



Tapping into the wealth of local banana diversity: The 10 most popular varieties in markets across the world

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XII International Symposium on Banana: Celebrating Banana Organic Production, Angers, France

15 August, 2022

Problem: Cavendish monoculture

2018 Global Production

57% Cavendish

15% Plantain

15% Highland & other cooking

13% Other dessert types

- From Lescot (2020). *Banana Genetic Diversity*, Fruitrop Magazine n°269

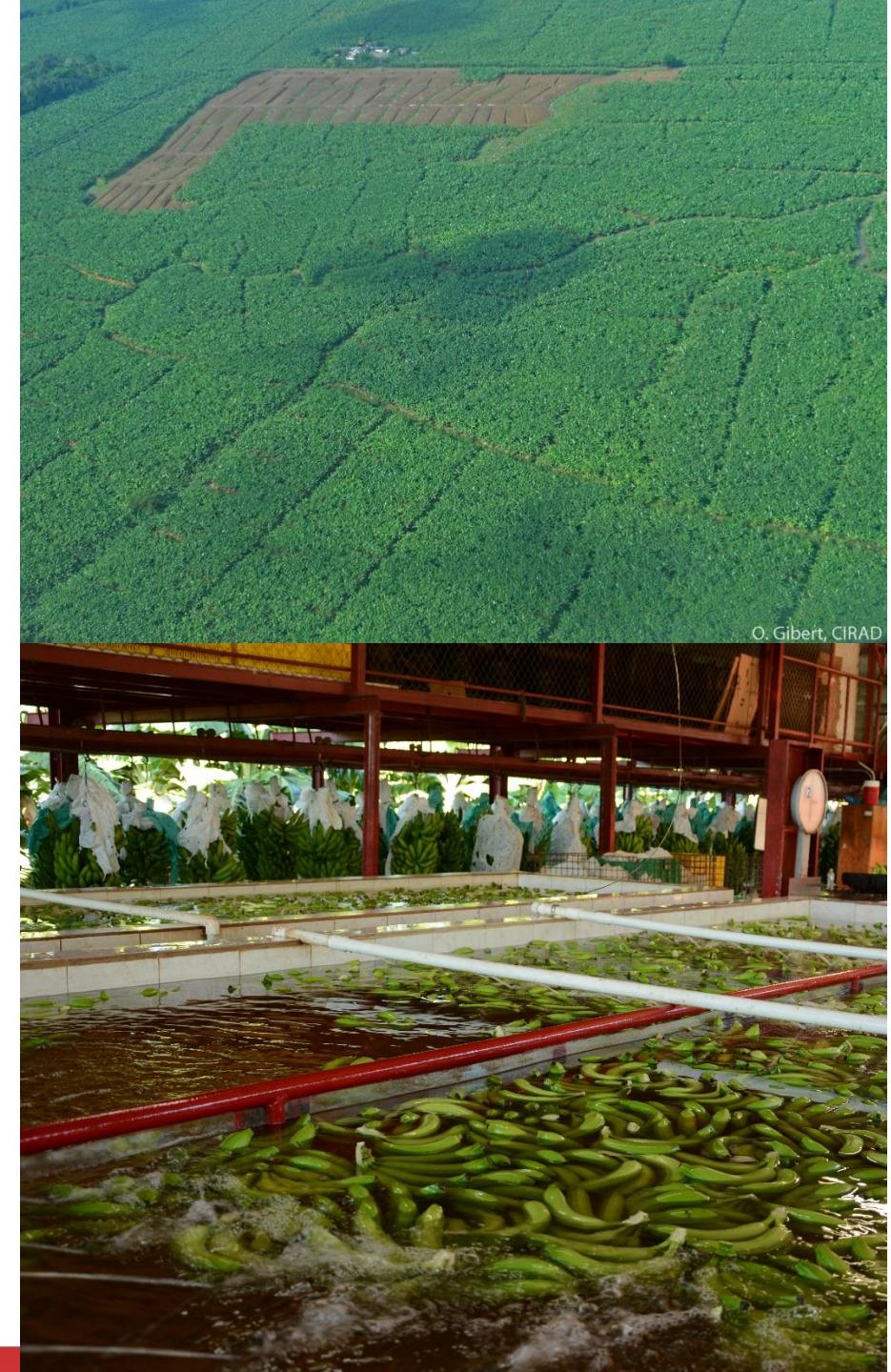
Low diversity



More Pests and Diseases



More non-organic
inputs



Solution: Beyond Cavendish

- Wide diversity exists but is decreasing worldwide (ref. Fruitrop)
- Diversity can keep pest and disease under control
(e.g. high diversity in Indonesia minimizes impacts of P and D (pers comm Agus Sutanto))
- Success of new or improved cultivars depends on acceptance/marketability
- Local cultivars preferred by consumers are part of the solution



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MusaNet – since 2011

Global collaborative framework for *Musa*-related research – implementing the [Global Musa Strategy](#)

Covering the all disciplines in banana research with over **100 member scientists** and over **60 national and regional collections**

7 thematic groups: Conservation, Diversity, Evaluation, Genomics, Information, Production Systems and Value Chains



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MusaNet is the global collaborative framework for *Musa* related research and a partnership of all key stakeholders, aiming to ensure the long-term conservation and increased use of *Musa* diversity globally



Male flowers, photo by Rachel Chase

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MusaLit is a bibliographic database of more than 18,000 references on bananas. A PDF is freely available for more than half of the references.

