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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)

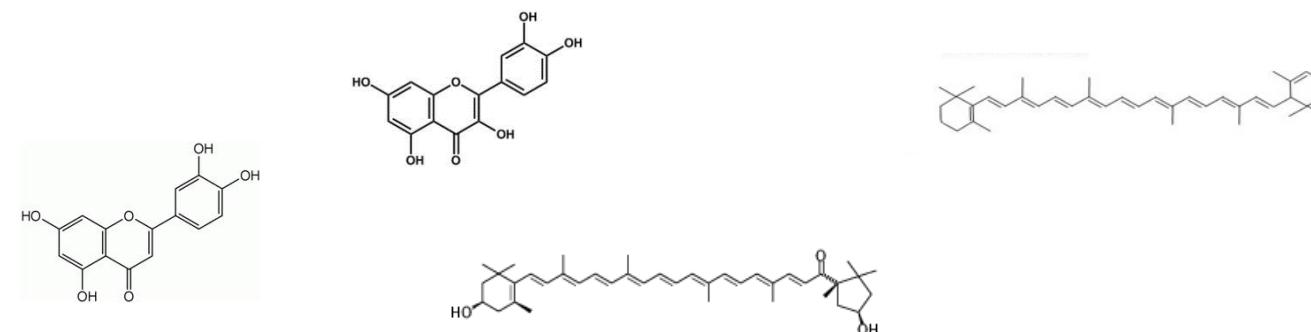
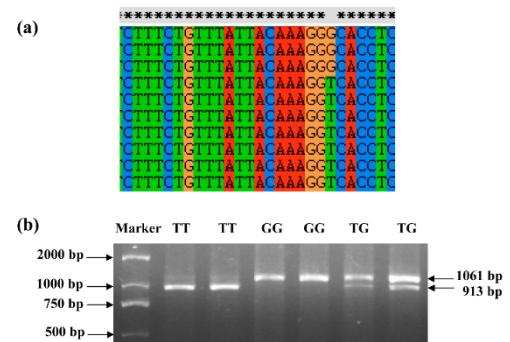
- Aimed at conservation of plant genetic resources (PGRs) and their exploitation for plant breeding. Mainly vegetables (Solanaceae, cucurbitaceae, brassica, phaseolus).

- 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 Breeding group activities & Spanish diversity in peppers *COMAV Institute - UPV*



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



EUROPELAND

A) Main Production/Exports

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



B) Traditional sector



I.G.P.
Pimiento Asado
del Bierzo



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

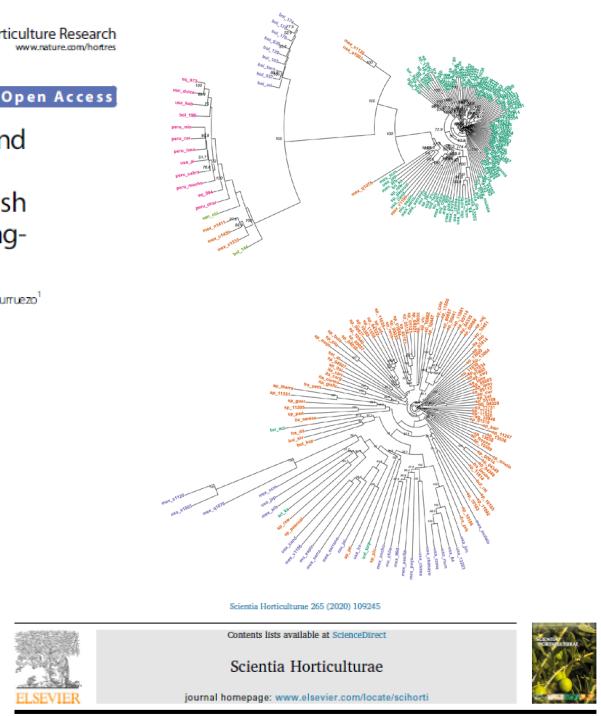
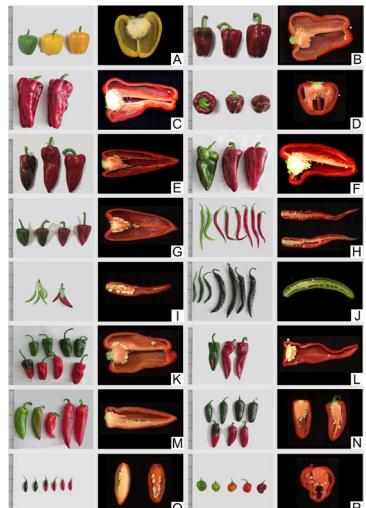
Horticulture Research
www.nature.com/hortres

