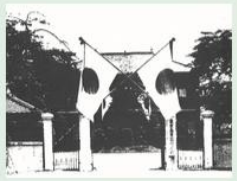
Introduction of

Tokyo University of Agriculture and Technology (TUAT)

a mid-size national university having two faculties, Faculty of Agriculture and Faculty of Engineering

History of TUAT


Imperial Tokyo Sericultural College main entrance


Main building just after completion


New school building in Koganei


Faculty of Agriculture main building and main entrance when TUAT was established


BASE building

150th anniversary project logo


Komaba Agriculture School building


Exterior of dormitory


Moved from Nishigahara to Koganei


Faculty of Textile main building and main entrance when TUAT was established


United Graduate School of Agricultural Science building


Ellipse

1874 1878 1914 1919 1935 1940 1944 1949 1962 1985 1995 2004 2014 2016 2024

Naito-Shinjuku Branch of the Industrial Promotion Board, Ministry of Home Affairs was founded

Komaba Agriculture School established

Imperial Tokyo Sericultural College established

Department of Practical Applications established at Faculty of Agriculture, Tokyo Imperial University

Tokyo Imperial College of Agriculture and Forestry established (Department of Practical Applications became independent and moved to its present location in Fuchu)

Moved from Nishigahara to the present location in Koganei

Tokyo College of Agriculture and Forestry established
Tokyo Textile College established

TUAT (Faculty of Agriculture/Faculty of Textile) founded

Faculty of Textile renamed as Faculty of Engineering

United Graduate School of Agricultural Science (doctoral courses) established

Faculty of General Education discontinued
Graduate School of Bio-Applications and Systems Engineering established

Graduate courses restructured and shifted to the national university corporation Tokyo University of Agriculture and Technology

Construction of the 140th Year Commemorative Building (Ellipse) completed

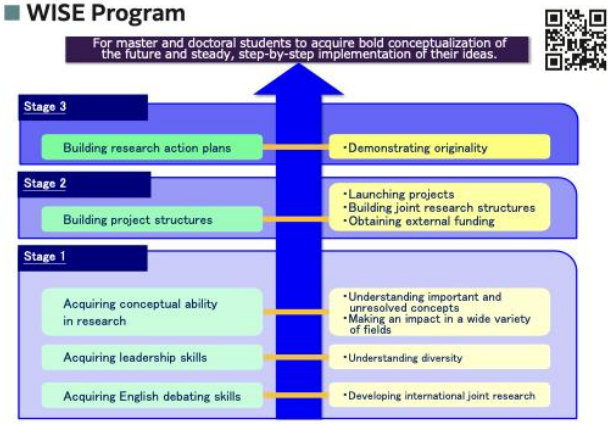
Institute of Global Innovation Research established

150th anniversary

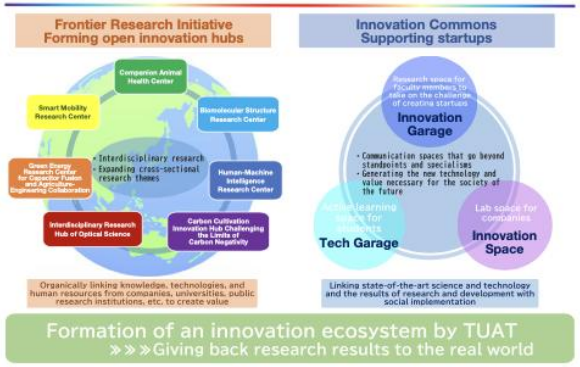
Education

TUAT is dedicated to fortifying its foundational and cutting-edge research capabilities, with a focus on agricultural and engineering sciences. Concurrently, we are advancing education and research endeavors, addressing interdisciplinary challenges on a global scale. Over seventy percent of our undergraduate students continue their studies in graduate school. TUAT provides a five-year integrated Master's and Doctoral degree program called the World-leading Innovative and Smart Education (WISE Program) and similar initiatives. Furthermore, aiming to apply research outcomes to real-world societal needs, TUAT creates new industries and industrial structures through initiatives such as the Deep Tech Industry Development Organization.

WISE Program



Deep Tech Industrial Development Organization



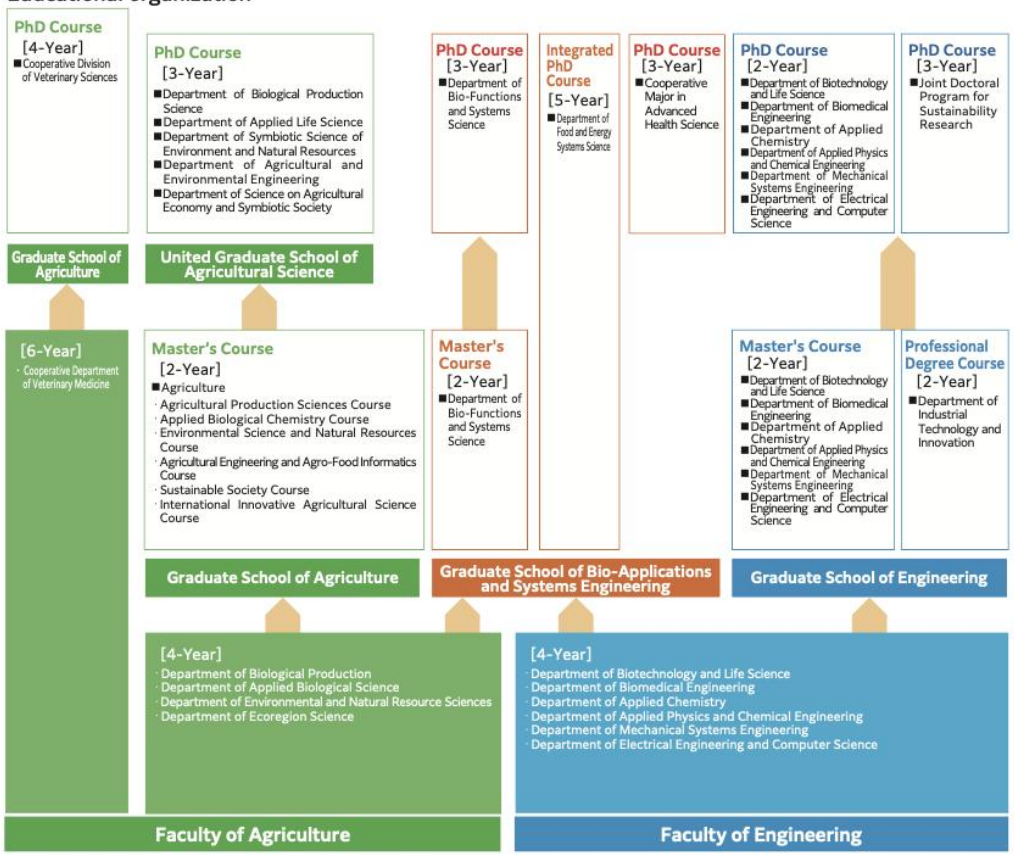
Formation of an innovation ecosystem by TUAT
»»»Giving back research results to the real world

Number of degree recipients until the end of March 2023

Master's	Cumulative totals until 2021-2022	2022-2023
Engineering	12,890	424
Agriculture	7,211	227
Academic	100	1
Technology Management (professional course)	617	38
Total	**20,818**	**690**

PhD	Cumulative totals until 2021-2022	2022-2023
Engineering	1,569	57
Agriculture	2,005	40
Academic	88	1
Life science	36	2
Veterinary science	5	16
Total	**3,703**	**116**

Educational organization



Research organizations (faculty member affiliated organizations)

Institute of Agriculture | **Institute of Engineering**

TUAT at Present

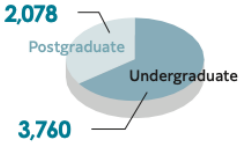
Basic Data

Name Tokyo University of Agriculture and Technology
Location 3-8-1 Harumi-cho, Fuchu-shi, Tokyo, 183-8538

English website | TUAT song | official mascots Hakken and Koken | Emblem | Logo

• Number of students
As of May 1, 2023

5,838



• Number of faculty /administrative staff members
As of May 1, 2023

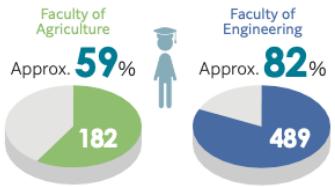
629

409 faculty members
220 administrative staff

• Number of students per faculty member (undergraduates)
As of May 1, 2023

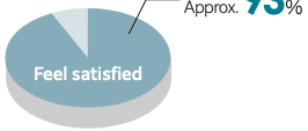
Approx. **9** students per **1** faculty member

• Undergraduates entering graduate schools after graduation
2002-2023 academic year results



73% of all undergraduates
308 Number of graduates 600

• High levels of student satisfaction with campus life



From 10th survey of the student life (2021-2022 academic year)

• Gender ratio for undergraduates
As of May 1, 2023

Faculty of Agriculture **5:5**
Faculty of Engineering **7:3**
All undergraduates **6.5:3.5**

Research

• Number of joint research projects with the private sector per faculty member

No. **1** in Japan
2021-2022 academic year results

• Amount of money received per faculty member for the cost of joint research with the private sector

No. **4** in Japan
2021-2022 academic year results

• QS World University Rankings 2023

Number of citations per faculty: No. **5** in Japan

• QS Asia University Rankings 2023

Overall: No. **20** in Japan
Number of citations per paper: No. **1** in Japan

• QS World University Rankings by Subject 2023

Agriculture & Forestry: No. **2** in Japan

Education

• The Japan University Rankings 2023

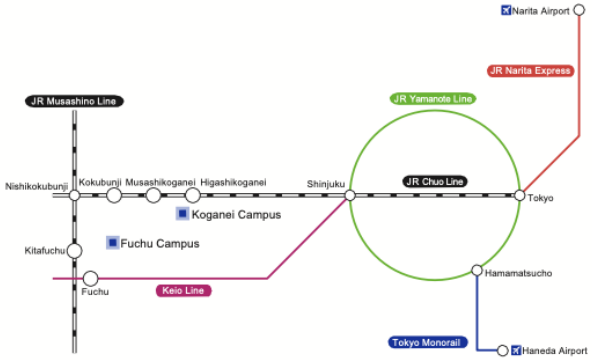
No. **20** overall

Benesse Corporation "The Japan University Rankings"
https://japanuniversityrankings.jp/rankings/total-ranking/

• Overseas partner universities
As of May 1, 2023

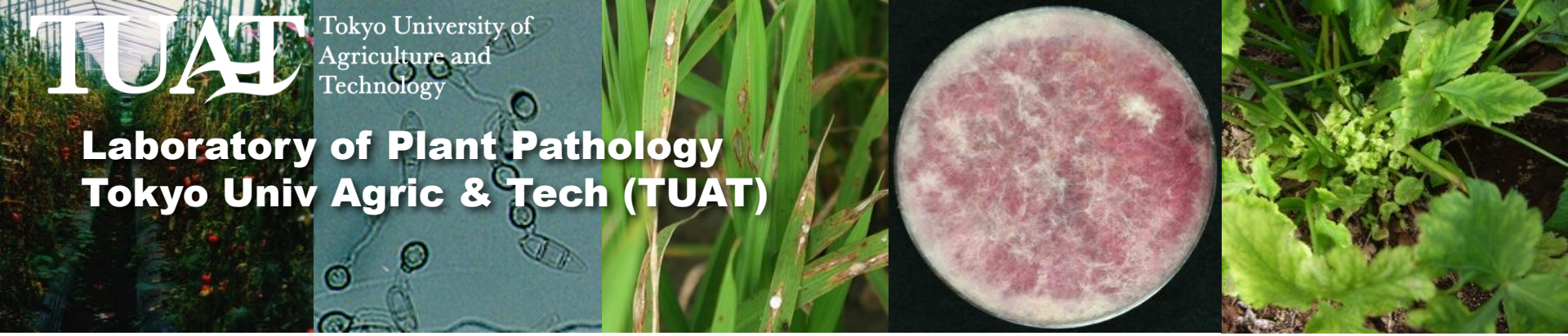
160 universities/institutions
[41 countries/regions]

Access



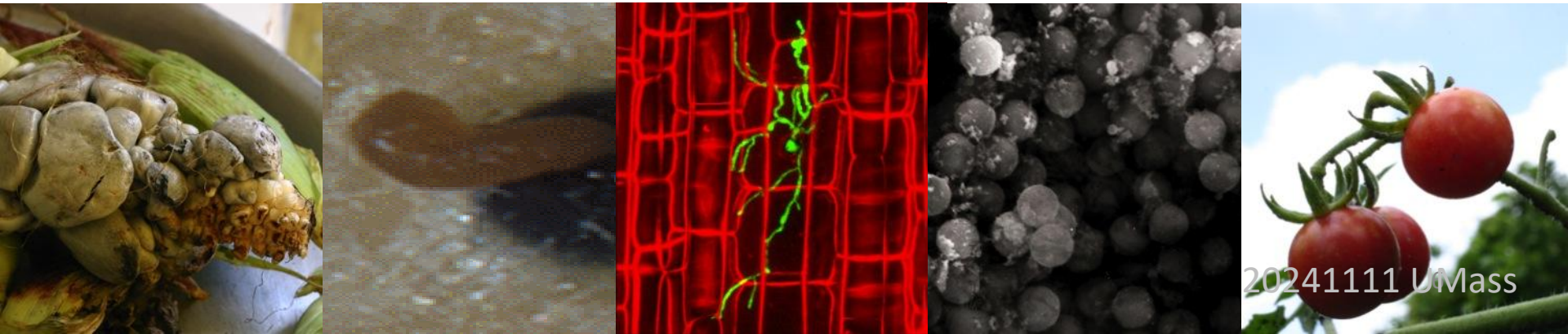

制作　もやしもん製作委員会
2:09.59


柵の中に
入らぬこと
農学部



Genomic and Molecular Studies to Understand the Phytopathogenic Evolution and Epidemic of *Fusarium oxysporum* f. sp. *cubense*