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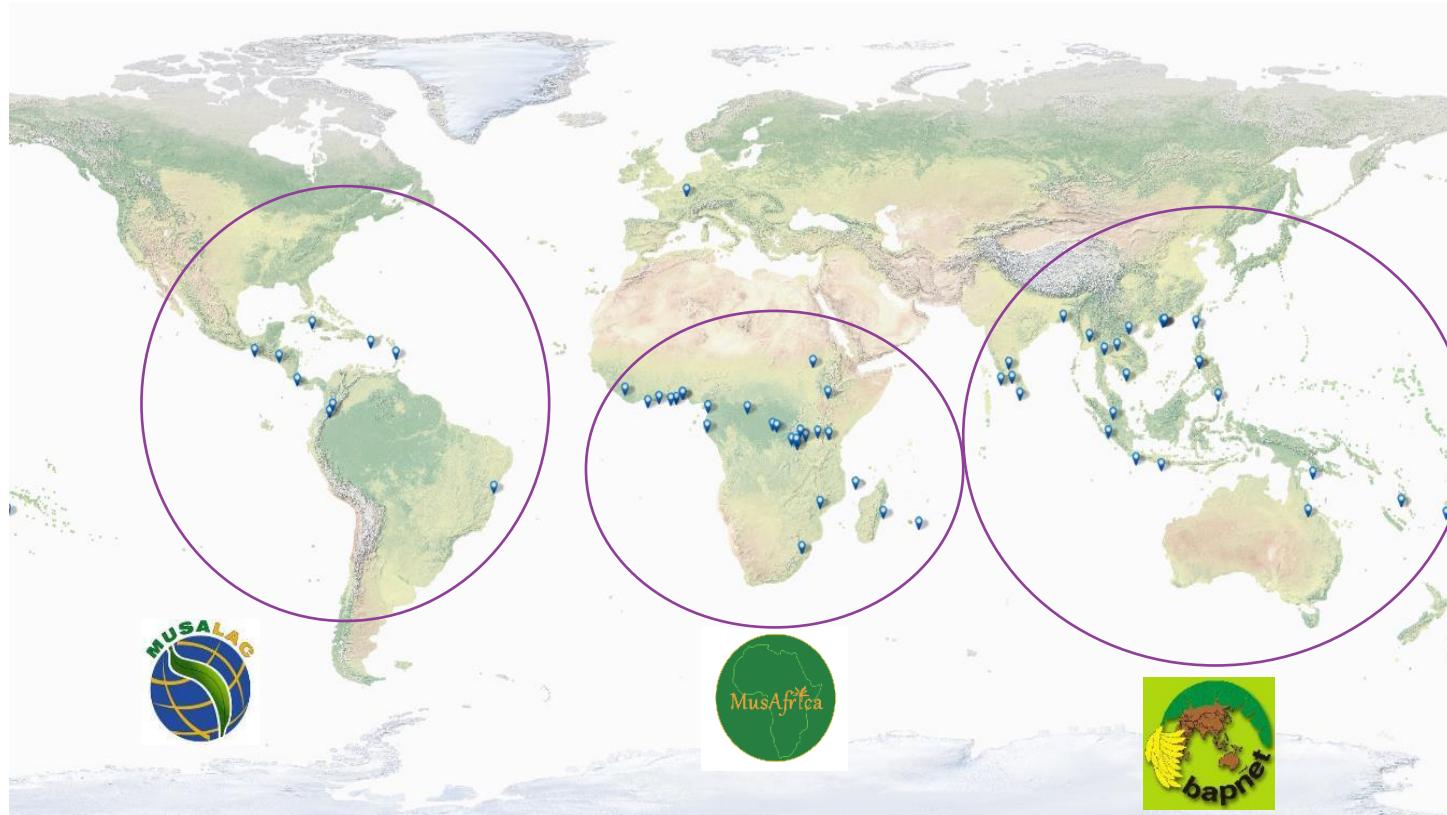
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Top varieties survey

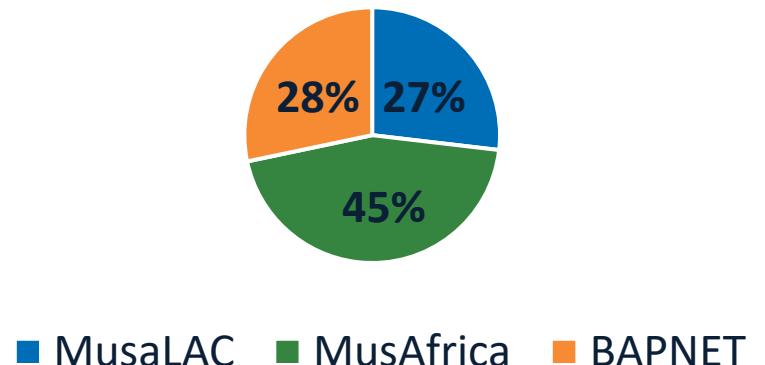
Survey of the top 10 varieties in the market in **50 countries** in Asia and Pacific, Africa and Latin America and the Caribbean



MusaNet Regional Networks

- 392 different cultivars
- 23 different subgroups
- 9 different genome groups

Data by region



■ MusaLAC ■ MusAfrica ■ BAPNET

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MusaNet regional characterization and documentation workshops



