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The CORBANA field collection, Guápiles, Costa Rica

MusaNet Latin American and Caribbean regional workshop at CORBANA

MusaNet, in partnership with the [Corporación Bananera Nacional of Costa Rica \(CORBANA\)](#), held its fourth regional workshop on banana characterization and documentation in Guápiles, Costa Rica, from 12-17 November 2018.

In attendance were 14 invited curators and in total 25 participants (see photo below) of Latin

American and Caribbean *Musa* collections and members of the Latin American and Caribbean banana network, [MusaLAC](#). The workshop allowed the curators to share their knowledge and experiences in best practices for banana germplasm conservation and exchange, disease prevention and management and field management of their collections. CORBANA researchers also shared early screening methods for priority traits such as resistance to nematodes and Black leaf streak, practices on biological control and improving nutrition. There was a special focus on the prevention of Fusarium Wilt Tropical Race 4, which poses a serious threat to the LAC banana-producing region.

During the three field days, the curators scored accessions in the CORBANA field collection using the *Musa* minimum descriptor application ([MusaTab](#)) on handheld tablets which they later uploaded to their laptops using MGIS.net. A special session was devoted to training participants on how to use [MusaID](#), the application developed to identify cultivars *in situ* based on morphological datasets.

The successful workshop was financed by GIZ, the CGIAR research programme on Roots, Tubers and Bananas (RTB) and the CGIAR Genebanks Platform. For the full workshop report, including pdfs of all presentations, [click here](#).



[New catalogue of CARBAP's rich plantain collection](#)



Musalogue

Catalogue de germoplasme de *Musa*
Plantains d'Afrique occidentale et centrale
 Collection CARBAP

Lucien Ibobondji Kapuku, Gérard Ngho Newilah, Kodjo Tomekpe, Max Ruas, Rachel Chase et Nicolas Roux
 Edité par Claudine Picq













