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

*30 October 2024, Almeria, Spain*



# Leibniz Institute of Plant Genetics and Crop Plant Research (IPK), Gatersleben, Germany



# *The Federal ex-situ Genebank of Germany*



Source: Wikipedia



Largest Genebank in the EU27

Conservation of Biodiversity  
(152,000 accessions; 3,095 species)

Distribution of seeds  
(> 15,000 samples p.a.)



Safety Duplicates

# IPK Gatersleben – Pepper Collection



1,533 pepper accessions

1,245 *C. annuum*

48 *C. baccatum*

6 *C. chacoense*

68 *C. chinense*

5 *C. eximium*

132 *C. frutescens*

1 *C. galapagoense*

25 *C. pubescens*

3 *C. sp.*

## Biostatus

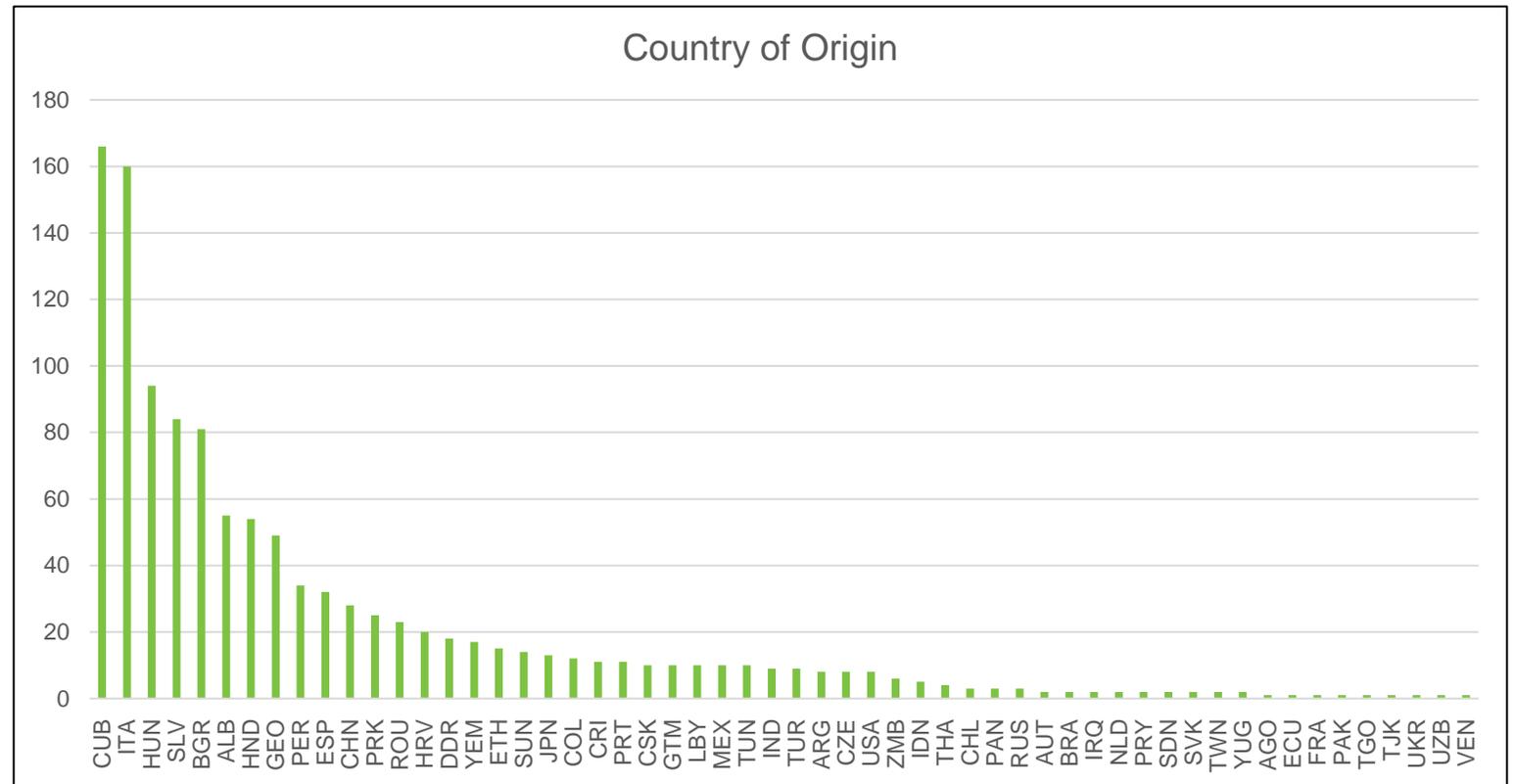
Wild – 33 acc.