Cameroon, 2015



Uganda, 2016



Tahiti, 2023



Malaysia, 2017



Costa Rica, 2018

Top 10 *Musa* varieties in Colombia

Alvaro Caicedo Arana

	Common name	Genotype/ Subgroup	Particular trait of interest	Production area (ha y tonnes/yr)
1	Harton	AAB - Plantain	Climas cálidos (0-1000 msnm), 4-5 manos	<u>PLT. 415.000ha</u> 65.000 (15%),
2	Dominico Harton	AAB - Plantain	Clima medio calido (800-1700), 5-9 manos	275.000 (65%)
3	Dominico	AAB - Plantain	Climas medios frios (1000-2000) 10-14 manos	40.000 (10%)
4	Pompo / Comino	AAB - Populou	Agroindustria – Chips, patacones, fritos.	20.000 (7%)
5	Cachaco / cuatro filos	ABB - Bluggoe	<sigatoka, <sigatoka, hoja para envoltura	15.000 (3%)
6	Banano Común	AAA - Gros Michel	Fusarium, Calidad: Sabor y textura.	<u>BAN. 80.300ha</u> 26.240 (33%)
7	Banano Cocos y otros.	AAA - Gros Michel	Porte mas bajo (altura)	6.560 (8%)
8	Banano Valery	AAA - Cavendish	Exportación. Fusarium-R4	35.500 (44%)
9	Banano Willians	AAA - Cavendish	Exportación. Fusarium-R4	12.000 (15%)
10	Bananito - Bocadillo	AA - Sucrier	Sigatoka, sequia,	<u>2.587</u> <u>(16.200tn)</u>

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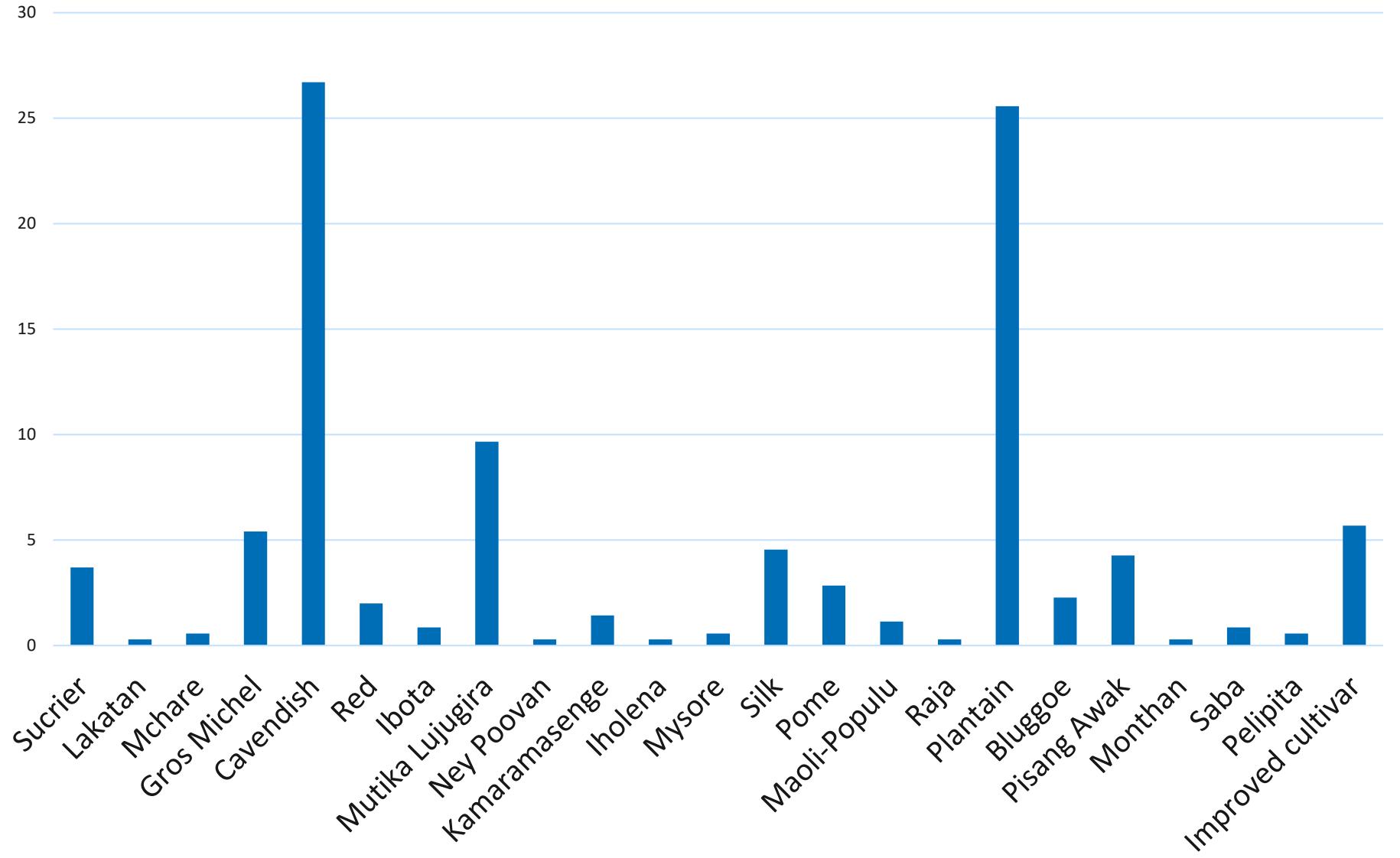
Top 10 *Musa* varieties in Thailand

