Centro de Investigaciones Fitoecogenéticas de Pairumani

FUNDACIÓN SIMÓN I. PATIÑO

Bioversity International

24th INTERNATIONAL Pepper CONFERENCE

GENETIC DIVERSITY OF *Capsicum baccatum* FROM THE PRIMARY ORIGIN CENTER

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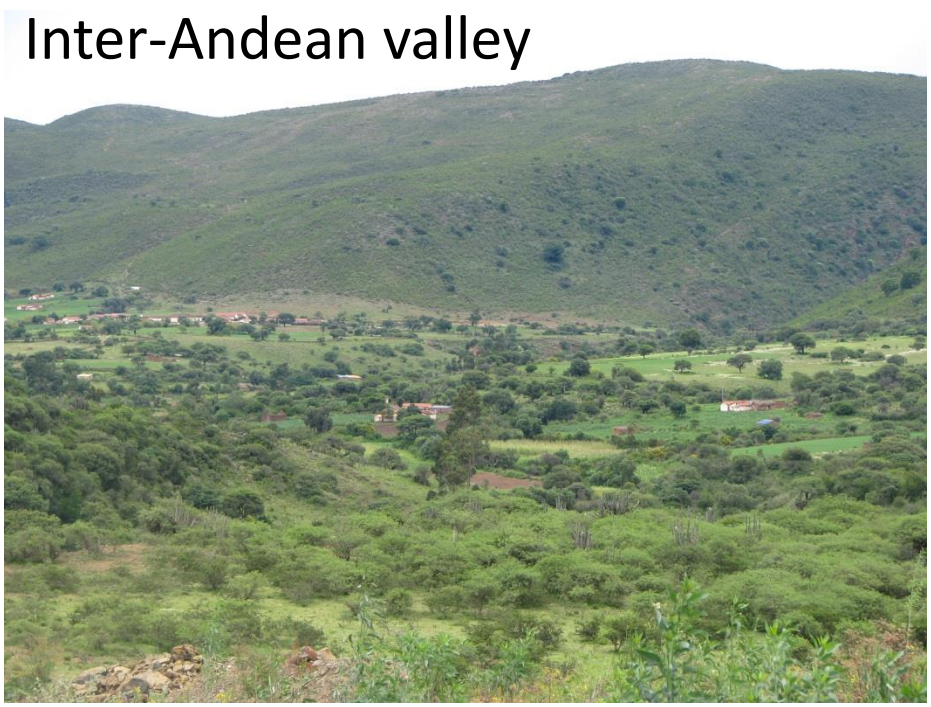
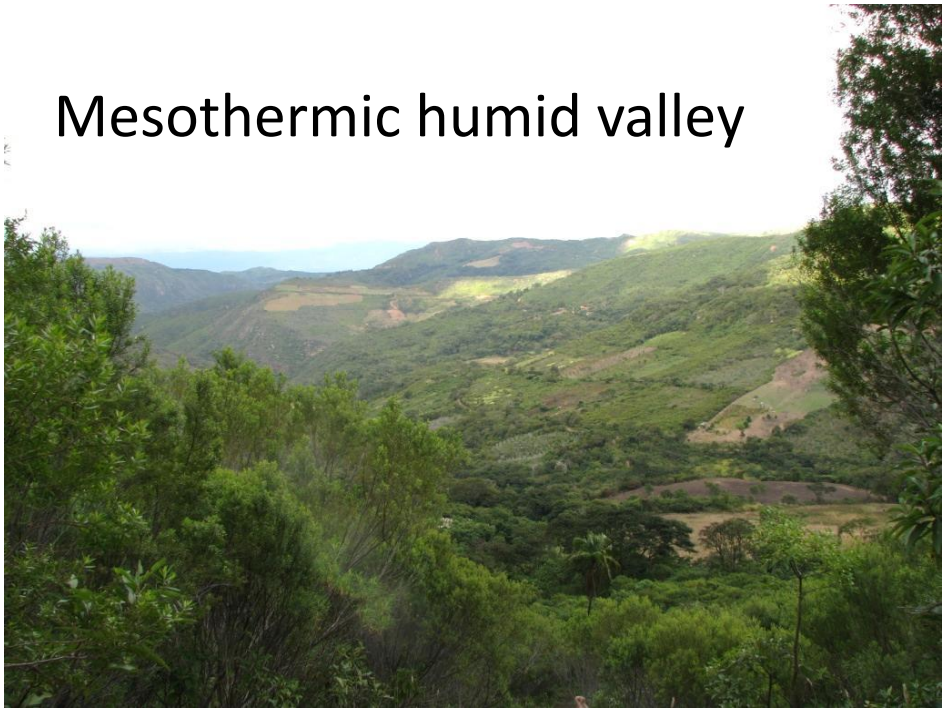
- Bolivia constitutes a primary center of diversity of *Capsicum.*
- The fruits of several wild pepper species are consumed as food as well as used for medical purposes.
- The diverse ecosystems allowed the development of a great diversity of species and varieties of native peppers.

