



# Adrian Rodríguez Burruezo COMAV Institute Universitat Politècnica València

*EUROPEPLAND– Implementing a trans-EUROpean  
PEPper LANDrace collection for resilient agriculture*

*30 October 2024, Almeria, Spain*



# Short presentation of the institute

- The Instituto de Conservación y Mejora de la Agrodiversidad Valenciana (COMAV) is a Research Institute of the Universitat Politècnica de Valencia
- Founded in 1999
- On the basis of its SeedBank (originally founded in the 80s)
- Aimed at conservation of plant genetic resources (PGRs) and their exploitation for plant breeding. Mainly vegetables (Solanaceae, cucurbitaceae, brassica, phaseolus).
- Research lines very diverse.  
From basic seed multiplication and characterization (phenomic and genomic)  
To GWAs, screenings for new sources of variation (pathogens, abiotic stress, quality), introgressions, experimental populations, valorization and improvement of landraces, etc.



# Project activities on pepper - context

- Capsicum fruits. One of the most important vegetables and spices in the World
  - Huge variation
  - Adapted to most regions in the World
  - Selected for a plethora of culinary uses as vegetable and/or spice (different ripening stages, fresh or draw, roasted, fried, pickled, canned, powder, etc.)



# Project activities on pepper - context



- World production (just fresh) > 25 Mill. t
- China, Turkey, Mexico, Indonesia, Spain, USA, .....



- 2022 production = **1.53 Mill. t (#2 vegetables)** **value > 1,600 Mill €**  
**65% increase last 10 years**

Tomato #1 = 3.65 Mill. t  
Onion #3 = 1.22 Mill. t  
Watermelon #4 = 1.17 Mill. t  
Lettuce #5 = 0.96 Mill. t

- Acreage = 22,250 ha (16,000 ha protected)
- Exports >400,000 t (value > 600 mill eur.)

- Among the **main world producers** of powder and oleoresins as food colorants



# Project activities on pepper - context

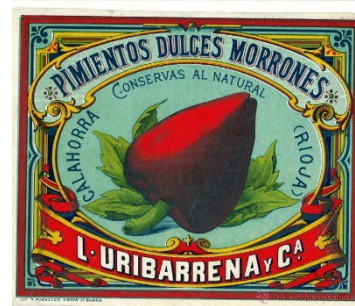


## A) Main Production/Exports

- Almeria (El Ejido)
- Murcia (C. Cartagena)
- Alicante (Vega Baja)



## B) Traditional sector



**ETC.**



# Project activities on pepper - context



➤ PROBLEMS in the last years

**COMPETENCE** foreign countries outside the EU

**LOWER Production costs**

➤ OPPORTUNITIES

**DIVERSIFYING THE PEPPER SECTOR IN SPAIN OFFERING NEW ATTRACTIVE PRODUCTS, BASED IN LANDRACES**

NOTE: Increase of the demand on more healthy foods and/or coming from sustainable farming systems



MOREOVER: promoting the valorisation and use of landraces contributes to

- 1) On farm/in situ (dynamic) conservation of genetic resources
- 2) Mitigates genetic erosion process
- 3) Contributes to a more diversified and **RESILIENT** agrifood system



# Project activities on pepper - context

## COMAV-UPV Capsicum breeding team - Main research activities -





# Project activities on pepper



## 1. Phenotyping and genotyping of large collections

### National Project RF2004-00004-00-00 (2010-2014)

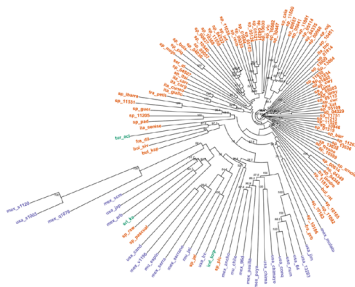
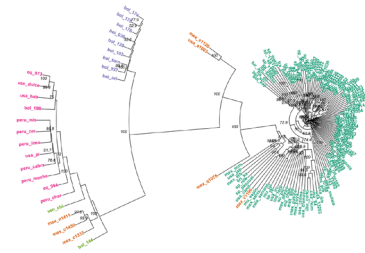
Pereira-Dias et al. *Horticulture Research* (2019) 6:54  
<https://doi.org/10.1038/s41438-019-0132-8>