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<p>Données de passeport</p> <p>Nom interne accession: N102019 Code international (IC): N102019 Synonyme: - Genre: Musa Section: Enana Espèce Groupe: AAB Sous groupe: Plantain Type: - Variété locale: - Pays d'origine: Bénin</p> <p>Caractérisation</p> <p>6.1 Apparence générale de la plante</p> <p>6.1.1 Port habituel: Normal 6.1.2 Hauteur: Normal</p> <p>6.2 Pseudostrome / rejets</p> <p>6.2.1 Nombre de pseudostrome (ps): 2 6.2.2 Nombre total de feuilles linéaires: 12 6.2.3 Nombre de pseudostrome: 2 6.2.4 Nombre de pseudostrome: 2 6.2.5 Couleur de base des gaines linéaires: Vert clair 6.2.6 Développement des gaines linéaires: Tendre 6.2.7 Couleur de la veine: Jaune (tronc) 6.2.8 Type de bord des gaines: Très peu de rigoles visibles de gros 6.2.9 Nombre de rigoles: 8 6.2.10 Développement des rigoles: Entre 1/2 et 3/4 de la table du pseudostrome</p> <p>6.3 Pétiole / nervure / feuille</p> <p>6.3.1 Nombre de la base des pétioles: Petites taches 6.3.2 Couleur des nervures: Vert foncé 6.3.3 Couleur des nervures: Vert foncé 6.3.4 Couleur des nervures: Vert foncé 6.3.5 Couleur des nervures: Vert foncé 6.3.6 Couleur des nervures: Vert foncé 6.3.7 Couleur des nervures: Vert foncé 6.3.8 Couleur des nervures: Vert foncé 6.3.9 Couleur des nervures: Vert foncé 6.3.10 Couleur des nervures: Vert foncé</p>	<p>6.4 Inflorescence / bourgeon mâle</p> <p>6.4.1 Longueur de la hampe (cm): 15-60 6.4.2 Couleur de la hampe: Vert foncé 6.4.3 Couleur de la hampe: Vert foncé 6.4.4 Couleur de la hampe: Vert foncé 6.4.5 Couleur de la hampe: Vert foncé 6.4.6 Couleur de la hampe: Vert foncé 6.4.7 Couleur de la hampe: Vert foncé 6.4.8 Couleur de la hampe: Vert foncé 6.4.9 Couleur de la hampe: Vert foncé 6.4.10 Couleur de la hampe: Vert foncé 6.4.11 Couleur de la hampe: Vert foncé 6.4.12 Couleur de la hampe: Vert foncé 6.4.13 Couleur de la hampe: Vert foncé 6.4.14 Couleur de la hampe: Vert foncé 6.4.15 Couleur de la hampe: Vert foncé 6.4.16 Couleur de la hampe: Vert foncé 6.4.17 Couleur de la hampe: Vert foncé 6.4.18 Couleur de la hampe: Vert foncé 6.4.19 Couleur de la hampe: Vert foncé 6.4.20 Couleur de la hampe: Vert foncé</p> <p>6.5 Fruit</p> <p>6.5.1 Nombre de fruits: Couchés vers la hampe 6.5.2 Nombre de fruits (sans ventouse): 18 6.5.3 Longueur des fruits à maturité (cm): 22 6.5.4 Type des fruits: Deux dents légèrement incurvées 6.5.5 Hauteur des fruits à maturité (cm): Base du style proéminente 6.5.6 Couleur des fruits à maturité: Vert foncé 6.5.7 Couleur des fruits à maturité: Vert foncé 6.5.8 Couleur des fruits à maturité: Vert foncé 6.5.9 Couleur des fruits à maturité: Vert foncé 6.5.10 Couleur des fruits à maturité: Vert foncé 6.5.11 Couleur des fruits à maturité: Vert foncé 6.5.12 Couleur des fruits à maturité: Vert foncé 6.5.13 Couleur des fruits à maturité: Vert foncé 6.5.14 Couleur des fruits à maturité: Vert foncé 6.5.15 Couleur des fruits à maturité: Vert foncé 6.5.16 Couleur des fruits à maturité: Vert foncé 6.5.17 Couleur des fruits à maturité: Vert foncé 6.5.18 Couleur des fruits à maturité: Vert foncé 6.5.19 Couleur des fruits à maturité: Vert foncé 6.5.20 Couleur des fruits à maturité: Vert foncé</p> <p>Évaluation</p> <p>7.1 Cycle moyen à l'installation: 1 7.2 Nombre de plants installés: 5 7.3 Nombre de plants récoltés: 300 7.4 Durée du premier cycle (j): 300 7.5 Nombre de plants récoltés (j): 300 7.6 Nombre de plants récoltés (j): 300 7.7 Nombre de plants récoltés (j): 300 7.8 Nombre de plants récoltés (j): 300 7.9 Nombre de plants récoltés (j): 300 7.10 Nombre de plants récoltés (j): 300 7.11 Nombre de plants récoltés (j): 300 7.12 Nombre de plants récoltés (j): 300 7.13 Nombre de plants récoltés (j): 300 7.14 Nombre de plants récoltés (j): 300 7.15 Nombre de plants récoltés (j): 300 7.16 Nombre de plants récoltés (j): 300 7.17 Nombre de plants récoltés (j): 300 7.18 Nombre de plants récoltés (j): 300 7.19 Nombre de plants récoltés (j): 300 7.20 Nombre de plants récoltés (j): 300</p> <p>Évaluation post-récolte</p> <p>Grain de sucre à maturité (g): 3,7 Taux de matière sèche de la pulpe à maturité (g/100g): 36 Force de la pulpe à maturité (kg/100g): 2,8 Taux de matière sèche de la pulpe à maturité (g/100g): 36 Force de la pulpe à maturité (kg/100g): 2,8 Taux de matière sèche de la pulpe à maturité (g/100g): 36 Force de la pulpe à maturité (kg/100g): 2,8</p>
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Collection CARBAP - French giant













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Collection CARBAP - French giant

A new Musalogue (3rd in the series) has been published on the MusaNet website. It presents the remarkable plantain (AAB) collection (145 accessions) conserved by CARBAP in Njombé, Cameroon. The catalogue aims to facilitate the correct identification of African plantains and disseminate important information on their extraordinary diversity, agronomic potential, and post-harvest qualities, in order to encourage better use by researchers, extension workers, farmers and other actors in the plantain community. Each accession is documented with 58 morphological descriptors and 10 high-quality colour photos.

The catalogue is a result of collaboration by a multidisciplinary scientific team from CARBAP, CIRAD and Biodiversity International, who participated in the project Food Security Thematic Programme Phase 2 (FSTP2) of the European Union, which permitted the collection and analysis of the data presented in the catalogue.

