather events seriously affect agricultural productivity in these areas as for example: i) changes in phenology; ii) changes in productivity; iii) changes in pest and diseases; iv) overgrazing; v) changes in mortality; vi) changes in regeneration; vii) soil degradation. We aim at assessing the impacts that climate change can pose to agriculture in semiarid areas, the status, advances and challenge and the potential for adaptation. This will be done having an ecosystem services perspective, since agricultural ecosystems depend on ecosystem services provided by natural ecosystems. On the other hand, agroecosystems also produce a variety of ecosystem services, such as regulation of soil and water quality, carbon sequestration, support for biodiversity and cultural services. Agriculture can also be the source of numerous disservices. Thus, tradeoffs should be evaluated in terms of spatial scale, temporal scale and reversibility. On the contrary to climate mitigation, in which the response is only effective if implemented at a global scale, climate adaptation can reduce climate vulnerability at the local level. We show how Scenarios Workshops and Adaptation Pathways was successful in creating participatory robust adaptation plans for the agriculture in Portuguese semiarid areas.

[KSC-02]
ABS-065

Climate resilient crops - a major challenge for improving global food security and safety

Máguas, Cristina - Faculty of Sciences, Universidade de Lisboa, Portugal

At present time, some of the most important challenges are related with food security under present climate change. Indeed, climate change is already affecting food security through increasing temperatures, changing precipitation patterns, and greater frequency of some extreme events. Particularly in the Mediterranean region, climate change is causing large negative effects on yields due to drought intensification. Changing climate is predicted to have a wide range of negative impacts on plant physiology metabolism, soil fertility and carbon sequestration, microbial activity and diversity that will limit plant growth and productivity, and ultimately food production. Indeed, the efforts to pursued global food security and food safety will require an intensive research effort across all food chain, starting with crop production and the nutritional quality of the food products. However, there is much uncertainty concerning the resilience of plants, soils, and associated microbes to climate change. To develop Climate-Resilient Crops, intensive efforts need to be undertaken to improve yields with lower resources use and/or increased use efficiency, enhancing the sustainability of yield through improved biotic and abiotic stress tolerance traits. In addition, significant efforts are focused on gaining a better understanding of the root/soil interface and associated microbiomes, as well as enhancing soil properties. Moreover, more diverse agroecosystems with a broader range of traits and functions will be better able to perform under current climate change conditions, and thus to protect crop productivity against environmental change. Finally, and given the importance of agriculture as an important source of anthropogenic emissions of the greenhouse gases (GHG), the possibility of breeding low GHG-emitting cultivars is of crucial importance to obtain a sustainable agriculture that balances climate change and food security.

[KSC-03]
ABS-002

Scheduling irrigation for a digital, sustainable, and intensive agriculture

Fernández, José Enrique
Cuevas, María Victoria
Romero, Rafael

One of the main concerns of the irrigator is to determine, with the possible highest precision, the time and amount of irrigation. This task, known as irrigation scheduling, is crucial in a context of sustainable intensive agriculture, where an optimum balance between the benefits of irrigation and the conservation of water as a natural resource must be achieved. This explains the constant development of new approaches to overcome this challenge, based on scientific advances and technical improvements. Here we focus on new methods to schedule precision irrigation in a context of sustainable intensive agriculture. More precisely, we address the importance of defining both the production target and a suitable irrigation strategy, as well as new approaches to schedule irrigation, such that the economic crop water productivity is optimised. We review both the fundamentals and new sensors and related equipment to schedule irrigation in a context of digital agriculture, with especial attention to plant-based sensors, due to the potential of using the plant as a biosensor for assessing water stress. We address the need of combining the use of sensors in the field with remote imagery, to account for the natural variability in commercial farms and orchards. We also address main limitations of some of these methods, such as the cost and data processing requirements, which are behind their poor acceptance among irrigators, and analyse possible solutions to palliate those limitations. Finally, we outline new tendencies derived from the production of low-cost sensors by large companies, the use of artificial intelligence and related techniques to process the data, and that of mechanistic models to improve the assessment of the crop water needs.

[KSC-05]
ABS-064

Impacts on food security and diet

Portugal Gaspar, Pedro - ASAE, Inspector General

Climate change is a significant challenge to both food security and safety, as well as diet. As matter of fact, the food safety is a critical component of the food security and FAO defined food safety as the foundation of a healthy diet and life.
These two concepts are closely linked and must be considered together to promote an effective world's sustainability. On this basis, food safety assumes an important role within the European Union, as it has an integrated approach applied as a basic principle of food safety policy.
Food quality is a shared responsibility between food operators, food safety authorities and governments, which must implement a strong food control system. In Portugal, the Economic and Food Safety Authority (ASAE) is the national entity responsible for the discipline of the exercise of economic activities in the food and non-food sectors. Having administrative autonomy, acts as a police and law enforcement body.
Considering the above mentioned, this presentation is organized in five main topics:

- The concepts of Food Security and Food Safety.
- ASAE's role and structure. This part includes the key elements of its authority, its organizational and territorial structure, as well as its areas of intervention.
- ASAE's responsibilities and activities in Food Safety, namely the execution of plans of control (national plans and coordinated plans); the execution and participation in activities to tackle the food fraud and the development of cooperation to promote the food safety and to participate in different kinds of initiatives.
- The Novel Food according to the EU Regulation 2015/2283 of 25 November and ASAE's activity in this domain.
- Final Remarks that include a little reflection about the model of food production vs food consumption and the ASAE's commitment to promptly respond to the new trends and requirements.

[KSC-06]
ABS-034

Grape and winegrowing: the canary in the coal mine not only for agriculture - A perspective from a food microbiologist

Malfeito-Ferreira, Manuel - Instituto Superior de Agronomia

The issues of carbon footprint and climate change have been thoroughly investigated during the past decades in viticulture and winemaking. Given the susceptibility of grape ripening to variation in daily temperature, the prominent viticulturist, Richard Smart, compared grapegrowing to the former utilization of canaries in coal mines to anticipate death by asphyxiation. The current favorable image of the organic mode of production has also led to an increasing interest to investigate issues of sustainability and consumer behavior that may anticipate other impacts beyond those of agriculture. In the case of wines, consumers tend to associate the organic label to higher sensory quality. The preference for these wines is higher even when tasters recognize what would be considered as spoilage in their conventional counterparts. In psychology, this behavior reflects an “halo” effect described as the cognitive bias whereby the perception of someone, or something, is positively influenced by the opinions towards that person, or object. That is, wines are considered better not because of their intrinsic quality but because of their positive association to the organic brand. This ideological bias maybe explained by recent developments in neuroscience showing that emotional responses are an integral part of the sense of smell. In this presentation, data on the sustainability issues of different modes of production will be summarized together with the challenges faced by scientific research in fields susceptible to the influence of global societal trends.

Abstracts – Oral Communications

SYMPOSIUM

AGRICULTURE AND FOOD SUSTAINABILITY

NEW CLIMATE CHANGE SCENARIOS

11-13 OCTOBER 2021 . Madeira Island . Portugal

[OC-01]
ABS-055

Assessing the anticipated climate changes impacts in Madeiran agriculture through characterization and monitoring case study agrosystems

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Two models have been developed to describe the climate scenarios for the Madeira region starting in 2050 and in 2070. These scenarios are on the Climate-Madeira Strategy (CMS) and anticipate an average rise of temperature, from 1.4 to 3.7ºC) and a decrease of precipitation from 30 to 40%), by 2070. Winter and summer events were used to stress out the extreme changes expected. According to the CMS, agriculture is one of six sectors of Madeira´s economy that will suffer the impacts of climate changes and need further climatic action. Although we do not know how these changes will express and pressure the agrosystems and their cultures, and which kind of adaptation actions need to be undertaken. During the CASBio project, the annual temperature and precipitation variation of 1961-1991 and 2010-2020 meteorological data series, has been analysed and compared with the CMS summer and winter extreme events, to understand the trend in climate changes affecting agriculture. Six agrosystems with distinct characteristics were characterize and monitor, during 3 years. Those agrosystems included a vineyard, a banana plantation and temperate fruits orchards, horticulture farms, and the semi-arid agrosystem in Porto Santo (another inhabited island of the archipelago). Agrosystems´ annual variation of temperature, precipitation, water field capacity, soil conditions, microbiological communities, plants and insects' diversity, and crop production has been assessed. The results were used to determine a baseline of the agrosystems indicators. In addition, its variation compared with a hypothetical agrosystem and analysed in light of variation of climate variables. The agrosystems baseline is seen as a start point for long-term monitoring and allows furthering quantifying the influence of climate changes on agrosystems productivity, resilience and sustainability.

[OC-02]
ABS-041

Floristic composition and biodiversity structure of Madeira Archipelago agro systems

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This work is part of one of CASBIO's sub-projects: Assessment and monitoring of agro systems and environmental conditions, with the determination of their status and resilience. More specifically, the work is about point 1.1 Inventory and characterization of selected agro systems. An overview of the floristic composition and biodiversity structure of six agro systems from Madeira Archipelago is presented. For each agro system, a 3-year survey of natural occurring plant species was made, using the Braun-Blanquet phytosociological method. Frequency of the present species was recorded for the whole agro system and intensity was done in selected 1 m2 areas. Species were ranked according to their Life form and conservation status. Biodiversity indices were calculated for Species Richness (S), Corrected Evenness (E´) and Hill Indicex (N2). The floristic composition of the agrosysytems yielded 57 floristic families and 238 species. Arco de São Jorge had the highest number of species (130) in 38 families, while Porto Santo had the lowest number of species (86) in 27 families. (N2) had an average index of 3.31 for all agro systems. The agro system of Porto Santo presented the lowest value (2.70) and Jardim da Serra had the highest value of diversity (3.83). Santa Cruz presented the lowest (E´) (0.52) and Porto Moniz had the highest value (0.61), with an average of 0.56 of species homogeneity for all agro systems. (S) had an average value of 61.26 species for all agro systems. The Calheta agrosystem had the lowest value (50.83) and Jardim da Serra had the highest (80.50) number of present species. The results show that agrosystems with higher altitude, with Organic Farming practices and have horticultural production have on average the highest values on all indices, as tJardim da Serra, Porto Moniz and Arco de São Jorge. In the case of specific agrosysytems like vineyards or banana plantations, such as Porto Santo, Estreito da Calheta and Santa Cruz these present lower values.

[OC-03]
ABS-051

Bacterial and Archaeal community's structure: the characterization and monitoring of a vine agrosystem from Madeira

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Microbial diversity plays a vital role in shaping ecosystem functions in the soil, and monitoring the structure is fundamental to understand community dynamics. In this work, bacterial and archaeal communities' structure, two major groups in agrosystems operation, were assessed in a vine agrosystem from the Madeira archipelago for two years. The study included microbiota analysis via classical microbiology (for bacteria) and molecular techniques (for bacteria and archaea). Bacteria were quantified by using the dilution method, and molecular analysis was performed by the TRFLP method which is a rapid and robust method for assessing microbial community structure. Diversity indices, that provide important information about the community, were determined based on terminal restriction fragments (TRFs). Results from the classical approach, showed differences among seasons for bacteria quantification, being the summer, significantly different from spring and autumn. The group had the highest values for viable cells in intermediate seasons (autumn and spring) and the lowest in summer, and although studies report summer as the season for optimal growth and abundance, is precipitation-dependent, which is low in the study site. Relations between diversity indexes (based on TRFs) and seasonal variation, climatic data, and edaphic parameters were assessed for bacteria and archaea groups. Preliminary results show that season variation and climatic and edaphic parameters resulted in changes in the community´s shape of both groups and influence the structure and the dynamic of the community. This work is part of a wider data collection project: CASBio - Evaluation, and monitoring of agrobiodiversity and sustainability of agrosystems in the new climate scenarios, an evaluation, and monitoring project for agrobiodiversity and sustainability of agrosystems in the new climate scenarios, and the development of knowledge and technology to bioeconomics ´promotion.