Tsutomu Arie
arie@cc.tuat.ac.jp



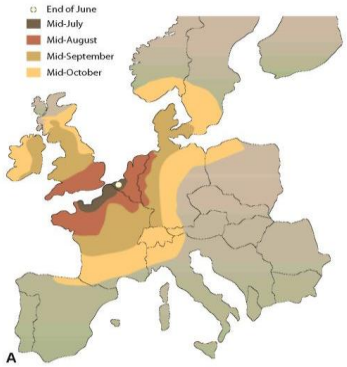
Invasive plant diseases threaten human lives indirectly

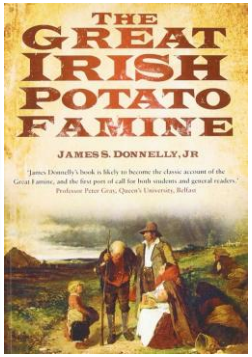
Potato famine

1845–1846

Population : ~1.25 billion

1 million people dead



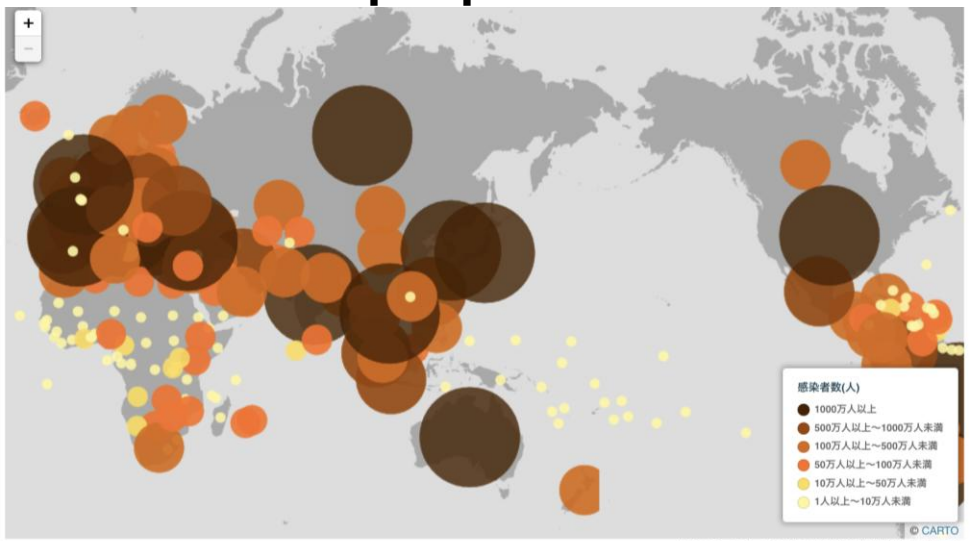


COVID-19

Jan 2020–Mar 2023（NIH）

Population : ~8 billion

6.9 million people dead



※米 ジョンズ・ホプキンス大学の発表をもとに作成

※地図「Natural Earth」から作成

Impact of invasive plant diseases in human history

Table 1.5 Some examples of the impact of plant diseases.

Type of impact	Disease	Agent	Country/region affected
Famine	Late blight of potato	*Phytophthora infestans*	Europe 1845–1846
	Brown spot of rice	*Helminthosporium oryzae*	India 1942–1943
	Cassava bacterial blight	*Xanthomonas campestris* pv. *manihotis*	Zaire 1970–1975
	Failure of maize crop	Maize mosaic virus?	Guatemala, 9th-century Mayan civilization
Economic	Coffee rust	*Hemiliea vastatrix*	Sri Lanka 1870; now worldwide
	Cocoa swollen shoot	CSSV (virus)	Ghana/Nigeria 1930–
	Panama disease of banana	*Fusarium oxysporum* f.sp. *cubense*	Central America 1930–1955
Agricultural	Southern corn leaf blight	*Bipolaris maydis*	USA 1970
	Citrus canker	*Xanthomonas campestris* pv. *citri*	USA 1910– ; South America
Ecological	Dutch elm disease	*Ophiostoma novo-ulmi*	Northern hemisphere 1930, 1970–
	Jarrah die-back	*Phytophthora cinnamomi*	Western Australia 1920–

Lucas (1998)

Examples of recently important invasive plant diseases

- Citrus Greening by *Candidatus* Liberibacter asiaticus
- Dutch Elm by *Ophiostoma ulmi*
- Soybean rust by *Phakopsora* spp.
- White pine blister rust by *Cronartium ribicola*
- Chestnut blight by *Cryphonectria parasitica*
- **Banana new wilt disease by *Fusarium oxysporum* f. sp. *cubense* race TR4 (FWB)**
- Sweet potato foot rot disease by *Phomopsis destruens*
- Tomato yellow leaf curl virus (TYLCV) disease transmitted by whitefly

USDA addresses the invasive plant pests by:

- Encouraging adoption and implementation of integrated pest management (IPM) techniques
- Helping farmers make pest management decisions that are environmentally friendly
- Coordinating invasive species efforts at the national level
- Investing in research to develop trade mechanisms that reduce risk of pest entry
- Developing and maintaining real-time information on invasive pests

Banana is closing to disappearing by the pandemic of invasive New FWB

nature

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NEWS · 19 AUGUST 2019

Alarm as devastating banana fungus reaches the Americas

The region produces most of the world's banana exports – and the fungus affects the most popular commercial variety.

Jonathan Lambert

Bananas are one of Colombia's most important exports. Credit: Luis Acosta/AFP/Getty

RELATED ARTICL

Fungus threatens t banana

Strict EU ruling on g edited crops squeez science

Uganda prepares to bananas

SUBJECTS

Agriculture P

NATIONAL GEOGRAPHIC

https://www.nationalgeographic.com/environment/2019/08/banana-fungus-latin-america-threatening-future.html

ENVIRONMENT

The banana is one step closer to disappearing

A fungus that devastates banana plants has now arrived in Latin America, the Colombian government confirms.

BY MYLES KARP

PUBLISHED AUGUST 12, 2019

A fungus that has wreaked havoc on banana plantations in the Eastern Hemisphere has, despite years of preventative efforts, arrived in the Americas.

ICA, the Colombian agriculture and livestock authority, confirmed on Thursday that laboratory tests have positively identified the presence of so-called Panama disease Tropical Race 4 on banana farms in the Caribbean coastal region. The announcement was accompanied by a declaration of a national state of emergency.

The discovery of the fungus represents a potential impending disaster for bananas as both a food source and an export commodity. Panama disease Tropical Race 4—or TR4—is an infection of the banana plant by a fungus of the genus *Fusarium*. Although bananas produced in infected soil are not unsafe for humans, infected plants eventually stop bearing fruit.

AGRICULTURE

Banana growers fight renewed extinction risk as lethal fungus spreads

Resurgence of Panama disease threatens one of world's most valuable crops

Bananas are displayed at a shop in Halle, Belgium. Eaten across the world, the fruit is grown in the tropics, from Southeast Asia to Latin America. © Reuters

KOJI KATO, Nikkei science editor
August 8, 2022 00:27 JST

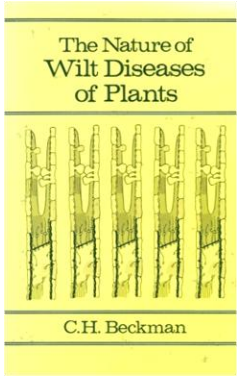
TOKYO -- Decades after decimating banana plants worldwide, Panama disease once again threatens to wipe out the crop key to economies across Asia, Latin America and beyond.

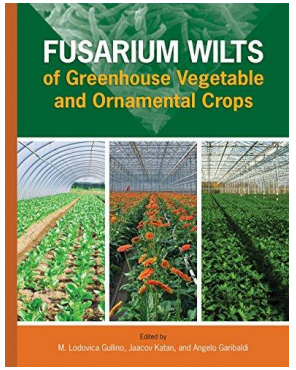
The genus *Fusarium*

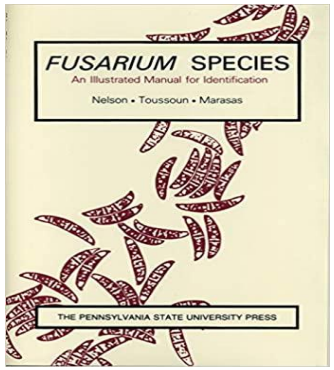
Fungi/Ascomycota/Sordariomycetes/Hypocreales/Nectriaceae

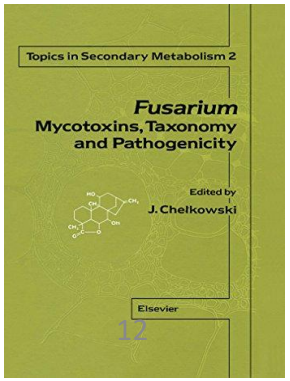
Ascomycota
Perfect stage: *Nectria*、*Gibberella*等
More than 100 species
Classification is currently undergoing
(*F. oxysporum* species complex, etc.)

Mycoprotein（*F. venenatum*）
Biocontrol agent（NPF）
Animal pathogen (as MRL 8996)
Plant pathogens
F. oxysporum (as Fol 4287)
F. solani
F. fujikuroi
F. graminearum→mycotoxin









Fusarium oxysporum

Fusarium oxysporum (species)

forma specialis (f. sp., forms)

taxonomy based on host plant species

f. sp. *cubense* (Banana wilt, or, Panama disease)

f. sp. *lycopersici* (Tomato wilt)

f. sp. *conglutinans* (Cabbage yellows)

、、、 (more than 120 forms)

Race

taxonomy based on host plant varieties

race 1 (Incompatible cv. Cavendish)

race 2 (Incompatible cv. Cavendish, endemic in CA)

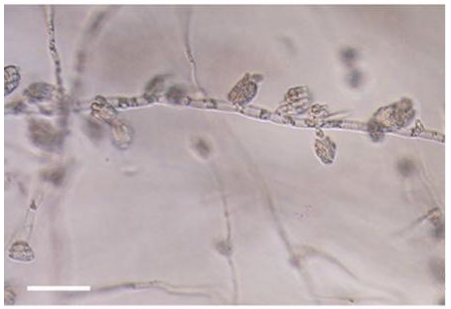
race 4 (Compatible cv. Cavendish)

race SR4 (Sub-tropical race 4, weak pathogenicity)

race TR4 (Tropical race 4, strong pathogenicity)

***F. oxysporum* f. sp. *cubense* race TR4:New FWB fungus**

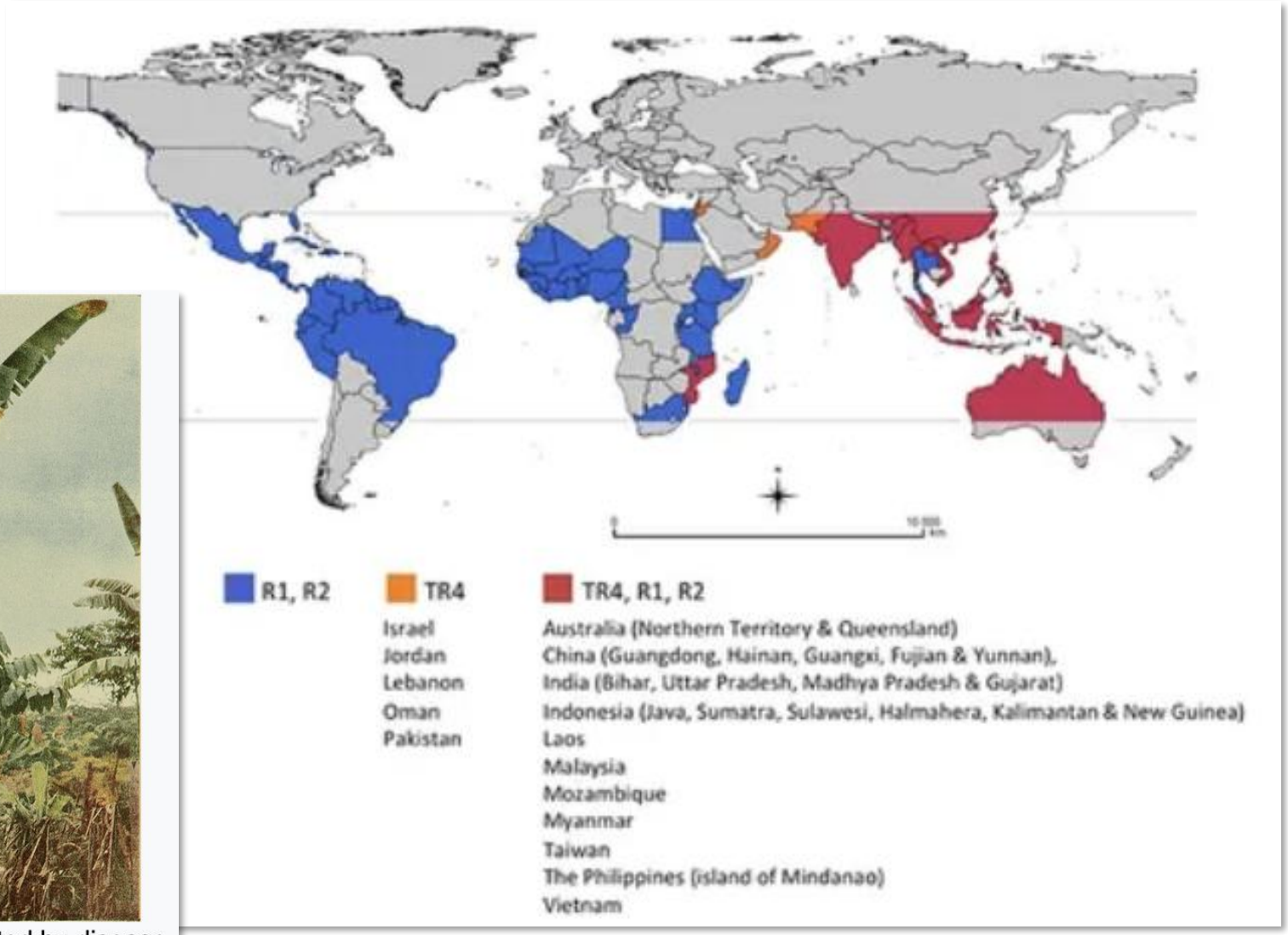
Fusarium oxysporum f. sp. *cubense* (*Foc*) the pathogen of Fuasrium wilt (FWB)