Horticulture Research  
[www.nature.com/hortres](http://www.nature.com/hortres)

ARTICLE Open Access

Genetic diversity, population structure, and relationships in a collection of pepper (*Capsicum* spp.) landraces from the Spanish centre of diversity revealed by genotyping-by-sequencing (GBS)

Leandro Pereira-Dias<sup>1</sup>, Santiago Vilanova<sup>1</sup>, Ana Fita<sup>1</sup>, Jaime Prohens<sup>1</sup> and Adrián Rodríguez-Burruezo<sup>1</sup>



*Scientia Horticulturae* 265 (2020) 109245

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*Scientia Horticulturae*

journal homepage: [www.elsevier.com/locate/scihorti](http://www.elsevier.com/locate/scihorti)



Phenomics of elite heirlooms of peppers (*Capsicum annuum* L.) from the Spanish centre of diversity: Conventional and high-throughput digital tools towards varietal typification

Leandro Pereira-Dias<sup>a</sup>, Ana Fita<sup>a,\*</sup>, Santiago Vilanova<sup>a</sup>, Elena Sánchez-López<sup>a</sup>, Adrián Rodríguez-Burruezo<sup>b</sup>

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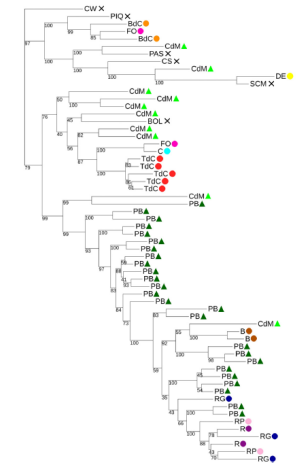
RECEIVED 20 May 2024  
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Genetic diversity, population structure, and phylogeny of insular Spanish pepper landraces (*Capsicum annuum* L.) through phenotyping and genotyping-by-sequencing

Neus Ortega-Albero<sup>1</sup>, Lorenzo Barchi<sup>2</sup>, Ana Fita<sup>1</sup>, Miguel Díaz<sup>1</sup>, Felipe Martínez<sup>1</sup>, Joana-Maria Luna-Prohens<sup>3</sup> and Adrián Rodríguez-Burruezo<sup>3\*</sup>



Scale 0.1



# Project activities on pepper



## 2. Valorisation landraces by adaptation to organic farming & quality



**EU H2020**  
GA 727230  
(2017-2020)



**EU Horizon Europe**  
GA 101059872  
(2022-2026)

### *Spanish Ministry of Science*

**RTA2007-00026**  
(2008-2010)

**RTA2010-00038-C03-03**  
(2010-2014)

***CapsOrganics 1***  
RTA2014-00041-C02-02  
(2015-2019)

***CapsOrganics 2***  
PID2019-110221RR-C32  
(2020-2023)

***CapSostOMICs***  
PID2022-137735OR-C33  
(2023-2026)

### **Main issues**

Evaluation of large collections of peppers for adaptation to organic and fruit quality

**Selection of landraces**

Development of improved lines of Spanish landraces by introgression of virus resistances, adaptation to organic farming & fruit quality

**Hybridization & BCs**

**Sugars, flavonoids,  
carotenoids, ascorbic, OCVs**

# Project activities on pepper



## 2. Valorisation landraces by adaptation to organic farming & quality

### Regional Government of Valencia

**Tesoro agroecológico de Villena**  
(AGCOOP\_A/2018/015)

**Saf&Pepper**  
(AGRVAL/2023/023)

### Main issues

Evaluation of large collections of local wax peppers (**pimiento blanco de villena**) for adaptation to organic and fruit quality

**Selection of landraces**



M.I. AYUNTAMIENTO DE  
**VILLENA**



# Project activities on pepper



## 2. Adaptation to organic farming & other low input conditions

*Several from the Spanish Ministry of Science  
and Regional Government of Valencia*