[OC-04]
ABS-052

Seasonal dynamic of soil fungal communities in two distinct agroecosystems

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Climate is one of the main drivers of organism's growth and species distribution. Thus, a variation in climate has the potential to change the structure of soil communities. Giving the central role of soil fungi in agroecosystems, we monitored seasonally, for two years, soil fungal communities of two agroecosystems from Madeira Archipelago with distinct agricultural practices and climate conditions. Agroecosystem 1 (Quinta das Vinhas - QV) is a vineyard under monoculture, located at south of the island exposed to dry conditions in most of the year. Agroecosystem 2 (Quinta do Mitra - QM) is a horticulture plantation, were intercropping and crop rotation prevails, located at north of the island with mild temperature and high precipitation and humidity. Quantification of soil fungi was done by classical microbiological methods and community structure was analysed by Terminal Restriction Fragment Length (T-RFLP) technique. Counts of viable cells in culture media showed significant differences among seasons only for soil fungal community of QV. Regarding the structure of fungal community, QV shows more susceptibility to seasonal variation. However, correlations indicate that climatic conditions influence indirectly the structure of the community, by altering soil parameters. The structure of fungal community of QM was shaped not only by edaphic parameters, but also by maximum temperature and humidity, however differences were not pronounced among seasons. In Arbuscular Micorrhizal Fungi (AMF) community, changes were not significant, meaning that this fungal group is quite stable along seasons in both agroecosystems. This study clearly shows that the influence of climate in soil fungal communities, as a whole, depends on agroecosystems conditions. Nonetheless, the AMF community tends to adapt to climate change in both scenarios under study.

[OC-05]
ABS-053

Modeling the potencial distribution of the Spotted Wing Drosophila (*Drosophila suzukii*) in Madeira island

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Drosophila suzukii (Matsumura, 1931), commonly known as Spotted Wing Drosophila, is native from South East Asia and it's the only species of *Drosophila* that the females lay their eggs in healthy ripening fruits. In this way, it´s a serious economic pest to small and stone fruits, that include cherry, raspberry, blackberry, blueberry, strawberry, peach, plums, nectarines, grapes. This invasive species was recorded for the first time in Europe in 2008 and mainland Portugal in 2012. In Madeira island, it was first identified in 2014 in traps placed in vineyards in Caniçal, located in the extreme east of the island. Since it´s a plague of great concern it is extremely important to know its degree of dispersion in Madeira island. Therefore, from 2014 until the present, samplings are being made in fruit crops throughout the island, using traps. Models for the distribution of *D. suzukii* were generated using the Maximum Entropy Modeling (MaxEnt). According to the values obtained for AUC (area under the curve of sensitivity x specificity), the results obtained were 77.4%, which is considered good. Regarding the environmental variables analyzed, the one that most contributes to the dispersal of the occurrence of the insect in Madeira corresponds to the terrain (orography) contributing 90.5% of the estimated model. Continuous monitoring of the dispertion of D. suzukii in the region is important to deeper the knowledge and to find management and control tools for the plague.

[OC-06]
ABS-048

Quality composition of Madeiran sweet potato grown under different agro-climatic conditions

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Sweet potato (*Ipomoea batatas* (L.) Lam.) is an important staple food in several regions of the world. At Madeira Island (Portugal), it is a crop of economic, social, and cultural importance. Current climate events, such as drought and temperature, are the abiotic collateral consequences of climate change that put agricultural production and quality at risk. We currently know that the Madeiran sweet potatoes have a good capacity of adaptation to drought stress conditions. However, there is little information on how this local crop adapts to Madeira's terrace agrosystem and variated environmental conditions. Here, we show productivity, and root tubers and shoots (stem, stalk, and leaves) quality composition of 2 sweet potato accessions – "5 Bicos" and "Inglesa" – grown under ideal conditions and out of agro-climatic and season conditions, determined using high-precision near-infrared spectroscopy (NIRS). Both the accessions were grown together on approximately 75m2 terraces at Funchal (QSR, 179m a.s.l.), Câmara de Lobos (CEP, 208m a.s.l.), Santana (CES, 416m a.s.l.), and Jardim da Serra (QL, 723m a.s.l.). The planting was done in Winter and Summer, with organic material sideration without phytopharmaceuticals application, and harvest after 8 months. Overall, we find that the number of roots was significantly correlated with protein, starch, and total mineral content in tuber and shoot tissues. At upper altitude (QL), "5 Bicos" had higher starch content, number of roots, and biomass productivity than "Inglesa". Still, comparing the 4 terraces, the tubers of both accessions shown the highest protein content, low starch and biomass content, and higher mineral incrementation in shoots at QL – i.e., this variation was indicative of stress response. In conclusion, the lower temperature registered at the highest altitude in Winter comprised the productivity and trigger stress in both accessions, showing a higher difference in the quality constituents when compared to Summer.

[OC-07]
ABS-056

Towards a sustainable and circular economy: Agrifood waste as a source of biomolecules for improving the global food system

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The agrifood sector has been experiencing great challenges in the last decades. New climate scenarios, environmental pollution, crop diseases, and food shortage are currently among the most serious issues in these sectors. Each year, 20 to 40% of crops are lost due to plant pests and pathogens. Moreover, over one-third of all food produced globally goes to waste and food processing results in considerable amounts of side products. The inadequate disposal of these materials is a transversal environmental concern. Thus, there is an urgent demand for innovation and adjustments in agricultural and food science in terms of food production, processing, packaging, safety and shelf-life extension. New and efficient strategies to cope with environmental pollution of soils, water, food and the atmosphere are equally important. Recently, a growing number of innovative applications based on green chemistry and biotechnology have been gaining rising attention and bringing new possibilities regarding bio-wastes valorization and food sustainability, including the development of smart and active packaging, biobased pesticides and fertilizers, and new food additives. Particularly, the biorefinery of agrifood by-products allows the transformation of high-volume/low-value materials into low-volume/high-value ones, fulfilling the increasing necessity for sustainable production routes and meeting consumers' demand for natural and safe products at the same time. Innumerous applications have been suggested, reinforcing the concept of circular economy and mitigating the inherent environmental burden, as well. This overview focuses mainly on the potential of recovering value-added compounds from biowaste and sums up possible applications for these molecules in the fields of food preservation, agricultural productivity and environmental remediation.

[OC-08]
ABS-003

Keeping up with grapevine summer stress: The kaolin case

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In Mediterranean-type climate regions, the summer season is characterized by combined periods of drought, high light and temperature, imposing a pressing challenge for sustainable grapevine production in the upcoming decades. The foliar application of kaolin (5%), a white clay mineral, is a recognized strategy to minimize leaf and fruit sunburns, improve the physiological performance of plants, and modulate the accumulation of defence compounds and plant growth regulators. However, its effectiveness in field-grown varieties exposed to different stress types and magnitudes is still ambiguous, as well as the physiological mechanisms underlying summer stress acclimation. Hence, we selected a field-grown Portuguese variety, Touriga-Nacional (TN), planted in the Douro-Superior sub-region, to assess kaolin effects on leaf temperature, gas exchange, ABA content, chlorophyll accumulation, xanthophyll cycle dynamics, and chlorophyll fluorescence analysis over two growing seasons (2017 and 2018) at the veraison and ripening stages. The results showed that kaolin beneficial effects on leaf cooling and gas exchange parameters were mainly observed in 2017, which correspond to the hottest and driest year of the study, indicating that climate plays a primary role in shaping kaolin effectiveness. Besides, ABA content and VvNCED gene expression decreased in TN treated leaves at veraison, suggesting changes in the upstream pathway of ABA synthesis involving carotenoids metabolism. Indeed, the xanthophyll cycle zeaxanthin accumulation decreased in treated leaves at veraison, and presented a lower Chl(a+b)/Car ratio and increased Chla/Chlb, displaying some features of high light acclimated plants. Despite the complexity of studying plant stress responses under field conditions, these findings support evidence that kaolin application can improve grapevine ability to deal with prolonged periods of summer stress.

[OC-09]
ABS-012

Potential of maize-cowpea intercropping system to reduce the climatic change impacts in Portugal

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Barata, Ana Maria – INIAV
Pereira, Graça – INIAV
Gaspar, Carlos – INIAV
Martinho, Paulo - Sementes Vivas
Groenewegen, Micha - Sementes Vivas
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Vaz, Madalena – INIAV
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Meneses, Manuela - INIAV

Maize is an arable crop with great expression in Portugal and cowpea is a grain legume cultivated worldwide due to the adaptation to drought, nitrogen-fixing ability and high nutritional values. With climate change, average temperatures start to rise, the availability of water for irrigation is decreasing and it is necessary to study the use of less demanding crops at soil level. Several local populations of cowpea from Portugal can be intercropped with maize, even there is little information on this intercrop in Portugal or in similar contexts. The aim of the current study was to evaluate Portuguese cowpea populations intercropped with maize grown organically under different conditions. Experiments were conducted in order to identify the best genotype combinations of cowpea and maize, to optimize the sowing seed rate and the number of irrigations during the crop cycle. The experiments took place over three years (2018 to 2020) in three locations: Braga (North), Idanha-a-Nova (Centre) and Elvas (Alentejo) each one with different edaphoclimatic conditions. During the first year, eleven genotypes of cowpea were characterized to find the three more adapted. In the second year, the three genotypes of cowpea were intercropped with a Portuguese cultivar of maize, using two different sowing densities. The results indicate that the factor “genotype” and “local” originated highly significant differences for all parameters. Both in 2018 and in 2019 the edaphoclimatic conditions of each location significantly influenced the duration of the vegetative and reproductive phase of the plants. Analyzing the index LER in Elvas and Idanha-a-Nova, some treatments showed values higher than 1, in contrast to what happened in Braga, which may indicate that the intercrop is more favorable in places where temperature are higher and there is low humidity in the soil.

[OC-10]
ABS-015

Responses to soil compaction stress among maize hybrids (*Zea mays* L.) - Selection approach

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Climate changes and degradation of agricultural areas are a phenomena progressing worldwide in the environment. Environmental stresses, ie. soil compaction (SC), have already impacted human communities and could be more significant in future. Different levels of SC occur as a result of natural processes and due to overuse of heavy machinery in soil cultivation, which affects soil structure, strength, bulk density, porosity, aeration and water infiltration capacity. About 70 million ha of agricultural lands are degraded by SC and it strongly affects plant growth, development and productivity. Effects of different levels of SC were investigated in 18 maize hybrids during field and greenhouse experiments. Maize hybrids in the field experiments were subjected to low (L) or high (H), and in the greenhouse experiments to low (L: 1.10) and high (C: 1.60 g cm−3) SC level. Differences between maize hybrids grown under non-stress and stress conditions were found in a decrease in grain yield (GY), grain number (GN), weight of 1000 grain (W-1000), seedling dry matter (DM), emergence (EM), plant height (H), leaf area (LA) and leaf greening (SPAD). Stress Susceptibility Index (SSI), Geometric Mean Productivity Index (GMP) and Tolerance Index (TI) were evaluated by determining the effects of low (L) or high (H) SC levels on grain yield (GY) or dry matter of the above-ground part (DM). The values of SSI, GMP and TI enabled us to rank the tested hybrids with respect to their susceptibility to soil SC. SSI and TI indexes made it possible to identify maize hybrids resistant and sensitive to SC stress. Changes in growth traits were greater in the hybrids with high SSI and TI. Correlation coefficient (r) between stress susceptibility index (SSI) of maize hybrids in the field and greenhouse experiment was high and statistically significant. This observation may indicate that genetically determined susceptibility to SC stress in maize hybrids was similar throughout the ontogenesis.