Landrace – 1,015 acc.

Breeding line – 55 acc.

Advanced cultivar – 428 acc.

Unknown – 2 acc.

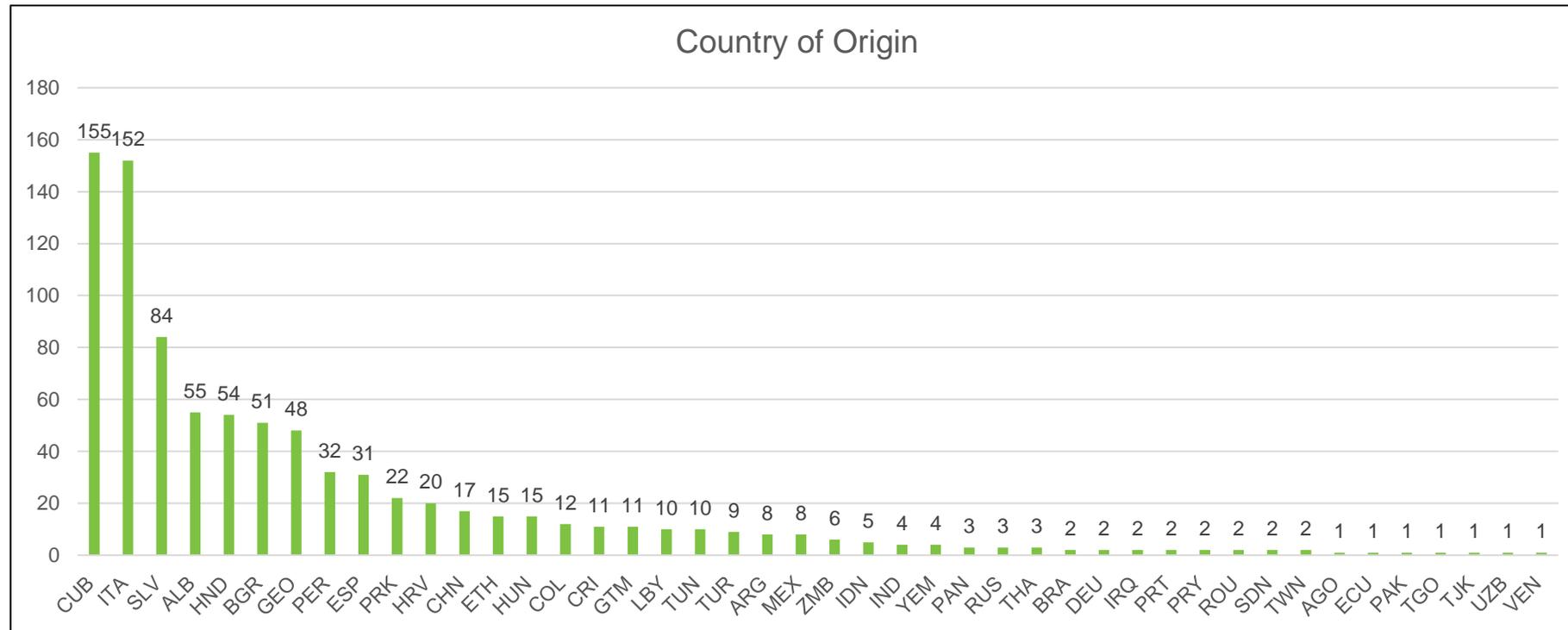


56 countries

Regeneration: 50-60 acc. per year

# Pepper landraces collection

1,015 landraces from 44 countries



# Pepper Regeneration – Protocol of Reproduction



species	month of sowing	preculture	life form	pollination
<i>C. annuum</i>	Januar/February	not necessary	annual	self
<i>C. pubescens</i>	Januar/February	not necessary	annual	self/insects

species	isolation	location	floor space	protection from birds
<i>C. annuum</i>	not necessary	greenhouse/foil tunnel	4 m <sup>2</sup>	not necessary
<i>C. pubescens</i>	isolation	greenhouse/foil tunnel	4 m <sup>2</sup>	not necessary

