Influence of cultivated biodiversity on the evolution of pathogen populations:

The rice/blast interaction in the traditional YuanYang terraces (China)

Elisabeth FOURNIER
INRAE
Montpellier, France

Alexander Calder, *Ballons and blue flower*

Diversification of agrosystems for the control of plant diseases

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Fast and furious adaptation
of pathogen populations

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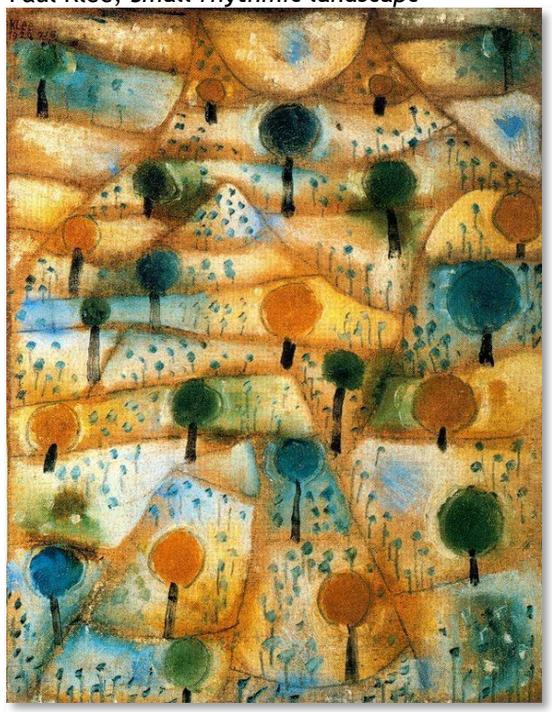
Paul Klee, *Small rhythmic landscape*



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pathogen adaptation
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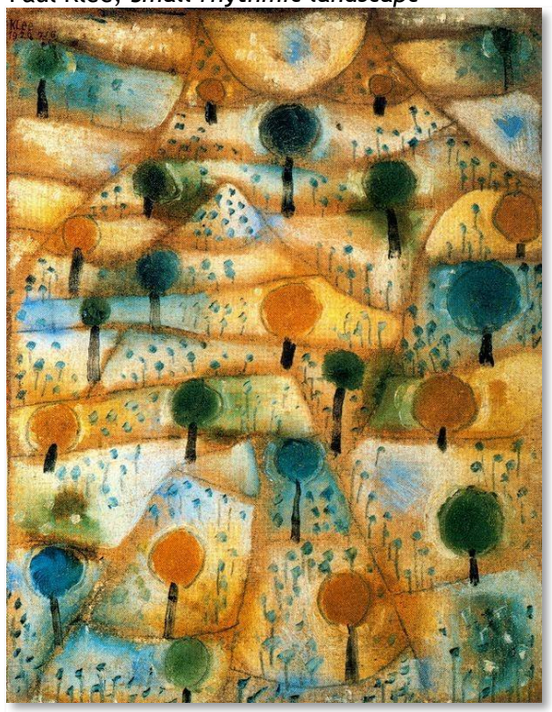

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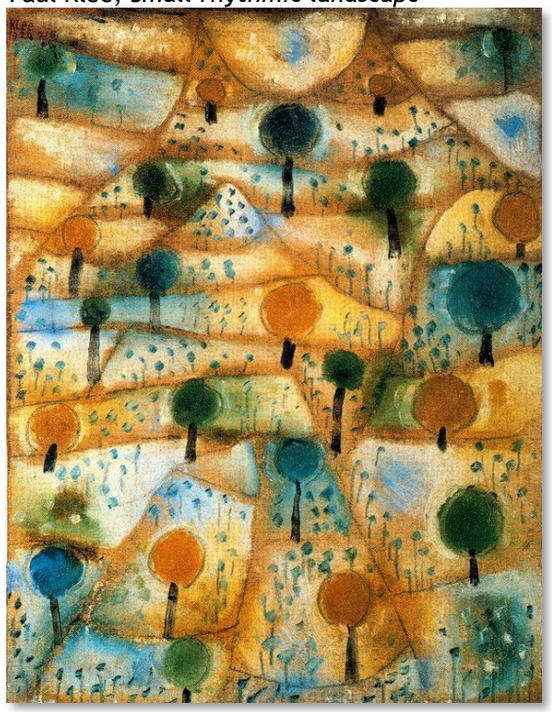

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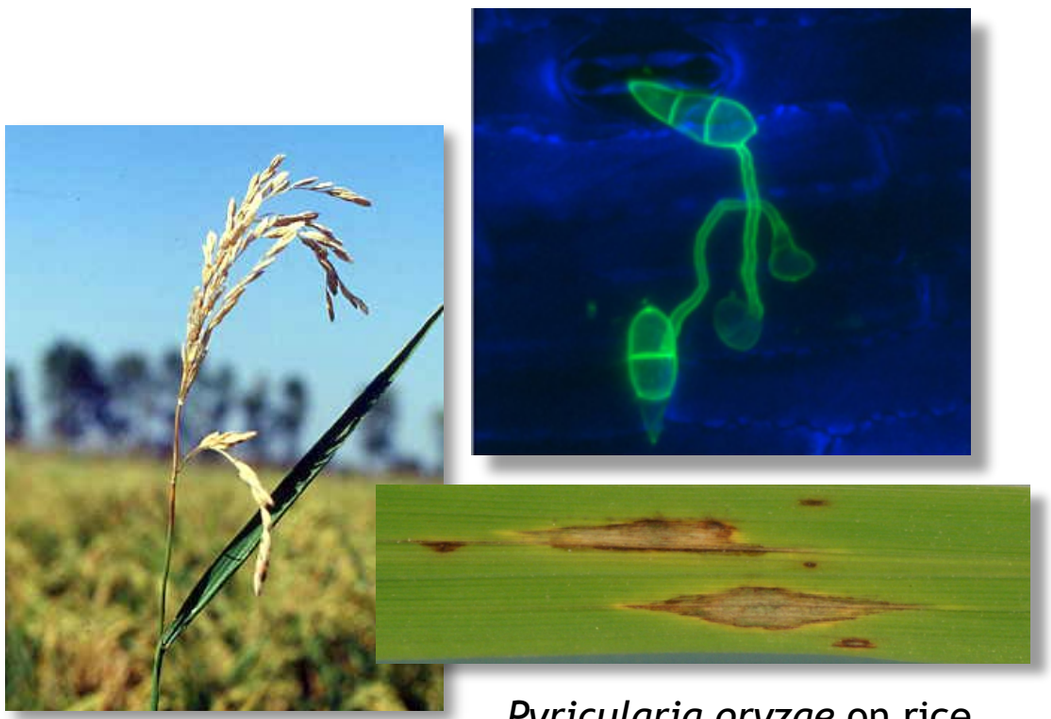