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-Díaz¹, Santiago Vilanova¹, Ana Fita¹, Jaime Prohens¹ and Adrián Rodríguez-Burrueto¹



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

Leandro Pereira-Díaz^a, Ana Fita^{a,b}, Santiago Vilanova^a, Elena Sánchez-López^b, Adrián Rodríguez-Burrueto^a

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Check for updates

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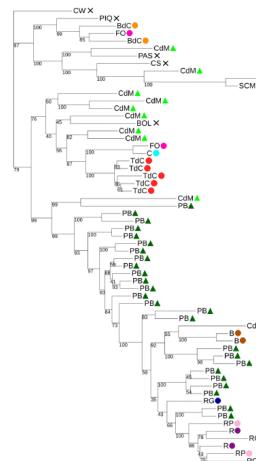
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Genetic diversity, population structure, and phylogeny of insular Spanish pepper landraces (*Capsicum annuum* L.) through phenotyping and genotyping-by-sequencing

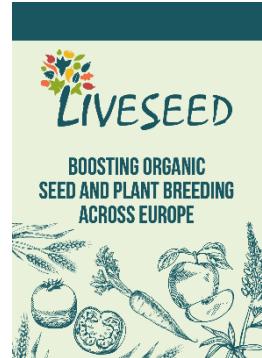
Neus Ortega-Albero¹, Lorenzo Barchi², Ana Fita¹, Miguel Díaz¹, Felipe Martínez¹, Joana-Maria Luna-Prohens³
and Adrián Rodríguez-Burrueto^{1*}



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)



M.I. AYUNTAMIENTO DE
VILLENA



Main issues

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

Selection of landraces



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

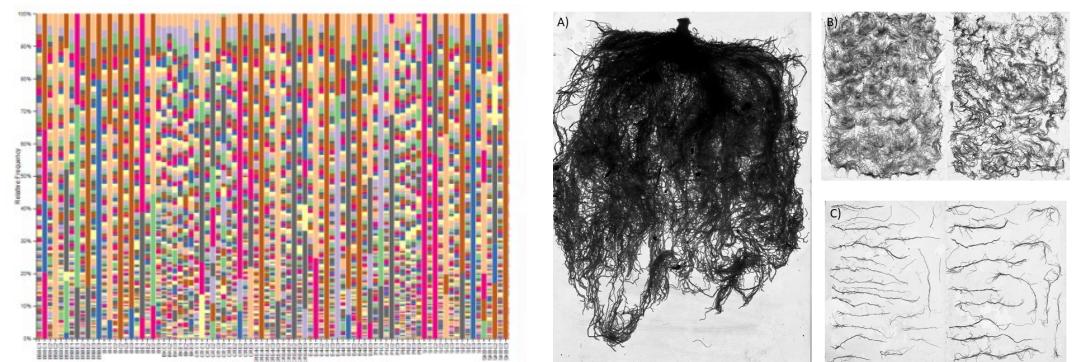
- Low fertilization (NUE, PUE)
- Low irrigation (drought)
- Salinity conditions
- Use of rootstocks
- Root and soil interaction
- Crop rotation brassica



Article

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

Leandro Pereira-Dias ¹✉, Daniel Gil-Villar ¹✉, Vincente Castell-Zeising ², Ana Quiñones ³✉,
Ángeles Calatayud ³, Adrián Rodríguez-Burrueto ¹ and Ana Fita ^{1,*}✉
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 ¹, Ana M. Ribes-Moya ¹✉, Claudia Pallotti ¹✉, Ana Jimenez-Belenguer ^{2,*}✉,
Clara Pérez Moro ¹✉, María Dolores Raigón ¹✉, Adrián Rodriguez-Burrueto ¹ and Ana Fita ^{1,*}✉



Project activities on pepper



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

PEPPER 4 NUT
(2022-2025)