Penchan Suthanukool

	Common name	Genotype/ Subgroup	Particular trait of interest	Production area (ha)	volume (tonnes)
1	Klaui Namwa	ABB	Fresh Fruit, Sweet, Processing	52,553	184,251
2	Klaui Khai	AA	Fresh Fruit, Processing	10,117	32,159
3	Klaui Hom	AAA	Fresh Fruit, Processing	9,960	30,082
4	Klaui Tani	BB	Leaf, Handmade	2,687	8,290
5	Klaui Lebmunang	AA	Fresh Fruit, Processing	1,498	3,426
6	Klaui Hin	ABB	Fresh Fruit, Feed	247	87
7	Klaui Hakmuk	ABB	Grill, Processing	NA	NA
8	Klaui Nak	AAA	Fresh Fruit	NA	NA
9	Klaui Tepparot	ABBB	Leaf	NA	NA
10	Klaui Nangpraya	ABB	Food/Processing	NA	NA

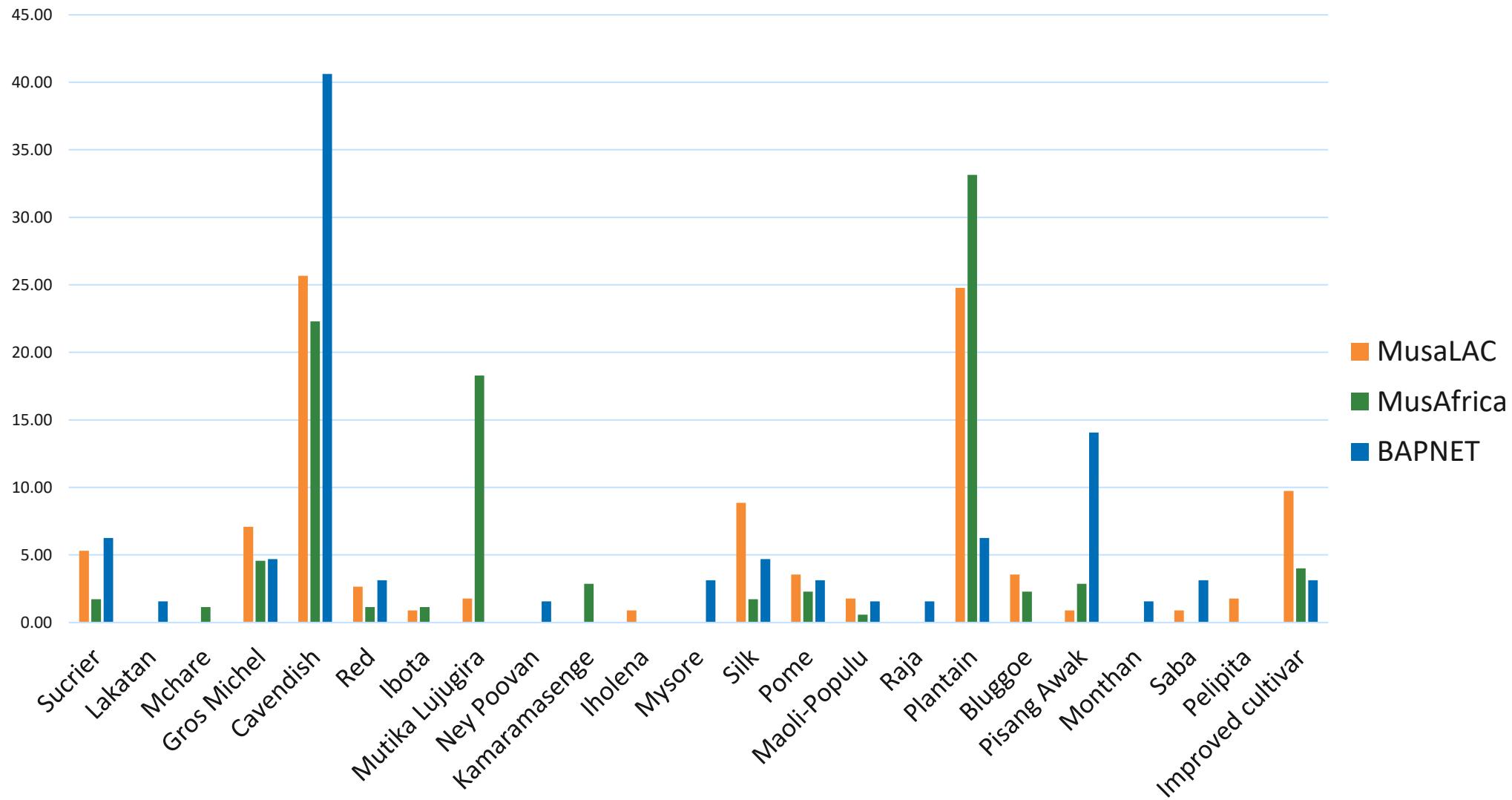
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Subgroup all regions (%)



| AA || AAA || | AB || AAB || | ABB || Tetraploids

Subgroup by region (%)