The goal of this study was to determine the genetic diversity of 205 accessions of landraces and wild peppers of *C. baccatum* maintained by the Pairumani's Phytoecogenetical Research Center.


Inter-Andean valley


Mesothermic humid valley


Dry inter-Andean valley


Humid forest

Pairumani's Phytoechogenetical Research Center (CIFP)

The CIFP works on the development of improved varieties of corn, faba-beans, common beans, snap beans, pea and lately pepper, amaranth and lupin; looking to improve yield, earliness, tolerance to diseases and pests, tolerance to adverse climatic factors, as well to improve the nutritional quality.

Socioeconomical conditions and consumers demand change continually, the Center is always responding to them, in order that the small Andean farmers improve their life quality.

The increase in income of the small farmers who grow the improved varieties released by the CIFP, has been quantified in more than 8 million dollars per year.

Work collection

Cold chamber 0°C

Cold chamber -20°C

More than 5000 accesions

The Pairumani's Phytoecogenetical Research Center has a working collection of *Capsicum:* cultivated and wild species.

CULTIVATED

C. baccatum
C. pubescens
C. chinense
C. frutescens
C. annuum

WILD

C. bacccatum var. baccatum
C. caballeroi
C. cardenasii
C. ceratocalyx
C. chacoense
C. eximium
C. minutiflorum
C. coccineum
C. eshbaughii
C. neei (new species)

Capsicum baccatum

- *Capsicum baccatum* is a highly diverse species that offers abundant phenotypic variation, although its genetic diversity remains little studied.
- *C. baccatum* var. *pendulum* is cultivated and *C. baccatum* var *baccatum* is a wild type.
- *C. baccatum*, var. *baccatum* is locally called “arivivi”.

Capsicum baccatum

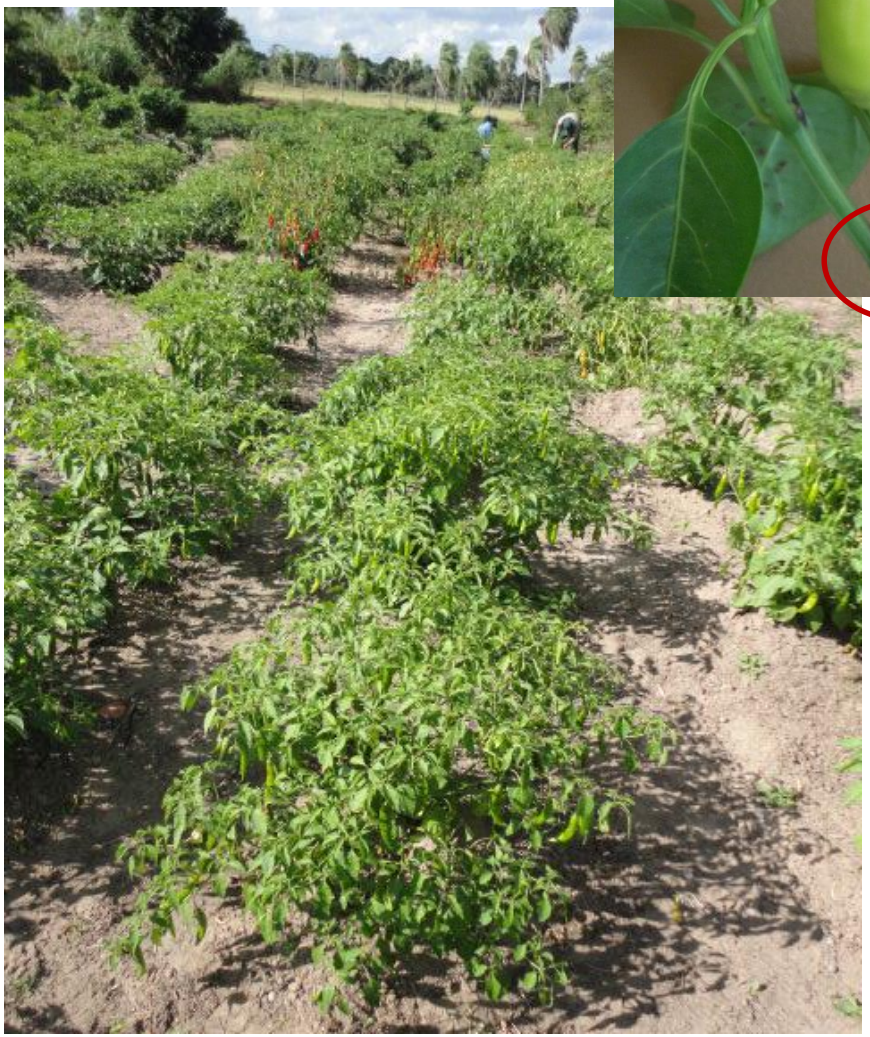
- Both the cultivated and the wild accesions, are wide spreaded in the country.
- *C. baccatum* var. *pendulum* is cultivated mainly in the high inter-Andean valleys and dry inter-Andean valleys.
- *C. baccatum* var. *baccatum* grows in humid and lowlands' environments.