Soilborne pathogen
Difficult to control

The pandemic history of FWB

Gros Michel banana affected by disease, Costa Rica, 1919 Wiki



Dita M et al. (2018) Front Plant Sci 9:1468

Switching to resistant variety Cavendish

cv. Gros Michel

Race 1

Race SR4

Race TR4

cv. Cavendish

(resistant to race 1)

Ohho Express

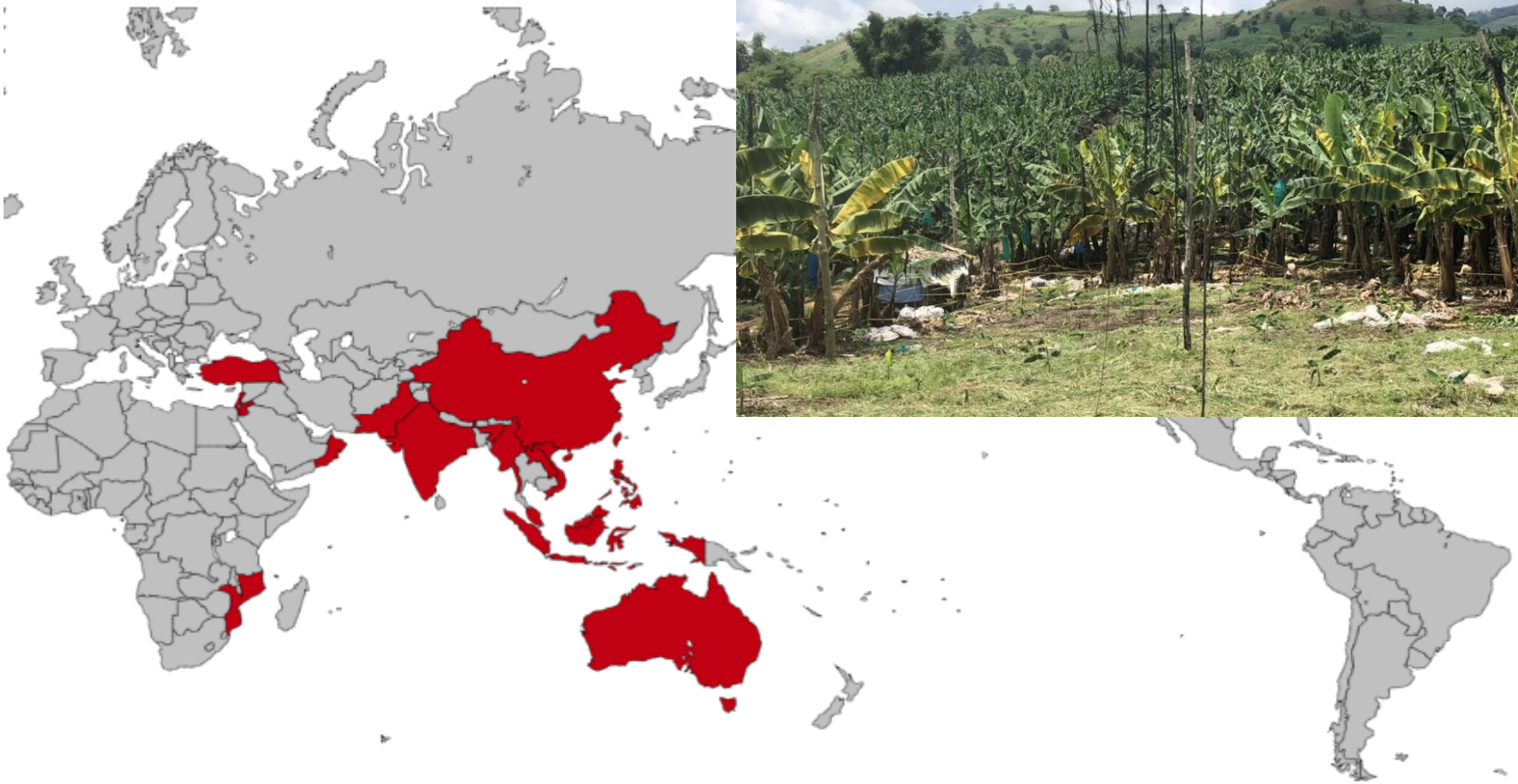
~~Race 1~~

Race SR4 **(weak pathogenicity)**

Race TR4 **(strong pathogenicity)**

The Pandemic of New FWB

Fusarium oxysporum f. sp. *cubense* race TR4



How is *Foc* transmitted?

Transmission through

- Soil
- Air
- Water (Flood, irrigation)
- Human foot and equipment
- Seedling plants

Countermeasures (Similar to those for COVID-19)

- Isolation of fields
- Sanitary management (Shoes, Equipment)
- Prohibition of movement of Seedlings, Fruits, Residues
- Pathogen-free seedlings
- Soil disinfection, etc.

New FWB has arrived in South America (Colombia)

2019

Science Contents News Careers Journals

SHARE 6K 62

Monocultures of the Cavendish banana variety are highly susceptible to *Fusarium*. ISTOCK.COM/MG81

Devastating banana disease may have reached Latin America, could drive up global prices

By Erik Stokstad | Jul. 17, 2019 , 2:20 PM

https://www.sciencemag.org/news/2019/07/devastating-banana-disease-may-have-reached-latin-america-could-drive-global-prices

NATIONAL GEOGRAPHIC

The banana is one step closer to disappearing

A fungus that devastates banana plants has now arrived in Latin America, the Colombian government confirms.

Science AAAS

Colombia confirms that dreaded fungus has hit its banana plantations

By Sabine Galvis | Aug. 12, 2019 , 4:25 PM

New FWB has arrived in South America (Piura, Peru)

gob.pe

MIDAGRI (/midagri) < News (/busquedas?contenido%5B%5D=noticias&institucion=senasa)

National Agrarian Health Service of Peru (/senasa)
Ministry of Agrarian Development and Irrigation (/midagri)

SENASA confirms outbreak of Tropical Fusarium Race 4 in Piura

Press release

Photos: Senasa

April 12, 2021 - 8:47 am

After the SENASA phytosanitary surveillance system detected a suspected case of Tropical Fusarium Raza 4, the Ministry of Agrarian Development and Irrigation began the immediate execution of phytosanitary measures to control the outbreak and thus protect the national production of bananas and plantains that spreads in the national territory, with an area of 170,000 hectares.

The results of the samples evaluated at the SENASA Plant Health Diagnosis Center confirm the presence of *Fusarium oxysporum* f. sp. *cubense* Race 4 Tropical (Foc R4T) on a 0.5 hectare plot, located in the district of Querecotillo, in the province of Sullana, department of Piura.

Through Chief Resolution No. 0048-2021-MIDAGRI-SENASA, published in the Official Gazette El Peruano, the entire national territory has been declared a state of

COMUNICADO Nº02 2021

El Servicio Nacional de Sanidad Agraria – SENASA, pone en conocimiento lo siguiente:

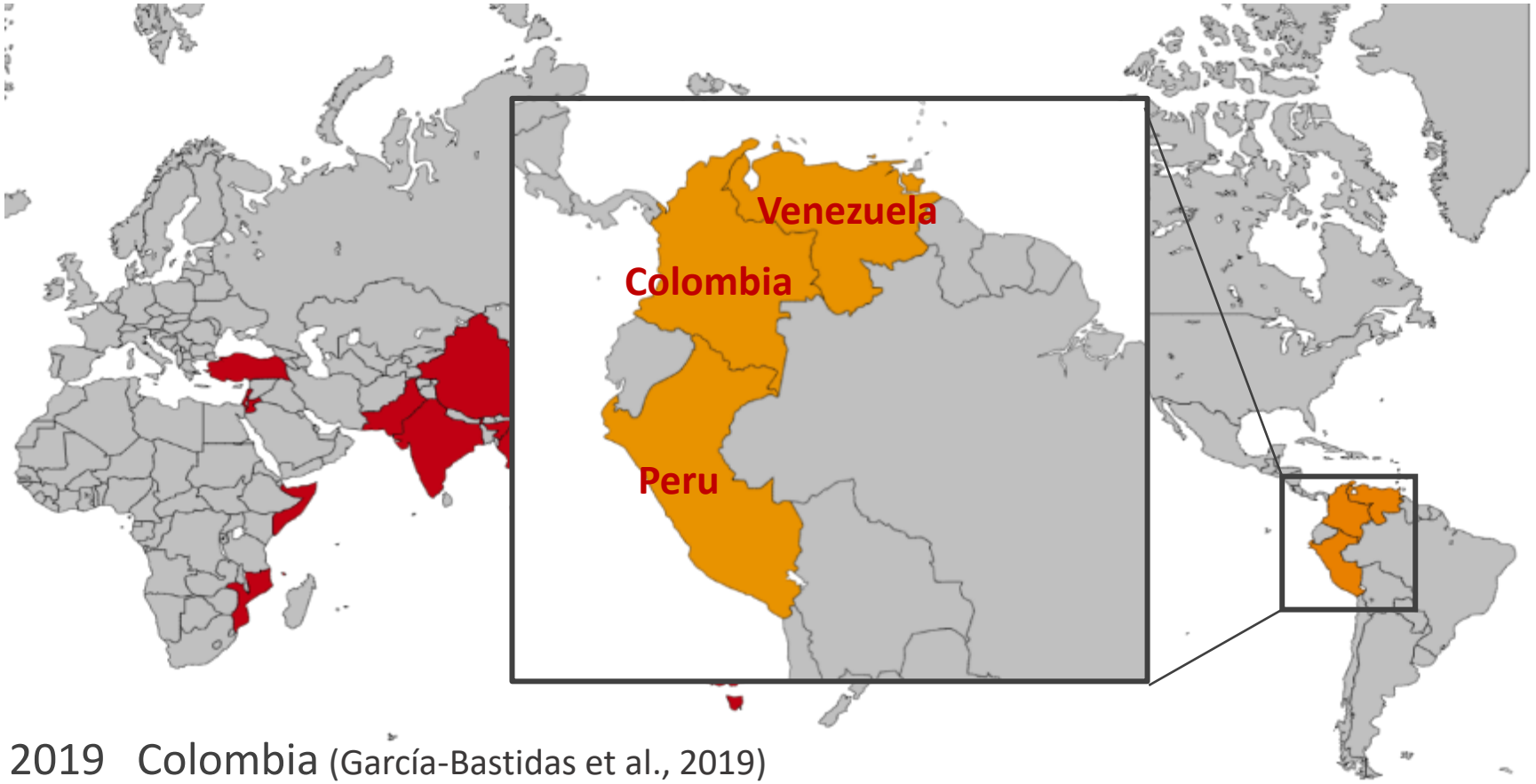
1. Mediante comunicado de fecha 08 de abril de 2021, el SENASA hizo de conocimiento de la posible presencia de *Fusarium oxysporum* f. sp. *cubense* Raza 4 Tropical (Foc R4T) en una parcela de 0.5 ha en el distrito de Querecotillo, provincia de Sullana, departamento de Piura.
2. La Unidad del Centro de Diagnóstico de Sanidad Vegetal del SENASA, ha emitido resultado POSITIVO a las pruebas de PCR y Secuenciamiento para esta plaga FocR4T.
3. Mediante Resolución Jefatural Nº 048-2021-MIDAGRI-SENASA, se ha dispuesto la emergencia fitosanitaria nacional para la ejecución de acciones de vigilancia, control y erradicación de la mencionada plaga, poniendo mayor énfasis en las principales regiones productoras de banano y plátano.
4. El hongo Foc R4T no afecta a la salud humana, por lo que el consumo de plátano y banano es seguro e inocuo para la población.
5. El hongo Foc R4T no se viabiliza a través de la fruta del banano o plátano; por lo que no debería haber impactos negativos a las exportaciones de esta fruta.
6. El SENASA cuenta con un adecuado sistema de vigilancia, diagnóstico de laboratorio y un plan de control que permita atender en forma eficaz y eficiente este foco.
7. Finalmente, se recomienda a los productores de plátano/banano, evitar llevar material vegetal (plantones o hijuelos) a sus parcelas e implementar medidas fitosanitarias con énfasis en bioseguridad, acorde a las recomendaciones del SENASA.