| AA || AAA || AB ||

AAB

|| ABB || Tetraploids

Asia and Pacific

India

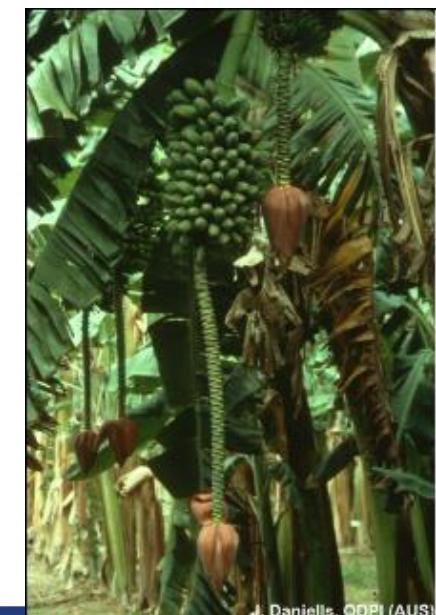
	Common name	Genotype/Subgroup	Particular trait of interest
1	Poovan	AAB/Mysore	Wilt resistance
2	Rasthali	AAB/Silk	Mealy pulp and apple flavour
3	Thellachakkarakeli	AAA	good taste, rich in carotenoids (Pro Vitamin A)



Large Kalapua

Papua New Guinea

	Common name	Genotype/ Subgroup	Particular trait of interest	Production
1	Large Kalapua	ABB	Tolerant to drought/good starch content, blends well with sago	10 tonnes/ha
2	Dwarf Kalapua	ABB	Dwarf variant, drought tolerant	6 tonnes/ha
3	Daru	ABB	Tolerant to drought/flood/salinity	10 – 15 tonnes/ha



Africa

Uganda

	Common name	Genotype/Subgroup	Particular trait of interest
1	Mbwazirume	AAA/EAHB	Cooking, big bunch, commercial
2	Kibuzi	AAA/EAHB	Cooking, big bunch, big fingers, compact
3	Enyeru	AAA/EAHB	Cooking, medium fingers

Mbwazirume



© NARO (UGA)

Cameroon

	Common name	Genotype/Subgroup	Particular trait of interest
1	Batard	AAB/Plantain	Intermediate French plantain; pounded, fried, flour, roasted, boiled,
2	Big Ebanga	AAB/Plantain	False Horn plantain; pounded, fried, flour, roasted, boiled
3	French clair	AAB/Plantain	French Plantain; roasted, boiled, fried

Big Ebanga



R Swennen - KUL

Latin American and Caribbean

Colombia

	Common name	Genotype/Subgroup	Particular trait of interest	Production
1	Harton	AAB/Plantain	Warm low climates, 4-5 hands. Export	65,000 ha
2	Dominico Harton	AAB/Plantain	Most consumed cultivar, medium warm climate, 5-9 hands	275,000 ha
3	Dominico	AAB/Plantain	Cold medium climates, 10-14 hands	40,000 ha

Dominico



Costa Rica

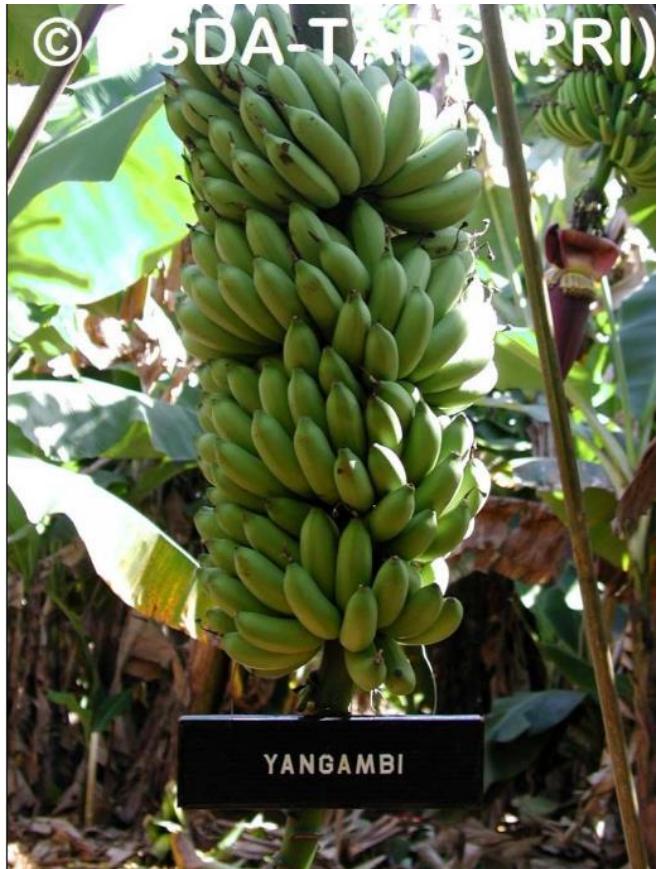
	Common name	Genotype/Subgroup	Particular trait of interest	Production
1	Datil (Pisang mas)	AA/Sucrier	Local consumption/ export	3000 ha
2	Gros Michel	AAA/Gros Michel	Local consumption	3000 ha
3	Pelipita	ABB	Local consumption	1000 ha