Capsicum baccatum var. *pendulum*

- It’s commercialized in small local markets and in supermarkets.
- It’s sold as fresh fruit, as dried fruit or processed products.

Capsicum baccatum var. *baccatum*

- It grows in the field or around farmer's houses.
- It is harvested by extractive means.
- Its harvest can cause environmental problems because plants are rip off and neighboring plants of other species are damaged.
- It is commercialized in small local markets and has high commercial demand.



A morphological characterization of the samples was carried out using the Descriptors of *Capsicum* spp. of IPGRI, current Bioversity International.

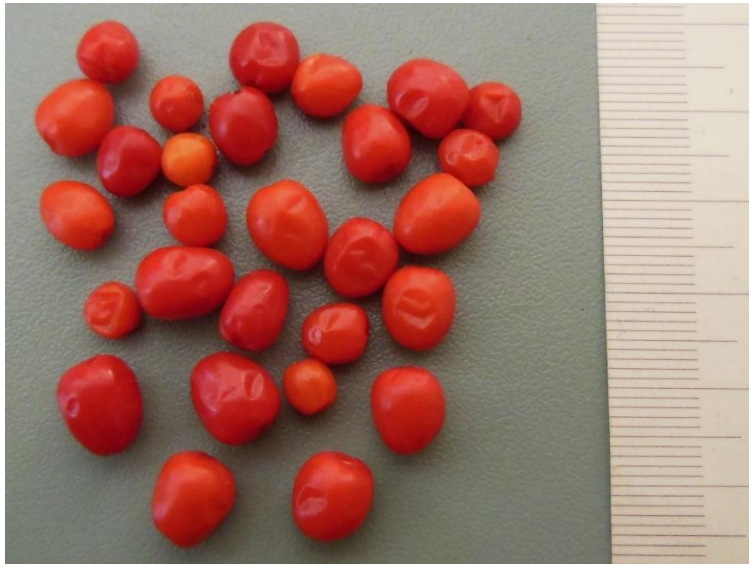
Morphological characterization

- The characterization showed wide morphological variability including commercially valuable traits such as fruits' color, shape and size.
- In the collection there were accessions not classified taxonomically, the study allowed to identify them.
- Several accessions of supposedly wild *C. baccatum* var. *baccatum* have been revealed to be small-fruited landraces of the cultivated *C. baccatum* var. *pendulum.*
- Accessions with intermediate morphological characteristics between both varieties of *C. baccatum* were observed, being possible hybrids.