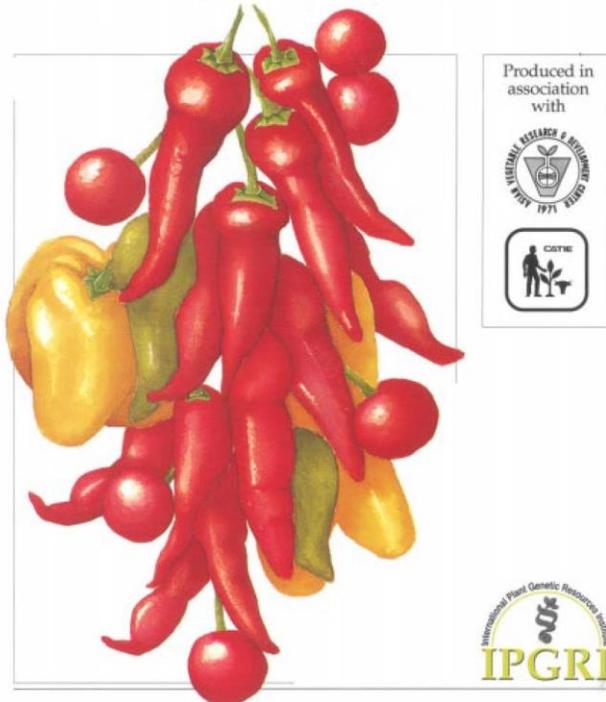
species	method of harvest	first cleaning	second	
<i>C. annuum</i>	picking	hand cleaning	hand cleaning	
<i>C. pubescens</i>	picking	hand cleaning	hand cleaning	

# Pepper Collection – Characterization

Characterization during regeneration – IPK descriptor for pepper

31 agronomical and morphological traits + photo documentation  
(data partly available online)

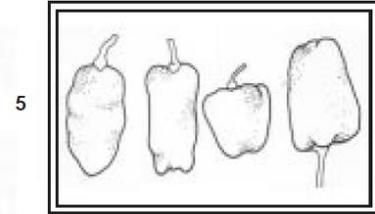
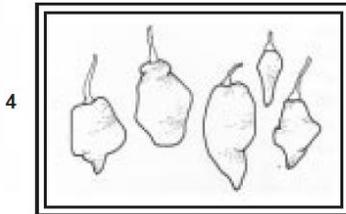
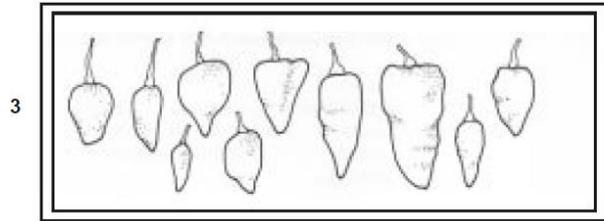
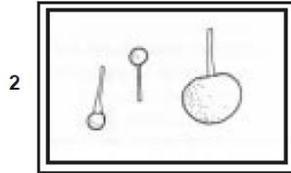
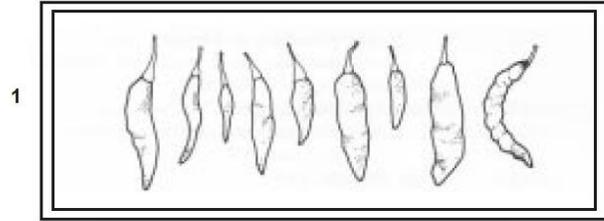
Descriptors for  
**Capsicum**  
(*Capsicum* spp.)