Pyricularia oryzae on rice

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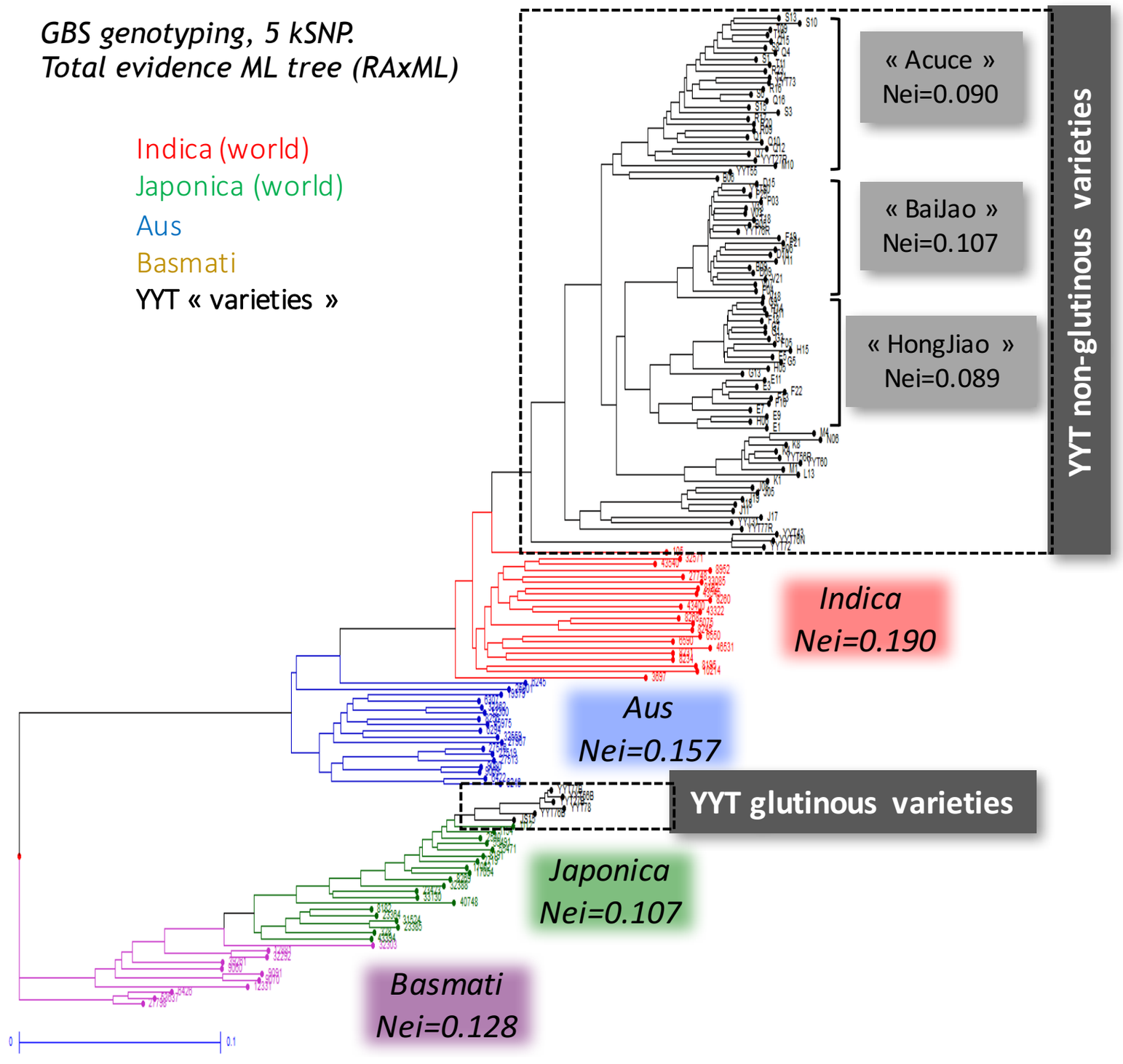
Total evidence ML tree (RAxML)

Indica (world)
Japonica (world)
Aus
Basmati
YYT « varieties »



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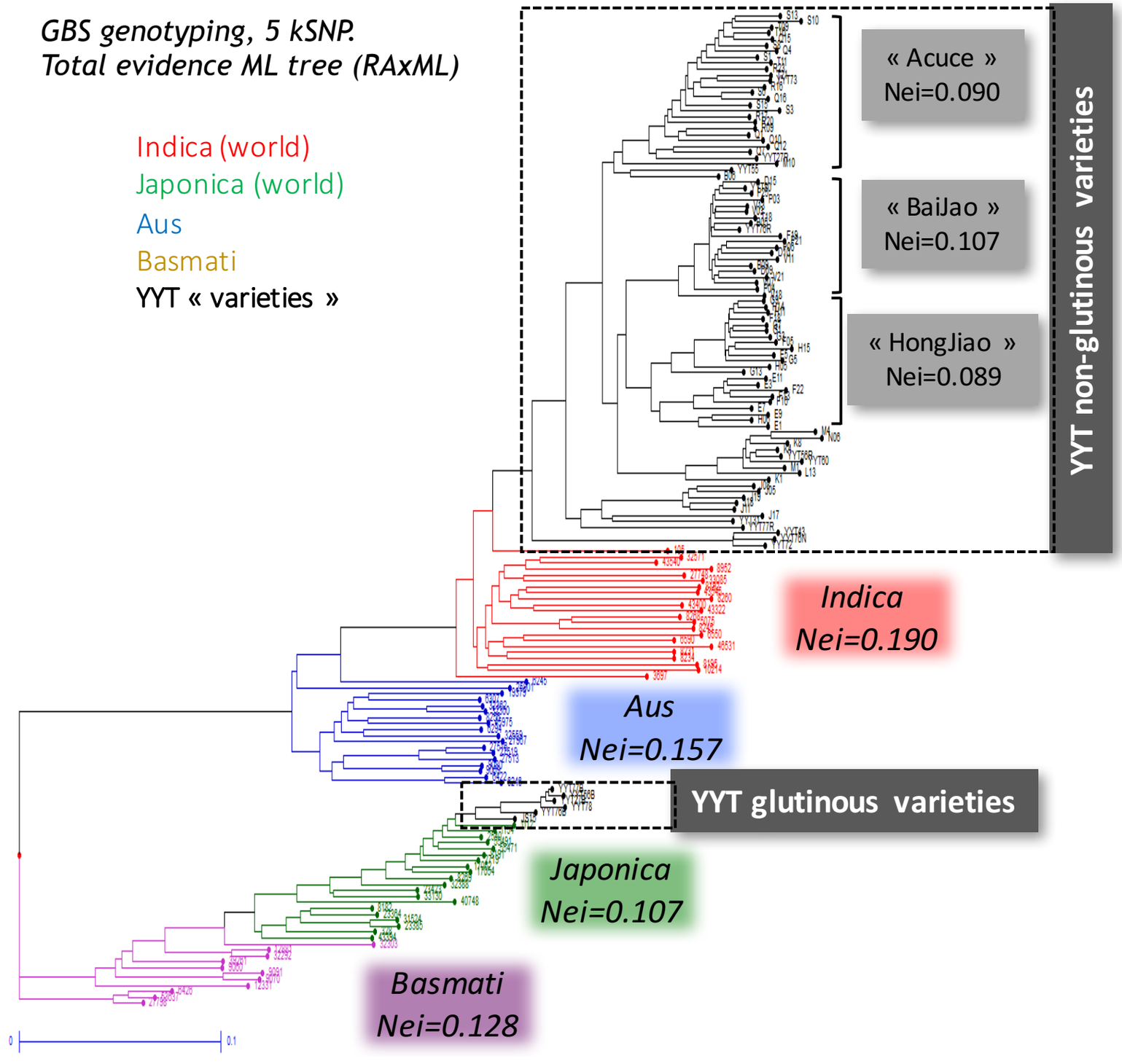