C. baccatum var. *pendulum*

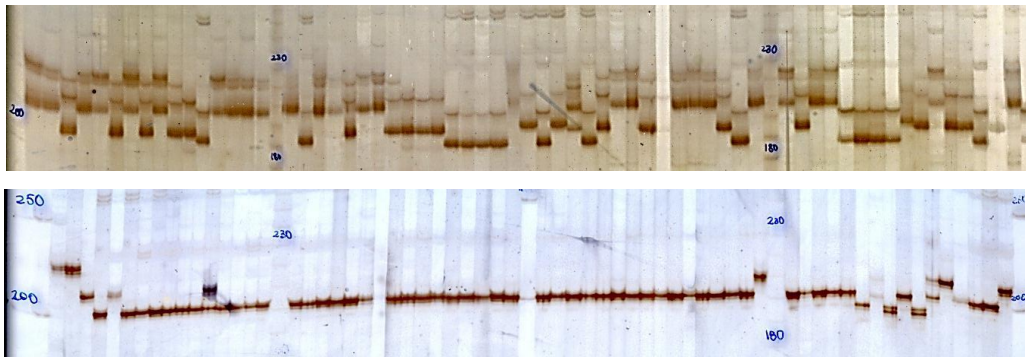
C. baccatum var. *pendulum*

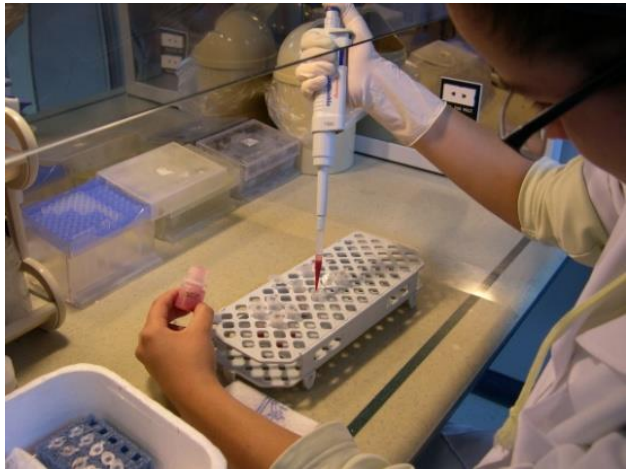
C. baccatum var. *baccatum*

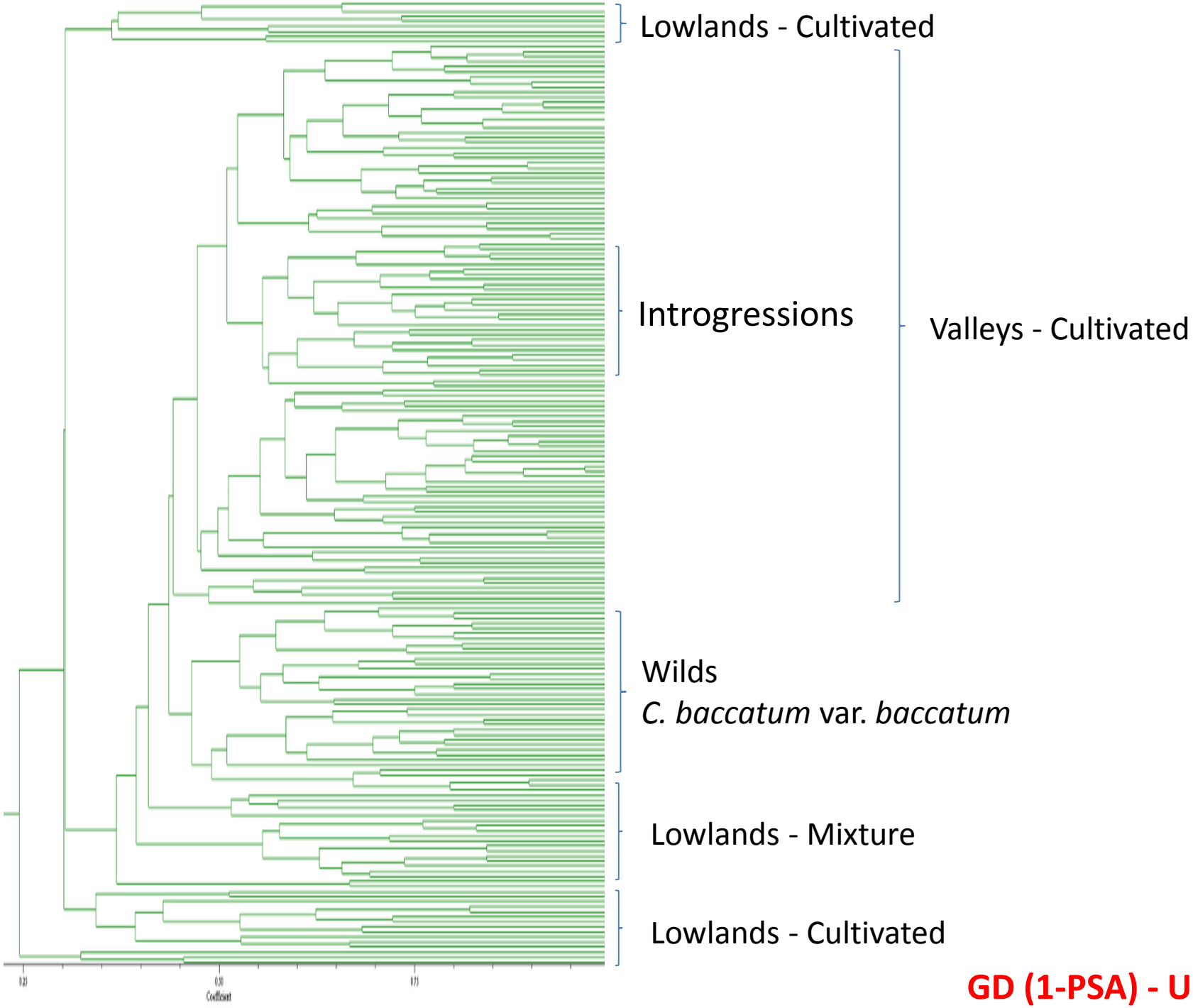


Molecular characterization

- The genetic diversity and population structure were estimated using 18 microsatellites markers.
- High levels of polimorphisms were found whit a total of 90 alleles identified and an average of 5 alleles per market.
- Genetic distances were calculated as 1 - proportion of shared allelles (Bowcock et al. 1994), also known as the absolute genetic distance (AGD).
- The genetic distance data was used for UPGMA clustering to construct a dendrogram.