Pelipita

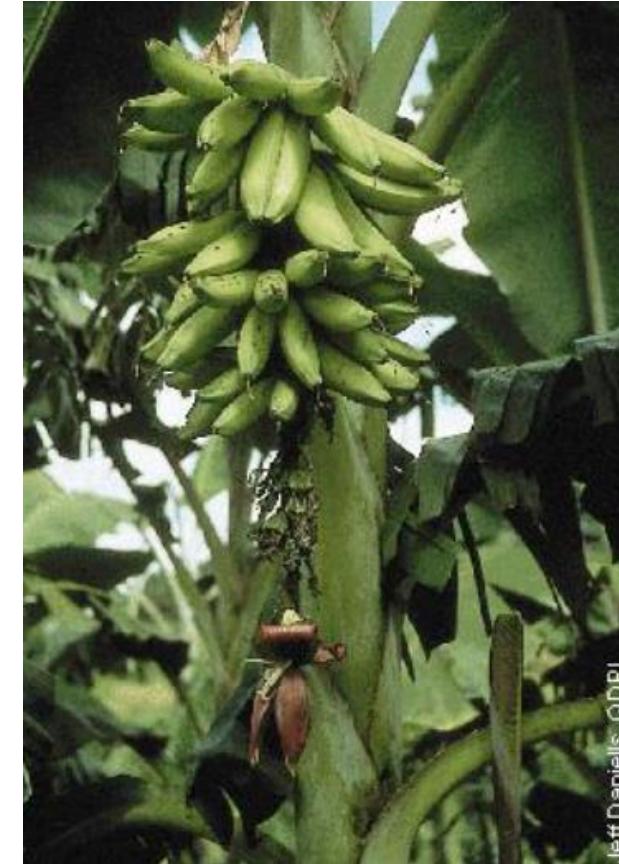


Examples of transcontinental use of cultivars

Yangambi Km 5 (AAA/Ibota) – Originated in DRC, now a popular variety in Brazil with resistance to Sigatokas and Fusarium Race 1



Bira (AAB/Iholena) – Originated in PNG, popular in Burundi for its high Pro-vitamin A content



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The International *Musa* Germplasm Transit Centre (ITC)

- Established in 1985 and hosted by the Katholieke Universiteit Leuven, Belgium
- Holds ‘in trust’ under the FAO the world’s largest collection of banana
- Currently comprises 1,682 accessions *in vitro*, sourced from 38 countries

Van den houwe et al. CABI Agric Biosci (2020) 1:15
<https://doi.org/10.1186/s43170-020-00015-6>

CABI Agriculture and Bioscience  **CABI**

REVIEW **Open Access**

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Safeguarding and using global banana diversity: a holistic approach

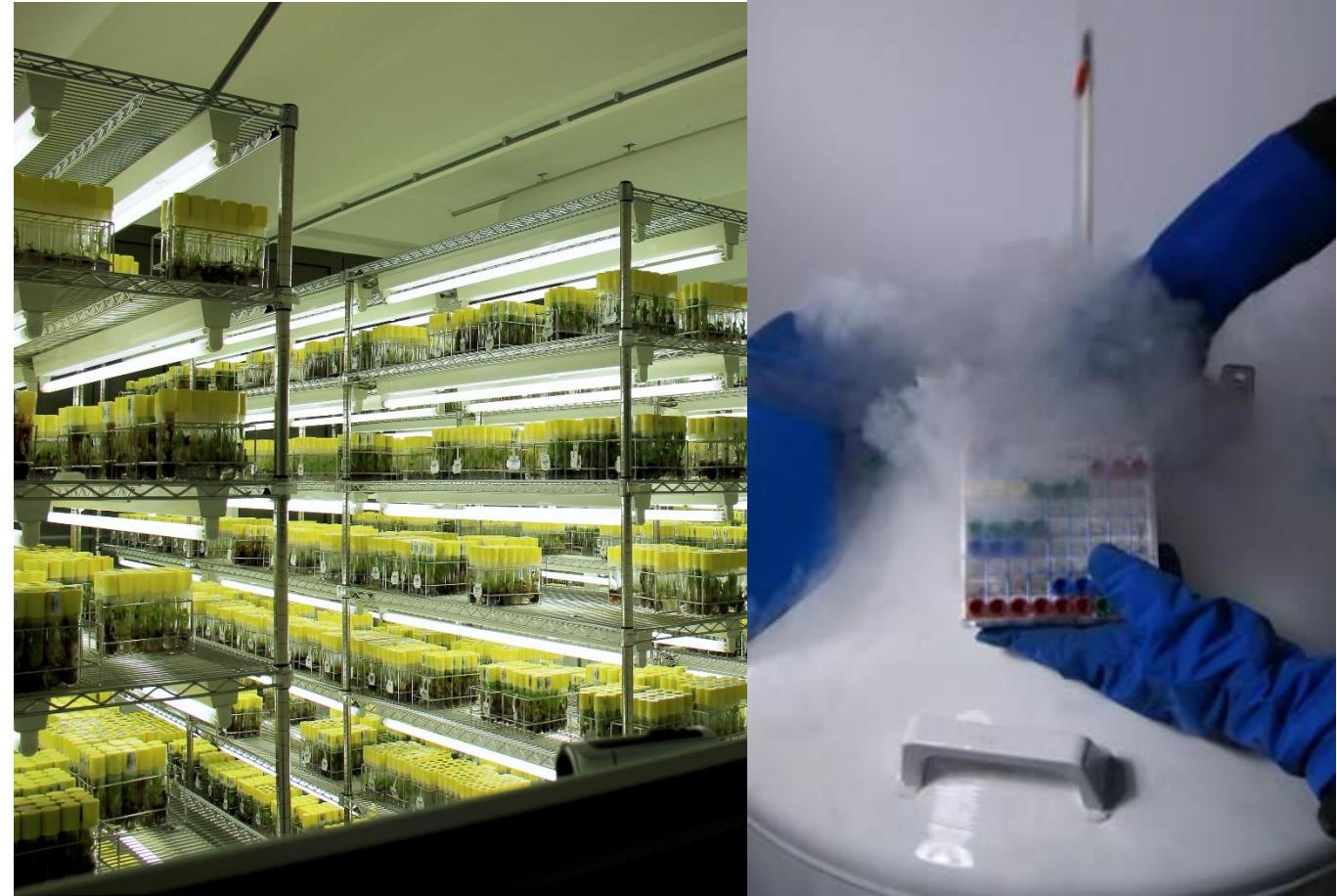
Ines Van den houwe¹, Rachel Chase², Julie Sardos², Max Ruas², Els Kempenaers³, Valentin Guignon², Sébastien Massart⁴, Sébastien Carpentier¹, Bart Panis¹, Mathieu Rouard² and Nicolas Roux^{2*}