[OC-11]
ABS-018

Soil nutrient estimation using machine learning and Sentinel-2 Earth observation data

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Intensive farming and climate change endanger soil quality in various ways, inevitably leading to extensive food production issues if adequate measures are not in place. In order to deploy corrective actions, it is necessary to measure the damage. Still, traditional soil monitoring techniques are costly and time-consuming since they involve probing the ground with special sensors or collecting samples to be later analyzed in laboratory. For this matter, Earth Observation from Satellites, along with Machine Learning (ML), can be used to monitor several indicators of soil degradation, such as soil nutrients, soil salinity, soil heavy metal pollution. Yet, despite the growing interest in combining ML with earth observation data in the most diverse application domains, applications in soil sensing are still limited in the literature, In this talk, we present the results of an experiment to understand how one can leverage ML algorithms and earth observation data to estimate the quantity of soil nutrients. To state more precisely, we show how to combine data from Copernicus Sentinel-2 and the Land Use and Coverage Area frame Survey dataset (LUCAS soil) to formalize a machine learning regression problem aimed at estimating the levels of Nitrogen (N), Potassium (K), and P (Phosphorus) from soil samples in the presence of different types of crops, e.g., maize, sugar bets, and nuts trees. Four different classic ML algorithms for regression were implemented and evaluated. Namely, Gradient Boosting (GB), Support Vector Machines (SVM), Multi-Layer Perceptron (MLP), and Random Forests (RF). The obtained results show that it is possible to produce soil nutrients estimates using Sentinel-2 with fair performance. However, we also observe that the performance varies considerably across algorithms, nutrients, and crop types, which suggests the need for additional research concerning the preparation of training data and the fine-tuning of the ML algorithms.

[OC-12]
ABS-029

Antimicrobial peptides for crop protection against the fungal pathogen *Botrytis cinerea*

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Grey mould fungus Botrytis cinerea infects over 200 plant species, causing annual losses of $10 billion to $100 billion, worldwide. Fungal disease control is mainly based on the application of synthetic copper-based chemical pesticides. However, their use is increasingly considered unacceptable by local and international regulations, as well as by consumers themselves. The development of safe and reliable alternatives to traditional inorganic pesticides remains a challenge for the agri-food sector and is considered a priority in the EU and other countries. Antimicrobial peptides (AMPs) have emerged as key components of the innate immune system in almost all organisms. AMPs are distributed throughout the animal and plant kingdom, so they must have played a key role in the evolutionary success of species. Despite showing a great diversity of sequences, PAMs have several common properties: they are small molecules, with a molecular weight of 2-10 kDa, possessing amphiphilic properties, and are usually positively charged at neutral and physiological pH values. We have studied different AMPs from the genome of animals showing in vitro activity against Botrytis cinerea. In precision agriculture, PAMs could be useful for the use of smart systems that enable nanoscale treatment, transporting and delivering therapeutic substances with precision and making their production more cost-effective.

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[OC-13]
ABS-033

The role of the Cuarentagri project in monitoring pests and issuing phytosanitary sheets as an embryo of the creation of an agricultural warning system in the Azores

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The Cuarentagri project aims to identify harmful organisms that can affect the different regions of Macaronesia and in particular the Azores. These regions and countries have a biodiversity not comparable to the continental European territory and particular climatic conditions that allow the cultivation of some crops that are not present in the rest of Europe, but are affected by different harmful organisms. The main objective of this project is to prevent and/or reduce the establishment and proliferation of new harmful organisms in the different partner regions and countries, promoting better training in pest risk analysis (PRA) for technicians and producing and disseminating this information to technicians and citizens in general. It is therefore very important to know which harmful organisms from the European Union priority lists are most likely to be introduced in Macaronesia, facilitating the delineation, modelling and development of contingency plans in anticipation to deal with these phytosanitary problems. Relatively to the main crop pests, it is intended to put monitoring devices (different types of traps and attractants) in the field that allow to know and monitor the evolution of their populations and allow the prediction of their appearance, creating an alert system and making the emission of agricultural warnings. For this purpose, phytosanitary sheets are prepared fortnightly in the Azores with information on the appearance and evolution of the main key pests in different crops. Information and awareness-raising activities are also developed for farmers in the field. The project is being developed on three islands in the Azores: Terceira, São Miguel and São Jorge, and covers the key pests of the following crops: banana, olive, citrus, apple, chestnut, pasture, potato and strawberry.

[OC-14]
ABS-035

Root treatment with menadione sodium bisulfite induces resistance against *Botrytis cinerea* in tomato plants: A promising eco-friendly fungicide alternative

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Botrytis cinerea, the causal agent of gray mold disease has a great economic impact on several important crops. This necrotrophic fungus causes disease symptoms during vegetative growth and also into post-harvest stage. The current method to combat this disease is fungicide application, with high economic costs and environmentally unsustainable impacts. Moreover, there is an increasing general public health concern about these strategies of crop protection. We studied the protection of tomato plants against B. cinerea by previous root treatment with menadione sodium bisulfite (MSB), a known plant defense activator. Root treatment 48 hour before inoculation with MSB 0.6 mM reduced leaf lesion diameter by 30% and notably cell deaths, compared to control plants 72 h after inoculation. We studied the expression level of several pathogenesis-related (PR) genes from different defense transduction pathways, and found that MSB primes higher PR1 expression but is impaired to induce resistance against B. cinerea in salicylic acid-deficient NahG transgenic lines. Additionally, in the absence of pathogen challenge, MSB increased tomato plant growth by 28 % after 10 days. Our data provide evidence that MSB protects tomato plants against B. cinerea by priming defense responses through the SA-dependent signaling pathway and reducing oxidative stress.This work confirms the efficacy of MSB as plant defense activator against Botrytis cinerea and presents a novel and sustainable alternative to combat gray mold disease in important crops.

[OC-15]
ABS-047

[oral communication not presented]

[OC-16]
ABS-022

Physiological performance and water status of sweet cherry trees with pre-harvest application of biostimulants

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In order to achieve the adaptation to a new climate-changing environment, plant biostimulants have emerged as new and promising products to increase the use-efficiency of agronomical inputs or promote stress crop tolerance. Effect of foliar pre-harvest application of two concentrations of biostimulants (glycine-betaine (GB) and seaweed extract (Ecklonia maxima-SW)) and their combination in physiological performance and water status of sweet cherry trees of cultivar Early Bigi, was studied. Significant differences were found with the application of low concentrations of GB and SW in leaf gas exchange parameters, mainly in the transpiration rate (E) and the stomatal conductance. Several parameters of leaf water status were also significantly affected by pre-harvest treatments, such as leaf mass per unit area (LMA), the density of foliar tissue, succulence, water saturation deficit, and cuticular transpiration rate. Values of leaf succulence, LMA and density were significantly higher using the combination of low concentration of both biostimulants, when comparing to control trees. Although this data reports only one year of study, positive effects of GB and SW and their combination in cv. Early Bigi is clear, pointing out that the pre-harvest application of these biostimulants can be considered a good approach to promote the adaptation of sweet cherry trees to stressful environmental conditions. Further studies are undergoing to confirm the present results and to provide a clear strategy to improve the physiological status of sweet cherry trees.

[OC-17]
ABS-032

Modifications on commercial drones por precision agriculture

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Precision Agriculture (PA) is a strategy that permits improvements in the agricultural yield, reducing labor time and potential risks by analyzing temporal, spatial and individual data. This leads to monitoring the global health of the crops, as well as adopting effective management decisions, such as optimal use of fertilizers, pesticides, tillage and irrigation processes assisting the farmers in managing their business, with the consequent economic, social and environmental impact. UAVs (Unmanned Aerial Vehicle) equipped with specific sensors play a key role in all these steps as the main tool for monitoring the crops. However, presently available commercial UAVs for PA include multispectral cameras as payload with a limited number of spectral bands and hence a reduced amount of information related to the physical, chemical and biological properties of the samples. On the other hand, the use of hyperspectral technology, with hundreds (or even thousands) of spectral bands, permits a better understanding of all these variables, increasing the level of confidence in the whole process. In this article, the authors present the modifications made on a commercial drone (Dji Matrice 600) in order to include a hyperspectral camera (Specim FX series) and on-board processing based on NVIDIA GPUs embedded systems for generating an important number of vegetation indices. This flying platform is completed with a friendly interface in order to ease the planning of the trajectories to be pursued. The validation process has been done in the island of Gran Canaria, Spain, during a monitoring campaign in summer 2019.

Acknowledgements
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[OC-18]
ABS-036

The Pervemac II project and its actions regarding a sustainable agriculture and food safety in Azores

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The overall objective of PERVERMAC II project is to promote a sustainable use of pesticides in the agricultural production and ensure food security in the Macaronesia region (Azores, Madeira, Canaries and Cape Verde). This project in Azores islands will contribute with their several actions to ensure farmer's safety, with special regards to those who apply pesticides in field, and consumer´s health through the residues level quantification in the vegetable and fruits locally produced and imported and, at the same time, stop the environmental contamination. For this purpose, the level of residues in agricultural products produced in Azores and imported was analysed during the last four years (2017 to 2020) in order to promote food safety. Food surveys to a population sample were also made to obtain the real proportion of vegetable and fruits in the population normal diet and study the correlated level of pesticides residues that maybe present in the food intake by humans. Fortunately, on most of all the products analysed, no pesticide residues were found. Pesticides residuals were only found on a small portion of the samples and the allowed limit by law was never been reached. Other project activities focused in increase awareness about the adoption of good diet and actions promoting the implementation of organic production and their products consumption were conducted with students and Azorean consumers. Actions regarding the increasing of knowledge and technology transfer to farmer and technicians were done to ensure the adoption and implementation of integrated pest management measures, promoting the sustainable use of pesticides by the farmers and the use of alternative means of protection against the major pest problems that appear on Azorean horticultural and fruit crops.

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[OC-19]
ABS-054

Sensors in food safety – An overview

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Food safety is one of the most pressing concerns of modern society. A growing world population has increased the demand for food production and distribution. As a result, fertilizers and pesticides are often used to ensure crop productivity, and antibiotics and additives are increasingly added to animal feed. These chemicals, unintentionally, often end up in food products. The increase in human activity has also caused the contamination of soils and water with heavy metals, drugs, and other toxic chemicals, which inevitably enter the food chain. Biological contaminants, such as viruses, bacteria or mycotoxins can also naturally occur in food products. Not only do these contaminants pose serious health risks for humans, but their early detection is also very challenging. Traditional methods for the analysis of food contaminants involve culture growth, immunological assays, polymerase chain reaction methods, and liquid or gas chromatography techniques. Although these methods are well established, accurate, sensitive, and selective, they are also costly and time-consuming. The use of sensors has emerged as a potential alternative for the detection of food contaminants. Sensors are usually categorized according to their detection principle, as electrochemical, optical, piezoelectric or calorimetric, and are generally comprised of three main components: a receptor, which interacts with the analyte; a transducer, which converts the variation of energy into a signal; and a detector, which receives the signal. These devices present several advantages over other analytical methods, as they can possess great resolution and selectivity, and can provide fast results, allowing the early detection of contaminants. This work aims to present a general overview of the sensing technologies reported for the detection of food contaminants, with a particular focus on optical sensors.

[OC-20]
ABS-059

Sustainability case studies on Madeira wine production

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Nowadays the demand for healthy and sustainable products has increased pressure on the agri-food sector. Consumers, producers, and policy makers are more susceptible to the sustainable development and environmental awareness. The wine industry is being confronted by serious challenges. In part, this is because productivity is highly influenced by climate change, but also due to the demands of increasingly environmentally conscious buyers. As a result, wine producers need to invest more in management strategies and mitigation measures for a sustainable production. To improve their sustainability performance and implement more environmentally friendly practices, it is important to consider some critical points in wine production, like grape processing and fermentation, the aging process, and the use of enological products. This work aims to present two case studies of practical examples of sustainability studies on Madeira wine production. In the first case study, two tartaric stabilization methods were compared: cold contact stabilization (CCS) and chemical stabilization (CS) using potassium polyspartate. Unlike CS, CCS is a method that involves higher costs due to the consumption of water and electricity. However, both methods showed similar results for tartaric stability, coloring matter, and turbidity. The second case study, still in a preliminary stage, describes the impact of emerging aging technologies, such as microwaves (MW) and ultrasounds (US), on the aging process. The selected variables were exposure time and frequency in the US study, and exposure time and power in the MW study. The results showed that there were slight differences in the MW samples but not in the US samples. Regarding the sensory analysis, there were no differences found between the samples that underwent MW and US and the control sample, in the conditions tested.