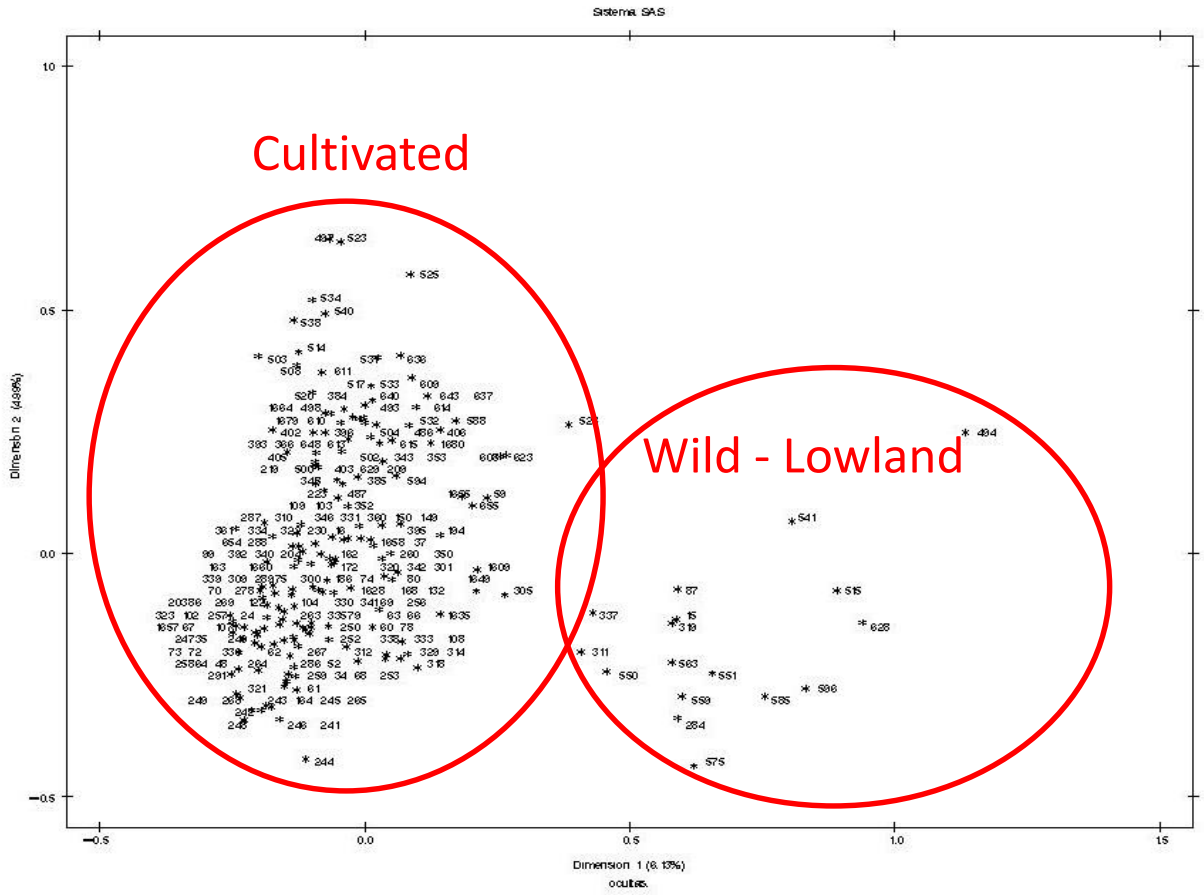






GD (1-PSA) - UPGMA

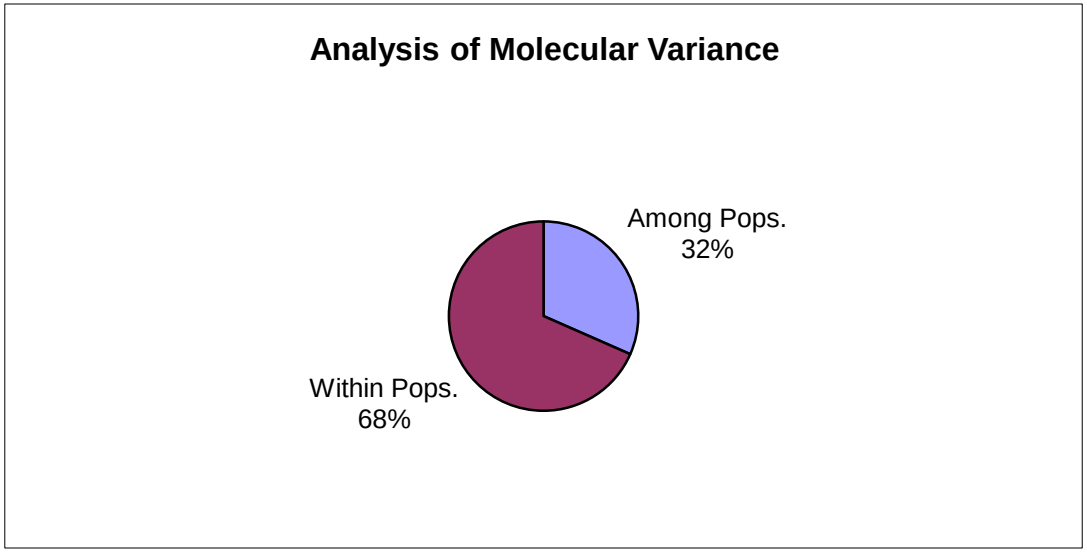
The dataset was used for a **factorial correspondance analysis (FCA).** The FCA separates the accesions into two clusters across the two first dimensions which explained together 11,12% of the variance. The cultivated *C. baccatum* were separated from the wild accesions. However, in the group composed of wild types, there are some accesions cultivated in the lowland, suggesting introgressions.



The **analysis of molecular variance (AMOVA)** was realized to determine the proportions of the molecular variance between and within groups of accessions.

