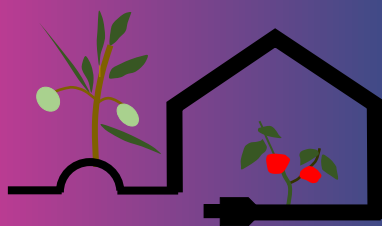


Horchimodel 2023

International Symposium on Models for Plant Growth, Environments, Farm Management in Orchards and Protected Cultivation



26-28 JUNE 2023
UNIVERSIDAD DE ALMERÍA
ALMERIA-SPAIN



Plant modelling for the adaptation of smart horticulture to climate change



Instituto Andaluz de Investigación
y Formación Agraria, Pesquera, Alimentaria
y de la Producción Ecológica
Consejería de Agricultura,
Pesca, Agua y Desarrollo Rural



ISHS

International Society for Horticultural Science



Welcome to Almería, Spain, for the International Symposium on Models for Plant Growth, Environments, Farm Management in Orchards and Protected Cultivation (Horschimodel 2023)

Spanish scientists welcome you to Horschimodel 2023, a great event to promote horticultural sciences and innovation worldwide around crop modelling.

Spain, a horticultural country

Spain is the leading producer of fruit and vegetables in the European Union, with a volume of more than 23 million tons.

Spain has fast become one of the most desired tourist destinations on the planet, being the second most visited country in the world, recording more than 82 million tourists.



1st

Producer of fruit and vegetables in Europe



2nd

Tourist destination in the World

Almería, the province of protected crops

Almería is a modern city located in the historical Andalusian region of Spain. It has a long tradition in agriculture, starting during the transition from the Neolithic to the Bronze Age (4000-1800 b.C.) with the development of Los Millares complex, an archaeological site located 20 km northwest of Almería. Today, the 32,000 ha of plastic greenhouses provide 3.7 million tonnes of fruits and vegetable along the year, allowing Almería to be the first horticultural production area in Spain with more than 100,000 jobs.





Institutions supporting the symposium

University of Almería (UAL) - <https://www.ual.es/>

Andalusian Institute of Agricultural, Fisheries, Food and Organic Production Research and Training (IFAPA) - <https://www.juntadeandalucia.es/agriculturaypesca/ifapa/web/>

International Society for Horticultural Science (ISHS) - <https://www.ishs.org/>



Chairs of the ISHS Divisions

Dr. Evelyne Costes - Physiology and Plant-Environment Interactions of Horticultural Crops in Field Systems.

Dr. In-Bok Lee - Precision Horticulture and Engineering.

Chairs of the ISHS Working Groups

Dr. Nadia Bertin - Modelling in Fruit Research and Orchard Management.

Dr. Luo Weihong - Modelling Plant Growth, Environmental Control, Greenhouse Environment (HortiModel).



Conveners

Prf. Dr. Francisco Domingo Molina Aiz – University of Almería - *ISHS Member of Division Precision Horticulture and Engineering and Workgroup Modelling Plant Growth, Environmental Control, Greenhouse Environment.*

fmolina@ual.es

Dr. Lorenzo León Moreno - IFAPA-Córdoba - *ISHS Member of Division Physiology and Plant-Environment Interactions of Horticultural Crops in Field Systems and Workgroup Modelling in Fruit Research and Orchard Management.*

lorenzo.leon@juntadeandalucia.es



Local Organizing Committee

Prf. Dr. Diego Luis Valera Martínez - University of Almería. Vice-Rector for Research and Innovation of the University of Almería - *ISHS Member of Division Precision Horticulture and Engineering.*

dvalera@ual.es

Prf. Dr. Alejandro López Martínez –University of Almería. Director of the Research Management Secretariat of the University of Almería.

alm212@ual.es

Prf. Dr. María Luisa Gallardo Pino –University of Almería - *ISHS Member of - ISHS Member of Division Physiology and Plant-Environment Interactions of Horticultural Crops in Field Systems and Workgroup Modelling Plant Growth, Environmental Control, Greenhouse Environment and Workgroup Modelling in Fruit Research and Orchard Management.*

mgallard@ual.es

Prf. Dr. Virginia Pinillos Villatoro –University of Almería. *ISHS Member of - ISHS Member of Division Physiology and Plant-Environment Interactions of Horticultural Crops in Field Systems.*

vpinillo@ual.es

Dr. Mirelle Nathalie Honoré –University of Almería. *ISHS Member of - ISHS Member of Division Physiology and Plant-Environment Interactions of Horticultural Crops in Field Systems and Workgroup Modelling Plant Growth, Environmental Control, Greenhouse Environment and Workgroup Modelling in Fruit Research and Orchard Management.*

mh052@inlumine.ual.es

Dr. Salvador Parra Gómez - Territorial Delegation Agriculture, Livestock and Fisheries Almería – Spanish Government).