[OC-21]
ABS-062

Aiming for a sustainable beer production: Creating opportunities with our by Products

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Closing cycles and circular economy is deep rooted in Empresa de Cervejas da Madeira culture. Back in the 70's we implemented a CO_2 recovery system that uptakes most of the CO_2 naturally produce by the yeast during the fermentation. In 2003 we were the first brewery in Portugal to commit to a set of rules and standards created by the International Organization for Standardization (ISO) to improve our environmental performance (ISO 14000). With the environment in mind we kept making small changes: reduced plastic weight in our non-reusable plastic bottles, caps and plastic film; substituted plastic rings by cardboard in secondary packing of cans; all the cardboard in secondary packaging is from sustainable managed forests (FSC); all our spent grain goes to farmers for cattle feed; our glass bottles are reusable. The solar energy is our latest environmental project. In 2019 we started covering our 5000m^2 roof with 2273 solar panels and our next big environmental motivated project will substitute our steam fuel boiler for organic matter boiler to feed the remaining energy necessities of the factory, in early 2022. But we obviously do not want to stop there. And mainly we need the help of the academic community to helps us close 2 important cycles that are still disruptive. Two by products that we produce in large quantity, yeast and diatomaceous earth, that are still send to our waste water treatment plant, treated and collect by Madeira Waste Recycling for incineration.

Abstracts – Poster Presentations

SYMPOSIUM

AGRICULTURE AND FOOD SUSTAINABILITY

NEW CLIMATE CHANGE SCENARIOS

11-13 OCTOBER 2021 . Madeira Island . Portugal

[PC-01]
ABS-001

Improved artemisinin production in a climate change scenario

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Currently, 400000 people die of malaria every year and the best available treatment is the artemisinin-based combination therapy. Artemisinin is a sesquiterpene endoperoxide lactone that also has activity against several types of cancers, as well as anti-viral and anti-inflammatory properties that made this a potential COVID-19 treatment. However, the only commercial source of artemisinin is the Artemisia annua plant which produced it in small quantities. Also, the chemical synthesis is complex and with low yields. This situation results in a global supply shortage. Thus, A. annua cultivation is facing various challenges including climate change. This made necessary the optimization of strategies to increase their yield. The most common strategy to increase a secondary metabolite is elicitation. This consists in apply biotic or abiotic elicitors. The first one refers to substances from fungi, bacterial, viral or other plants. The second one, can be physical (such as water stress) or chemical. Also, some elicitors are used as biostimulants such as chitosan which has a protective role against water stress and also act as an elicitor in several species including A. annua. Thus, the combination of chitosan treatment with water deficit could have a synergetic effect in artemisinin production, allow the cultivation in arid areas without yield losses or a water saving in the crop. The increase in yield or the increases in water resistance could allow facing the increasing demand for artemisinin. This study presents the effects in artemisinin production as well as the physiological changes of A. annua plants treated with chitosan under drought stress.

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[PC-02]
ABS-004

Kaolin effects on berry quality of Touriga-Franca grapevines in distinct Mediterranean wine-growing regions

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Grapevine ripening is modulated by temperature and precipitation levels, affecting the yield and berry quality potential, particularly in Mediterranean-type climate regions that were recently described as climate change hotspots. In those regions, the foliar application of protectants is considered a short-term strategy to avoid leaf and cluster damage and improve the physiological performance of vines. However, in vineyards with distinct mesoclimates, kaolin effectiveness within a given variety remains less explored, as well as its putative role in improving berry ripening under a changing climate. Thus, this study was performed in two Portuguese wine-growing regions (Alentejo and Douro) and aimed to monitor the effects of a foliar pre-veraison kaolin (5%) treatment on several berry quality traits and phenolics accumulation in Touriga-Franca berries during the 2017 growing season. Based on three bioclimatic indices, the Alentejo vineyard showed a lower night temperature index (CI class: cool nights) than the Douro vineyard (CI class: temperate nights). However, both sites presented a very warm and dry climate classification. At veraison, berry soluble sugars decreased in treated grapevines from both vineyards, while total acidity and tartaric acid increased 30.6% and 17.2%, respectively, in the treated berries from Alentejo. Though kaolin treatment had no consistent effect on the berry acidity parameters in the Douro vineyard at this stage, berry total phenols, ortho-diphenols, and anthocyanins increased at harvest in treated vines. On the other hand, no significant effects were observed regarding these parameters in the Alentejo vineyard, while tannins increased 60.2% in treated berries, and soluble sugars decreased (-30.2%). From a climate change perspective, the application of protectant compounds should be further explored in the wine industry to elucidate the advantages of particle-film application on improving wine quality and winemaking performance.

[PC-03]
ABS-005

Kaolin application outcomes in white wine: Cerceal variety

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The protective effect of kaolin was evaluated in a white grapevine cultivar, 'Cerceal', in the 'Alentejo' region (southeast Portugal) where plants face extreme conditions, with high temperatures and low precipitation, during the summer season. It is known the positive effects of kaolin in several varieties in leaf tissue and fruit quality. In this study, we addressed the hypothesis that kaolin effects lead to several changes in wine characteristics on the primary and secondary metabolism. Results showed that kaolin wine characteristics were strongly affected, with a high total acidity due to the increase of tartaric and malic acids, while the sugar concentration decreased 8.9% in berries, provoking a low wine alcohol level. Furthermore, kaolin foliar pulverization induced high potassium, magnesium and iron content, and low copper and aluminium concentrations. Moreover, wine from kaolin-treated vines presented higher content of esters associated with fruity notes, whereas the control wine showed higher content of esters related to hostile notes. Overall, the results strengthen the promising nature of kaolin application as a summer stress mitigation strategy protecting grapevine plants and inducing more balanced wines.

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[PC-04]
ABS-006

Nutritional valorisation of *Musa* spp with NaOH treatment for animal feed source

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The use of alternative feeds for ruminants is a strategy aimed to reduce feed costs and overcoming the shortage of pasture during critical times. Thereby, banana culture residues, leaves and pseudo-stems, could be used as a fibre source for feeding ruminants in banana producing areas, namely Madeira Island and the Canary Islands. The main goal of this work was to evaluate the impact of Sodium Hydroxide (NaOH) treatment on the nutritive value of banana tree (*Musa* spp), to see if it can be used as a fibre source for ruminants. The banana tree samples were collected and dried at 60ºC in an oven with controlled air circulation. They were then sprinkled with a NaOH solution (2, 4, 6, 8 DM%) and placed in a proper container. The chemical properties of both treated and untreated (control) *Musa* spp samples were analysed in triplicate The obtained results indicate that the NaOH treatment leads to a significant decrease in Neutral Detergent Fibre (NDF) either in leaves or in pseudostems (from 72.42 to 56.27 DM% and 59.15 to 48.77 DM% respectively), Acid Detergent Lignin (ADL) (from 11.87 to 10.14 DM% in leaves and 4.58 to 3.18 DM% in pseudostem) and a non-significant decrease in Crude Protein (CP) (from 14.17 to 12.97 DM% and 7.52 to 5.9 DM% respectively). Acid Detergent Fibre (ADF) decreased in leaves (40.44 to 37.56 DM%) and increased in pseudostems (28.90 to 30.79 DM%). A significant increase was observed in Ash, in both samples (from 18.29 to 29.47 DM% in leaves and 18.28 to 22.62 DM% in pseudostem). With this, we can conclude that NaOH in 6 and 8 DM% concentrations have a positive effect on *Musa* spp nutritional value.

[PC-05]
ABS-007

Microorganisms as bioindicators of fertility in conventionally and ecologically cultivated soils in the Canary Islands

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Nowadays there are no indicators that allow establishing a well-defined standard on the quality and fertility of soils. Fertility is understood as the aptitude that the soil presents to provide a crop with good development conditions through the adequate supply of water and essential nutrients in quantity and balance, which leads to obtaining profitable and sustainable production (1). The objective of this work was to study the microbiota present in different types of soils and crops, and their variation for 2 years. The purpose was to detect correlations that allow establishing quality indicators, which would allow knowing the fertility status of a soil. A total of thirteen types of microorganisms were studied by plate culture to assess their usefulness as bioindicators of the quality and fertility of the soils. The samples were taken from six farms on the island of La Palma, two of avocado and four of banana cultivation. Some of these presented traditional management and others ecological. Based on the obtained results, it was possible to rule out a large part of these indicators due to their scarce variation between treatments and over time. This made it possible to establish the indicators to pay attention to in future studies. In addition, a greater number of microorganisms was observed in the farms treated in an ecological way compared to the conventional ones.

References

1. Navarro, G. y Navarro, S. (2014). Fertilizantes: química y acción. Madrid: Mundi-prensa.

[PC-06]
ABS-008

Foliar application of L-Ornithine improves the resilience to water deficit in Barley sensitive lines

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Agriculture is highly dependent on meteorological conditions; water scarcity and the global increment of temperatures driven by climate change affect negatively the crops yield. To meet the expected food demand increment, up to 98% by 2050, entails an enormous pressure on the natural resources. Natural compounds, as amino acids (AAs) and polyamines (PAs), can improve the performance of stressed crops while reducing the negative impact of traditional agricultural practices. One of the precursors of PAs is the AA ornithine (Orn) which, in turn, can be a precursor of the stress-related AA proline. For that, we hypothesized that the exogenous application of Orn in barley (Hordeum vulgare L.) plants grown under water stress could improve their resilience. Mutant barley defective in ABA accumulation (cv. AZ34) and its corresponding wild type (cv. Steptoe) were grown under two water regimes: 60% and 30% field capacity (FC), as optimal and drought stress conditions; and two foliar applications of Orn 1 mM were applied to the 14 and 18 day old plants. The experiment consisted of monitoring the morphological and physiological changes, the photosynthetic performance, and the evaluation of the final biomass and RWC. For both cultivars, significant reductions in biomass (30 to 40%) were observed on the stressed plants with respect to controls. Without water deficit, the foliar application of Orn improved the growth and CO_2 assimilation of AZ34. The stressed AZ34 plants sprayed with Orn tend to have the highest RWC values and the slightly more negative osmotic potential records, pointing to treatment as an inductor of an improved osmotic adjustment. Altogether, we could conclude that Orn can work as stress alleviator in barley sensitive lines. Besides, it is clear that the ABA pathway act as a signal to activate the defence mechanisms against adverse conditions, in which the crosstalk with Orn pathway plays a relevant role in controlling plant osmotic adjustment.

[PC-07]
ABS-009

CUARENTAGRI: A project to address the main phytosanitary problems and threats of the main crops in the Macaronesian region

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Both Azores, Madeira and the Canary Islands, as outermost regions of the European Union, and Cabo Verde and Senegal, as Third Countries, have a unique biodiversity, distinctive to the European mainland territory. These conditions allow the cultivation of plants not present in the rest of Europe, which are affected by different injurious organisms. The particular climatic conditions, the fragmented territory and the intense commercial and turistic exchanges of these regions make them extremely vulnerable to invasion by exotic species. The EPPO, along with other international institutions, perform pest risk analysis for the Mediterranean region and Central Europe, which could introduce changes in the phytosanitary regulations. However, the regions concerned by this project are usually left out of those analysis. Hence, this project takes on the challenge to fill the gaps detected on plant protection in the studied regions.

