



GCRF Bioinformatics and Biological Resources
Developing a hybrid bean collection to advance climate-ready bean breeding
Virtual Workshop, 1st March 2022



Introductions: Project Team



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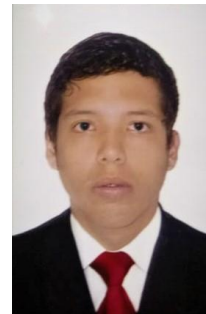
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Conejo**



Juan Reyes



Daniel Debouck



Steve Beebe

Genetic diversity in *Phaseolus* spp.

- **Primary**

- *Phaseolus vulgaris* L. var. *aborigineus* (Burkart) Baudet

- **Secondary**

- *Phaseolus albescens* McVaugh ex Ramirez-Delgadillo & A. Delgado; *Phaseolus coccineus* L.; *Phaseolus costaricensis* Freytag & Debouck; *Phaseolus dumosus* Macfad.; *Phaseolus persistentus* Freytag & Debouck

- **Tertiary**

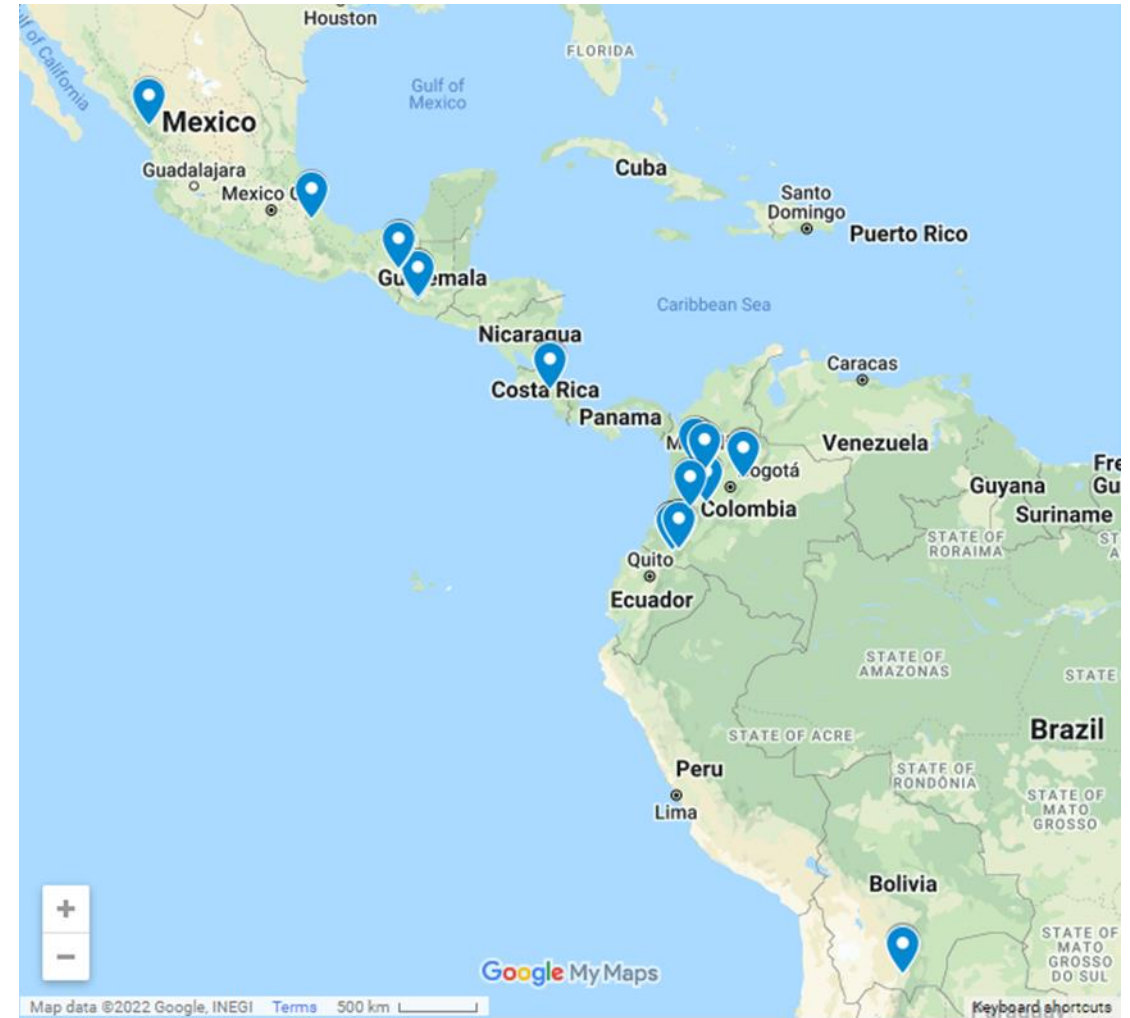
- *Phaseolus acutifolius* A. Gray; *Phaseolus acutifolius* A. Gray var. *acutifolius*; *Phaseolus acutifolius* A. Gray var. *tenuifolius* A. Gray; *Phaseolus angustissimus* A. Gray; *Phaseolus carteri* Freytag & Debouck; *Phaseolus filiformis* Benth.; *Phaseolus maculatus* Scheele; *Phaseolus parvifolius* Freytag

-Naturally occurring hybrids combining wild, landrace and cultivated spp.