### **SOLECO**

CIPROM/2021/020  
(2015-2019)

### **HORTNEXT**

AGROALNEXT/2022/027  
(2022-2025)

### **InniPebra**

PID2022-136529OR-C22  
(2015-2019)

**ETC.**

### **Main breeding issues**

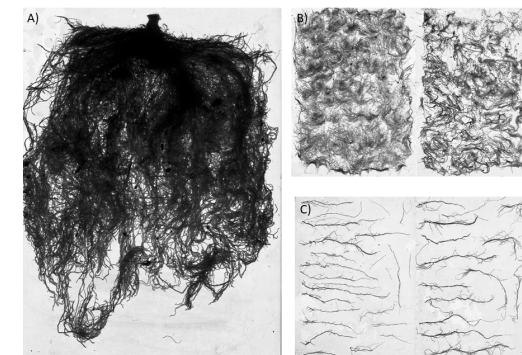
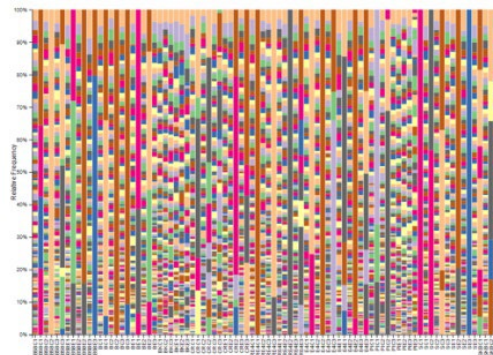
- Low fertilization (NUE, PUE)
- Low irrigation (drought)
- Salinity conditions
- Use of rootstocks
- Root and soil interaction
- Crop rotation brassica



Article

### **Main Root Adaptations in Pepper Germplasm (*Capsicum* spp.) to Phosphorus Low-Input Conditions**

Leandro Pereira-Dias <sup>1</sup>, Daniel Gil-Villar <sup>1</sup>, Vicente Castell-Zeising <sup>2</sup>, Ana Quiñones <sup>3</sup>,  
Ángeles Calatayud <sup>3</sup>, Adrián Rodríguez-Burruezo <sup>1</sup> and Ana Fita <sup>1,\*</sup>  
*Agronomy* **2020**, *10*, 637; doi:10.3390/agronomy10050637



Article

### **Root–Soil Interactions for Pepper Accessions Grown under Organic and Conventional Farming**

Ivan I. Morales-Manzo <sup>1</sup>, Ana M. Ribes-Moya <sup>1</sup>, Claudia Pallotti <sup>1</sup>, Ana Jimenez-Belenguer <sup>2,\*</sup>,  
Clara Pérez Moro <sup>1</sup>, María Dolores Raigón <sup>1</sup>, Adrián Rodríguez-Burruezo <sup>1</sup> and Ana Fita <sup>1,\*</sup>