salvador.parra@juntadeandalucia.es

Dr. Evangelina Medrano Cortés – IFAPA La Mojonera - *ISHS Member of Workgroup Modelling Plant Growth, Environmental Control, Greenhouse Environment.*

evangelina.medrano@juntadeandalucia.es





Plant modelling for the adaptation of smart horticulture to climate change

Spirit of Horchimodel 2023

The HorchiModel 2023 symposium will be held in Almería (Spain) from June 26th to 28th 2023.

The symposium incorporates under the aegis of two ISHS Working Groups "Modelling in Fruit Research and Orchard Management" and "Modelling Plant Growth, Environmental Control, Greenhouse Environment", respectively:

- XI International Symposium on Modelling in Fruit Research and Orchard Management.
- VI International Symposium on Models for Plant Growth, Environment Control and Farming Management in Protected Cultivation (HortiModel)

This event will be an opportunity to bring together in the same space and time specialists in the modelling of fruit and vegetable production systems both orchards and greenhouses and to present their research innovations, to share ideas and knowledge and discuss state-of-the-art and future perspectives for the modelling.



Crop models can provide integrated understanding and cross-talk between physiological processes at multiple plant scales, optimizing trait combinations for selecting innovative genotypes, simulate complex greenhouses and orchard designs, anticipating the consequences of environmental fluctuations, soil water restriction or pest attack, for system control and management limiting spread of insects or pathogens.

Plant modelling can help achieve sustainable agriculture by optimizing the use of inputs such as water, nutrients, energy or phytosanitary products. Models also can improve the economic performance of farms by predicting yields, fruit quality or the start of the harvest.

Crop modelling has the potential to enable society to assess the efficacy of manipulating genotype and agronomic management technologies to mitigate and adapt crop production systems to climate change.





Topics

- **Topic 1:** Decision support modelling tools for sustainable horticulture.

- Water, nutrient and energy management.
- Climate control systems.
- Computational Fluid Dynamic (CFD) models.
- Plant status and stress response.
- Plants and sensors.
- Digital twins.



- **Topic 2:** Methodological issues for plant systems modelling.

- Data acquisition and model calibration.
- Multi-scale, integrative approaches.
- Model selection and evaluation.
- Model reduction and simplification strategies.
- Model combination and scale integration.

- **Topic 3:** Modelling plant and organ development and physiology.

- Plant/organ growth and development.
- Carbon partitioning.
- Fruit quality.
- Biotic stress control.



- **Topic 4:** Modelling plant architecture.

- Plants 3D reconstruction.
- Plants architecture and production.
- Functional–structural plant modelling.
- Light interception.

- **Topic 5:** Modelling plant adaptation to climate change.

- Crop and climate.
- Plant defence and disease control.
- Phenology.
- Life Cycle Assessment (LCA).



Keynote Speakers



- **Hicham Fatnassi:** "Considering plant activity in greenhouse climate models using Computational Fluid Dynamics: What has been accomplished and what remains to be done."

International Center for Biosaline Agriculture, Dubai - United Arab Emirates.

<https://www.biosaline.org/staff/dr-hicham-fatnassi>



- **Gerhard Buck-Sorlin:** "Crop Modelling in and for Horticulture: Paradigms, Methods, Workflows and Scales."

Teams ImHorPhen & STRAGENE. Institut Agro, Université d'Angers, INRAE, IRHS, SFR QuaSaV – Angers – France.

https://www6.angers-nantes.inrae.fr/irhs_eng/Contacts-and-Location/Staff-directory/Buck-Sorlin



- **Leo Marcelis:** "Modelling plant and organ development and physiology." Horticulture and Product Physiology. Wageningen University & Research, Wageningen – Netherlands.