Lima, 12 de abril de 2021

PERÚ Ministerio de Desarrollo Agrario y Riego — SENASA PERU — BICENTENARIO PERÚ 2021

New FWB has arrived in South America (Venezuela)

2023



2019 Colombia (García-Bastidas et al., 2019)

2021 Peru (Acuña et al., 2020)

2023 Venezuela (Herrera et al., 2023)

Countermeasures in Peru

¿Qué es Fusarium Raza 4 Tropical – Foc R4T?

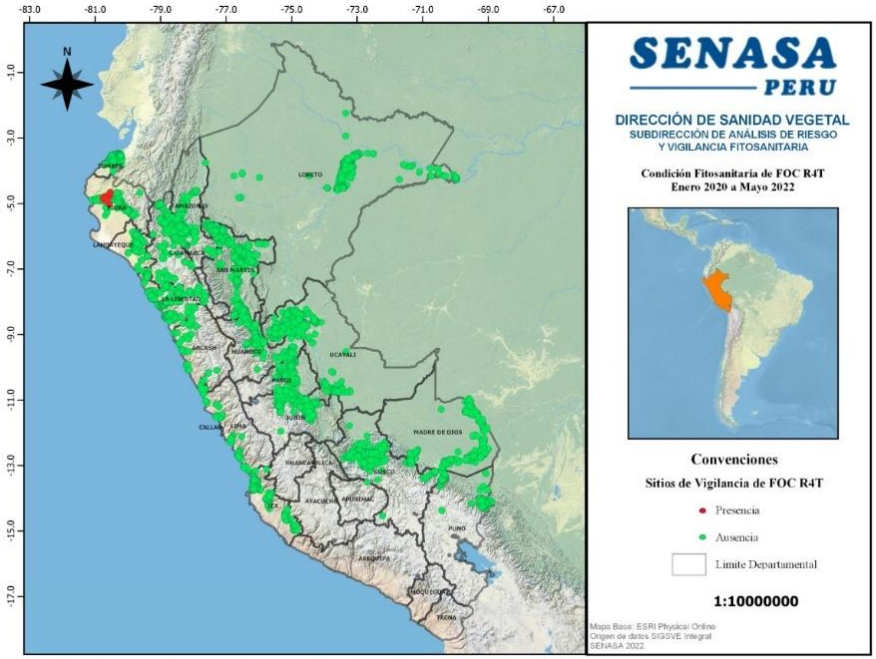


- ✓ Hongo del suelo que sobrevive por décadas.
- ✓ No tiene control químico eficaz.
- ✓ Afecta todas las variedades de banano y plátano.
- ✓ Causa marchitez hasta la muerte de la planta.
- ✓ No existen variedades comerciales resistentes ni tolerantes.
- ✓ No afecta la fruta ni a las exportaciones.
- ✓ No afecta la salud humana.

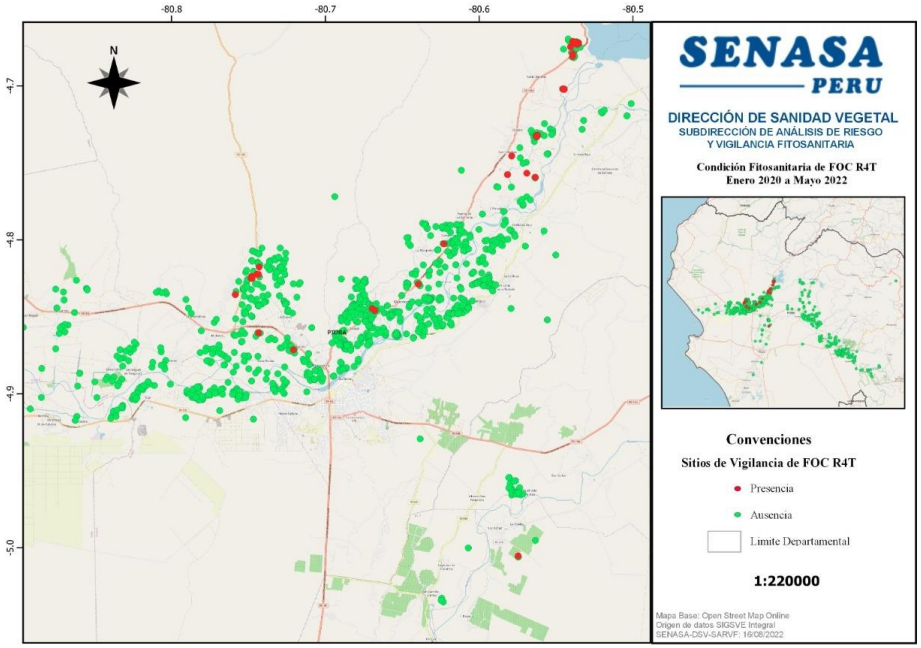
Countermeasures in Peru

Foc R4T - Piura - Perú - 2022

Mapa de sitios de prospección y positivos a Foc R4T a nivel nacional (2021 – 2022)

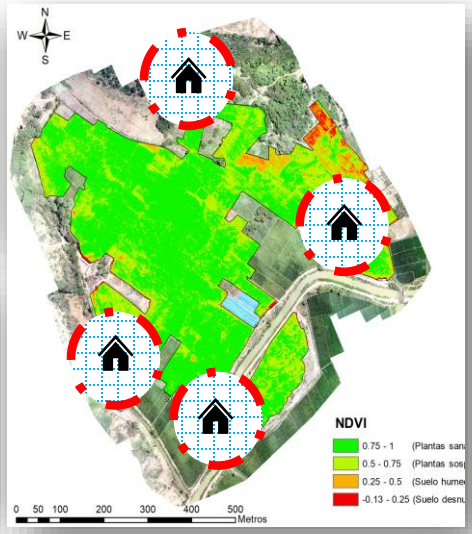


Ubicación de reportes positivos a Foc R4T (Sullana – Piura) (Abril 2021 – Agosto 2022)



Countermeasures in Peru

Contención – manejo de Foc R4T en Piura



PERÚ Ministerio de Desarrollo Agrario y Riego

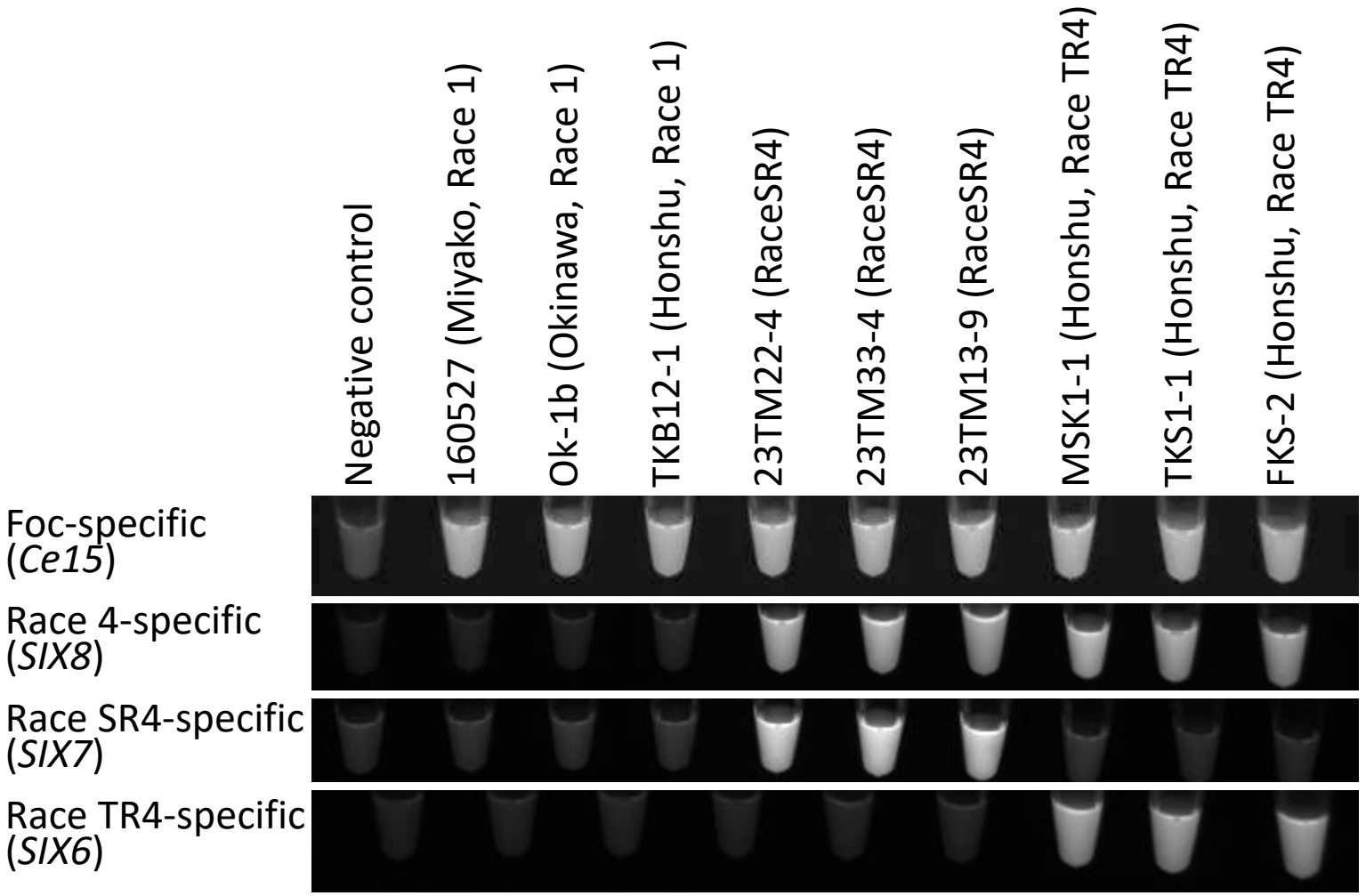
SENASA PERU

BICENTENARIO PERÚ 2021

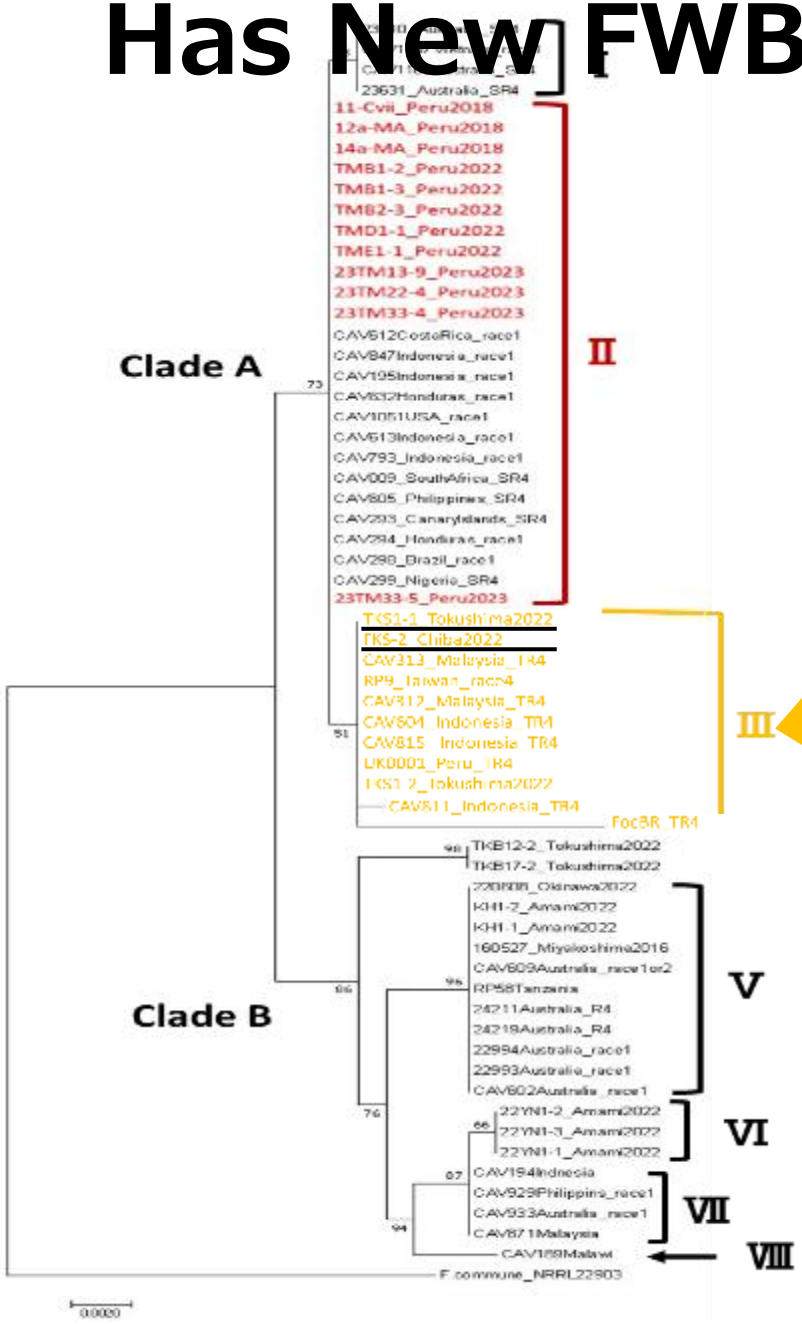
Has New FWB arrived in Japan?