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The ITC's role

- conserve and safely backup global banana diversity in perpetuity (*in vitro* and in cryo)
- a transit centre through which germplasm is cleaned of viruses and freely shared among countries.



Only 15% of the varieties in the top 10 survey are conserved at the ITC

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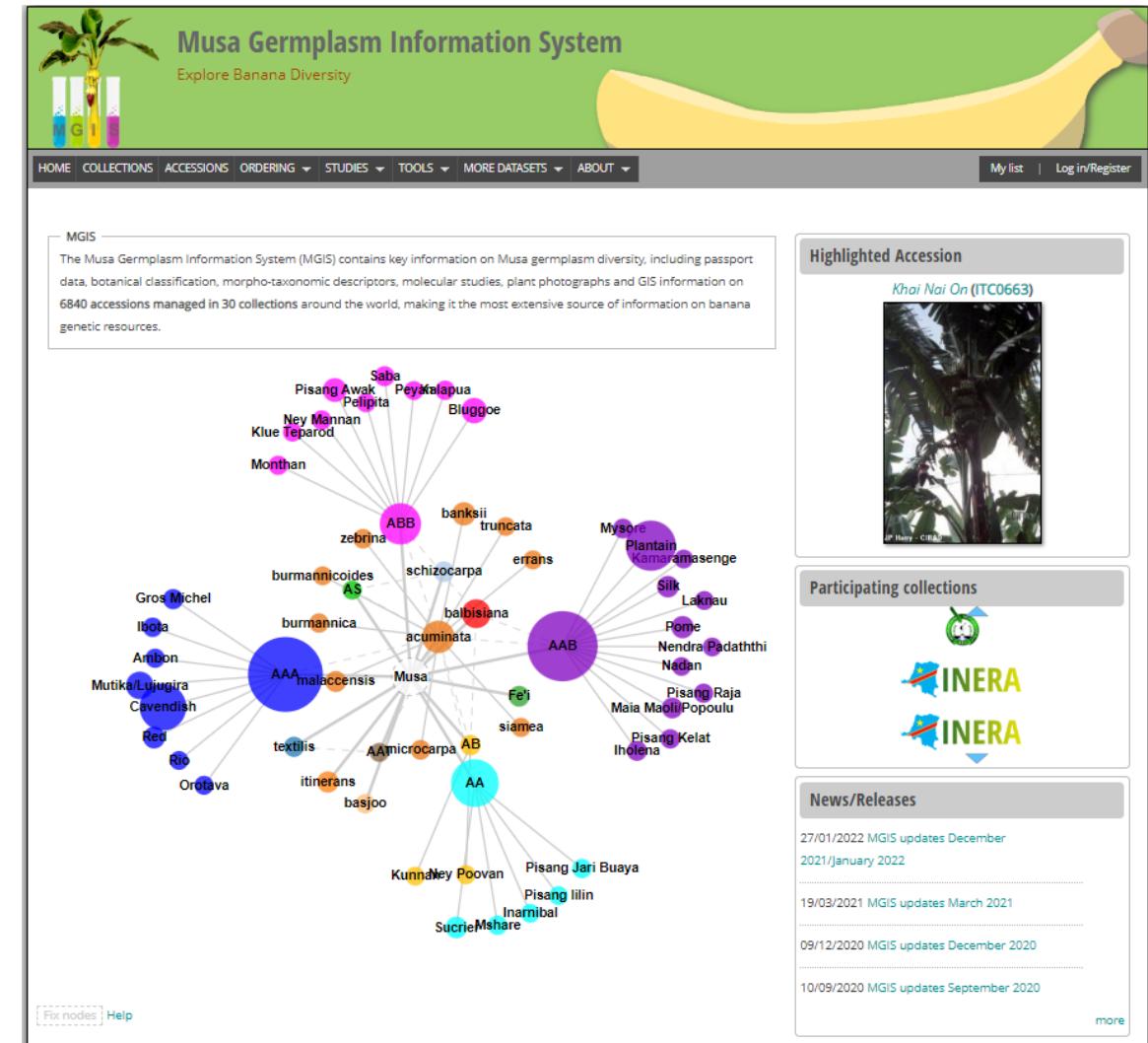


MGIS – *Musa* Germplasm Information System

31 collections currently share accession-level data on collection location, morphological and molecular characterization, evaluation, and related publications.