[PC-08]
ABS-010

The impacts of climatic changes in chestnut productivity

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Over the centuries, the chestnuts production has evolved according to the spatial and economic distribution of humanity. Chestnut tree is cultivated due to the high value of its fruits and wood, and it is an important resource worldwide. In 2019, the chestnut tree area worldwide was approximately 596 × 103 ha for fruit production (Southern Europe, Southwestern United States of America, and Asia) and produced approximately 2.5 million t. The Chinese chestnut (*Castanea mollissima*), Japanese chestnut (*Castanea crenata*), American chestnut (*Castanea dentata*), and European chestnut (*Castanea sativa*) are cultivated owing to the economic relevance. *Castanea sativa* are documented since Ancient Greece and the Roman Empire, and the production is situated in Western and Southern Europe. In 2019, 311 × 103 t were produced. Five genetic poles can be identified: three in Greece, the northwest coast of the Iberian Peninsula, and the rest of the Mediterranean. Climate is considered one of the main drivers of biodiversity and ecosystem change, which may influence the development of plant species. It is expected that in future climate conditions may cause damages to crop in the upcoming decades. For the chestnut ecosystems in the Iberian Peninsula, climate change may represent a major threat, leading to significant losses of goods and ecosystem services. It is vital to identify the impacts of climate change on trees, improving the current understanding of climate-tree interconnections. The future sustainability of chestnut cultivation depends on the adaptation strategies to be implemented. These measures promote the adaptative capacity and reduce vulnerability to climate change effects, at the same time profit from positive opportunities, such as to reduce costs or increase gains associated with climate change. Adaptative measures are divided into two main parameters, short-term and long-term, which depend mainly on the application time, and/or by the entities responsible for actions.

[PC-09]
ABS-011

Exploratory study of artisanal ciders derived from regional cultivars of Madeira Island

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Cider is the smallest, but the fastest growing sector of the alcoholic beverage industry, showing great potential to promote the sustainable development of rural communities. Cider is a fermented alcoholic beverage made from apple juice and its diversity derives from the heterogeneity of traditions, cultural preference, geographical area, and of the apples themselves. In recent years, cider production in Madeira has been gaining more interest. Local farmers/producers are facing not only an opportunity but also a challenge for securing the production of regional ciders along with the sustainable rural development, given that apple orchards must become more and more sustainable and resilient to climate pressures, such as the inherent diseases and pests. Thus, to study the ciders derived from regional varieties is quite important. The typicity and quality of a cider are highly reliant on the apple cultivar used for fermenting, but also from the “terroir”, which, altogether with cider making process, create a unique regional profile. Thus, the metabolic characterization of regional ciders is extremely important to gather a more comprehensive knowledge of the metabolites that characterize it and that can attest to the quality and authenticity of these products. In this study, artisanal ciders from regional varieties were studied and compared with industrial ones purchased in the local market. Several intrinsic parameters were analyzed for characterizing their organoleptic properties, namely CIELab coordinates and several primary and secondary metabolites of the ciders, such as organic acids, monosaccharides, polyphenols, and aroma volatiles. Significant differences were found between the metabolite profile of artisanal ciders and industrial ones. These preliminary results provide basic information to give support the uniqueness of these regional ciders, aiming to enhancing their quality and safety.

[PC-10]
ABS-013

Comparing genotypes and cultivars of *Brassica* crops with different breeding systems, for food safety

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Ambitious targets have been set out by the European Union's (EU) Farm to Fork strategy to agricultural lands under organic farming by 2030. New EU Organic Regulation is also to phase out derogations for non-organic seed. So, cultivars adapted to organic systems are key to realize the full potential of organic agriculture in Europe. Supported by the objectives of the H2020 project Liveseed, the public private partnership between INIAV I.P. and the Living Seeds-Sementes Vivas Company aims to: increase the availability of organic seeds; apply a breeding approach to local varieties conserved ex-situ (landraces), and apply a cultivar test model to identify suitable cultivars. Brassica crops were chosen and an action plan, in organic farming, was developed for massal selection (during 4 years) of landraces (characterized and conserved at the National Genebank, BPGV). This work presents the results of one of the goals: a multi-local comparative test, in organic conditions, of Brassica genotypes (6 advance lines) with commercial Brassicas cultivars, organic and conventional (6 cvs.). The test was carried out in Braga and Idanha-a-Nova. The experimental design was a randomized block with split plots and 3 replications. The agronomic potential of different biological components to new and traditional foods – microgreens, baby leaf, turnip roots, turnip greens, turnip tops and cabbage sprouts and leaves was evaluated. The results showed that there is interest in adapting landraces to an organic farming system, adding value to the agro-biodiversity at a local level. The advance line of the B. napus presented the best potential to geographical adaption and to different food uses. Interesting indications were obtained for advanced lines of B. oleracea and B. rapa, this to turnip roots. In conclusion, the response of organic varieties was similar to conventional ones and, the methodology used can be useful at a time when climate change plays a big role in future food systems.

[PC-11]
ABS-014

Effects of separate or combined soil compaction and/or drought stresses on root system structure of maize (*Zea mays* L.) single-cross hybrids

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Within their natural habitats plants are subjected to a combination of different stresses that include soil compaction and soil drought. Effects of soil compaction stress were investigated in maize hybrids subjected to low (L, 1.10), medium (M, 1.30), and high (H, 1.60 g cm−3) soil compaction. The hybrids selected for the study differed in their susceptibility to growth under soil compaction stress conditions. We used appropriate methods of non-destructive cleaning and analysis of all intact compartments of the root system. Petrolatum-wax test, proved as an effective screening technique for selecting resistant and sensitive maize hybrids, was also applied. The seedlings were grown in custom-made “root-box” and “root-basket” containers. The penetration resistance (PR) strength of 0.52 and 1.07 MPa was satisfactory for estimating root penetration index (RPA) among maize hybrids. The soil compaction stress affected root system structure (RSS) in maize hybrids. The resistant hybrids showed a particular decrease in root dry matter (DM) in M and H treatments at 0.0 to 15cm soil depth, and an increase in the number of roots growing at an angle of 0º-30º in relation to the main growth axis. The soil compaction stress lowered root number (RN) and length (RL), shoot and root DM, and increased shoot to root ratio (S/R). The changes were greater in sensitive than in resistant hybrids. In addition, a regression coefficient (R2) between SSI and relative trace change (RTC) marked for changes in dry matter of shoot (S), roots (R), shoot to root (S/R) ratio and root length (RL) and number RN was statistically significant. Seedlings of maize single-cross hybrids demonstrated differences in their responses to soil compaction stress, which caused changes in shoot and root dry matter and the distribution of roots in the soil profile.

[PC-12]
ABS-016

Exploration of abiotic stress resistance in Maize and *Brassica* genus Portuguese landrace accessions

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The database of the Portuguese Genebank (BPGV), GRIN-GLOBAL (Germplasm Resource Information Network) stores over 2000 accessions of maize (*Zea mays* L.) and over 1200 accessions of *Brassica* genus (*Brassica napus*, *B. oleracea* and *B rapa*) resulting from diversity collection missions in the national territory. Considering the Portuguese landraces growing threat of climate change and the susceptibility of these crops to abiotic threats, it becomes necessary to screen maize and Brassica genus germplasm collections for drought and heat stress resistant phenotypes. To achieve this end, core samples representing all the Portuguese districts, including the Madeira and Açores archipelagos, were established and exploratory data analysis was performed on several years of characterization data. Multivariate data analysis was conducted on highly heritable morphological traits representing vegetative, phenological and yield components. Hierarchical clustering was computed on principal component analysis (PCA) or factor analysis of mixed data (FAMD) outputs, resulting in several main clusters. These clusters were described according to quantitative and qualitative traits, and a first proposal for the Portuguese maize and *Brassica oleracea* landraces agro-ecological groups based on morphological traits, origin and evolution is presented. In addition, analysis of life cycles and geographical origins of determined groups reveals evidence of local adaptation, with applications in plant breeding for more resilient crops. This is the first step in identifying abiotic stress resistance within the Portuguese maize and Brassica collection and proposing promising phenotypes within interesting agro-ecological groups.

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[PC-13]
ABS-017

Precision viticulture in the Canary Islands: Formation and research APOGEO program

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The Canary Islands are excellent models to study climate-smart viticulture, since a small territory displays an important variety of microclimates, presenting from drought-prone to humid areas, from sea-level to mountainous terrains. The Dirección General de Agricultura (General Directorate of Agriculture) of the Canary Islands, in cooperation with the University of Las Palmas de Gran Canaria (ULPGC) and the Spanish Research Council (CSIC), is carrying out the implementation of Precision Viticulture in the Islands, a part of INTERREG-MAC project APOGEO. The program focuses on three lines: development of low-cost monitoring systems, consisting of drones equipped with multispectral cameras for the early detection of problems and their remediation, optimization of the cultures to the local conditions, using the previously collected data, and formation of agriculture students on these new technologies. The preliminary results of this program are commented herein.

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[PC-14]
ABS-019

Fast and reliable way of testing biostimulant activity against water deficit under laboratory conditions in tomato seedlings

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One of the most promising and extensively reviewed fields in plant science nowadays are biostimulants effects on crops productivity under abiotic stress. Biostimulants are today a hot topic with substantial economic implications, with an important global market of billions of USS $ by 2025. The current definition of plant biostimulant by the EU regulation (2019) is: “A product that stimulates plant nutrition processes independently of the product’s nutrient content, with the sole aim of improving one or more of the following characteristics of the plant or the plant rhizosphere: nutrient use efficiency; tolerance to abiotic stress; quality traits; or availability of confined nutrients in the soil or rhizosphere.”. Molecules with biostimulant activity arise from different sources, and six main groups are described today: Seaweed and botanical extracts; Chitosan and other biopolymers; Beneficial fungi and bacteria; Protein hydrolysates and N-containing compounds; Inorganic compounds; Humic and Fulvic acids. New biostimulant improvement requires a testing protocol capable of describing the biostimulant effects on the morpho-physiological traits and the imposed stress. In this regard, different methods can be used to study biostimulants treatments on plants, from in-vitro studies to germination tests, plants growth analysis using a high-tech screening platform or plant phenotyping and metabolomics. All of them are exciting options to test and study biostimulants effects on plants. However, some of these high tools are either not accessible to all laboratories or not needed in the first stages of a novel biostimulant development. This opens the field to new low-cost and straightforward protocols, which allow the researchers a fast screening process with the aim of accepting or dismissing new biostimulants formulations. The presented protocol is fast, cheap and produced systematic data without high technological necessities to test biostimulant formulation everywhere.

[PC-15]
ABS-020

Trichodesmium Erythraeum: from bloom to Agriculture

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The diazotrophic cyanobacteria *Trichodesmium erythraeum* Ehrenberg ex Gomont, is one of the main contributors to marine nitrogen fixation. This contribution gives to this species an unquestionable and primordial role at the ecological level. It is known in most of the tropical and subtropical oceans, but it was in august 2004 when an upwelling of this organism was cited for the first time on the coasts of our archipelago and reported two more times in the year 2011 and 2017. Consequently, the study of this genera from cellular, molecular and physiological point of view has only begun to take off in Canary Islands in the last 5 years. Global warming, among other factors, leads to the loss of agricultural soil and also productivity. Under these circumstances, the development of new natural products from microalgae cultures could improve plants nutrient content and trigger the improvement of plants nutrient assimilation and efficiency. The same products could also play multiple roles, such as increasing plant response to both biotic and abiotic stress, as well as, improving the crops productivity. Among microalgae, cyanobacteria act as soil conditioners. They are excellent sources of vitamins, minerals, and essential amino acids. Cyanobacteria plays an important economic role and have applications in the biotechnological industry. Considering that another problem associated with global warming is the increase of marine cyanobacterial upwelling, we used *Trichodesmium erythraeum* species as a model in our experiments, thus providing solutions to the use of the biomass generated in each bloom. The biomass harvested in the event produced in 2017 has been used to elaborate crude extracts at different concentrations. These extracts have been studied in different experiments for their effects on seeds germination, plant root growth in a dicotyledon and leguminous species Vigna radiata (L.) R.Wilczek.