Has New FWB arrived in Japan?

Diagnose by LAMP using TR4-specific primer set



Has New FWB arrived in Japan?



The pathogen of the FWB found in Honshu, Japan, is in the same cluster III as race TR4 (the new FWB pathogen) reported overseas

Has New FWB arrived in Japan?

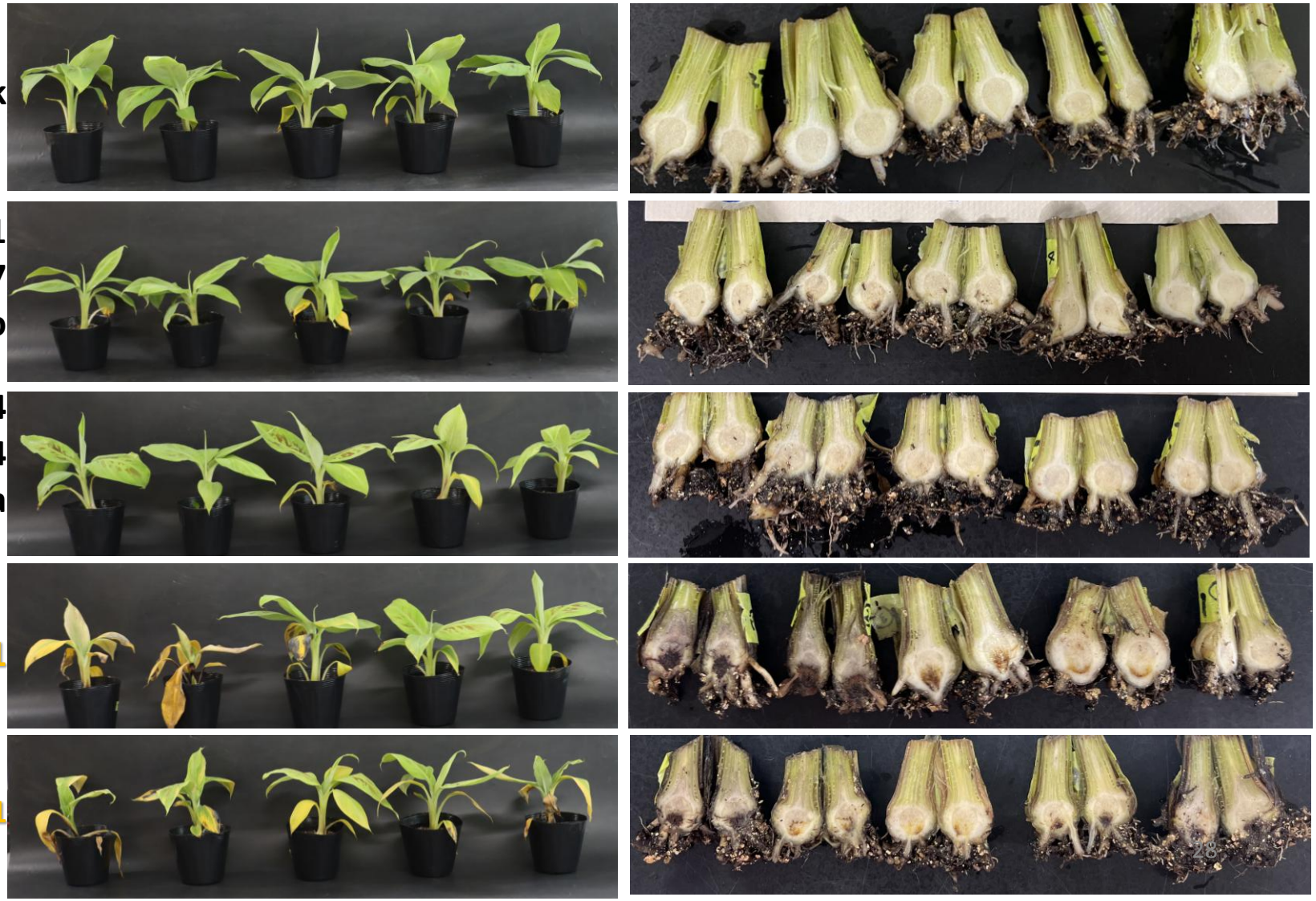
cv. Cavendish

Mock

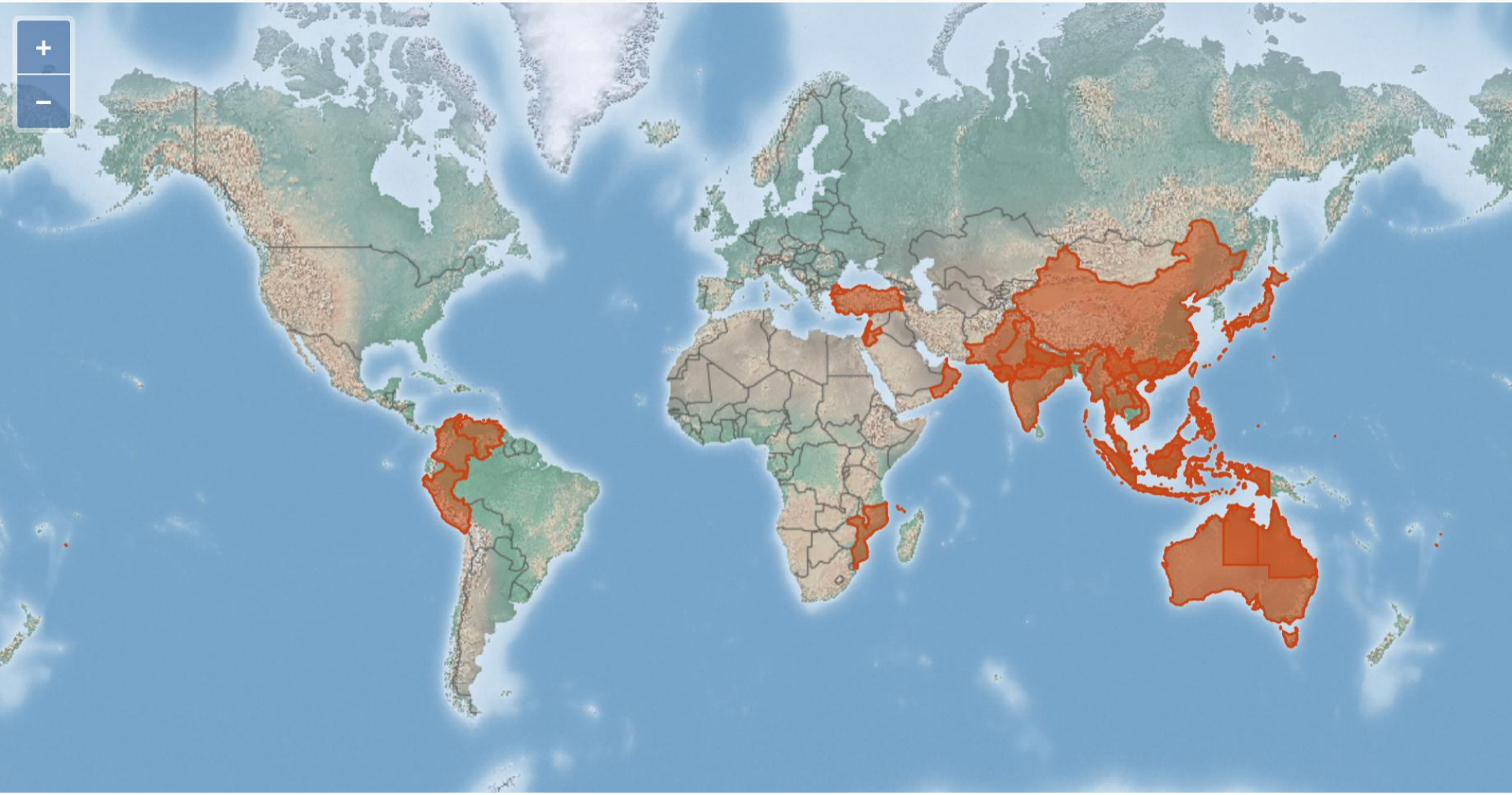
Race 1
160527
Miyako

Race SR4
23TM22-4
Tingo Maria

Race TR4
TKS1-1
MAS1-1



The Pandemic of New FWB



https://www.cabidigitallibrary.org/doi/full/10.1079/cabicompendium.59074053#REF-DDB-206236

A JST/JICA SATREPS Project

Establishment of an Alert System for *Fusarium oxysporum* f. sp. *cubense*, the Banana and Plantain Wilt Pathogen, and Mitigation of the Disease

Japan

Tokyo University of Agriculture and Technology (TUAT)

Japan International Research Center for Agricultural Science (JIRCAS)

Tottori University (TU)

Peru

Universidad Nacional Agraria La Molina (UNALM)

Instituto Nacional de Innovación Agraria (INIA)

Universidad Nacional Agraria de La Selva (UNAS)

Cooperative institution

RIKEN Institute of Physical and Chemical Research (RIKEN)

Funding institutions

Japan Science and Technology Agency (JST)

Japan International Cooperation Agency (JICA)

Research objectives

Peru

Low environmental impact
"Comprehensive wilt control package"

1. Diagnosis and warning system for FWB
2. FWB-tolerant variety of banana by mutation
3. Pathogen-free seedling production
4. Microbiota in disease-suppressive soil
5. Novel biological control

↓

Establishment of molecular diagnostic lab
Establishment of good agricultural practices
Training of experts and farmers

↓

Stable (organic) banana production
Improvement of farmers' standard of living
Training of young researchers

Worldwide

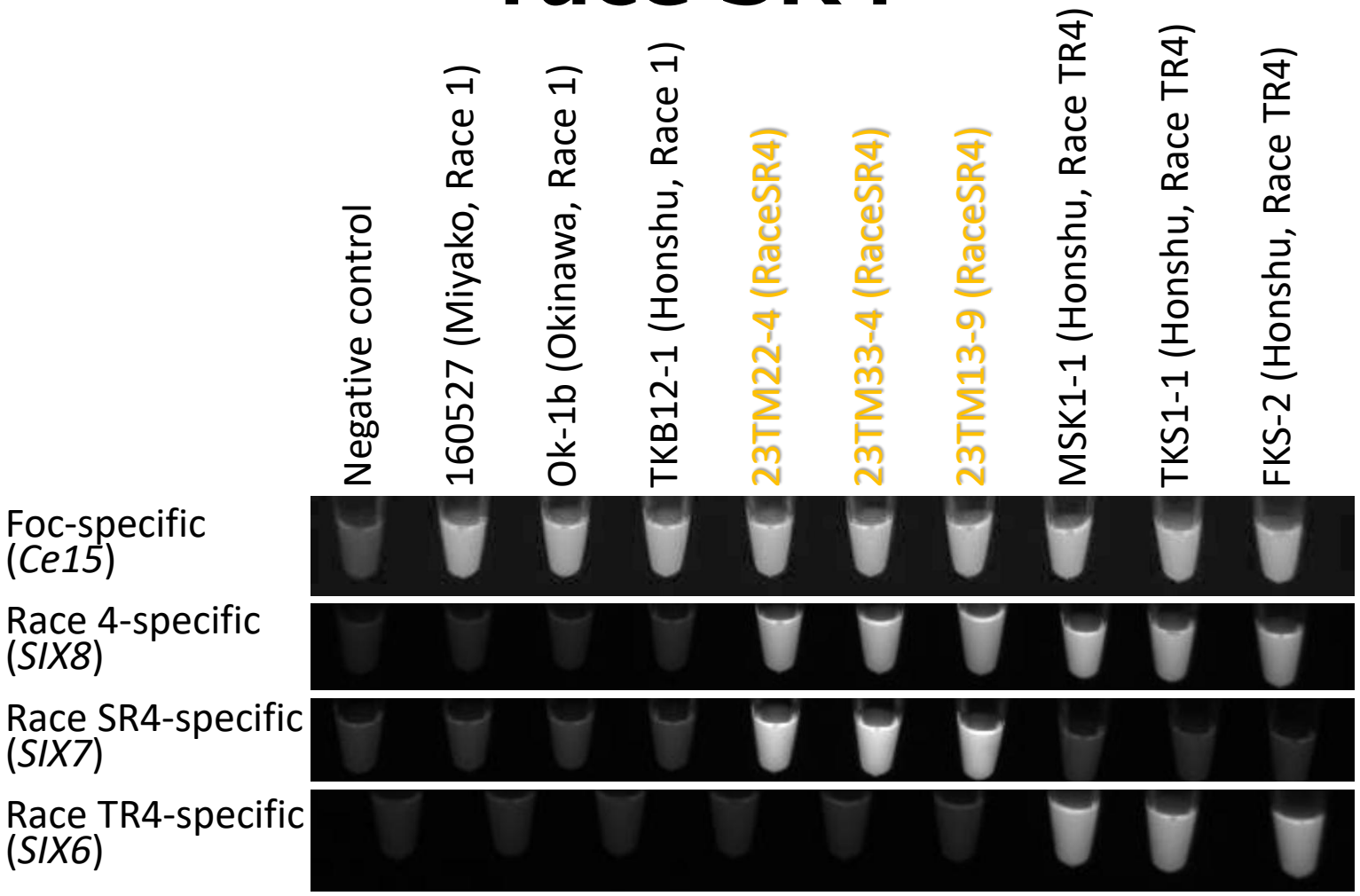
Stable production of organic bananas, human resource development