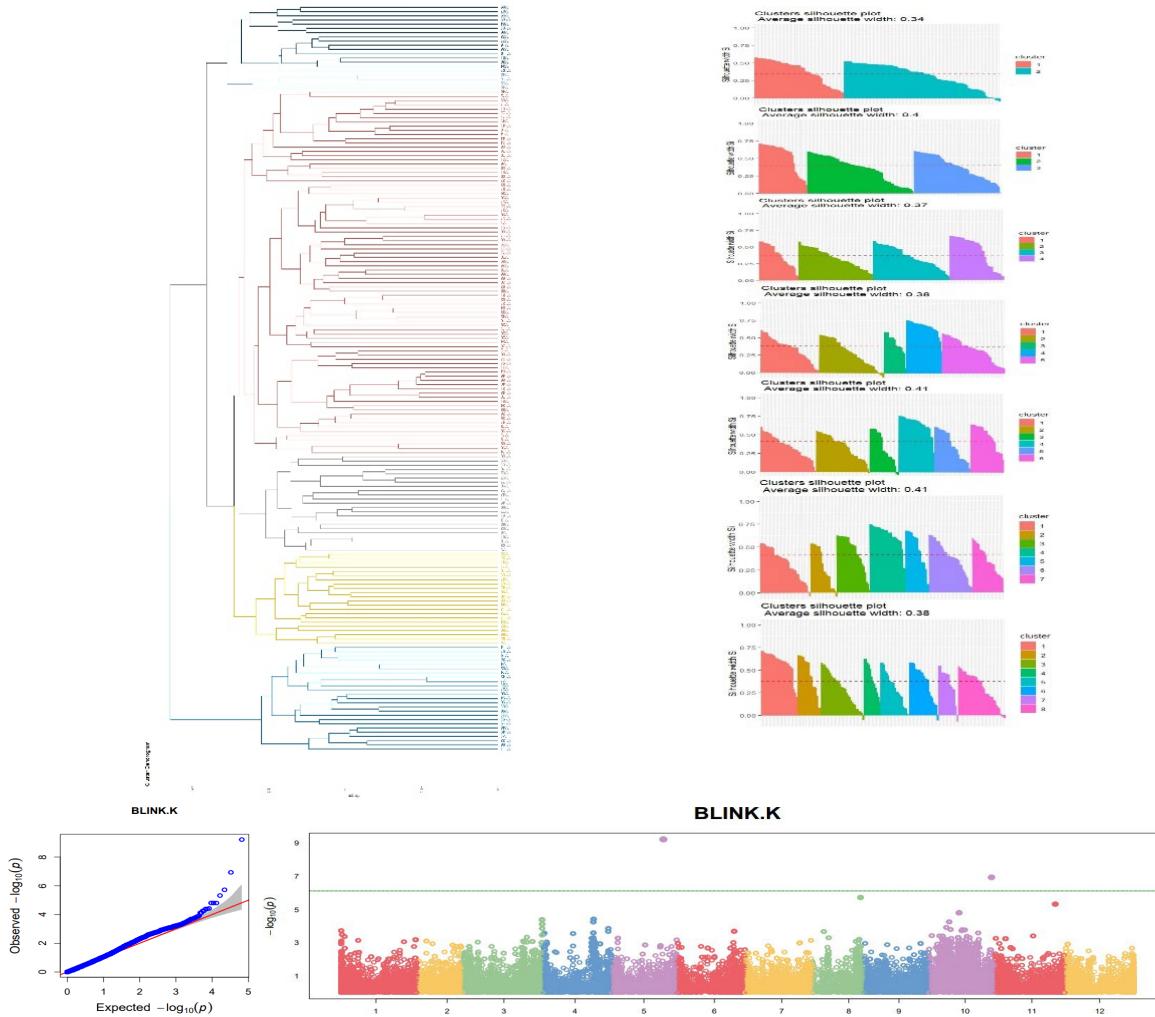
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de la Agrobiodiversidad Valenciana



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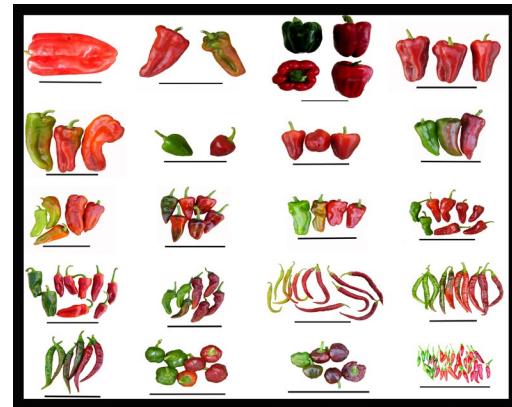


Your institute's pepper landraces collection



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!!