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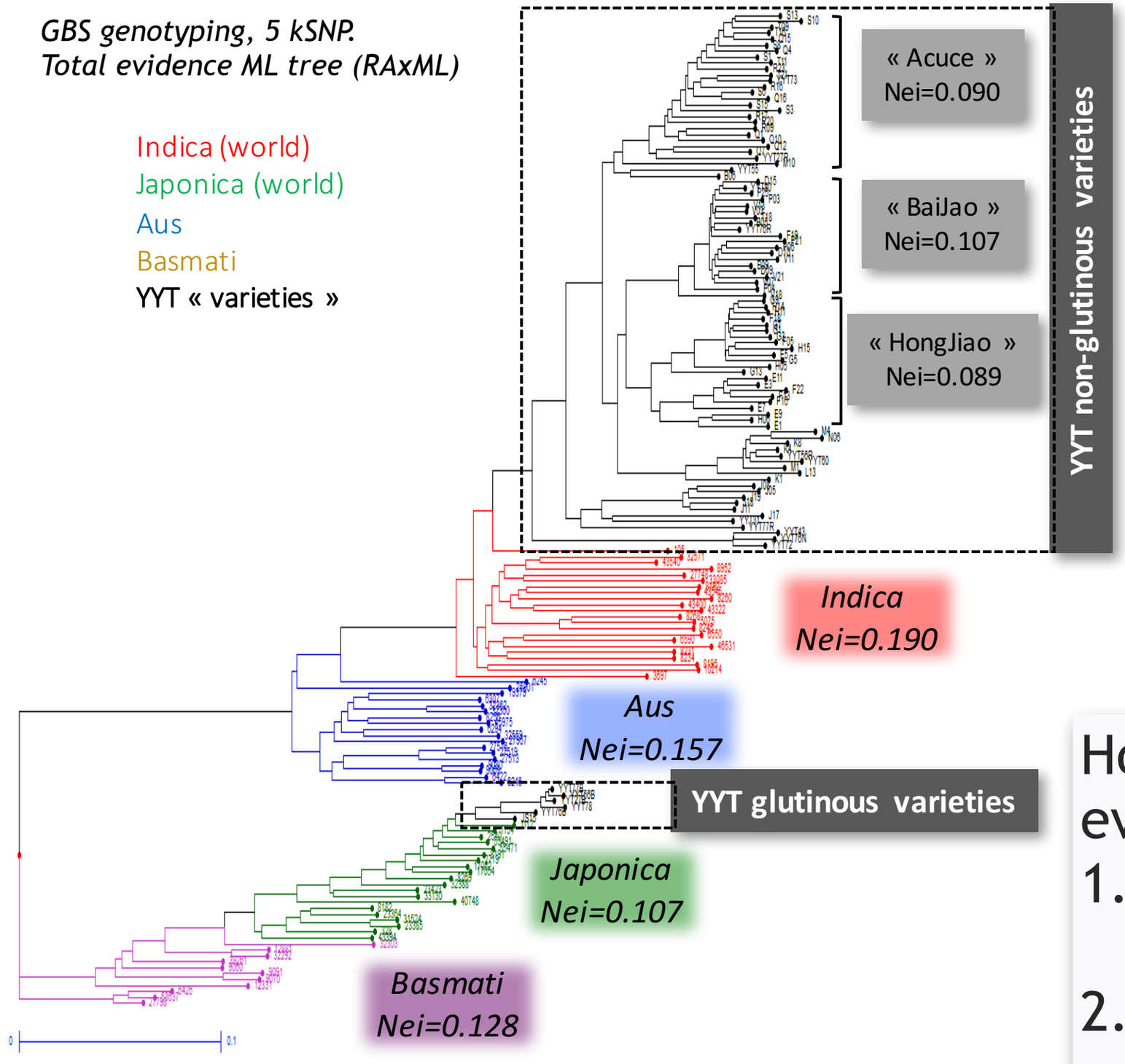

How do *P. oryzae* populations evolve when facing :

1. Huge diversity within and among indica landraces ?
2. Introduction of a modern variety in the area ?

1. Huge diversity within and among indica landraces

2. Introduction of a modern variety in the area

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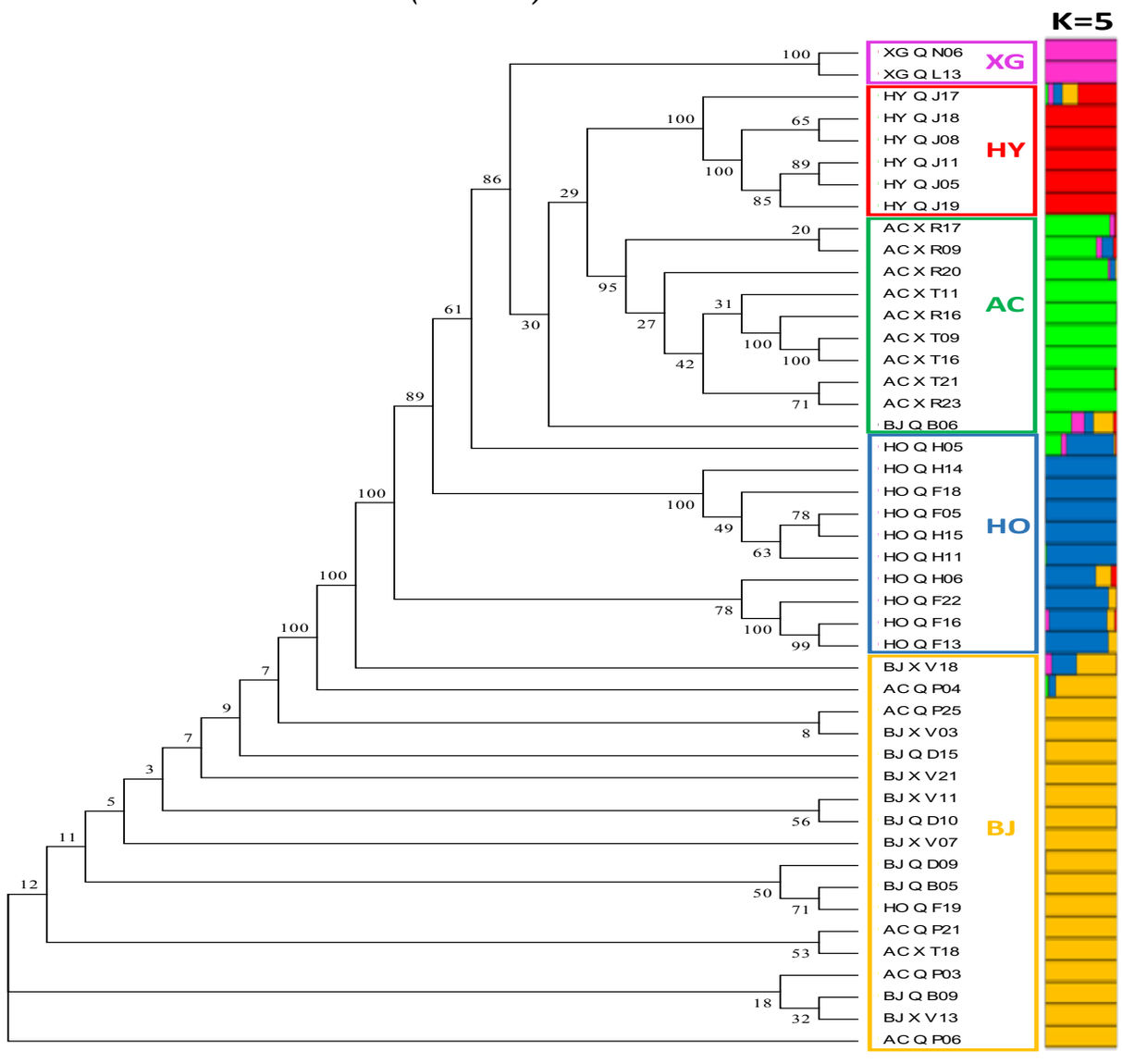