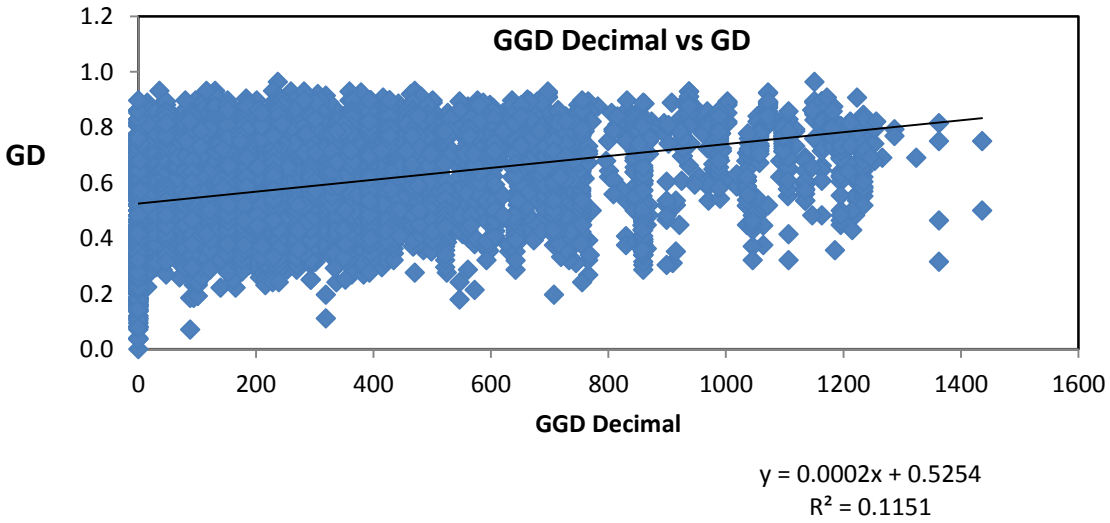
The AMOVA showed high molecular variance within the groups of accessions and low among both populations (cultivated and wilds).

Fst value provide a measure of the genetic differentiation among populations. A *Fst* of 0,192 implies that the two populations interbreeding freely and share genetic diversity.



Geographical data of the collection sites of accessions was compared with the genetic data to determined the correlation between geographical and genetic distances matrices by means of the **Mantel test**.

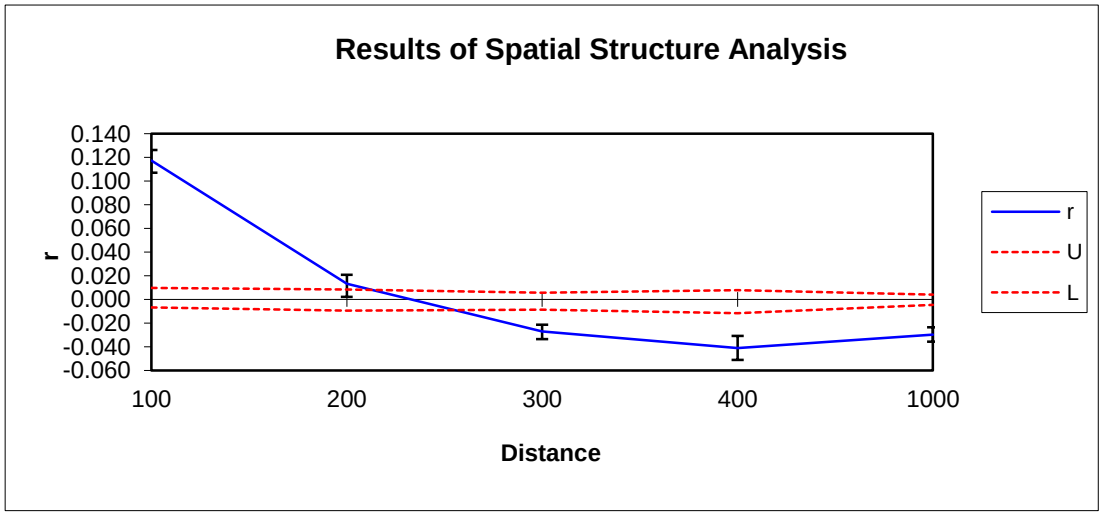
The Mantel test revealed a significant correlation between the geographical distance matrix, based on the latitude and longitude and the genetic distance matrix, based on the AGD.