[PC-16]

ABS-021

Comparative study of leaf gas exchange and water status, of commercial and traditional *Prunus dulcis* (Mill.) cultivars under rain-fed conditions

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Drought is the major abiotic stress in agriculture, and enhancement of plant characteristics under this stress is one of the major goals behind plant breeding. Almond is a drought-tolerant species, but its production yield increases significantly when water supply is not limited. To overcome the lack of water availability, the correct selection of cultivars is of great importance, as different responses of various almond genotypes have been reported in relation to drought stress. This work intends to highlight the adaptation mechanisms of several Portuguese traditional almond cultivars (Bonita, Casanova, Parada, Pegarinhos and Verdeal), comparing them to two foreign cultivars (Ferragnès and Glorieta), regarding leaf water status indexes and gas exchange parameters. For this, photosynthetic rate (A), stomatal conductance (gs) and transpiration rate (E), relative water content (RWC), leaf mass per area (LMA) and electrolyte leakage (EL) were studied in 2017, a year considered as extremely hot and dry. LMA showed higher values recorded for cvs. Parada and lower values for cvs. Glorieta and Verdeal. Lower EL was recorded for cv. Glorieta, while higher values were found for cvs. Verdeal and Ferragnés. Photosynthetic rate (A) shows three different results: higher values for cv. Glorieta, intermediate values for cvs. Pegarinhos and Parada and lower values for the remaining cultivars (Bonita, Casanova, Ferragnès and Verdeal). Significantly higher E and gs were found for cvs. Parada, while lower values were found for several cultivars (Bonita, Verdeal, Casanova and Ferragnès). The obtained results show a complex behaviour of almond trees under rainfed conditions, but highlight some potential drought resistance in Portuguese cultivars that should be further studied.

[PC-17]
ABS-023

Dicarboxylic acids: possible uses in germination and plant development

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Dicarboxylic acids are organic compounds containing two carboxyl functional groups. Currently, they have many uses in different areas, like the pharmaceutical or food industries. Azelaic acid, for example, is used for acne treatment for many years due to its antibacterial properties, while Fumaric acid is the food additive used for acidity regulation. Moreover, their use in a specific moment on the vital plant cycle is significant. Oxalic acid stands out from the others because of its purpose as a fruit preservative in post-harvest or its action as a pathogenic molecule in fungal infections. Although the dicarboxylic acids are a big group, most of them have unknown properties on plant germination and the first stages of development under biotic or abiotic stress. This work shows the results of using eleven dicarboxylic acids during germination and the first stages of mung bean life (Vigna radiata (L.) R. Wilczek) and the study of its potential antifungal properties. All of this can provide Biology and Agriculture with a new line of investigation that probably impacts the future.

[PC-18]
ABS-025

Combinatorial strategy to discover antifungic peptides for use in agriculture

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The development of short antimicrobial peptides for use in agriculture is eliciting much interest. Peptides from 5 to 50 amino acids have been reported as promising leads which induce low resistance (1,2). In this communication, we report a combinatorial strategy to produce libraries of ultra-short peptides with potential antifungic effect on Botrytis, Alternaria and/or Fusarium, three key phytopathogens causing multimillion crop losses.

References

1. E. Montesinos, E. Bardají, Synthetic Antimicrobial Peptides as Agricultural Pesticides for Plant-Disease Control, 2008, Chemistry & Biodiversity, 5(7):1225-37
2. A. Boto, J. M. Pérez de la Lastra and Concepción C. González, The Road from Host-Defense Peptides to a New Generation of Antimicrobial Drugs, Molecules, 2018, 23, 311

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[PC-19]
ABS-026

Screening of peptide libraries to discover new agents against phytopathogenic fungi

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The discovery of short or ultra-short antimicrobial peptides against phytophatogenic fungi and bacteria is a hot area, since these peptides have a multiple mode of action that prevents or greatly reduces the appearance of resistances (1). In the previous communication, we detailed a combinatorial strategy to produce a library of potential antifungic peptides. In this communication, we report the screening of different peptide libraries against three important phytopathogens, Botrytis, Alternaria and Fusarium, using the radial growth test in PDA (2). This study allowed the identification of promising candidates with a potent activity against these fungi, that cause severe losses to many different crops.

References

1. (a) A. Boto, J. M. Pérez de la Lastra and Concepción C. González, The Road from Host-Defense Peptides to a New Generation of Antimicrobial Drugs, Molecules, 2018, 23, 311. (b) E. Montesinos, E. Bardají, Synthetic Antimicrobial Peptides as Agricultural Pesticides for Plant-Disease Control, 2008, Chemistry & Biodiversity, 5(7):1225-37.

2. X-H. Li, M-S. Ji, Z-Q. Qi, Xi-W. Li, Y-X Shen, Z-M. Gu, Y. Zhang, S-H.Wei, Y-Z. Wang and D-Q. Wang, Synthesis of 2-amino-6-oxocyclohexenylsulfonamides and their activity against Botrytis cinerea, Pest Manag Sci, 2011, 67: 986–992.

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[PC-20]
ABS-027

Agricultural rum of Madeira matured on the seafloor: Assessment of changes induced by a pioneering seafloor ageing process

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Sugarcane is an agricultural product cultivated on Madeira Island since the era of its colonization. At the beginning, it contributed to the economic, social, and cultural development of the archipelago through the export of one of its by-products - sugar. Nowadays, from Sugarcane production, two products are essentially produced: the Agricultural Rum and sugar cane honey. The latter is essentially consumed in the archipelago, while the Rum is presently commercialized worldwide. Therefore, studies to assist these local companies to diversify products and to upgrade traditional processing technologies in order to generate income in this productive activity are currently welcome. The present study evaluates an innovative process to carry out the Agricultural Rum of Madeira maturation. Samples of Rum of bottle-aged in a cellar (reference samples) and after 7 and 14 months on the seafloor were compared in terms of volatile compounds. Herein, the results of terpenoids are presented. A total of nine terpenic compounds were identified in all samples. The terpenic compound present at the highest concentration is D-limonene, accounting for about 72% of the total terpenes. It is one of the most abundant compounds in sugarcane juice, which characterizes by citrus and mint notes. No significant differences were found between control and samples aged 14 months underwater, indicating this intrinsic feature of the raw material is preserved after underwater ageing. The same was observed regarding D-isomenthol and menthol. Otherwise, the concentrations of TDN, β- damascenone and farnesol, increased by 28.5%, 32.0% and 38.0%, respectively. β-damascenone is known to confer apple-like odour in cachaça and rum samples. Our results suggest that underwater ageing increases β-damascenone concentrations, suggesting that the synergetic effect of temperature, light and tides impact the release of this highly odoriferous compound, with a powerful and pleasant fragrance.

[PC-21]
ABS-030

New bio-informatics tools for the development of safer and more efficient peptide based-phytosanitaries

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Control of pests and diseases is a key activity in the farming industry; and thus, safe and efficient phytosanitaries are needed to prevent or remediate crop diseases. In the case of antimicrobial agents, the appearance of strains resistant to the phytosanitaries currently used causes an urgent need to develop new phytosanitaries efficient against crop pathogens, safe for human health and the environment, and that avoid the generation of resistance against them. In this sense, antimicrobial peptides are an emerging source of active substances which fulfills those requirements. In order to boost their development, we have developed a bio-informatics tool to predict the antimicrobial properties of peptides to be used for crop protection. Our machine learning-models were trained with two sets of antimicrobial and non-antimicrobial peptides which present an α-helix in their structure. Properties of the α-helix were calculated using "HeliQuest" tool, and the data was analyzed with various classification algorithms (K-Nearest neighbor, Support Vector Machine, Neural Network…). Finally, models were used to screen the antimicrobial fragment of a library of more than 800 cathelicidins to evaluate those who had more chances to have a significant antimicrobial activity and therefore potential use as antimicrobial peptide for the development of new, safe and efficient phytosanitaries.

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[PC-22]
ABS-031

Human exposure to toxic metals (Cd, Pb, Hg) from cereals consumption in Madeira

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Cereals play an important role in all diets due to its mineral content and nutritional value. However, the contamination of crops with environmental pollutants suggest that cereals could suppose an important source of toxic elements as Cd, Hg or Pb. The aim of the study is to determine the concentration of Cd, Pb and Hg in samples of different cereals consumed in the Maraconesian archipelago of Madeira. Interreg PERVEMAC II project (MAC/1.1a/049) has analyzed a total of 60 samples of cereals and derivates (rice, corn flour, rye flour, wheat flour, rye, wheat, oats, corn and cous cous). Cd and Pb were determined by absorption spectrophotometry (AAS) and Hg determination was conducted by cold vapor atomic absorption spectrophotometry (CVAAS). Rye is the cereal that recorded the mean highest levels of Pb (0.347 mg/Kg) and Cd (0.237 mg/Kg). Considering the maximum levels of toxic metals in foods for human consumption set by the European Commission Regulation 1881/2006, it was found that rye exceeds both the Pb and Cd limit set for cereals in 0.20 mg/Kg becoming a dietary risk. This fact highlights the need to continue the monitoring and risk analysis of heavy metals in cereals and its derivates.

[PC-23]
ABS-037

Unravelling the dehydrated sewage sludge potential to fertilize agricultural crops: A circular economy perspective to Porto Santo Island

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The use of neglected residues as a fertilizer into agro-systems intensifies the biosustainability and circular economy. In this line of thought, a research strategy was developed to test the potential of solar dehydrated sewage sludge (DSS), produced locally using residues of Porto Santo ETAR as amendment in sweet potato assays. Sewage sludge is a product of anthropogenic waste, which after the sewage waste treatment, becomes a concentrated sludge. This work intended to evaluate this resource composition and safety, determine fertilization potential, and identify possible threats for human health, including the translocation of toxic elements from the dehydrated sewage sludge to soil and crop. This evaluation occurred in 6 plots of 25m2 each, in duplicate, during 2 consecutive years, applying 4 and 8 kg.m2 in a single dose of DSS, reducing 50% in the 2nd year and having 1/3 of the testing plots as a negative control. Assays of the soil, pH > 7, and DSS heavy metals and toxic organic compounds were all below maximum values, stipulated by DL 276/2009 (Portuguese law) except for E. coli. After harvest, the rhizome and foliage of the sweet potato crop were evaluated, concerning heavy metals concentration and pathogen contamination (E. coli and Salmonella spp.). The results indicated that when 4 and 8 kg.m2 of DSS were applied, cadmium and lead were a concern in the whole plant and pathogen contamination was only relevant for the aerial part. In the 2nd year, where the dose was reduced by 50%, lead contamination was still significative in the rhizome. Several sweet potato samples were also assessed from nearby productions, which cadmium and lead exceeded permissible levels in foliage and only lead in the rhizome. Due to the proximity to the airport and sweet potato bioaccumulation behaviour, we do not recommend the use of DSS, although considered an important source of agronomic nutrients, when fertilizing sweet potato crop, especially in potential contaminated sites.