The catalogue is available in French [here](#). An English version will be published later this year.

In search of *M. balbisiana* in Vietnam

By Gabriel Sachter-Smith

The provinces of Northern Vietnam are varied in their climate, geography and cultures, making for a dynamic and fruitful expedition undertaken by six banana scientists from November 20 to December 12 2018. For three weeks, they road-tripped, covering as much ground as they could. As the van zipped up and down mountain sides, into river valleys and through villages, they would stop and get out to explore any bananas that might have caught their eye while their heads stuck out the window. Whether they were growing in someone's yard, on the side of a busy highway, or across a river on the top of a mountain, the team went to find out what it was. Mud-soaked shoes, leeches in their trousers, and holding on to what little shred of loosely-rooted vegetation on steep and slippery

hillsides were of minor inconvenience relative to the sheer joy of being on the edge of discovery as bananas of interest were photographed, measured and collected.

The primary target was to document the diversity of *Musa balbisiana*, and in particular potential variations of eBSV integrants, but any and all bananas the team stumbled across were evaluated. Many edible cultivars were seen, and though most were fairly common, a few unusual and potentially interesting specimens were observed. In addition, the team also sought to clarify the status of a number of species in the section Callimusa, many of which are poorly understood. As with any good look into the complex workings of our natural world, the team left with more questions than answers which they hope to resolve over the coming months as more field expeditions and a whole lot of leaf samples are analyzed.

The team included scientists from CIRAD, Bioversity International and the National Museum of Natural History of Paris as well as Vietnamese colleagues from the Institute of Tropical Biology (ITB) and the Northern Mountainous Agriculture and Forestry Science Institute (NOMAFSI). The mission was supported by two projects, one financed by the Agropolis Foundation through the « Investissements d'avenir » programme (Labex Agro:ANR-10-LABX-0001-01) » and a second one funded by the multilateral program Sud Expert Plantes Développement Durable (SEP2D). Further missions to China and Laos are planned for 2019.



Top photo: The team from left to right - Gabriel Sachter-Smith, Ly Ngoc-Sam (ITB), Matthieu Chabannes (CIRAD), Tien Dung Trieu (NOMAFSI), Thomas Haevermans (MNHN) and Marie-Line Caruana (CIRAD).

MusaNet banana genomics workshop at PAG XXVII

Another informative and interesting banana genomics workshop was held at PAG XXVII in January 2019, organized by Angelique D'Hont (CIRAD) and Mathieu Rouard (Bioversity International). The following six speakers took part:

- 1) **Jean-Marc Aury** (Genoscope) provided an update on the sequencing of *Musa* genomes conducted in the framework of [France Genomique Dynamo project](#). Seven banana genomes are underway using Nanopore and Optical mapping to reach chromosome scale assembly. First results are published in [Nature Plants](#).
- 2) **Eva Hribova** (IEB) summarised advances in analysis of chromosome rearrangements using whole chromosome painting, working on the *M. acuminata* subspecies *burmannicoides* Calcutta 4 as an example for application of the method, revealing large chromosomal rearrangements compared with *M. acuminata* subspecies *malaccensis* 'DH Pahang'.
- 3) **James Dale** (QUT Centre for Tropical Crops and Biocommodities) presented work on genome editing using CRISPR in Cavendish bananas. For TR4, 3-UTR regions in a Cavendish homolog NLR gene RGA2 were targeted using SDN-1 approach to drive up expression and provide disease resistance. Australia has approved the development of GM bananas from lab to field trial and will likely approve at least SDN-1 as non-GM.
- 4) **Leena Tripathi** (IITA) reported genome editing of plantain (AAB) to inactivate BSV from the host genome via CRISPR/Cas9, using an Agrobacterium-based integration of CAS9. 75% of regenerated events remained asymptomatic. Only few off targets were detected.
- 5) **Ana Almeida** (California State University East Bay) presented her [recently published work](#) focusing on insights into the genetic basis of floral morphological variation based on transcriptomic analysis of several species within the Zingiberales, highlighting the specific actions of transcription factors.
- 6) **Mathieu Rouard** (Bioversity International) described the currently available *de novo* assembly and genome annotation of representative genotypes for *M. acuminata* subspecies. High level of gene tree discordance, incomplete lineage sorting and introgressions were observed and thus providing a perspective on the rapid radiation of their ancestral populations in South East Asia. More details in [Genome Biology and Evolution](#).