<https://www.wur.nl/en/Persons/Leo-prof.dr.ir.-LFM-Leo-Marcelis.htm>



- **Katrin Kahlen:** "Modelling plant architecture in vineyards and greenhouses."

Department of Modeling & Systems Analysis. Hochschule Geisenheim University, Geisenheim – Germany.

<https://www.hs-geisenheim.de/en/persons/person/170/>



- **Ixchel Hernandez Ochoa:** "Exploring climate change impacts and adaptation strategies in crop production by using dynamic crop simulation models: possibilities and limitations."

INRES Crop Science. Universität Bonn, Bonn – Germany.

<https://www.lap.uni-bonn.de/en/staff/websites/ixchel-hernandez-ochoa>



Scientific Committee



Leo Marcelis
Wageningen University & Research (The Netherlands)



Rodney Thompson
University of Almería (Spain)



Cecilia Stanghellini
Wageningen University & Research (The Netherlands)



Danfeng Huang
Shanghai Jiao Tong University (China)



Hicham Fatnassi
International Center for Biosaline Agriculture, Dubai (United Arab Emirates)



Oliver Körner
Leibniz-Institute of Vegetable and Ornamental Crops (Germany)



Frédéric Boudon
Institut Agro, Montpellier (France)



Esteban José Baeza
Future Farms Solutions (Spain)



Silke Hemming
Wageningen University & Research (The Netherlands)



Katrin Kahlen
Hochschule Geisenheim University (Germany)



Valentina Baldazzi
Université Côte d'Azur (France)



María Victoria González-Dugo
Instituto de Agricultura Sostenible (Spain)



Gerhard Buck-Sorlin
Institut Agro - Agrocampus Ouest (France)



Luis Gonzaga Santesteban
Universidad Pública de Navarra (Spain)



Zhanwu Dai
Institute of Botany - Chinese Academy of Sciences (China)



Luigi Manfrini
Alma Mater Studiorum Università di Bologna (Italy)



Véronique Letort - Le Chevalier
Centrale Supélec MICS, Paris-Saclay (France)



Liqi Han
University of Queensland (Australia)



Ixchel Hernandez Ochoa
INRES Crop Science, Universität Bonn, Bonn (Germany)



Melba Ruth Salazar-Gutiérrez
Horticulture, Auburn University, Auburn (USA)



Eike Luedeling
INRES Crop Science, Universität Bonn, Bonn (Germany)



Symposium schedule

Time	Monday 26	Tuesday 27	Wednesday 28
8:00-8:30	D Welcome	D Welcome	
8:30-9:00	A Opening Ceremony Introduction by organizers and welcome	A Topic 3 - Modelling plant and organ development and physiology <i>Keynote speaker: Leo Marcelis</i>	D Welcome
9:00-9:30	A Topic 1 - Decision support modelling tools for sustainable horticulture <i>Keynote speaker: Hicham Fatnassi</i>	A Oral presentations Topic 3 - Session 1 4 Oral presentations of 15 min (12 min+3 min of questions)	A Topic 5 - Modelling plant adaptation to Climate change <i>Keynote speaker: Ixchel Hernandez Ochoa</i>
9:30-10:00	A Oral presentations Topic 1 - Session 1 2 Oral presentations of 15 min (12 min+3 min of questions)		A Oral presentations Topic 5 - Session 1 2 Oral presentations of 15 min (12 min+3 min of questions)
10:00-10:30	D Coffee Break	D Coffee Break	D Coffee Break
10:30-11:00	A Oral presentations Topic 1 - Session 2 6 Oral presentations of 15 min (12 min+3 min of questions)	A Oral presentations Topic 3 - Session 2 6 Oral presentations of 15 min (12 min+3 min of questions)	A Oral presentations Topic 5 - Session 2 6 Oral presentations of 15 min (12 min+3 min of questions)
11:00-11:30		C Oral presentations Topic 1 - Session 3 6 Oral presentations of 15 min (12 min+3 min of questions)	C Oral presentations Topic 1 - Session 5 6 Oral presentations of 15 min (12 min+3 min of questions)
11:30-12:00			
12:00-12:30	B Poster presentations – Session 1	B Poster presentations – Session 3	B Poster presentations – Session 4
12:30-13:00			
13:00-13:30	E Lunch	E Lunch	E Lunch
14:00-14:00			
14:00-14:30			
14:30-15:00	A Topic 2 - Methodological issues for plant systems modelling <i>Keynote speaker: Gerhard Buck-Sorlin</i>	A Topic 4 - Modelling plant architecture <i>Keynote speaker: Katrin Kahlen</i>	A Farewell Speech Closing remarks by the Organizing Committee
15:00-15:30	A Oral presentations Topic 2 - Session 1 4 Oral presentations of 15 min (12 min+3 min of questions)	A Oral presentations Topic 4 - Session 1 4 Oral presentations of 15 min (12 min+3 min of questions)	
15:30-16:00			Technical Tours - Visit to the University of Almería Experimental Farm - Visit to the Commercial greenhouses of the Biosabor Company - Visit to the olive orchards of the Oro del Desierto Company.
16:00-16:30	D Coffee Break	D Coffee Break	
16:30-17:00	A Oral presentations Topic 2 - Session 2 4 Oral presentations of 15 min (12 min+3 min of questions)	A Oral presentations Topic 4 - Session 2 4 Oral presentations of 15 min (12 min+3 min of questions)	
17:00-17:30		C Oral presentations Topic 1 - Session 4 4 Oral presentations of 15 min (12 min+3 min of questions)	
17:30-18:00	B Poster presentations – Session 2	A ISHS Business Meeting	
18:00-18:30	F Practical demonstration of modelling software and mobile applications		
18:30-19:00			
19:00-19:30			
20:00-20:30	Assistance to Flamenco show in "La Guajira"	Guided visit to the Almería "Alcazaba" fortified complex	
20:30-21:00		Walk from the "Alcazaba" to the Nautic Port of Almería	
21:00-21:30		Gala Dinner in "Catamaran" Restaurant in the Almería Nautic Port	
21:30-22:00			
22:00-22:30			
22:30-23:00			