Motivation

- Natural hybrid accessions from across centres of diversity (23.62 to -21.47)
- Collected and stored in genebank
- Useful starting point for breeders to identify diversity to mitigate against climate change?
- Understand more about the genetics (Pedigree unknown in some cases)





Aim:

To develop CIAT's collection of *Phaseolus vulgaris* hybrids, adding layers of targeted phenotypic information and genomic data to promote usability of these natural hybrids for climate-ready bean breeding

Hybrid accession	Species	Collection information	Representative parent 1	Representative parent 2
G24764B	<i>P. dumosus</i> x <i>P. vulgaris</i> hybrid	Colombia, Boyacá, Garagoa	G36179 , <i>P. dumosus</i> cultivated	G24764D , <i>P. vulgaris</i> feral
G35980H	<i>P. vulgaris</i> x <i>P. dumosus</i> cultivated	Colombia, Tolima, Chaparral	G23992 , <i>P. vulgaris</i> cultivated	G35980 , <i>P. dumosus</i> cultivated
G50785Y1	<i>P. vulgaris</i> x <i>P. coccineus</i> hybrid	Colombia, Antioquia, Andes	G50785V2 , <i>P. vulgaris</i> cultivated	G35998 , <i>P. coccineus</i> cultivated
G50879X4	<i>P. vulgaris</i> x <i>P. coccineus</i> hybrid	Colombia, Caldas, Salamina	G50879V1 , <i>P. vulgaris</i> cultivated	G36211 , <i>P. coccineus</i> cultivated
G51274I	<i>P. vulgaris</i> x <i>P. coccineus</i> hybrid	Colombia, Nariño, Pasto	G51274D , <i>P. vulgaris</i> cultivated	G35361 , <i>P. coccineus</i> cultivated
G36124	<i>P. dumosus</i> x <i>P. coccineus</i> cultivated	Colombia, Putumayo, San Francisco (valley of Sibundoy)	G35270 , <i>P. dumosus</i> cultivated	G35271 , <i>P. coccineus</i> cultivated
G36393	<i>P. dumosus</i> x <i>P. costaricensis</i> feral	Costa Rica, Cartago, Cartago	G35807 , <i>P. dumosus</i> cultivated	G40893B , <i>P. costaricensis</i> wild
G23860H	<i>P. vulgaris</i> feral	Bolivia, Tarija, Cercado	G23871 , <i>P. vulgaris</i> cultivated	G23860M , <i>P. vulgaris</i> wild
G35877A	<i>P. dumosus</i> feral	Guatemala, Sololá, Panajachel	G35729 , <i>P. dumosus</i> cultivated	G35877 , <i>P. dumosus</i> wild
G52443	3-way <i>Phaseolus</i> hybrid (INB47)	CIAT Bean Program	G5773 , <i>P. vulgaris</i> cultivated	G40102 , <i>P. parvifolius</i> wild; G40001 , <i>P. acutifolius</i> cultivated
ASC144	<i>P. vulgaris</i> x <i>P. dumosus</i>	CIAT Bean Program	CAL96 <i>P. vulgaris</i>	G35575A , <i>P. dumosus</i> , cultivated
MIB780	<i>P. vulgaris</i> x <i>P. dumosus</i>	CIAT Bean Program	FEB226 <i>P. vulgaris</i>	G35575B , <i>P. dumosus</i> , cultivated

Objectives

- **Develop a detailed resource for domesticated/wild hybrids of common bean (*Phaseolus vulgaris* L.) and sister taxa**
 - *P. coccineus*, *P. costaricensis* and *P. dumosus*
- **Provide characterisation data for these materials**
 - Characterisation including stomatal concentration and root angle
 - Phenotyping data for anthracnose, *rhizoctonia* root rot, web blight and white mould
 - Data on crossability with a widely adapted line
 - Genotype information from hybrids and putative parents
- **Engage with the breeder and research communities** to ensure awareness of the resource, promote up take



GCRF Bioinformatics and Biological Resources

Virtual workshop - Developing a hybrid bean collection to advance climate-ready bean breeding

1st March 2022, 08:00-12:15 Colombia (13:00-17:15 GMT)

Alliance



Programme

08:00-08:10 – Introductions

Invited speakers:

08:10 -08:40: Daniel G Debouck: When Nature helps your crossing programme (CIAT)

08:40-9:10: Benjamin Kilian: Pre-breeding achievement in the Crop Wild Relatives project (Crop Trust)

09:10-09:50: Steve Beebe & Clare Mukankusi: Wide crosses in *Phaseolus* bean breeding; Breeding with *P. coccineus* to improve resistance to disease, aluminum tolerance and root vigor (CIAT; CIAT-Uganda, PABRA)

Break/Descanso - 5 minutes

Project resource presentations:

09:55-10:25: CIAT – Selection and multiplication of adaptive germplasm for supporting trait characterization, phenotyping of key resilience traits under screenhouse conditions, Video tour,

10:25-10:55: NIAB – Screening for disease resistance to major common bean pathogens *Colletotrichum lindemuthianum*, *Rhizoctonia solani*, *Sclerotinia sclerotium*; Morphological assessment of root angle and stomatal density, F1 crossing program

10:55 – 11:15: EMBL-EBI – Accessing new climate-ready germplasm and genotypic/phenotypic resources

Break/Descanso – 15 minutes

11:30 – 12:15: Discussion panel: Opportunities and challenges in using wild relatives for climate change breeding