Selva, Peru: Research location

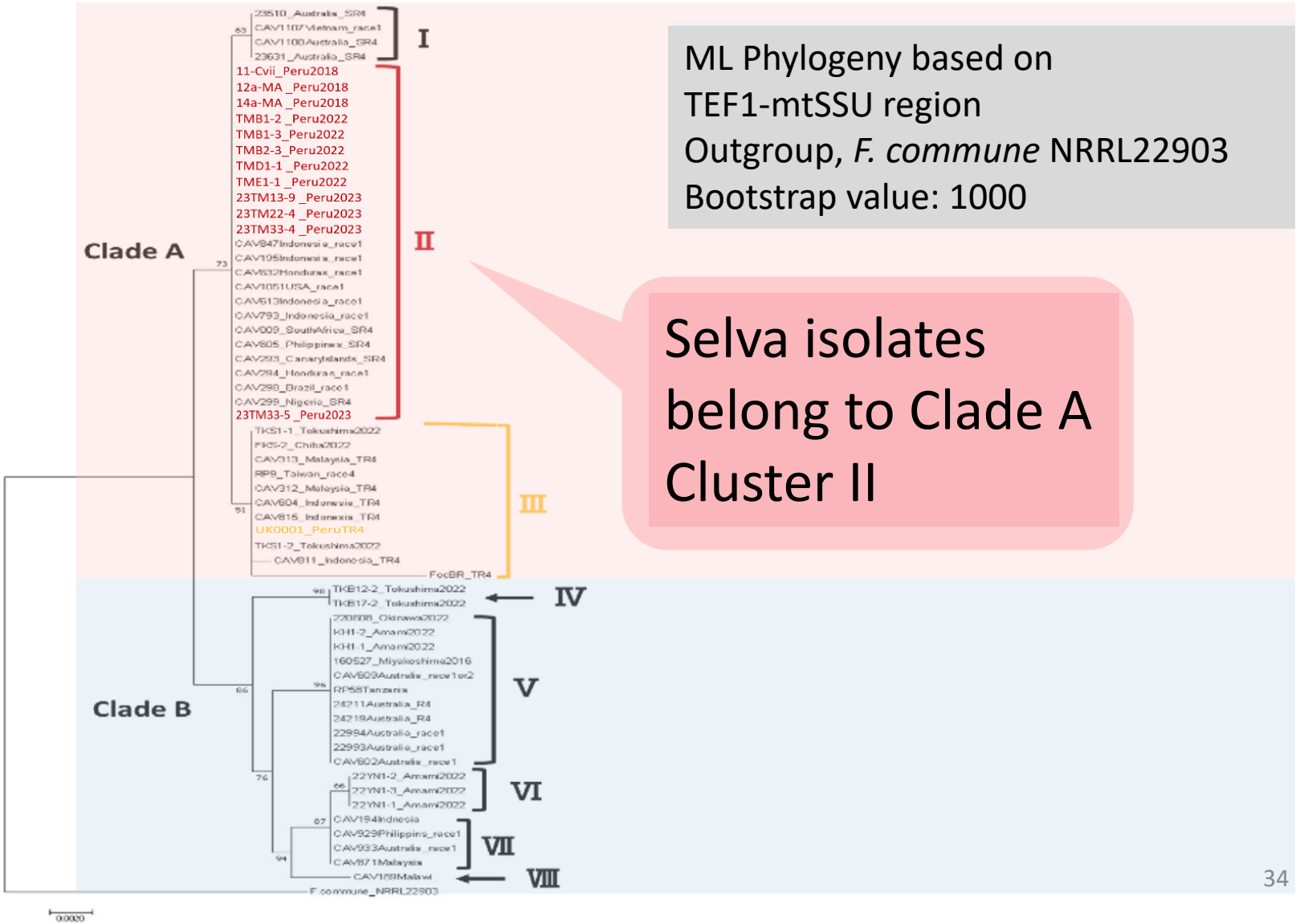
Piura area
TR4

Institutes
Blue green : Selva region
Fields
Laboratories

The *Foc* in the Selva region is race SR4



The *Foc* in the Selva region is race SR4

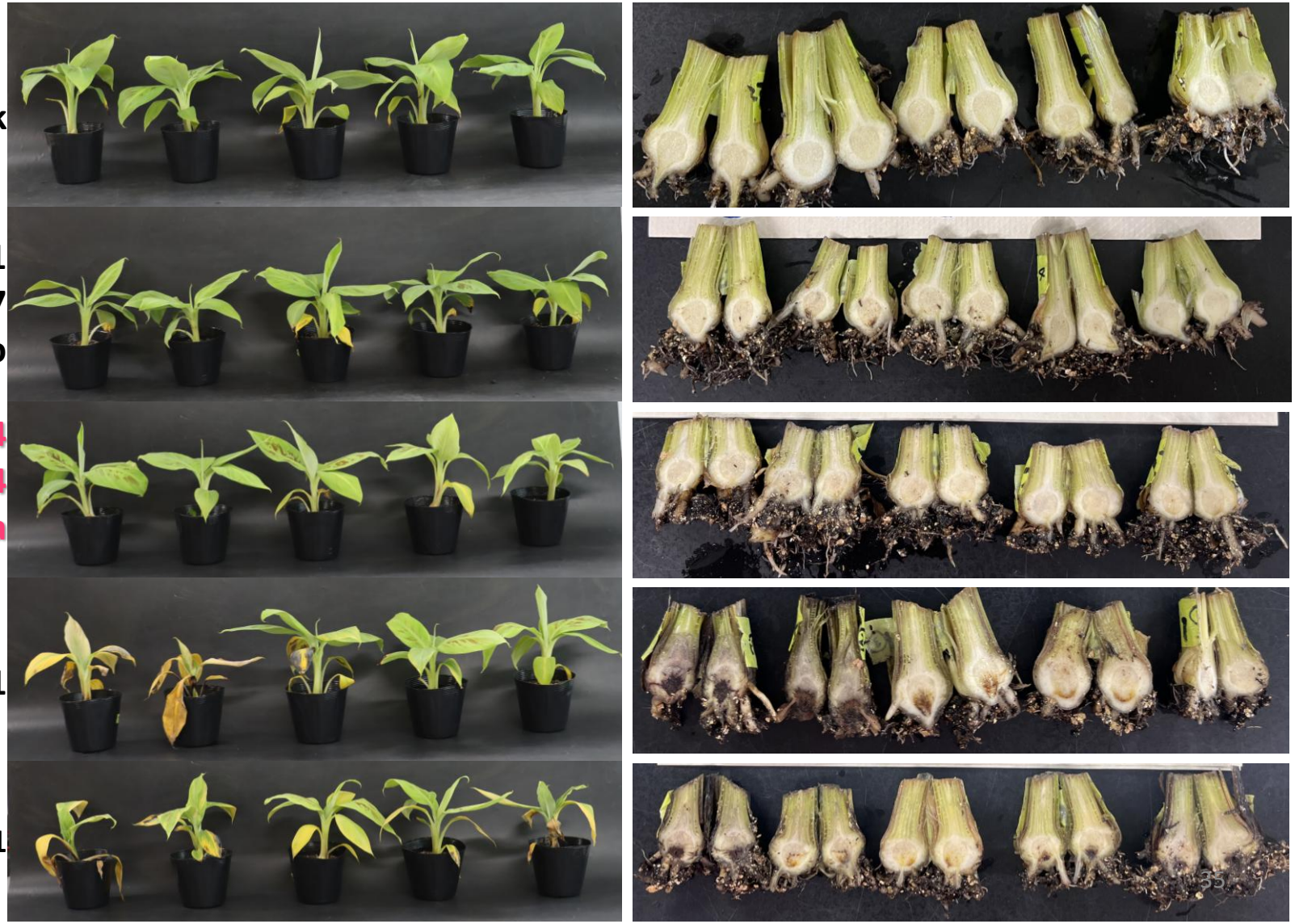


ML Phylogeny based on
TEF1-mtSSU region
Outgroup, *F. commune* NRRL22903
Bootstrap value: 1000

Selva isolates belong to Clade A Cluster II

The *Foc* in the Selva region is race SR4

cv. Cavendish

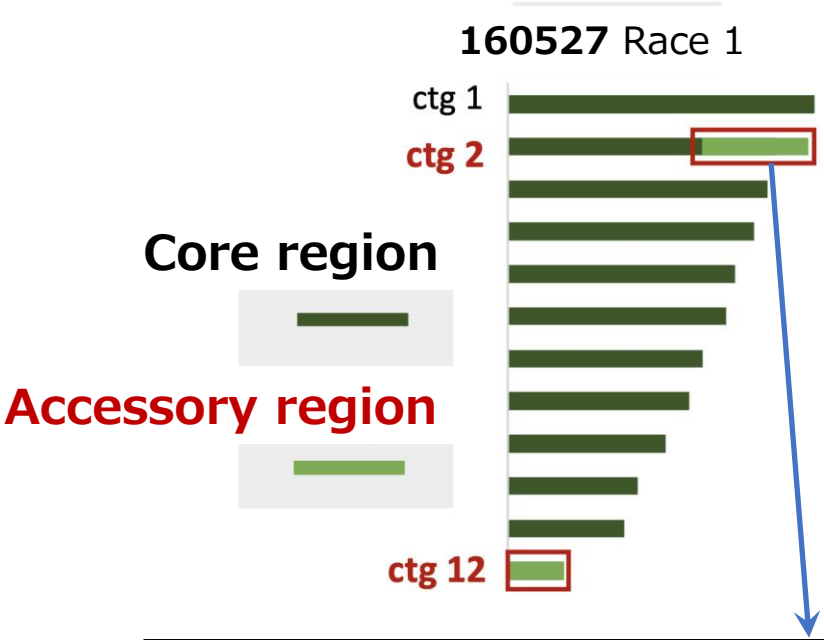


The *Foc* in the Selva region is race SR4

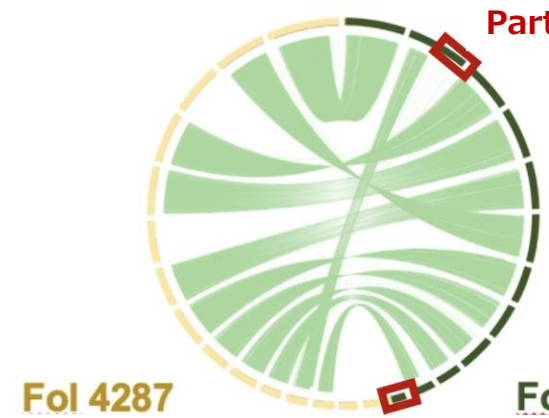
		SIX genes											
		SIX1a	*SIX1b-g*	*SIX2a-d*	*SIX4a-b*	*SIX6a*	*SIX6b*	*SIX7a*	*SIX8a*	*SIX8b*	*SIX9a*	*SIX13a*	*SIX13e*
Czislowski et al., 2018	TR4	+	+	+	+	+	−	−	+	+	+	+	+
	SR4	−	+	+	+	−	−	+	+	+	+	−	−
	R1	−	+	−	+	−	+	−	−	−	+	+	−
Isolates	3a-SE	−	+	+	+	−	−	+	+	+	+	−	−
	12a-MA	−	+	+	+	−	−	+	+	+	+	−	−
	14a-MA	−	+	+	+	−	−	+	+	+	+	−	−
	TMB1-2	−	+	+	+	−	−	+	+	+	+	−	−
	TMB1-3	−	+	+	+	−	−	+	+	+	+	−	−
	TMB2-3	−	+	+	+	−	−	+	+	+	+	−	−
	TMD1-1	−	+	+	+	−	−	+	+	+	+	−	−
	TME1-1	−	+	+	+	−	−	+	+	+	+	−	−
	23TM13-9	−	+	+	+	−	−	+	+	+	+	−	−
	23TM22-4	−	+	+	+	−	−	+	+	+	+	−	−
	23TM33-4	−	+	+	+	−	−	+	+	+	+	−	−
	23TM33-5	−	+	+	+	−	−	+	+	+	+	−	−

Accessory chromosomes in *Foc*

Core genomic region: essential for life activities, common among strains
Accessory genomic region: not essential for life activities, despesable, can be deleted, involved in pathogenicity and host determination