- A** Auditorium
- B** Bioclimatic Room
- C** Conference Room
- D** Hall of Aulario II
- E** University Restaurant
- F** Classroom 1 & 2



Submission

Start of Abstract submission: June 15th, 2022

Deadline for Abstract submission: January 15th, 2023

Notification of acceptance: January 15th, 2023

Deadline for full text paper submission: June 15th, 2023



Abstracts and papers have to be submitted via **ISHS submission tool:** [click here](#)

A valid ISHS user account is needed for the presenting author in order to submit the abstract. If you don't have a valid ISHS user account yet, please proceed to <https://www.actahort.org/members/newmember?asc=1> first and pay to activate your user account prior to submitting an abstract. You will then be entitled to register to the symposium at the 'ISHS member' rate.

Information on ISHS Membership can be found at <https://www.ishs.org/members>.

During the HORCHIMODEL 2023 Symposium **two Young Mind Awards** for **junior scientists** will be given. Information on ISHS Young Minds Awards, <https://www.ishs.org/young-minds-award>.

Abstract guidelines

All abstract for both oral and poster presentations should be prepared according to the instructions and submitted to the ISHS submission tool, <http://www.actahort.org/members/symposiar?nr=717>. An abstract in English, limited to 200-300 words in a single paragraph, is required in all cases.

The abstract should contain a concise but comprehensive statement of the problem and results. The title and abstract will be freely available on the ISHS website and should be considered an advertisement for the paper as it may be all that most viewers will read. Thus, it should be carefully and accurately written. Your abstract will be sorted and arranged to organize the program by the keywords you proposed in the abstract submission.

Specifications about abstract preparation can be found here: [Authors - International Society for Horticultural Science](#).

Proceedings guidelines

All oral speakers, must submit a manuscript for the Acta Horticulturae. Authors of posters are welcomed to submit their manuscript for Acta Horticulturae but posters cannot be published as such. Acta Horticulturae (ISSN 0567- 7572) is a peer reviewed series, mainly the proceedings of ISHS Symposia and the International Horticultural Congress. All Acta Horticulturae articles are available online at www.actahort.org.

Papers should be prepared following Acta Horticulturae author guidelines: [click here](#).



Registration

Registration is required to attend all the scientific sessions and social events. Please note that only fully registered participants will be admitted to the scientific sessions. A personalized confirmation e-mail will be sent to each participant once the payment of the registration fee has been received either through the platform **Integral System of Payments** of the University of Almería.