**GBIS**

<https://gbis.ipk-gatersleben.de/gbis2i/>

# Pepper Collection – Characterization



## Fruchtform – fruit shape

1= gestreckt, langgezogen – elongate

2= rund – almost round

3= dreieckig – triangular

4= glockenförmig – campanulate

5= blockförmig – blocky

Fig. 11 Fruit shape

# Pepper Collection – Taxonomical Determination



**Table 1.** Botanical identification for *Capsicum* spp.

Species	Wild (W) or cultivated (C)	Wild distribution	Corolla			Calyx		Flowers		Seed colour	Leaf		Anther colour
			Colour	Throat colour	Shape	Ridges	Teeth	No. per nodes	Position		Surface	Pubescence	
<i>annuum</i>	C, W	S USA to N Peru	White	-	Rotate	Moderate	Small	1	Various	Tan	Smooth	Smooth to pubescent	Blue or white
<i>chinense</i>	C, W	Upper Amazon	White trace of yellow	-	Rotate	Light, calyx constriction	Small	2-5	Various	Tan	Rugose	None	Blue
<i>frutescens</i>	C, W	Mexico to Central Brazil	Waxy greenish	-	Rotate	Light	None	1-5	Stiffly erect	Tan	Smooth	None	Blue
<i>galapagoense</i>	W	Galapagos Islands	White	-	Rotate	Trace	None	1-2	Pending	Tan	Smooth	Strongly	White
<i>chacoense</i>	W	S Bolivia to N Argentina	White	-	Rotate	Moderate	10 sharp teeth	1	Erect	Tan	Smooth	None	Yellow
<i>pubescens</i>	C	Mexico to Central Brazil	Purple	White	Rotate	Light	1 mm	1-2	Various	Black	Rugose	Strongly	Purple
<i>cardenasii</i>	W	Bolivia	Lavender	2 Yellow spots	Bell	Light	2 mm	1-2	Erect	Brown	Smooth	None	Purple
<i>eximium</i>	W	Bolivia and N Argentina	White to lavender	Green-yellow spots	Bell	Moderate	2 mm	3-5	Erect	Brown	Smooth	None to moderate	White with trace blue
<i>tovarii</i>	W	Central Brazil	Waxy pale green	2 Green-yellow spots	Bell	Light	None	5-6	Various	Tan	Lightly rugose	None	Blue
<i>praetermissum</i>	W	Central Brazil	White, pale blue	2 Green-yellow spots	Rotate	Light	1 mm	1-3	Erect	Tan	Lightly rugose	Moderate	White
<i>baccatum</i>	C, W	Bolivia, SW Brazil, SE Peru	White	2 Green-yellow spots	Rotate	Light	1 mm	1-2	various	Tan	Smooth	None	Yellow
<i>schottianum</i>	W	NE Argentina SW Brazil	White	Green	Rotate	Indistinct	None	2-3	Various	Black	Smooth	None	Yellow
<i>buforum</i>	W	SW Brazil	White to lavender	Green	Rotate	Light	2-3 mm	2-5	Various	Black	Smooth	None	Yellow

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doi: 10.3897/phytokeys.200.71667  
<https://phytokeys.pensoft.net>

MONOGRAPH

A peer-reviewed open-access journal  
**PhytoKeys**  
Launched to accelerate biodiversity research

## Monograph of wild and cultivated chili peppers (*Capsicum* L., Solanaceae)

Gloria E. Barboza<sup>1</sup>, Carolina Carrizo García<sup>1</sup>, Luciano de Bem Bianchetti<sup>2</sup>,  
María V. Romero<sup>1</sup>, Marisel Scaldasferro<sup>1,3</sup>



Minimum descriptors for eggplant,  
*Capsicum* (sweet and hot pepper)  
and tomato

2008

# Availability



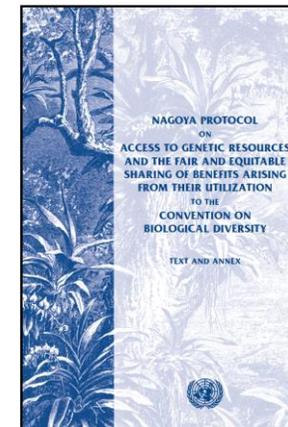
Convention on  
Biological Diversity



- Convention of Biological Diversity
- International Treaty for Plant Genetic Resources of Food and Agriculture  
(Annex1 species)

*Capsicum* is not part of the Multilateral System

- Standard Material Transfer Agreement
- Nagoya Protocol
- Plant breeders rights
- Special agreements



# Availability

## Phytosanitary Regulations

Plant Passport / Phytosanitary Certificate

Test against tomato brown rugose fruit virus

IPK material is tested during/after regeneration

→ many material is still not tested, not available



[https://greencommons.de/images/d/d6/Paprika\\_TOBRFV\\_10221-Dr\\_Raed\\_Alkowni.jpg](https://greencommons.de/images/d/d6/Paprika_TOBRFV_10221-Dr_Raed_Alkowni.jpg)