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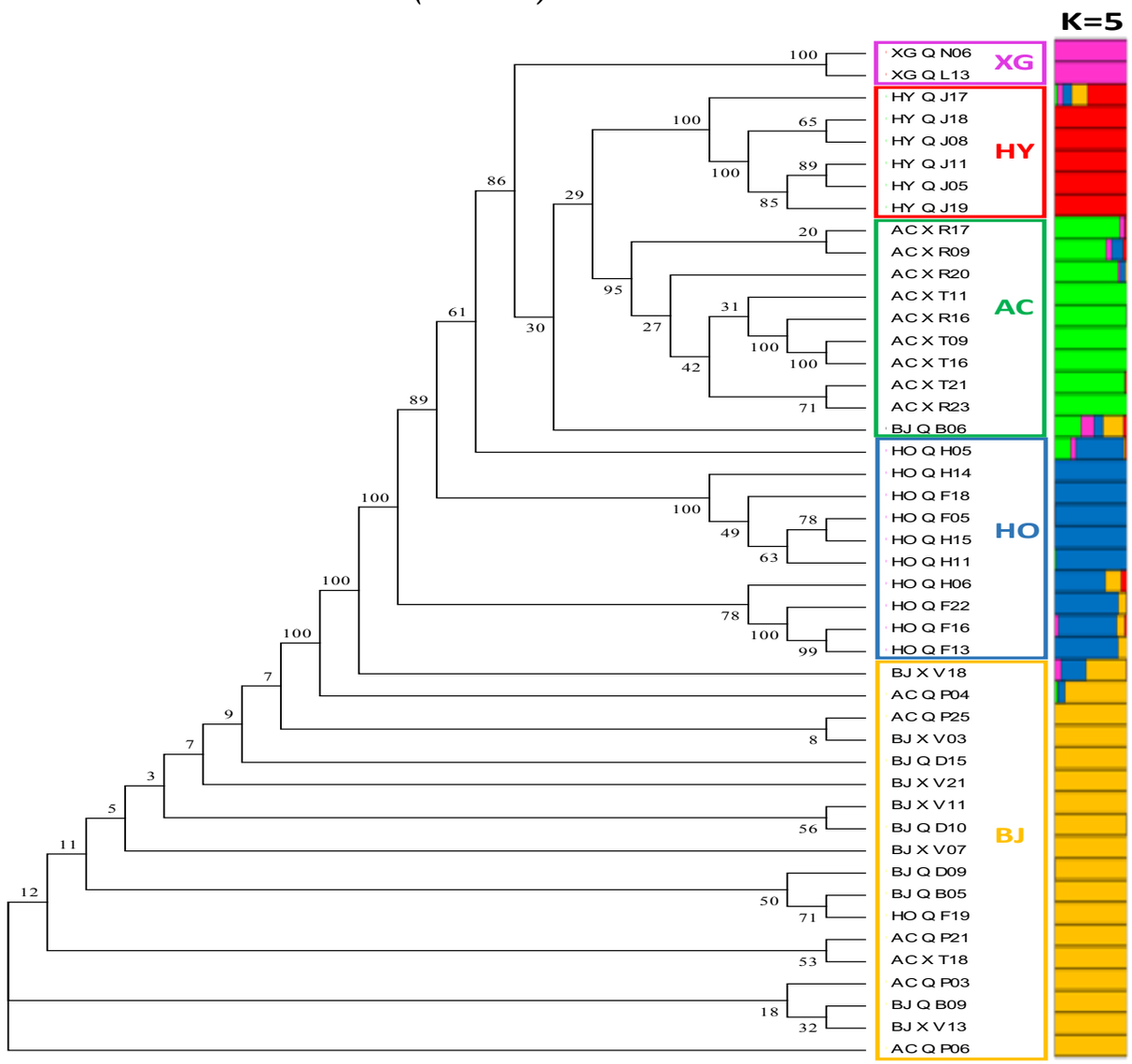

***P. oryzae**: full genome, 116 kSNP.*
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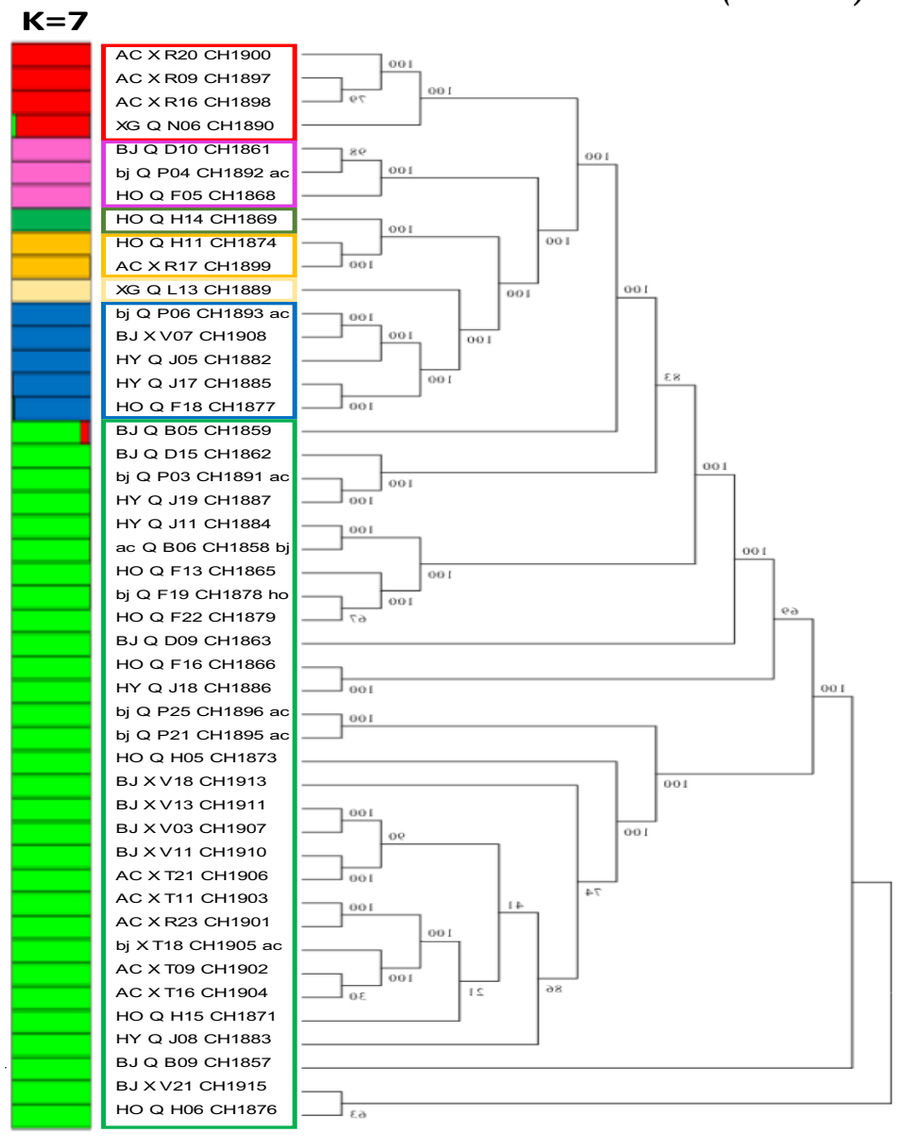