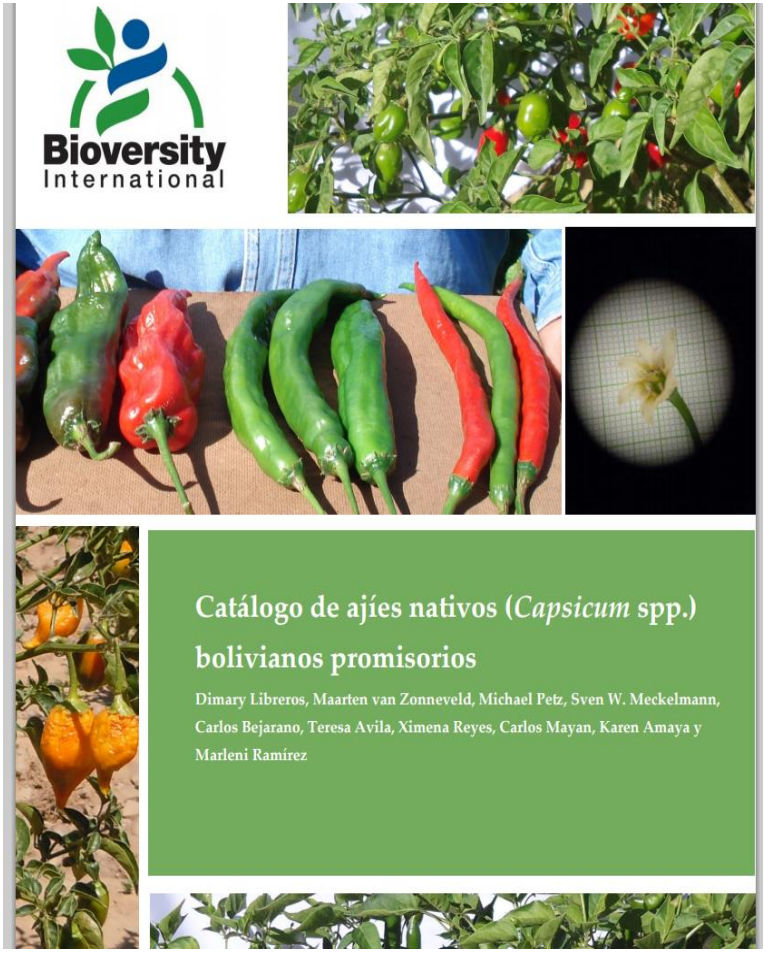


The **spatial structure of the geographical and genetic diversity** was investigated by the autocorrelation method of Smouse and Peakall (1999).

Spatial autocorrelation, confirmed a significant correlation between the geographic and genetic distances.

This observation suggested that the variability was correlated with the proximity of the collection site when it was less than 200 Km. This distance could be related to the exchange of seed by farmers.





PLOS ONE

RESEARCH ARTICLE

Screening Genetic Resources of *Capsicum* Peppers in Their Primary Center of Diversity in Bolivia and Peru

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New species – Manuscript under revision

PLOS ONE

Four New Species of Capsicum (Solanaceae) from the tropical Andes and an update on the phylogeny of the genus

--Manuscript Draft--

Manuscript Number:	
Article Type:	Research Article
Full Title:	Four New Species of Capsicum (Solanaceae) from the tropical Andes and an update on the phylogeny of the genus
Short Title:	New species of Capsicum from the Andes
Corresponding Author:	Gloria Barboza ARGENTINA
Keywords:	Capsicum; new species; Central Andes; phylogeny; karyology, chili peppers
Abstract:	Four new species of Capsicum (Capsiceae, Solanaceae) from Andean tropical forests in South America are described. Capsicum benoistii Barboza sp. nov. (incertae sedis) is endemic to a restricted area in south-central Ecuador and is most similar to the more widespread C. geminifolium (Dammer) Hunz. (Colombia, Ecuador, and Peru). Capsicum piuranum Barboza & S. Leiva sp. nov. (Andean clade) is found in northern Peru (Department Piura) and is morphologically most similar to C. caballeroi M. Nee of the Bolivian yungas (Departments Santa Cruz and Cochabamba) but closely related to C. geminifolium and C. lycianthoides Bitter. Capsicum longifolium Barboza & S. Leiva sp. nov. (Andean clade) occurs from northern Peru (Departments Amazonas, Cajamarca, and Piura) to southern Ecuador (Provincie Zamora-Chinchipe), and is

Conclusions

- The genebank collection of *C. baccatum* conserved in Pairumani, provides a wide diversity, that can be used for selection and breeding.

- The information provided by this study is being used to develop strategies for conservation and breeding.

- The population structure observed was not so clear, that we are doing a deeper studies for a better understanding of this structure of *C. baccatum*.

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