[PC-24]
ABS-038

Phenotyping arabidopsis drought resistance using image-based and spectroscopic data and machine learning algorithms

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Ongoing climate change requires the rapid improvement of agricultural plant cultivars by increasing their resistance to abiotic stress, particularly drought stress. The inherent limitations of manual plant phenotyping are considered the main obstacle to accelerating plant breeding. High-Throughput Plant Phenotyping, based on spectroscopic and image analysis techniques, aims to overcome this problem. Here we present an attempt to optimize early drought stress detection, by combining machine learning with spectroscopic and imaging techniques. We have tested myb69, a putative drought stress tolerant mutant from Arabidopsis thaliana and its wild type (Col-0) in two time points (28 and 32 'DAS'—days after sowing) corresponding to early and late stages of drought stress, respectively. To analyse the performance of these plants, we used a combination of multi-source data comprising digital (RGB and infrared thermal) image-derived features and spectroscopic techniques—reflectance, LIF (Laser Induced Fluorescence) and SFS (Spectral Fluorescence Signature)—, which were analysed with different machine learning algorithms. We found that image-derived characteristics perform better than spectroscopic features in the distinction between well-watered and water-stressed plants, regardless of the machine learning algorithm used, and that the detection of phenotypic features of drought effects is related to morphometric traits derived from plant size. Support vector machine (SVM) and random forests (RF) classification achieved improved results when compared with the other techniques tested. We conclude that geometric and colour-related traits combined with SVMs or RFs provide an effective way to assist in the early detection of water stress for phenotyping applications.

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[PC-25]
ABS-039

Screening of amino-acid derived thioureas as antimicrobials for the primary sector

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In spite of the advances in pest and phytopathogen control using biological and physical agents, in the last fifty years control has relied primarily on the use of synthetic chemical pesticides. However, since the mid-20th century, the types of compounds have changed substantially to increase selectivity and decrease environmental impact. Since requirements for the authorisation of a new plant protection product are increasingly stringent, the search for new active compounds is an area of great interest. Among fungicides, both inorganic compounds (copper salts, sulphur) and organic products (dithiocarbamates, phthalimides, etc) are used. Many thioureas are also known to present potent antibacterial, antifungal, and antiviral properties, and are currently used as pesticides and nematicides. Recently, some spirooxindole derivatives with thiourea and thiohidantoin groups have displayed promising antiviral, antifungal and insecticide activities. In our research on new thioureas we have focused on the synthesis of fluorinated thioureas derived from amino acids. In this communication, we will present our preliminary results of the synthesis of these compounds and also the evaluation obtained against different phytopathogenic fungi (Botrytis cinerea, Alternaria sp and Fusarium). The data obtained therefrom are used to perform a structure-activity relationship (SAR) study to determine the structural characteristics that could improve the selectivity and potency of these compounds.

[PC-26]

ABS-040

Effect of *Sargassum vulgare* aqueous extract in the growth rate of maize and tomato plantlets under drought stress.

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Reduced yield due to drought stress is one of the most problematic climate change effects on crops. One strategy to limit damage is to apply bio stimulants, that induce protective responses in the plants. One of the more promising are algae extracts. We have tested the effect of various concentrations of the extract of *Sargassum vulgare*, harvested in Madeiran waters, in maize and tomato plantlets, from local varieties. These plantlets were grown under water stress for 7 days, in a growth chamber, under controlled conditions. Plantlets were grown in germination substrate, in racks with 24 individual alveoli (1 plantlet per alveolus). Experiment was run in duplicate. After establishment, plants were subjected to water stress, with one rack maintained near field capacity (control fully irrigated), and 4 irrigated with 25% of the control. Three of these racks were treated with 1%, 5% and 10% of the aqueous extract, obtained through Timatic extractor, 24 hours prior to stress imposition, and one was maintained as treatment control. Plantlets were irrigated daily with Hoagland solution. Ten plantlets were harvested at stress imposition, and 10 plantlets per treatment were harvested after 7 days. Root and shoot length and dry weight were recorded, as well as total plantlet length and dry weight. Relative growth rate (RGR) and Relative Water Content (RWC) were calculated. We observed that stress reduced RGR, compared to fully irrigated, by 44.6% % in maize, and by 26.8 % in tomato. In maize, 1% of the extract did not appear to influence the plant growth under stress, however, in plants treated with 5% and especially plants treated with 10% of the aqueous extract, plants growth was stimulated under water stress, with plants treated with 10% extract growing 26% per day more than treatment control. In tomato, all the extract concentrations increased RGR by 9 to 10%. S. vulgare extract appears to provide a protective role for maize and tomato plants grown under water stress.

[PC-27]
ABS-042

MADEIRA-OPUNTIAS Project

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Climate change events could negatively impact the Madeira Island agricultural sector. The most affected crops will be those with more water requirements and with a low tolerance threshold for high temperatures and drought. On the other hand, some positive impacts are expected, such as the extension of the growing season in winter and the appearance of favorable conditions for new crops. The cactuses, namely the *Opuntia ficus-Indica* (L.) Mill has unique characteristics which show resilience to the changes of climate change. Locally named as "tabaibo", this cactus plant can promote biodiversity preservation, reducing water consumption, increasing carbon sequestration, and reducing CO_2 emissions in soils with low fertility. The fruit is the principal commercial exploitation from this cactus plant, with the vegetative parts – cladodes – being usually unused. As an example, cactus cladodes could contain high amounts of fiber that provide welfare benefits in lipids and sugars metabolism. However, the welfare benefits depend on the quality composition of the cladode, where the quality can vary with edaphic conditions. The Department of Agriculture and Rural Development, in partnership with the University of Madeira, the Insular Company and local "tabaibo" producers, is developing a project called MADEIRA – OPUNTIAS. The main objective is to monetize a culture that until now was considered "marginal" and to add value to it. It is a crop of interest to the Autonomous Region of Madeira, capable of boosting the farmer's profitability in semi-arid areas on the south coast, in the east and west of Madeira Island, as well as in Porto Santo Island. On both islands, there are areas with potential, where "tabaibo" cultivation is the most suitable to minimize erosion and contribute to soil preservation, and, where other crops do not find conditions for productivity, thus contributing to an increase in the strengthening of the carbon sequestration, and so product valorization.

[PC-28]
ABS-043

The expected impact of climate in the grapevine culture, in Madeira Region, Portugal

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It's increasingly important to know the effects of climate change on crops. This study aimed to determine the bioclimatic indices for the main wine-growing areas of Madeira island, for the current period and for two simulated climate scenarios to understand the potential and limits that will be imposed on the development of vine culture. The climate characterization process was mainly based on the Geoviticulture Multicriteria Climatic Classification System (CCM), composed of three indices: Heliothermic Index (HI), Night Cold Index (CI), and Dryness Index (DI). It was also used for the Winkler Index (WI), used to describe the suitability of crop cultivation in different climates. Through the analysis of the Heliotherm Index (HI) in general, the analyzed regions did not undergo drastic changes in terms of heat accumulation, except for the Santana region, which is currently classified as Temperate Warm and, in the future, if the simulations are carried out, they will pass to Very Warm. For the Fresh Nights Index, the regions of Quinta Grande, São Vicente, and Santana currently have minimum ideal temperatures for a good maturation of the vineyards. In the regions of Quinta Grande, São Vicente, Ponta do Pargo, and Santana according to the Winkler index, the quality of the wines will be altered if the simulations carried the outcome to fruition. Quinta Grande, São Vicente, and Ponta do Pargo which are currently classified as zone 4, with naturally sweet wines, came to zone 5 classified as wines with high acidity. Santana, which is currently classified as zone 2, where good quality wines are produced, will move to zone 4 or 5.

[PC-29]

ABS-044

Agroclimatic zoning and determination of cold hour accumulation for apple tree (*Malus domestica*) cultivation in Madeira Island

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The apple tree culture has several varieties with the most distinct requirements for cold hours. The present study aimed to carry out an Agroclimatic Zoning for apple tree cultivation, as well as to associate the inventory of apple producing areas in Madeira Island associated, as such, with the quantities of cooling units for a crop. For the Zoning process, 10 weather stations were used throughout Madeira island with observation periods from 1961 to 1990. An inventory process of apple varieties was carried out, in which the presence of 48 varieties crop was found. The Agroclimatic Zoning for the cultivation of apple trees presented that historically on the island of Madeira presented some ideal areas for the cultivation of apple trees, despite its subtropical climate. However, these places are like Special Conservation Zones (or Natura 2000 Network), making it impossible, therefore, to cultivate them in the most favorable areas according to the climate requirements of the culture. The accounting of accumulated cold hours was much below presented in the literature for all apple-producing areas on the Island. However, even though this number is very small, it can be considered sufficient to induce and break winter dormancy in Madeira.

[PC-30]
ABS-045

PhytoBlueFrac Project - Optimization of microalgae production to produce nutraceutical food supplements through selective fractionation

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The PhytoBlueFrac project rises from the company current capacity to produce microalgae with high nutritional value and economic potential, and the need to diversify and differentiate itself in the national and international markets. The main purpose is to produce food supplements from the lipid fraction, rich in carotenoids, fatty acids, and sterols, with high market value and high nutraceutical capacity. These compounds are known for their great antioxidant capacity, and its production and enhancement can be modelled according to the cultivation conditions (e.g. culture medium). The nutraceutical products developed have an outstanding biological ability that allows to prevent and treat some diseases that affect the world population. Another objective of this project is to use an innovative method of extraction by selective fractionation to obtain the products, in which the residue will be used to develop biofertilizers with wide application in sustainable agriculture. This last product combines the assumptions of the Blue Economy and the Circular Economy, strongly contributing to the development of sustainable agriculture, adapted to climate change, and effectively reducing the environmental footprint. The direct beneficiaries are the consumers, as they will have at their disposal novel nutraceutical, natural, and biological products, manufactured to provide a superior and differentiated quality level, accompanied by the "Made in Portugal" stamp. Another of the beneficiaries will be agricultural companies, which will have innovative biological biofertilizers available at competitive prices in the market.

[PC-31]
ABS-046

Study of Madeira Annona: genetic and biochemical characterization of regional varieties

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Annona (*Annona cherimola* Mill.) is a subtropical fruit crop cultivated in Madeira since the XIX century. Its adaptation to local agroecological conditions provides *sui generis* characteristics, which differentiates local production from fruits around the world. Annona´s fruits are sources of carbohydrates, fibers, protein, antioxidants, and other bifunctional compounds with health benefits and are the second most exported fruit from Madeira. A deeper characterization ensures the quality of agri-food products and complements genetic resources information. This communication presents the preliminary results of the biochemical and genetic characterization of 8 Annona varieties, with agronomical and economic interest. At genetic characterization, genomic DNA extracted from young leaves was amplified using 9 simple sequence repeats (SSRs), with fragment analysis by Beckman automatic system and dendrograms on similarity matrix by UPGMA. The dendrogram revealed 3 major clusters. The first comprised the varieties Funchal, D. Mecia, Moreira, and Matheus, the second Francesa, Perry Vidal, and Madeira, and the third the variety Anis. This last one is a non-cataloged variety and was placed separately from the other 2 clusters, indicating less genetic affinity. The best biochemical composition from the freeze-dried pulp flour was listed for Francesa and Matheus in crude fiber content, along with Madeira, Matheus, and Francesa in protein content. D. Mecia had the highest lipid and total mineral content. Data obtained contributes to a wider project regarding Annona valorization (fruits/by-products) and is embedded in the Annona regional plan of action and RIS3-RAM strategy for a bio-sustainability domain and economic valorization. Our work provides important knowledge to support the exceptionality of these varieties, aiming to ensure the quality of the agri-food products commercialized from the region.