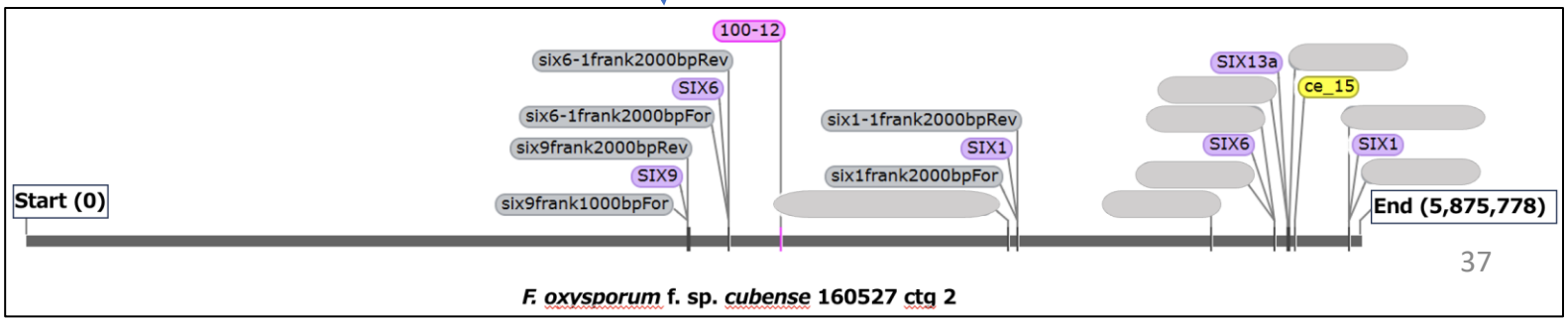


Comparison of the genome between FWB and the tomato wilt fungus



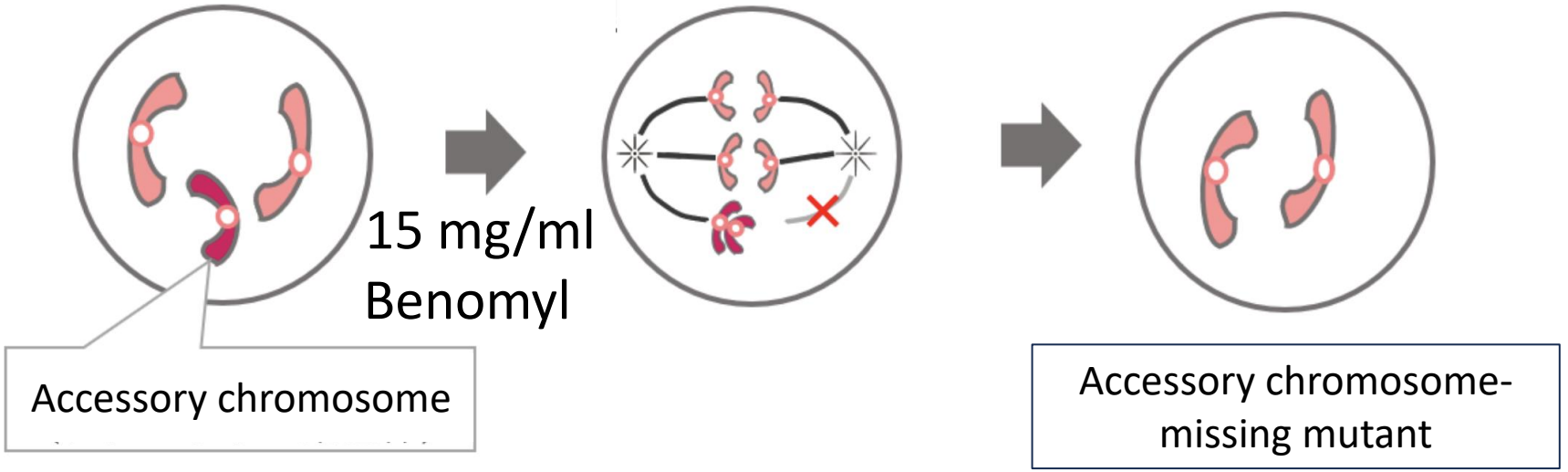
Fol 4287
Tomato wilt fungus

Foc 160527
Banana wilt fungus
Race 1



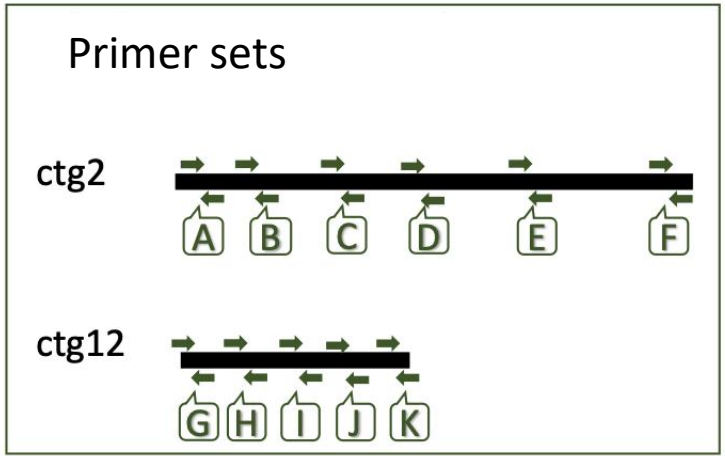
Generation of accessory chromosome-missing mutants

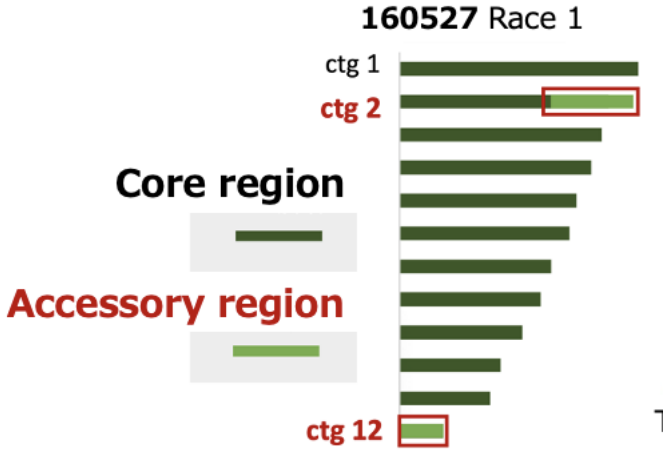
Accessory chromosome deletion mutants can be generated by treatment with a tubulin Polymerization Inhibitor, mitosis inhibitor benomyl (VanEtten 1998)

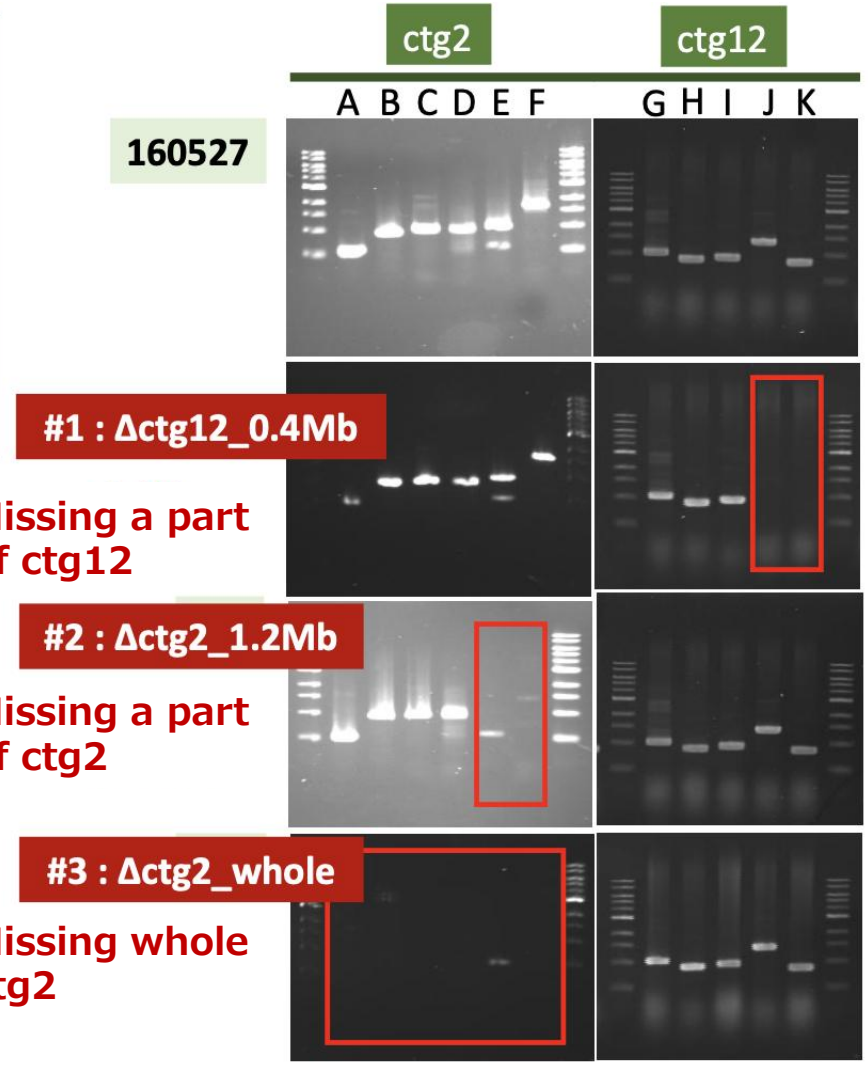


We have obtained three accessory chromosome-missing mutants (Matsui 2022)

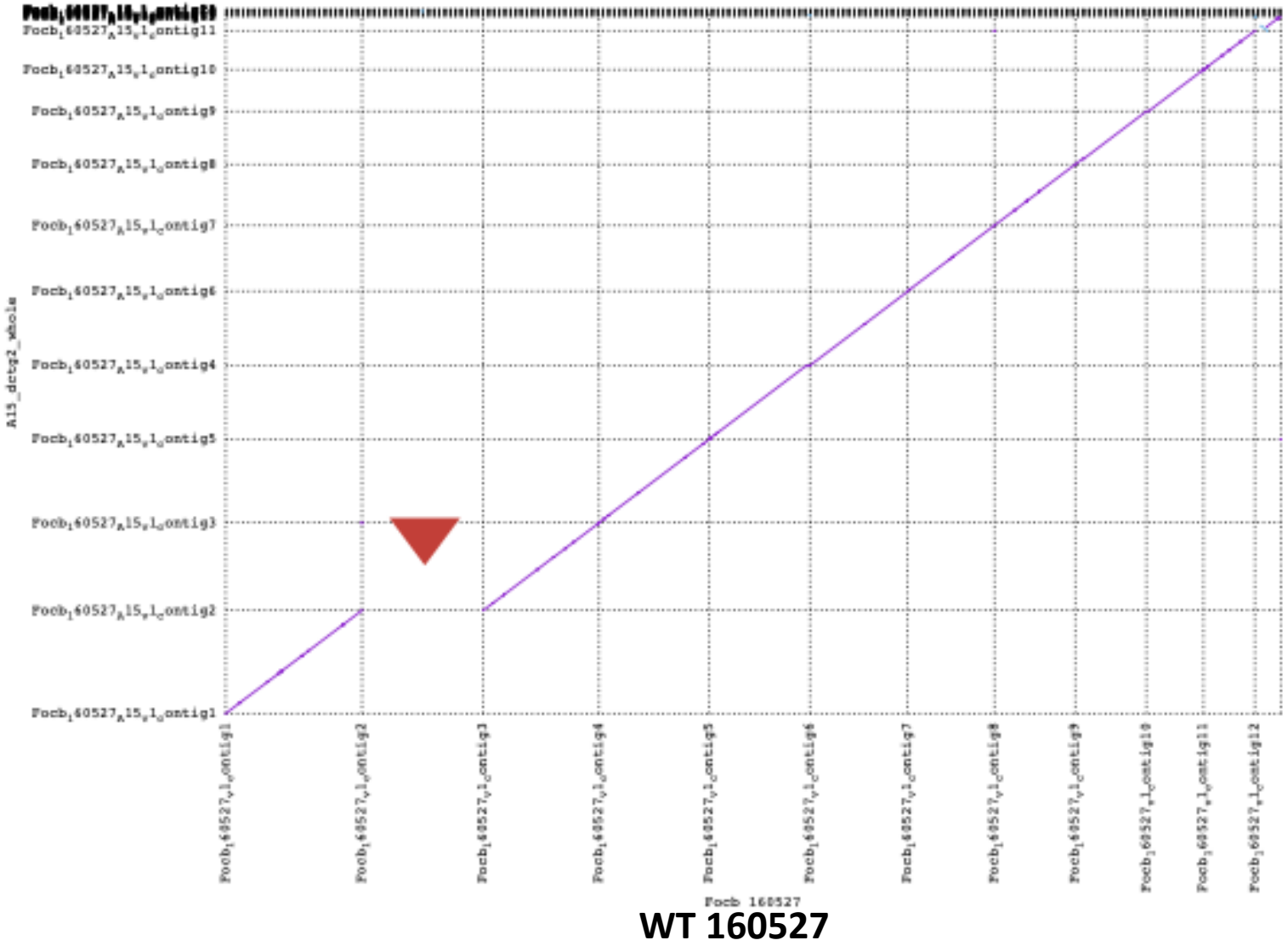
Generation of accessory chromosome-missing mutants