Click [here](#) for the presentation abstracts.



Mathieu Rouard presenting on *de novo* assembly and genome annotation of representative genotypes for *M. acuminata* subspecies.

Musa researcher profile: Dr. Jorge Sandoval



In this newsletter, we are pleased to feature Dr. Jorge Sandoval, Director of Research at Corporación Bananera Nacional of Costa Rica (CORBANA) and an Expert Committee representative for MusaLAC.

1. What is your background and how did you become interested in *Musa* research? In 1984, I finished my studies in the faculty of agronomy of the University of Costa Rica, on micropropagation of banana and plantain. Then for 8 years I worked on plant biotechnology in tropical crops, with emphasis on banana and plantain at the Tropical Agricultural Research and Higher Education Center (CATIE). At that time, a micropropagation project was started in banana, with the objective of propagating local cultivars resistant to black sigatoka and then distributing them to the producers. I was very interested in the subject and it was my first job and that is how my interest in bananas and the subsequent specialization in biotechnology began. In 1988, I obtained a master's degree in genetic improvement, on the anatomy and morphology of the banana plant in vitro, in the greenhouse and in the field. Then I obtained in 1994 a PhD in Plant Biotechnology with the theme Determination of the causes of somaclonal variation in banana (*Musa* AAA).

I joined the National Banana Corporation (CORBANA, Costa Rica) in 1995. Since 2002 to the present date, I hold the position of Research Director of CORBANA. Based on the accumulated work experience, my work carried out in the framework of the integral management of problems and resources, working in collaboration with different institutions and entities (INIBAP, Bioversity International, FAO, MUSALAC, PROMUSA, IICA, OIRSA, EMBRAPA, University of Wageningen and KUL). From 2002, my professional work has also been focused on the study and application of research administration through project management.

In May 2015 I achieved a specialty in professional project management. During the periods of 2003-2004 and 2009-2011 I was assigned the responsibility of the presidency of MUSALAC. During the 2016-2018 period, I was president of ACORBAT. I currently share actions as a member of the MusaNet Expert Committee.

With 34 years of accumulated experience in the field of scientific research, I have participated in review committees of specialized journals, in thesis committees, in international projects, meetings, national and international congresses. I have more than 90 publications in different scientific journals, and I also have international experience with technical visits to more than 40 countries.

I thank so many people who have collaborated and supported me during my professional efforts.

2. Can you tell us about some notable recent or current *Musa* related projects in which you are involved?

- Identification, isolation, cultivation and use of biological control agents for the control of black Sigatoka; project funded by CORBANA and by the Ministry of Science and Technology of Costa Rica. The objective is to obtain a biological product that helps to be part of the control strategy of this disease, reducing the use of synthetic fungicides.
- Alternative methods for the control of the burrowing nematode (*Radopholus similis*) in banana and, integral management of the production. This is a project where knowledge is being put into practice.

to obtain an impact on the health and quality of the soil, on the decrease of pesticides and on the implementation of a more ecological management of banana production, without decreasing the productivity.

3. What is a future *Musa* project you would like to work on?

Selection and evaluation of elite cultivars and others types of bananas to improve production and expand knowledge, whose results are added value that help improve people's diet and quality of life.

4. What is your favorite *Musa* species/cultivar and why? I was born and raised in a rural town where the predominant crop was coffee. The coffee producers at that time mixed their coffee plants with some Musaceae. There were two that were used: The Creole type or `Gros Michel` (AAA) or the Pisang Mas (AA) That's why I really like the Gros Michel, which is still available in Costa Rica. Then the Pisang Mas, for its small size and because it is more concentrated in sugar. Of course, if these two are not available, I use the Cavendish type without problems. I personally eat 3 to 4 bananas per week.

Dr. Sandoval can be contacted at: jsandoval@corbana.co.cr

Upcoming Events

BAPNET Steering Committee meeting to be held in Guangzhou, China from 6 to 9 May 2019

[Harlan III symposium](#) in Montpellier, France, from 3 to 7 June 2019, dedicated to the Origins of Agriculture and the Domestication, Evolution, and Utilization of Genetic Resources

Biodiversity-led collecting missions to Papua New Guinea, Samoa and Cook Islands in 2019

Further collection missions to China and Laos in 2019 by the CIRAD-led team that went to Vietnam



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