# Project activities on pepper



G2P-SOL – Linking genetic resources, genomes and phenotypes of Solanaceous crops



Pepper collection of IPK sequenced

PNAS

RESEARCH ARTICLE | AGRICULTURAL SCIENCES

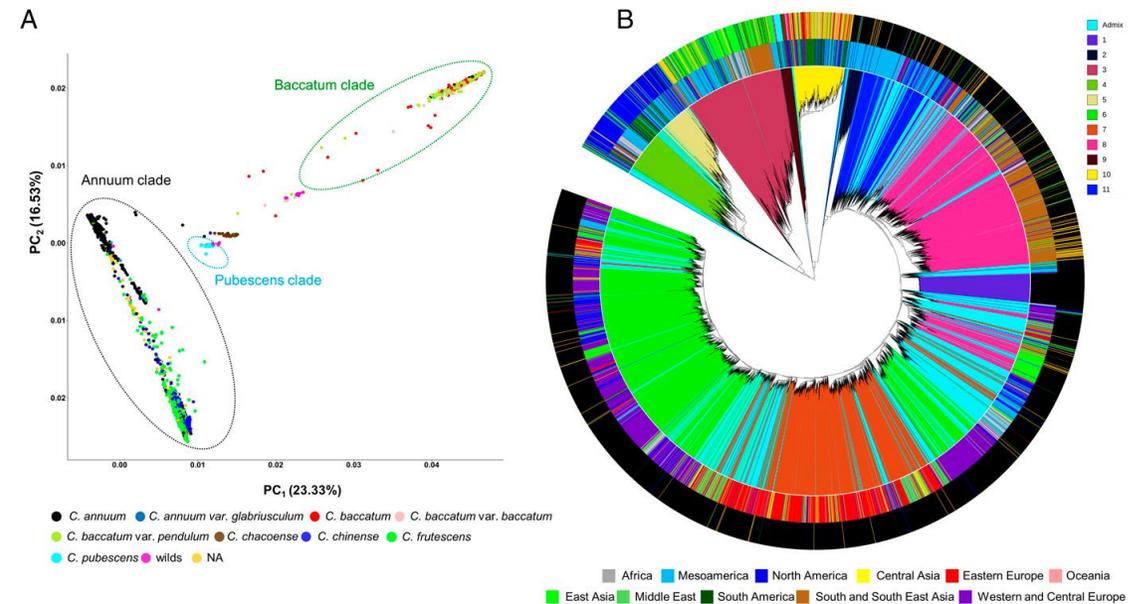
OPEN ACCESS

## Global range expansion history of pepper (*Capsicum* spp.) revealed by over 10,000 genebank accessions

Pasquale Tripodi <sup>a,2,1</sup>, Mark Timothy Rabanus-Wallace <sup>b,1</sup>, Lorenzo Barchi <sup>c</sup>, Sandip Kale <sup>b</sup>, Salvatore Esposito <sup>a</sup>, Alberto Acquadro <sup>c</sup>, Roland Schafleitner <sup>d</sup>, Maarten van Zonneveld <sup>d</sup>, Jaime Prohens <sup>e</sup>, Maria José Díez <sup>e</sup>, Andreas Börner <sup>b</sup>, Jérémy Salinier <sup>f</sup>, Bernard Caromel <sup>f</sup>, Arnaud Boyv <sup>g</sup>, Filiz Boyaci <sup>h</sup>, Gancho Pasev <sup>i</sup>, Ronny Brandt <sup>b</sup>, Axel Himmelbach <sup>b</sup>, Ezio Portis <sup>c</sup>, Richard Finkers <sup>g</sup>, Sergio Lanteri <sup>c</sup>, Ilan Paran <sup>j</sup>, Véronique Lefebvre <sup>f</sup>, Giovanni Giuliano <sup>k</sup>, and Nils Stein <sup>b,1,2</sup>

Edited by Elizabeth A. Kellogg, Donald Danforth Plant Science Center, St. Louis, MO, and approved June 21, 2021 (received for review March 5, 2021)

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Thank you very much for your attention!