Type of participation	Early Bird Conference Registration Before May 31 (2023)	Conference Registration After May 31 (2023)
ISHS member	500 €	600 €
Non-ISHS member	600 €	700 €
Student*	250 €	350 €
One-day registration*	200 €	300 €
Registration fee		
Gala dinner	60 €	60 €
Accompanying person	200 €	200 €

* No Acta Horticulturae.

All fees quoted in euros, VAT included.

Full registration fee (ISHS members and non-ISHS members) includes:

- Welcome Reception.
- Official Symposium program and participant's package.
- All lunches (3) and coffee breaks/refreshments breaks.
- City Tour and Technical tour.
- e-Acta electronic version of *Acta Horticulturae* proceedings.

Student registration fee includes:

- Welcome Reception.
- Official Symposium program and participant's package.
- All lunches (3) and coffee breaks/refreshments breaks.
- City Tour and Technical tour.
- Acta Horticulturae **not included**.

A certificate confirming student status is required to be submitted as a scanned copy to the Secretariat office of the conference (horchimodel2021@ual.es).

One-Day Registration fee includes:

- Official symposium program.
- Lunch and Coffee Break.

Accompanying person fee includes:

- Welcome Reception and Gala Dinner.
- City Tour and Technical tour.

In case of limit of people, for the visit to the technical tour, this will be done by order of registration, within those who have requested it.

Registration procedure

Registration for the symposium must be done through the platform **Integral System of Payments** of the University of Almería for online payment by credit card:

http://cvirtual.ual.es/sipUal/web/AutoliquidacionUal.seam?ID_UNIDAD=155&ID_ACTIVIDAD=521

1. First you can choose the **English** language in the upper right corner.
2. Select one of two options:

3. For the second option (for **non-members of the University of Almeria**), introduce your identify document or passport number and your name with the contact data.

4. Select the activity (**International Symposium on Model for Plant Growth...**) and the type of participation (for accompanying person you must repeat a second separate payment procedure).

5. Automatically, the amount to be paid should appear in the screen and you can indicate if you need an invoice.



6. If you have selected that you **need an invoice**, you need to include information clicking “**Additional information for the invoice**”. A new screen will be appeared for you to introduce all data corresponding to the applicant, company or University.

The screenshot shows a web form titled "Data for the Invoice". It includes sections for "Subject" (Applicant or Company/University), "Please, select the form of sending" (Email to the Applicant, Email to the Company, Post mail to the Company, Post mail to another address), "Additional Data for the Invoice" (Company Name, CIF/VAT number, Email, Telephone Number, Contact person), "Address" (Type of Address, Address, Number, Stair, Floor, Door, State/Country, Province, Municipality, Postcode), and "Otros Datos" (Observations). A green "Accept" button is at the bottom right. Yellow callouts with numbers 7, 8, and 9 point to the "Type of Address" dropdown, the "Observations" text area, and the "Accept" button respectively.

7. It is necessary to select the type of address. The names are in Spanish, you can use the general one, “**VIA**”.

8. You can include in “**Observations**” other information necessary to appear in your invoice. If you are ISHS Member, please include in this window your **ISHS Membership number**.

9. To finish with the data necessary for the invoice, click “**Accept**”.

10. After that, you need to select “**I express my agreement about the processing or my personal data**”.

11. Finally you can send the information to the payment system.

The screenshot shows a web form titled "Other Questions". It includes a checkbox for "I express my agreement about the processing of my personal data" and a "Send" button. Below the checkbox is a block of text containing legal information about data processing, including contact details for the University of Almería and the Spanish Agency for Data Protection. Yellow callouts with numbers 10 and 11 point to the agreement checkbox and the "Send" button respectively.