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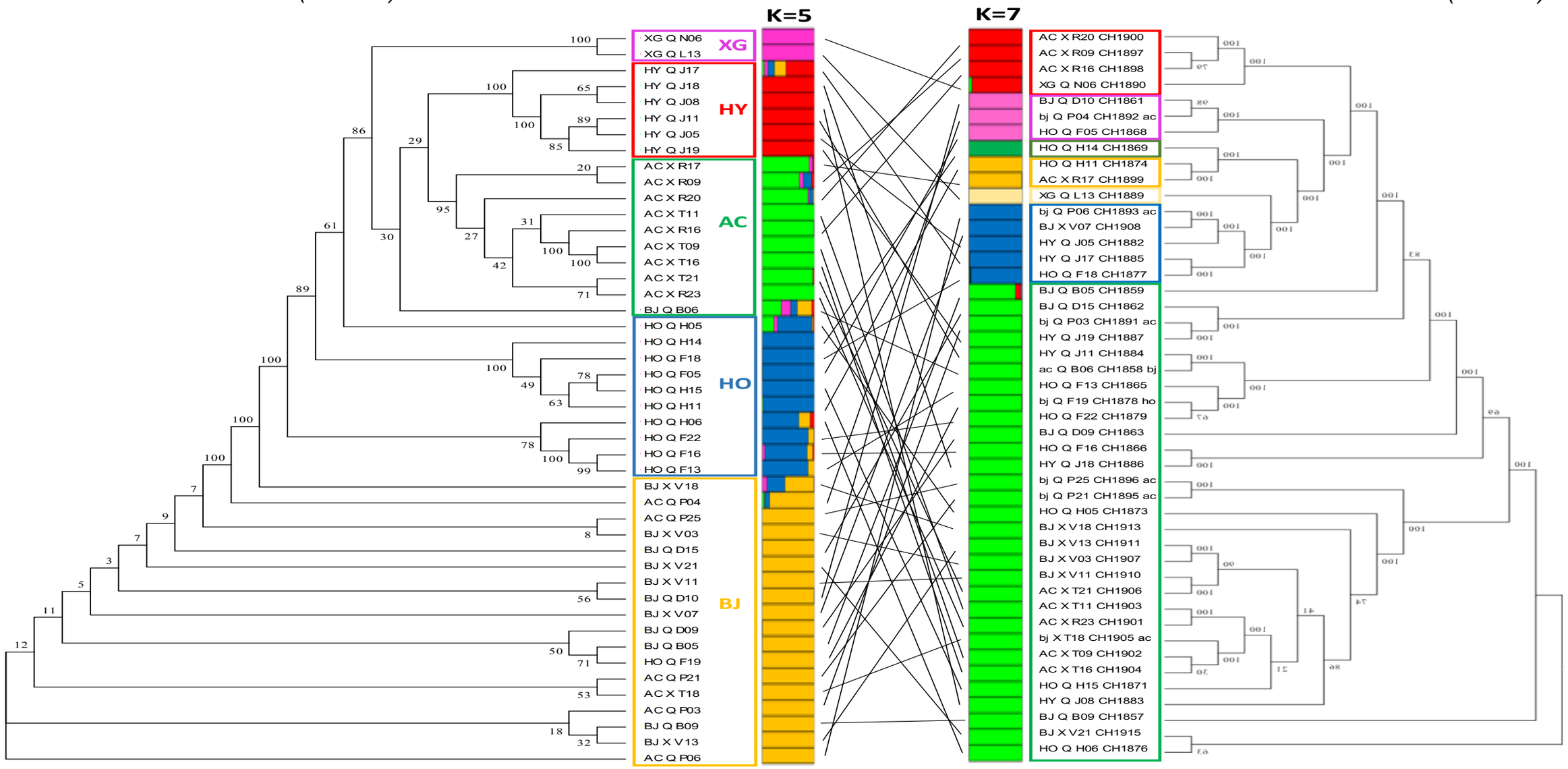

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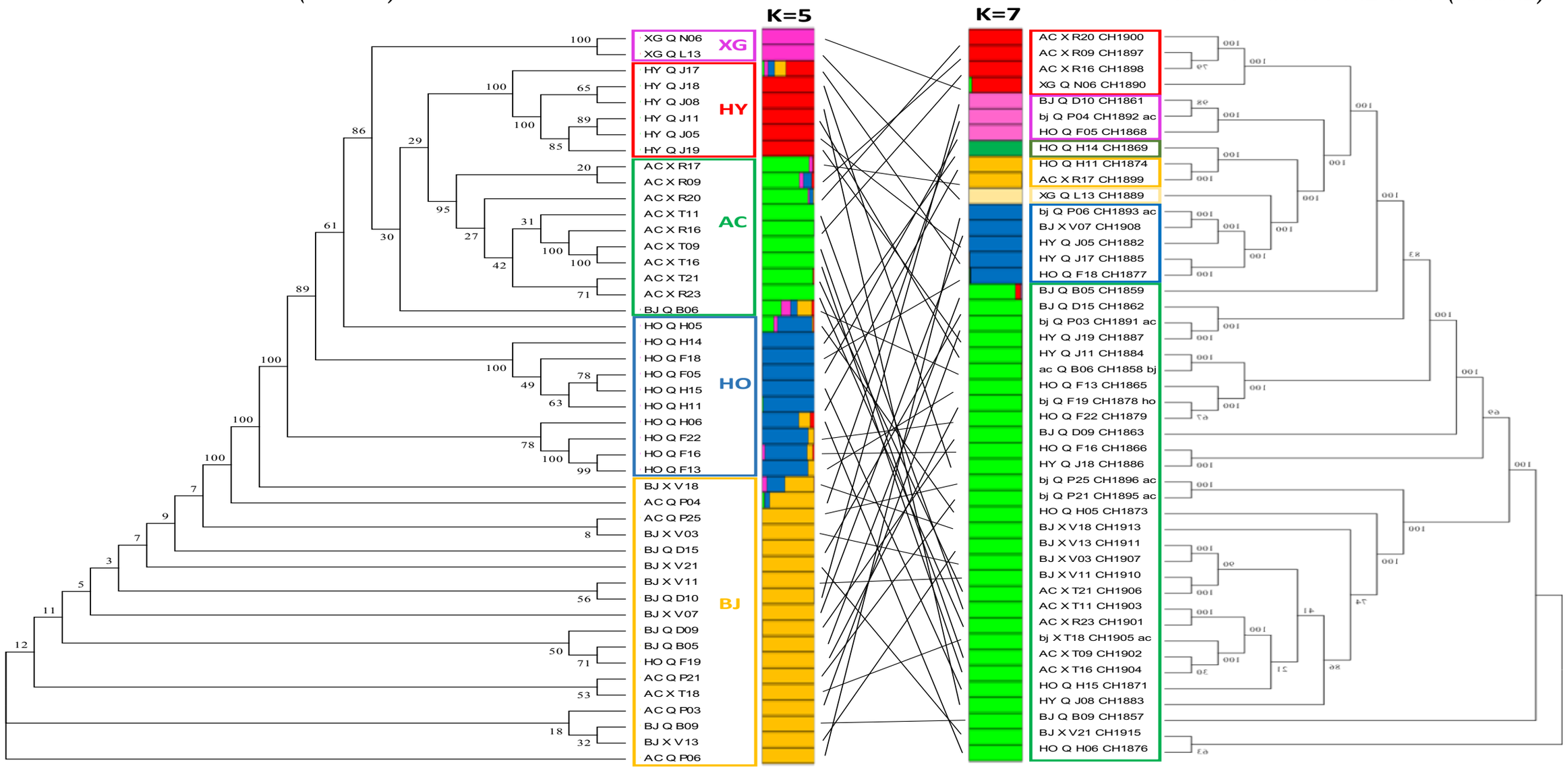