Goal: accession-level information for 60 collections

www.crop-diversity.org/mgis



Musa Germplasm Information System

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ITC0472 - Pelipita

Passport Data

	Accession number: ITC0472	
	Accession name: Pelipita	
DOI: 10.18730/9K0MU	Country of origin:	
Synonyms: Pisang kuri	PDCo Score: 6.32	
Biological status of accession: traditional cultvar or landrace	Available for distribution:	
Taxonomic classification: Musaceae > Musa > Eumusa > ABB		
Institute code: BELO84 (ITC)		
Acquisition date: 1988-07-25		
Status: active		
Type of storage:		

[Suggested](#) [Collecting](#) [Morphological](#) [Molecular](#) [Traits](#) [Publications](#) [Breeding](#)

[+ Suggested Accessions](#)
No suggested accessions.

[+ Collecting Location](#)

Latitude: 9° 44' 54.6" N
Longitude: 125° 30' 43.56" E
Country: Philippines

[+ Collecting/acquisition source](#)

Type	Name	Donor Code	Donor Institute Country
Collection	IHIA	IHIA II-93, 331	

[+ Morphological Characterization Pictures](#)

6.2.5 - Predominant underlying colour of the pseudostem

6.3.1 - Blotches at the petiole base

6.3.3 - Petiole canal III

6.3.4 - Petiole margins

6.3.22 - Colour of cigar leaf dorsal surface

6.4.4 - Peduncle colour

[+ Breeding](#)
Fetch breeding data through BrAPI

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[+ Genetic Integrity](#)
Ploidy: 3x (Musa Genotyping Centre (MGC), Institute of Experimental Botany (IEB), Olomouc, Czech Republic, 25/01/2001)

[+ Molecular Characterization](#)
DArT whole genome profiling of ITC accessions
Taxonomic Reference Collection (TRC)
Musa Genotyping Center Results (triploids)

[+ Chromosome Characterization](#)

Publication

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Diversity catalogue

In 2022/2023, online publication of a non-technical catalogue showcasing local banana diversity across the globe.

Focus will be on traits of interest (e.g. pest and disease resistance and post-harvest information).

Example of similar catalogue from Peru, soon to be published

Plátano Isla

Es una variedad del subgrupo Iholena (AAB). Se cultiva principalmente en la selva peruana en sistemas asociados a otros cultivos o en monocultivo. Consumido principalmente como fruta fresca. La pulpa, de color anaranjada, con alto contenido de beta carotenos es ampliamente utilizada en la alimentación de recién nacidos.



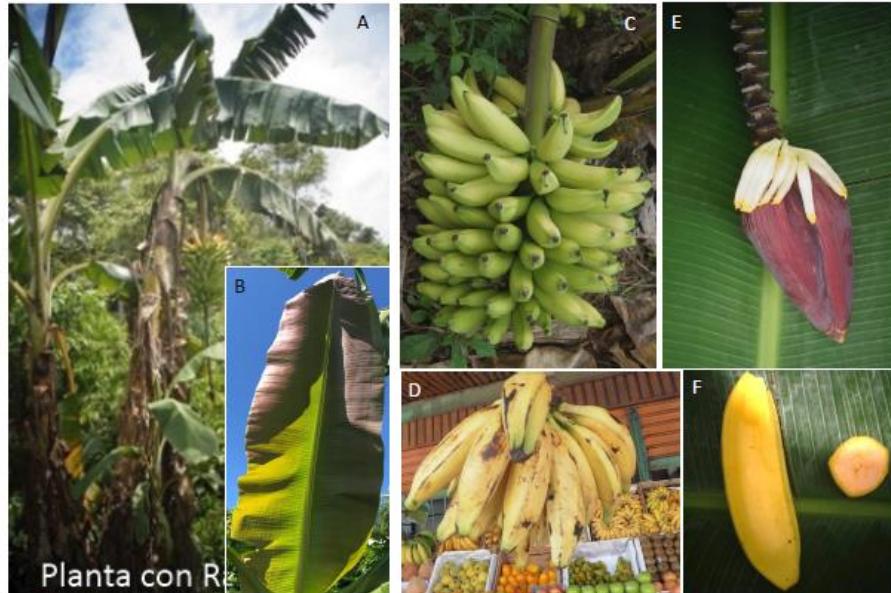
Sinónimos : Isla, Isla Maleño, Isla tallo verde, Isla tallo negro, Isla tallo blanco, Isla Guayaquil

Características Genéticas, Distribución y Usos

Grupo Genómico	AAB
Sub Grupo	Iholena
Distribución Geográfica	Junín, Amazonas, Pasco, Ucayali, Huánuco, San Martín, Loreto, La Libertad, Cajamarca, Lima
Usos	Consumo fresco como postre y en papilla para alimentación de recién nacidos



Descriptores de la variedad	Plagas y enfermedades	
Forma del Racimo	Cilíndrico	Sigatokas Susceptible
Nº de manos	4 - 7	Fusarium razas Susceptible
Nº de dedos/mano	50-80	1 y 4 tropical
Altura de Planta (m)	3-4	Picudo negro Susceptible



Conclusion

- Cavendish monoculture is dominating the banana market for export – but also in local markets in some regions
- Local diversity is disappearing worldwide
- Less diversity -> more pesticides/fungicides needed -> less organic banana production
- Researchers and breeders need more information on varieties preferred in the local markets in order to make alternatives to Cavendish more marketable/accepted
- Varieties can also be useful in countries other than where they originated
- We gathered data on the top 10 varieties in the local markets from 50 countries to showcase local diversity in a catalogue that will provide information on pest and disease resistance and other traits of interest.

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