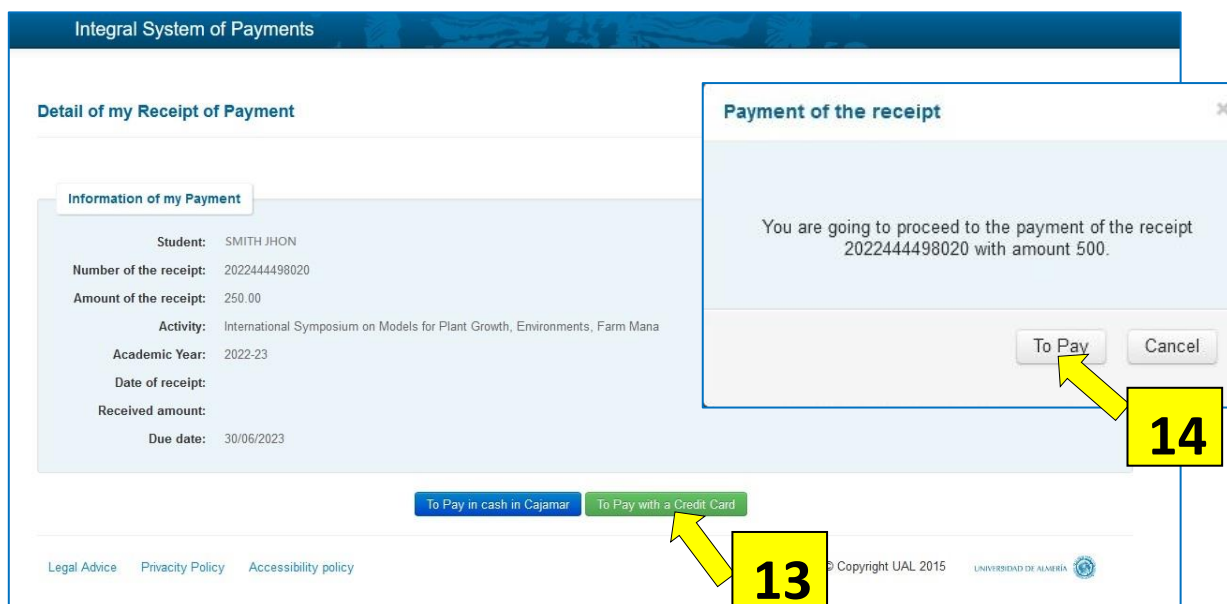


12. You need to click on the **Pay** button to manage the payment after verifying that the amount is correct.

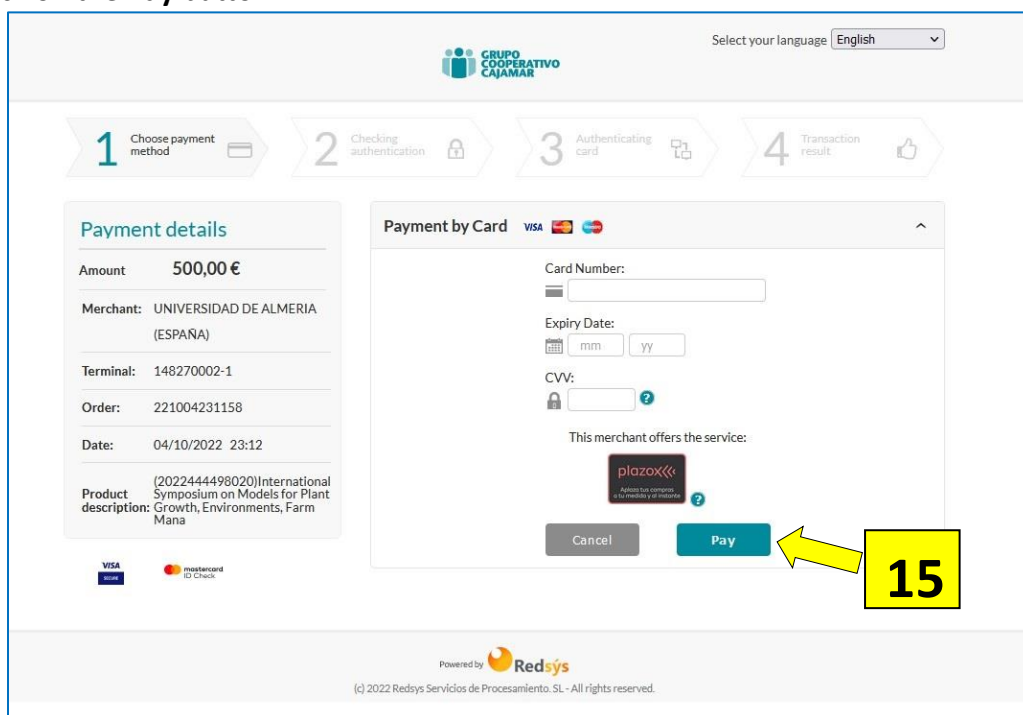


13. You can select **“To Pay with a Credit Card”**.

14. A new window of verification of the amount appear and you need to Click on the Pay button if is correct.



15. A new window or the system of payment Redsys appear. After introduce the data of the card, you need to click on the **Pay** button.