No host/pathogen genetic co-structure

1. Huge diversity within and among indica landraces

Qualitative and quantitative interactions

Cross-inoculations of paired samples

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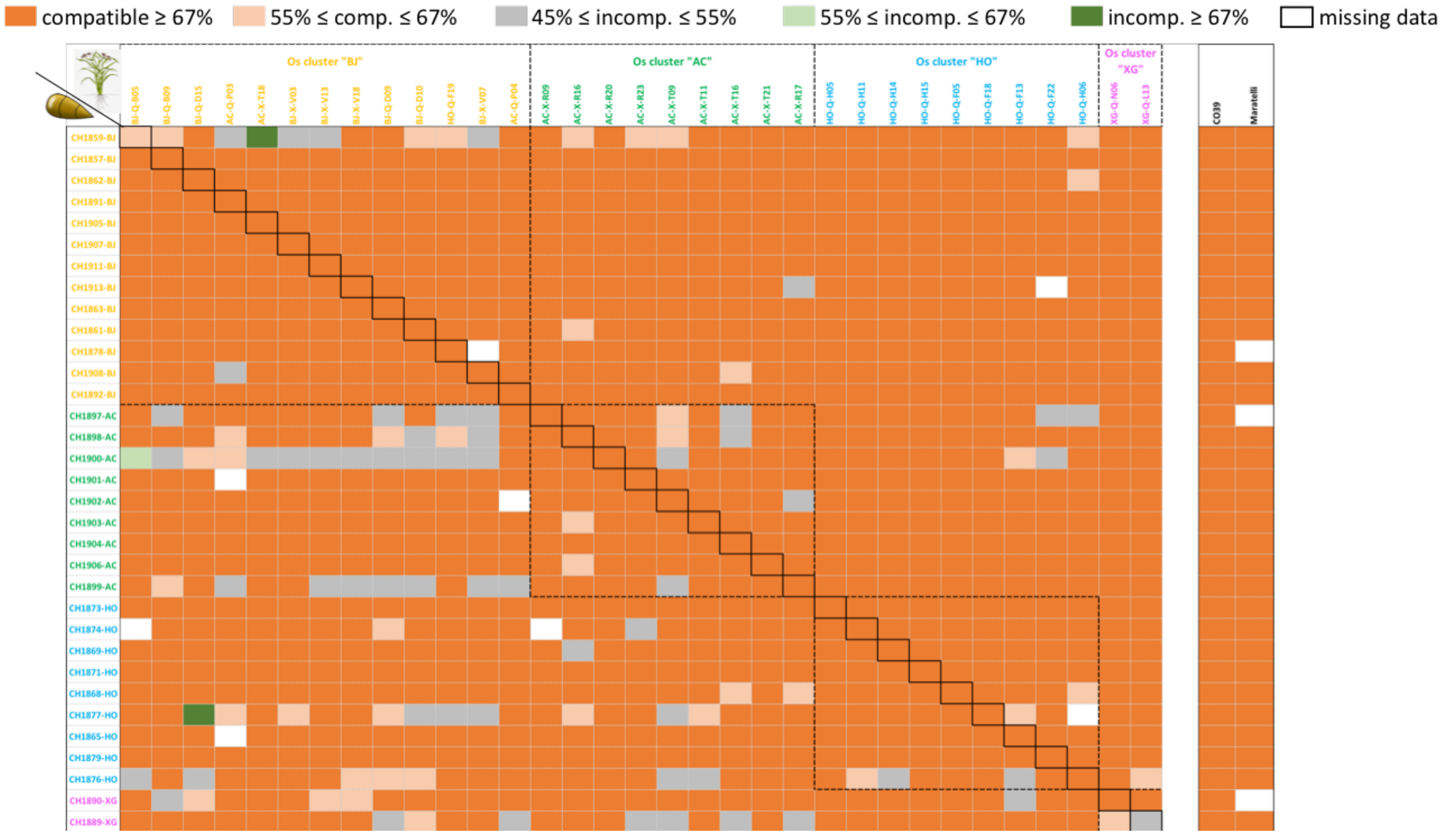

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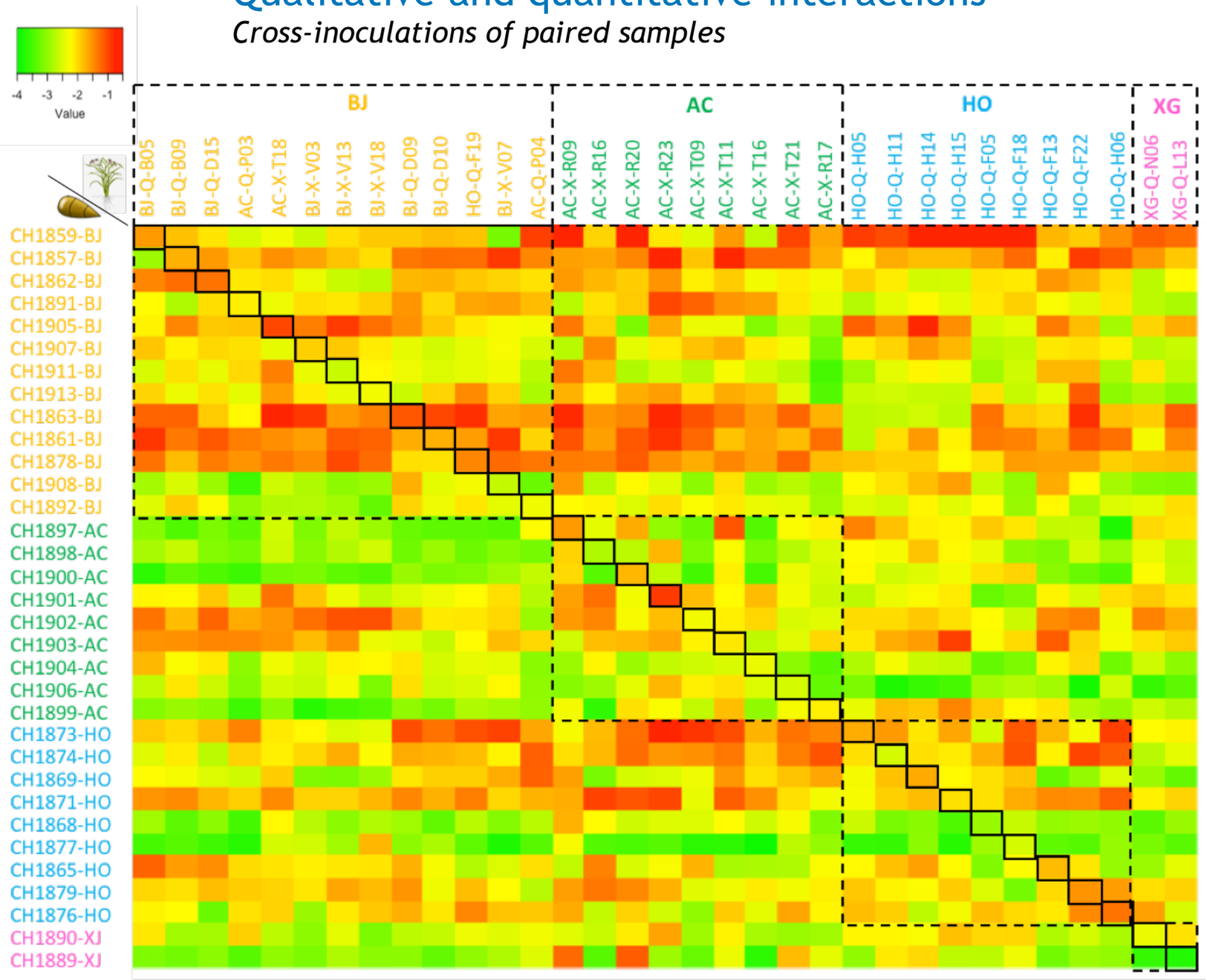