# Project activities on pepper



## 3. Other studies at genetic diversity in landraces, fruit quality, GWAS

**PEPPER 4 NUT**  
(2022-2025)

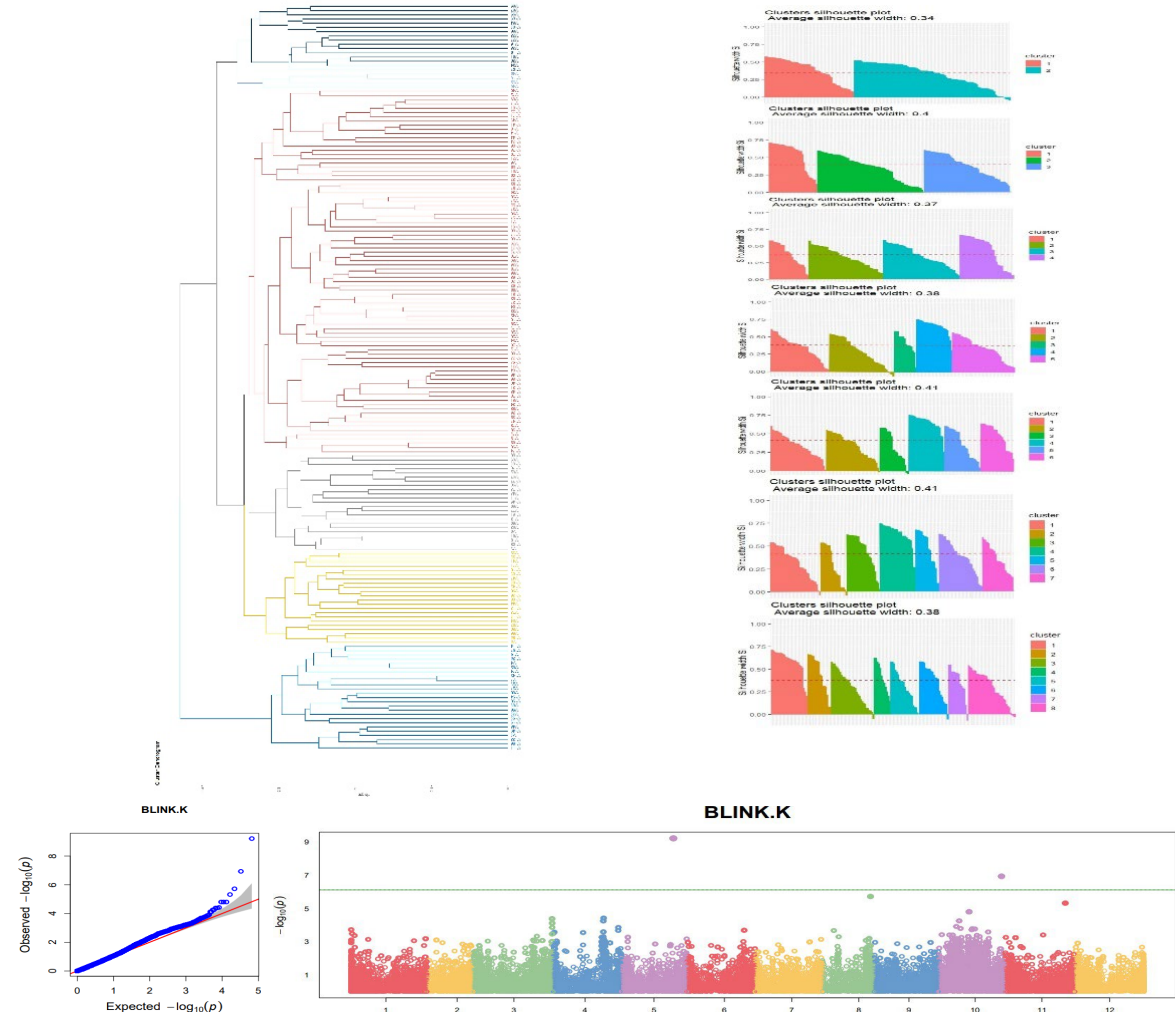


Instituto de Conservación y Mejora de la Agrodiversidad Valenciana



**SAKATA**

PASSION in Seed

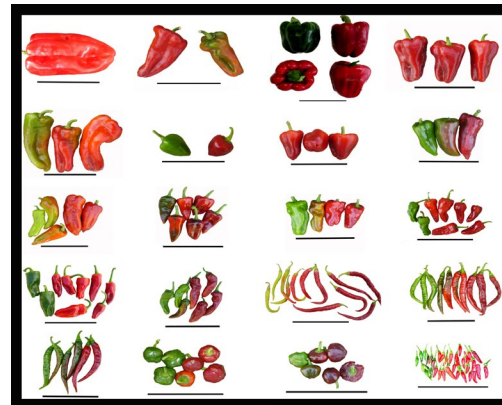


# Your institute's pepper landraces collection



This enabled us identifying 40 Spanish accessions for EuroPepLand among:

- Materials from our Seedbank BGV tested and characterised in our previous works
- Materials among PDOs, PGIs, other quality labels tried in our works
- Local endemisms. wax peppers from Villena, Balearic & Canary islands



**Representing/encompassing not only genetic diversity itself, or morphological, but also different responses to growing conditions, stress, quality factors**

**THANKS FOR YOUR ATTENTION!!**