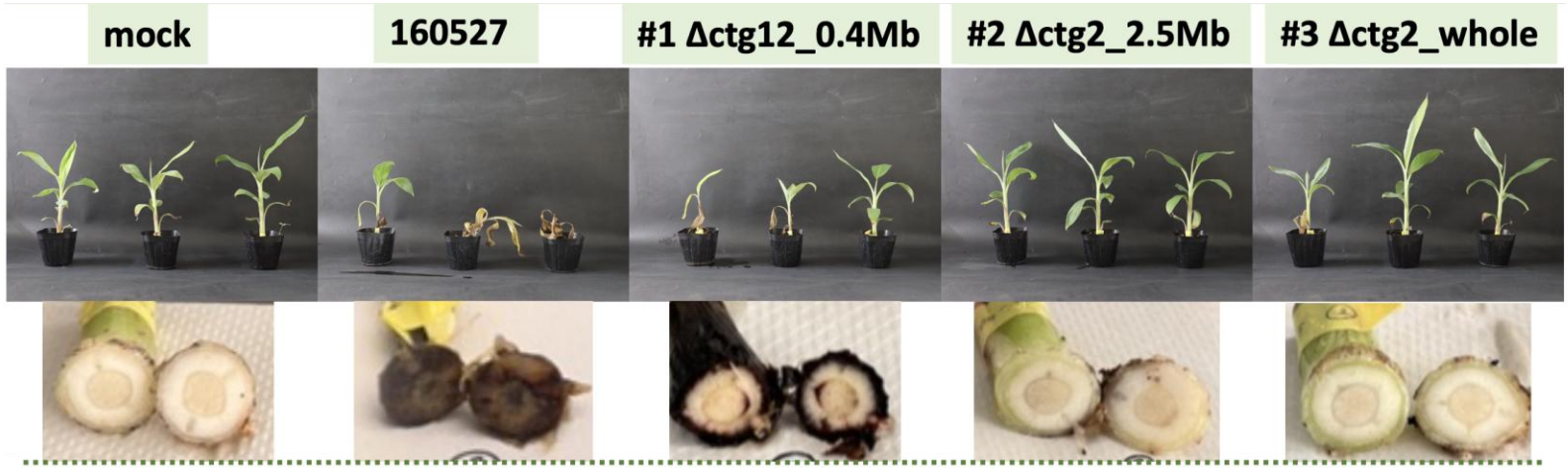


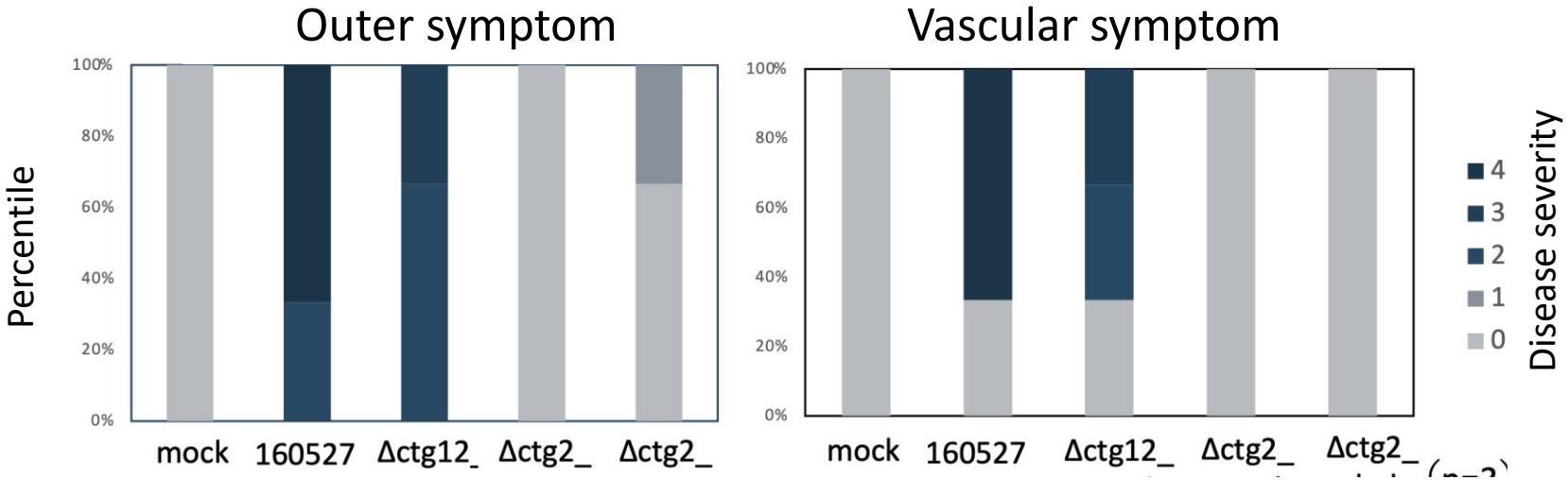


Generation of accessory chromosome-missing mutants



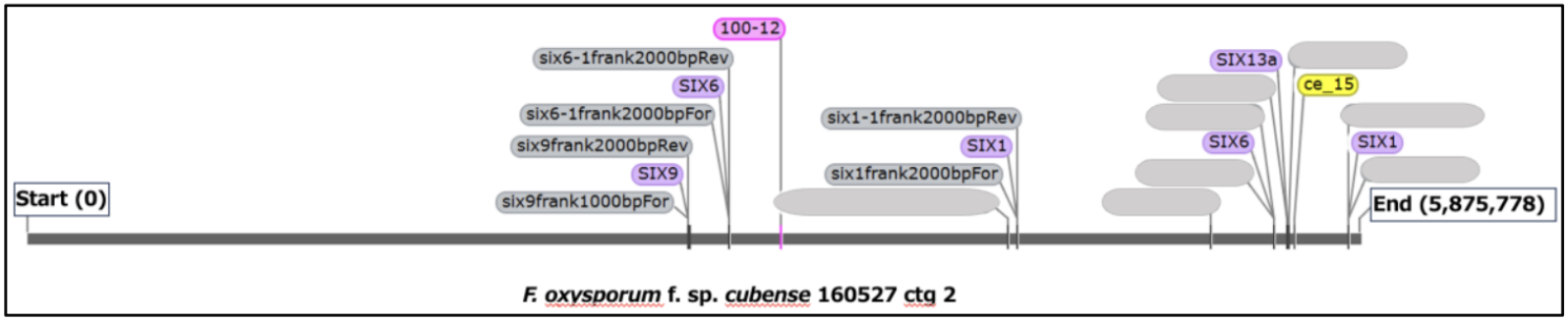
Ctg2-missing mutants lost pathogenicity





ctg2 is responsible for pathogenicity on banana

Development of LAMP primers for *Foc*- and its races-specific diagnosis



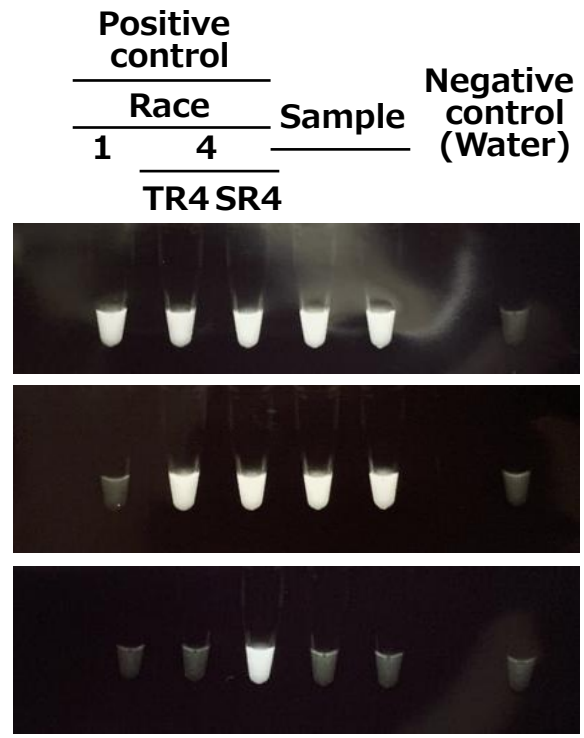
Putative virulence-related genes on accessory chromosomes

Retention patterns of *SIX* genes homologous to the tomato wilt fungus effector genes group in each race of *Foc*

Race	*SIX* genes													
	SIX1	*SIX2*	*SIX3*	*SIX4*	*SIX5*	*SIX6*	*SIX7*	*SIX8*	*SIX9*	*SIX10*	*SIX11*	*SIX12*	*SIX13*	*SIX14*
Race 1	d,f	-	-	b	-	b	-	-	a	-	-	-	a	-
Race SR4	g	d	-	a	-	-	a	a,b	a	-	-	-	-	-
Race TR4	a,h,i	c	-	a	-	a	-	a	a	-	-	-	a,e	-

Development of LAMP primers for *Foc*- and its races-specific diagnosis

Fusarium oxysporum f. sp. *cubense*	*Ce15*	*SIX8*	*SIX7*	*SIX6*
Race 1	+	—	—	—
Race SR4	+	a,b	a	—
Race TR4	+	a	—	+
Other forms	—	±	±	±



→Available in the market From Nippon-Gene company

Demonstrations and training on molecular diagnostic methods

Biocontrol of FWB using a nonpathogenic *Fusarium*

Control

Nonpathogenic *Fusarium* sp. W5

We are now testing vaccinated seedlings in which rhizosphere is colonized with a biocontrol agent, nonpathogenic *Fusarium* sp. W5

The nonpathogenic Fusarium was isolated in the collaboration with CTU

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PLANT MICROBIOLOGY

Spray Application of Nonpathogenic Fusaria onto Rice Flowers Controls Bakanae Disease (Caused by *Fusarium fujikuroi*) in the Next Plant Generation

Hiroki Saito,[a,b] Mai Sasaki,[a] Yoko Nonaka,[a] Jun Tanaka,[a] Tomomi Tokunaga,[a] Akihiro Kato,[a,b]* Tran Thi Thu Thuy,[c] Le Van Vang,[c] Le Minh Tuong,[c] Seiji Kanematsu,[d] Tomotaka Suzuki,[e]* Kenichi Kurauchi,[f] Naoko Fujita,[a]* Tohru Teraoka,[a,b] Ken Komatsu,[a,b,g] Tsutomu Arie[a,b,g]

[a]Laboratory of Plant Pathology, Graduate School of Agriculture, Tokyo University of Agriculture and Technology (TUAT), Fuchu, Tokyo, Japan
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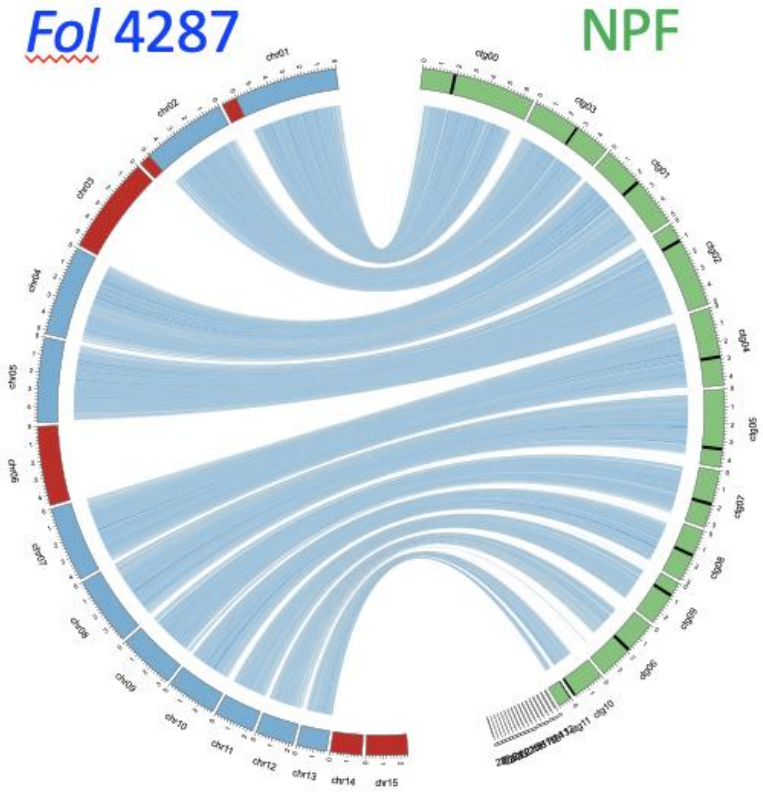
[c]Department of Plant Protection, College of Agriculture and Applied Biology, Can Tho University, Can Tho City, Vietnam
[d]Tohoku Agricultural Research Center, NARO, Morioka, Iwate, Japan
[e]Miyagi Furukawa Agricultural Experiment Station, Osaki, Miyagi, Japan
[f]Aomori Prefectural Industrial Technology Research Center, Kuroishi, Aomori, Japan
[g]Institute of Global Innovation Research (GIR), TUAT, Fuchu, Tokyo, Japan

Secondary metabolites of the non-pathogenic Fusarium

- ✓ Whole genome information will be open
- ✓ NPF W5 does not have the pathogenicity-related genes found in the tomato wilt fungus
- ✓ NPF W5 does not have the mycotoxin biosynthetic gene clusters



Acknowlegdment

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