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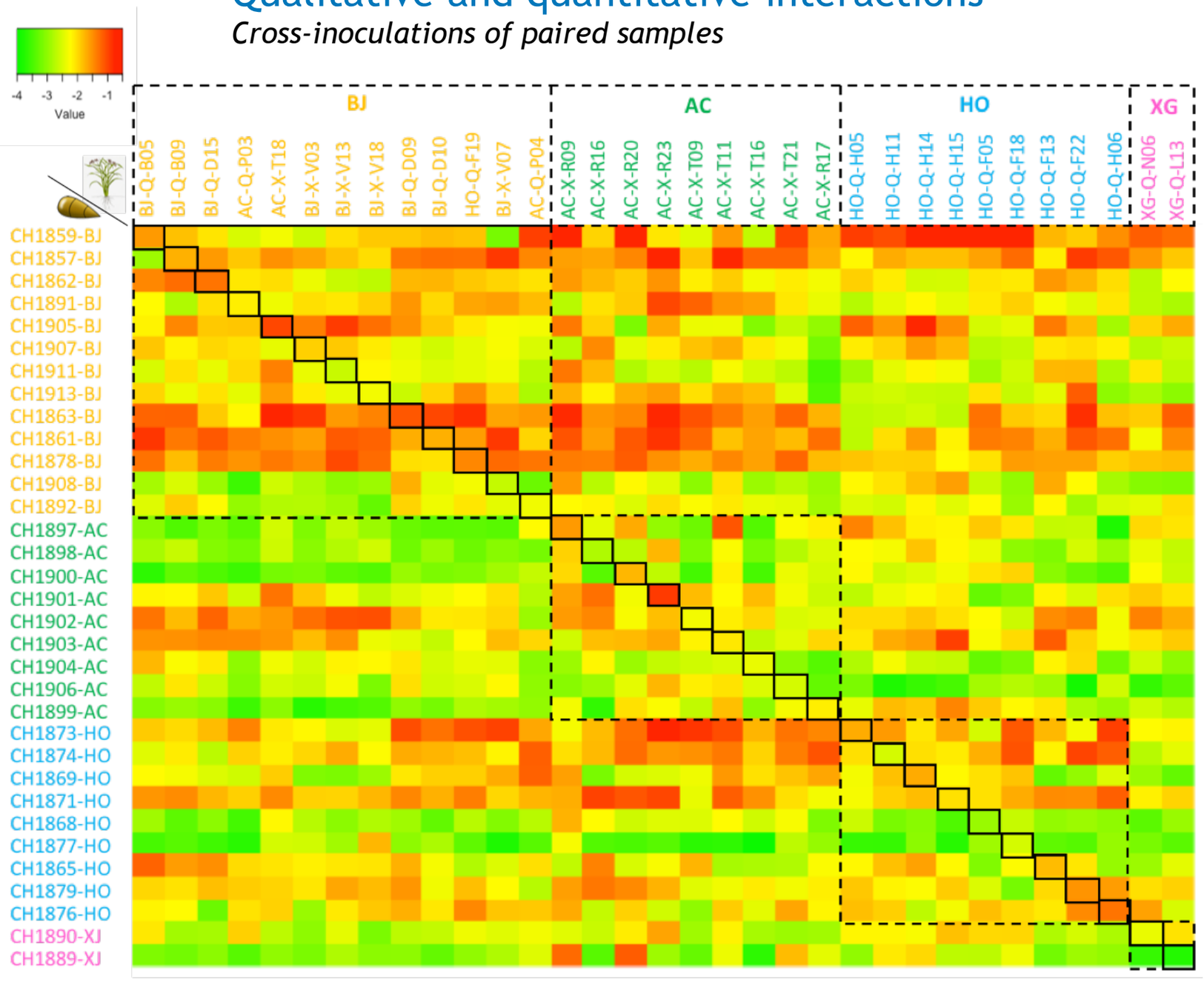