16. After the payment is authorized by your bank system the final window will appear with an **Authorized operation code** that you need to note or you can print the page.

GRUPO COOPERATIVO CAJAMAR

Select your language English

1 Select payment method

2 Requesting additional information

3 Verifying

4 Transaction result

Payment details

Amount: 500,00 €

Merchant: UNIVERSIDAD DE ALMERIA (ESPAÑA)

Terminal: 148270002-1

Order reference number: 221004231158

Date: 04/10/2022 23:12

Product description: (2022444498020)International Symposium on Models for Plant Growth, Environments, Farm Mana

AUTHORIZED OPERATION WITH CODE: 754537

Cardholder's name: JHON SMITH

Card Number: *****4980

Merchant Uri: https://virtual.ua.es/sjpUal/services/NotificacionSIS?wsdl

Product description: (2022444498020)International Symposium on Models for Plant Growth, Environments, Farm Mana

16

CONTINUE

17

17. To finish you need to Click on the **Continue** button and your payment will be automatically send to the Symposium Secretariat.



Horchimodel 2023 in the Almería University Campus



Scientific sessions and lunch will take place in the Campus of the University of Almería (UAL). The UAL which is situated along the seashore and near the city is a symbol of modern architecture.

Our buildings are original, light and efficient. The use of alternative energies and technological equipment converts our campus into a young and advanced site with a modern architecture facilitating life and daily work.



Scientific sessions could take place in the Auditorium (A), with a capacity up to 309 people, and in the Conference Room (C) of building *Edificio Ciencias Económicas y Empresariales*, with a capacity up to 130 people.



Close to the Auditorium there is the Hall of *Aulario II*, where the Welcome desk and the Sponsors' stands will be installed and where the coffee break will take place (D). The lunches will take place in the University Restaurant (E).



The poster presentation will take place in the Bioclimatic Room located in building *Edificio Departamental de Humanidades* (B). In this building we will have several rooms for the preview of the presentations and for the practical demonstrations of modelling software and mobile applications of crop models (F).

Video of the UAL Campus:

<https://www.youtube.com/watch?v=DuAktu9qunQ&list=PLuEoCznVQsOLWezpN1fykYrDvBa86oW5&index=1>

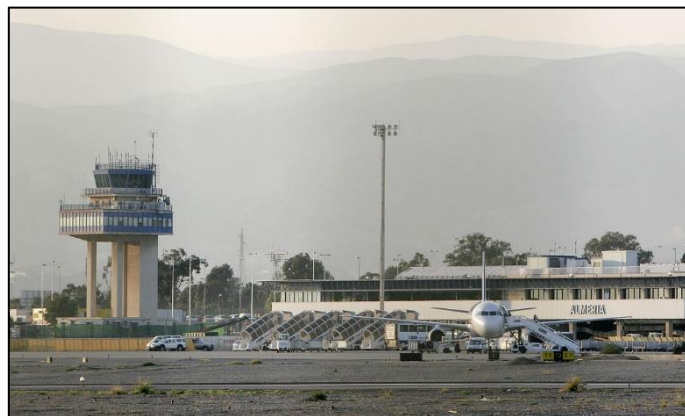


Horchimodel 2023 venue

Travel

Nearest international airports:

- Almería Airport (LEI) – 4.1 km
- Málaga-Costa del Sol Airport (AGP) – 224 km
- Alicante-Elche Miguel Hernández Airport (ALC) – 278 km



By bus or car:

- Málaga – 212 km (Highway A-7)
- Sevilla – 405 km (Highway A-92)
- Madrid – 544 km (Highways A-44 and A-92)

Accommodation

In the municipality of Almería there are 31 hotels with a capacity of 3,514 beds distributed between the city centre and the nearby neighbourhood of *El Toyo* (with hotels located on the beach, facing the Mediterranean Sea).



A list of the hotels of Almería is available in:

<https://www.dipalme.org/Servicios/cmsdipro/index.nsf/vista.xsp?p=Turismo&ref=hoteles>