[PC-32]
ABS-049

Implementing a biorefinery strategy to process macroalgae and obtain new bioproducts to increase the sustainability and resilience of the agrosystems and bioeconomy

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Biorefinery is an integrated system that efficiently converts biomass, through physical, chemical, biochemical, and thermochemical procedures into various products. This strategy applied to macroalgae allows to obtain bioactive extracts, bioethanol, lipids, polysaccharides, phycobiliproteins and fertilizers. The usefulness of the bioactive extracts includes nutraceuticals, antibacterial and antifungal products. The implementation of various extraction techniques in a biorefinery strategy, analogous to the oil industry, tends to increase the economic potential of these bioresources, reducing the production of residues or waste, valuing them, or using them as value-added and marketable by-products. Three local marine red macroalgae were used to produce several protein extracts, using phosphate buffer (0,1M, pH 6.8) and a pressurized liquid extractor. Phycoerythrin, a valuable bioactive pigment, was assessed in the protein extracts and higher values were from Grateloupia lanceola (3.11 mg/g dw), followed by Nemalion elminthoides (2.78 mg/g dw) and Asparagopsis taxiformis (0.29 mg/g dw). The extract optimization was performed applying a Box-Behnken design, varying two independent variables, sample weight (100, 200 and 400g fw) and number of cycles (6, 12 and 18). After protein purification, a liquid and solid residue will be assessed as a biostimulant and biofertilizer to evaluate its use in sustainable food production, through tests, where the "Cherry" variety of tomato will be used as a plant model. Such research is necessary to find new sources of raw material, not yet used, to obtain new biologically based products and strategies that allow to reduce the use of fertilizers and pesticides, promoting crop protection against climate change drivers, such as drought, dilapidation of nutrients and increase of biotic stress, allowing to reach targets of the European Ecological Pact.

[PC-33]
ABS-050

Study of nutritional and biofunctional components of avocado (*Persea americana* Mill.) fruits from Madeira Island

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Avocado (*Persea americana* Mill.), is one of the most important tropical fruit in the world, due to its nutritional and chemical characteristics. Recently popular as a health promoter fruit (superfood), the avocado became one of the most economically important tropical fruit in the world. Avocado is native to South America, and is currently distributed worldwide. In Europe, avocado is mainly produced in Spain, Greece, Italy, and Portugal. Portugal produces avocado essentially in Algarve and Madeira Island, owing to its Mediterranean temperate climate with shorts winters and longs summers. Avocado pulp is traditionally consumed in Madeira Island, with 2019 annual production of 12 ton/ha, and 4.4 ton export. Globally, the most produced variety is the commercial "Hass" due to its facility in cultivation, which creates a problem because these commercial varieties have been replacing the regional varieties, inciting the need to study the regional varieties and their value through a full quality profile. The aim of this project is to study a few local avocado accessions from Madeira Island, from morphology and phenology to nutritional and biochemical traits and compare them with commercial varieties, using all parts of the fruit, pulp, peel, and seeds. Qualitative and quantitative traits through phytochemical studies are also very important in this project because they can give the avocado antioxidant, antimicrobial, antifungal, and antibacterial capacity, which will culminate in its use as a wealth agent. These traits will be evaluated by Ultraviolet spectroscopy, Soxhlet extraction, NIR spectroscopy, High Pressure Liquid Chromatography, and Gas Chromatography techniques. This study will give us insides about regional avocado quality characteristics and their added value to create new local products, in relation to the commercial varieties, as well products from the waste from avocado peel and seed.

[PC-34]
ABS-057

Biochemical and mineral variability in seeds of two accessions of common beans from Madeira Island cultivated in different agro-climatic and season conditions

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Common bean (*Phaseolus vulgaris* L.) is a staple food worldwide due to its nutritional value, with high protein and minerals content. Traditional agriculture is declining worldwide due to intensive agriculture, with loss of crop biodiversity and nutritional quality. The effect of location and weather events can also affect crop yield and quality, depending on the crop's ability to tolerate altitude, precipitation, and temperature variations. Although there are some works on bean landraces, little is known about how Madeira's diverse agro-ecological and climatic conditions affects the crop development under mountain traditional agriculture. We analyzed the seed biochemical and mineral composition through prediction analysis by high-precision near-infrared spectroscopy (NIRS), and the yield of 2 accessions of Madeiran beans – "Rasteiro" and "Santana" – cultivated in different agro-climatic conditions. The bean accesses were planted simultaneously on terraces of approximately 48 m2 at Funchal (QSR, 179m a.s.l.), Câmara de Lobos (CEP, 208m a.s.l.), Santana (CES, 416m a.s.l.), and Jardim da Serra (QL, 723m a.s.l.). Planting was carried out in January/February and June/July, after deep fertilization with organic compost and without application of phytopharmaceuticals and was harvested after 5 months. We observed that accessions showed distinct changes in seed quality and yield behavior. Harvesting was not possible at: higher altitudes (CES and QL) and at lower temperatures in February; lower altitudes (CEP) with hot peaks in July – these conditions made flowering unfeasible, leading to seedless plants. Still, comparing the harvested seeds in the remaining plantations, "Santana" had the best dry seed weight, with the lowest starch content. The dry seed weight was variable according to altitude and was correlated with lipids and minerals (N, P, Fe, Mn). In conclusion, altitude and temperature compromised bean viability, yield, and quality.

[PC-35]
ABS-058

Analysis of the composition of organic compost produced and used in soil cover and regeneration

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Soil degradation derived from inappropriate, intensive agricultural practices and climatic changes, comes as a great global concern. The long periods of drought and irregular precipitation leads to reduced vegetation, intensified erosion processes and poor soils with high drainage, low organic matter content and water retention. The incorporation of organic compost to the soil is a strategic measure to soil regeneration, as it inputs an organic matter source, which improves the physicochemical and biological properties of soils, contributing as a nutrient source for crops under normal and stress conditions. This work presents a pilot study of the application of compost made from vegetal residues and cow manure, with 185 maturation days, to experimental areas, in two different proportions, 2,5 and 5 kg m-2. The final compost applied was characterized as an alkaline product with a pH of 8,13, an organic matter content of 18,46%, a C:N ratio that reached 23,49, a raw lignin of 10,80% and cellulose content of 2,31%. After 60 days, the plot with 5 kg m-2 compost, showed a soil pH of 7,50, electrical conductivity of 5,33 mV, higher water holding capacity of 115,48 %, and organic nitrogen of 0,17%. In the plot with 2,5 kg m-2 the highest values of organic matter (8,78%) and organic carbon (6,97) were obtained. The compost's input provided an immediate result in the microorganisms counting, after 15 days and the stimulation of the microbiological activity after 60 days, with higher values of basal respiration of 1,56E-02 and 1,47E-02 mg C kg-1 h-1, microbial biomass of 589,59 and 622,35 mg C kg-1, and metabolic quotients of 2,61E-05 and 2,36E-05 mg C mg C-1 h-1. The increasing proportion of applied compost provided agricultural productivity with rising values of lettuce crops planted in the experimental areas during the trial. The evaluation parameters provided sensitive indicators, critical to long term studies of the compost's contribution in the soil regeneration.

[PC-36]
ABS-060

Impact of training systems and rootstocks on the ripening process of Verdelho Grapes

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Sustainable viticulture is an underdeveloped concept and vine growers need to improve their practices to reduce their impact on the environment. As such, more studies in this field are essential. This research aims to add further data about the ripening process of Verdelho grapes – a variety often used to produce Madeira Wine – by comparing two vine training systems (trellising and espalier system) and two rootstocks (R99 and 1103P). Results showed that vineyards in the espalier system had greater bunch size and weight, higher berry volume, and higher levels of glucose and fructose, which is in accordance with what is described in the literature. Furthermore, these vineyards reached full maturation earlier than those in the trellising system. The grapes from vineyards in trellising systems had higher contents of organic acids and higher phenolic maturation index but had lower levels of glucose and fructose and took longer to reach the minimum alcoholic strength values recommended (9%) for the harvest – about a week after the grapes from the vines in espalier. Comparing the two rootstocks, grapes from R99 stood out for having higher levels of organic acids and ripeness index.These results allow us to assess that the espalier system is a good choice to produce Verdelho grapes in Madeira's climate since the grapes from vineyards in this training system reached full maturation one week earlier. The similar results obtained for grapes from R99 and 1103P can be due to genetic similarities, as described in the literature.

[PC-37]

ABS-061

Evaluating different traps and attractants to monitor *Drosophila suzukii* (Matsumura) in Terceira island (Azores)

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Drosophila suzukii (Matsumura) (Diptera: Drosophilidae) or "spotted winged drosophila" is a pest with a huge dispersion worldwide, is an insect responsible for fruit damage on many fruit hosts of economic importance. This pest was first identified in Azores in 2016 in S. Miguel. In the current scenario of climate changes, the global average temperature is increasing and temperature is the main factor which affect the distribution of insects. Monitoring activities and control strategies are very important to determine if population abundance threshold is exceeding, to determine the spread capabilities of a pest and planning the treatment applications in the field. The study was conducted in three strawberry orchards in Terceira Island in 2020. The study aims to test five different traps (Drosotrap with Drosalure, Red plastic cup filled with vinegar compound, Drososan trap filled with FruitFly attractant (Kopper), SuzukiiTrap, homemade plastic bottle filled with vinegar compound) and to determine which is the most efficient in terms of catches of *D. suzukii* adults. Results shown that the number of flies in SuzukiiTrap, plastic bottle filled with a vinegar compound and Drososan trap were significative higher (STrap: $p< 0.0003$; Plastic bottle: $p < 0.0001$; Drososan: 0.0041). Keywords: traps; climate change; strawberry; spotted-wing-drosophila; Azores.

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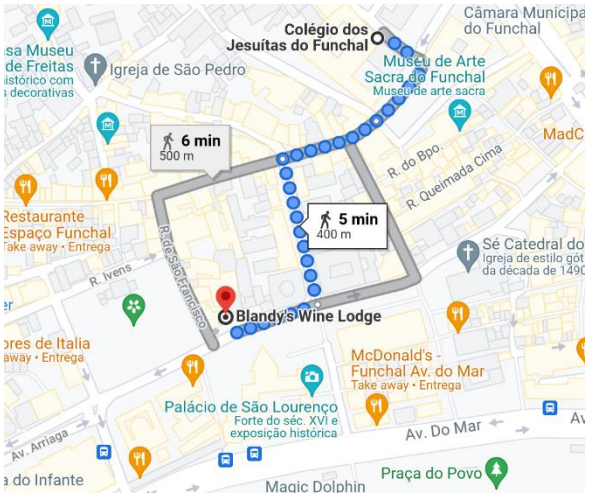

Meeting point
Av. Arriaga 28, 9000-064 Funchal

Important information regarding booking

If you wish to book this tour, please inform the AFSS2021 Organizing Committee (info@afss2021.com) until the **11th of October 2021**.

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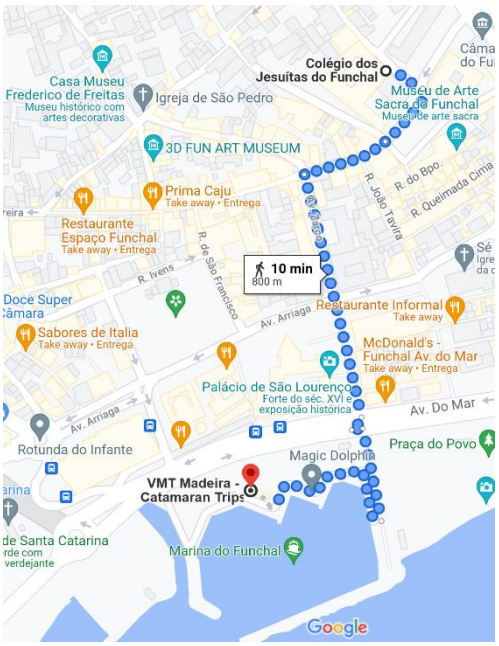

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MADEIRAN HERITAGE

Due to the need to offer both a cultural and diverse experience to tourists on the island, the Madeiran Heritage programme was established. This program is promoted by current and former university students or European volunteers and combines innovative experiences at several points of interest in Madeira with a multidisciplinary team. The research developed at the University of Madeira is used to combine scientific accuracy with dynamic and enriching experiences. The funds raised are then used to help finance several social and volunteer programmes within the university which aid students and their learning which will hopefully lead to fewer withdrawals from school and therefore combat the lack of qualified young people in Madeira. Visitors are an important part of this university programme that was awarded several prizes and distinctions.

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