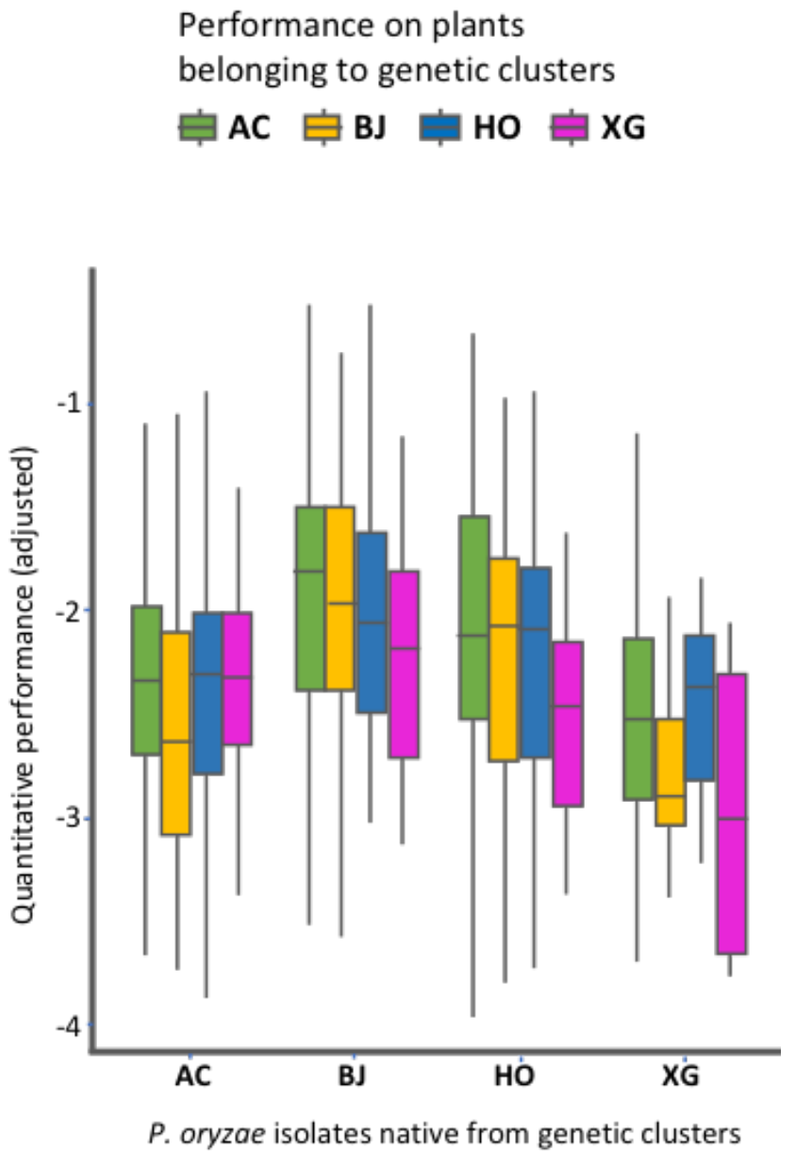

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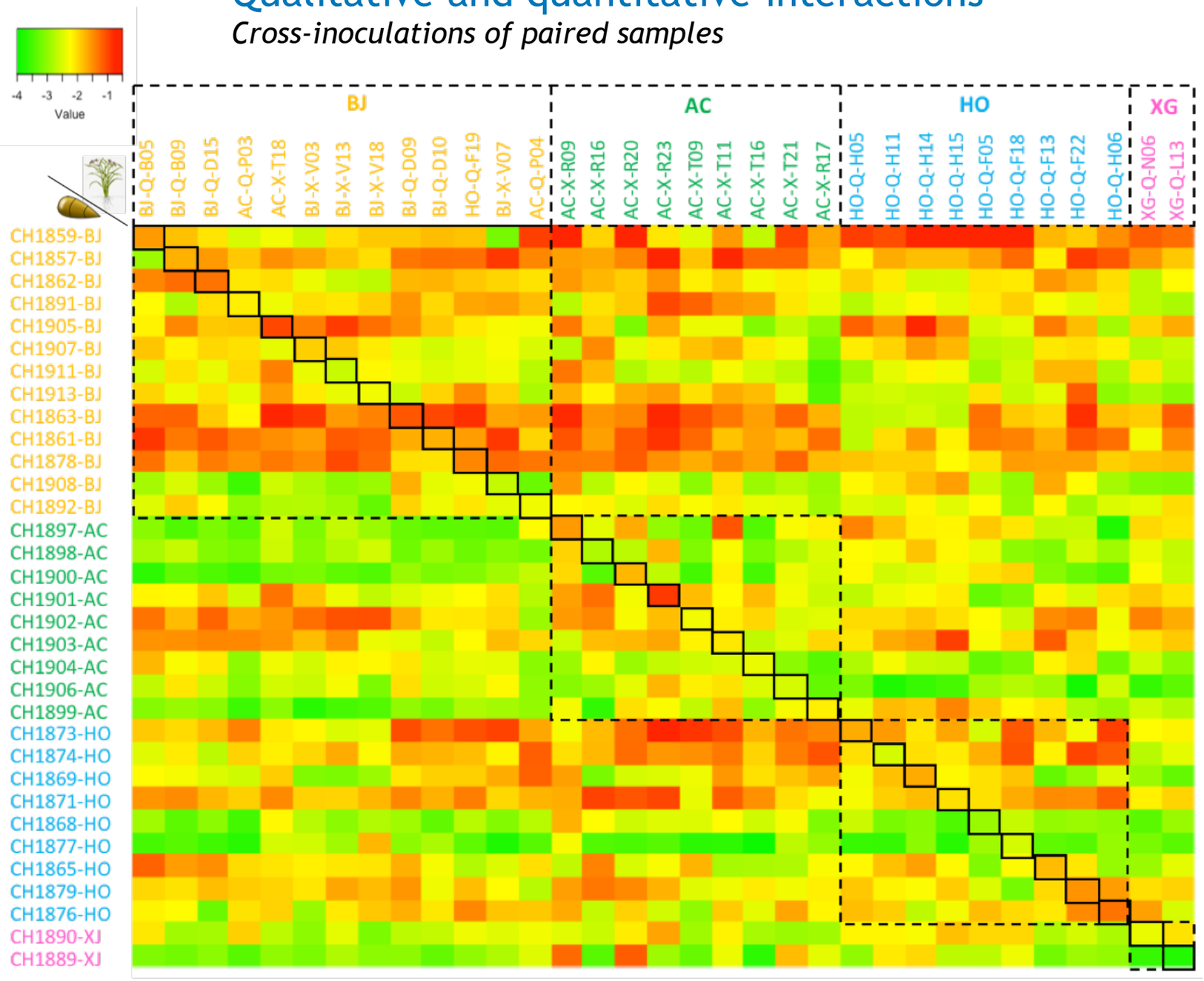

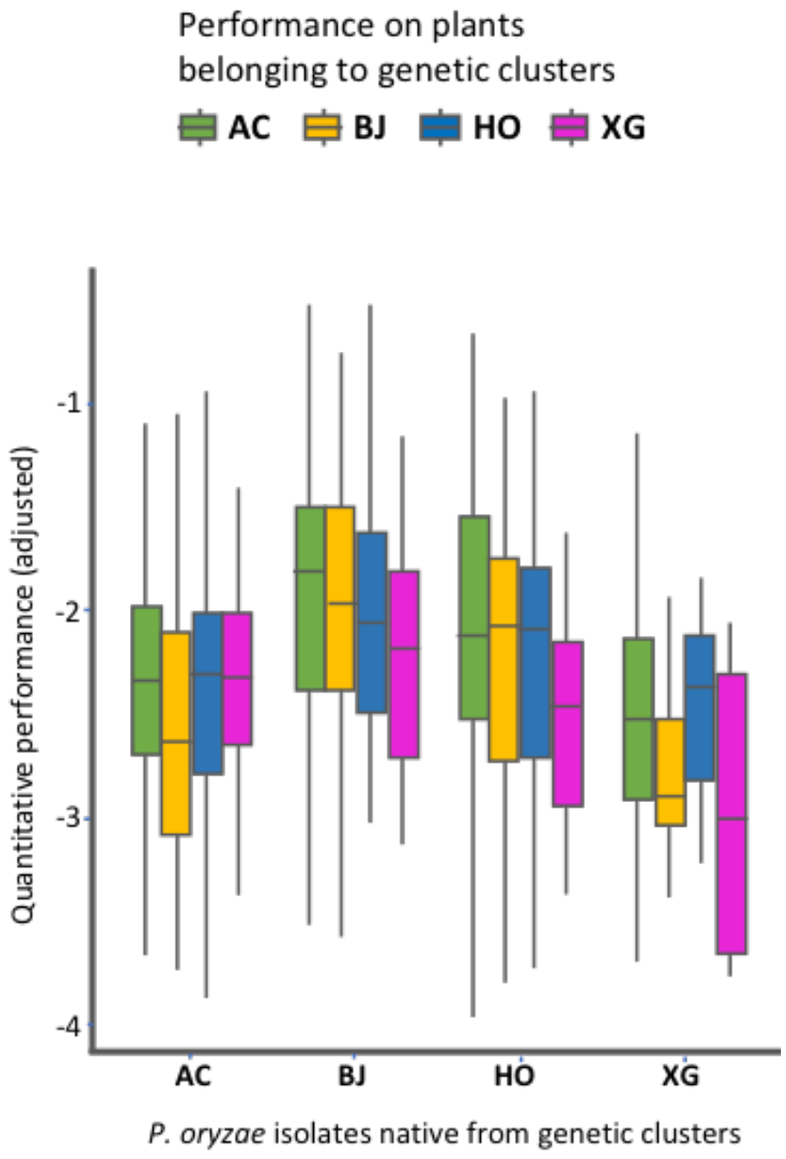

Maintenance of generalist *P. oryzae* genotypes with moderate performance on all indica landraces

1. Huge diversity within and among indica landraces

2. Introduction of a modern variety in the area

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Surveys of farmers in 9 villages of YYT in 2015

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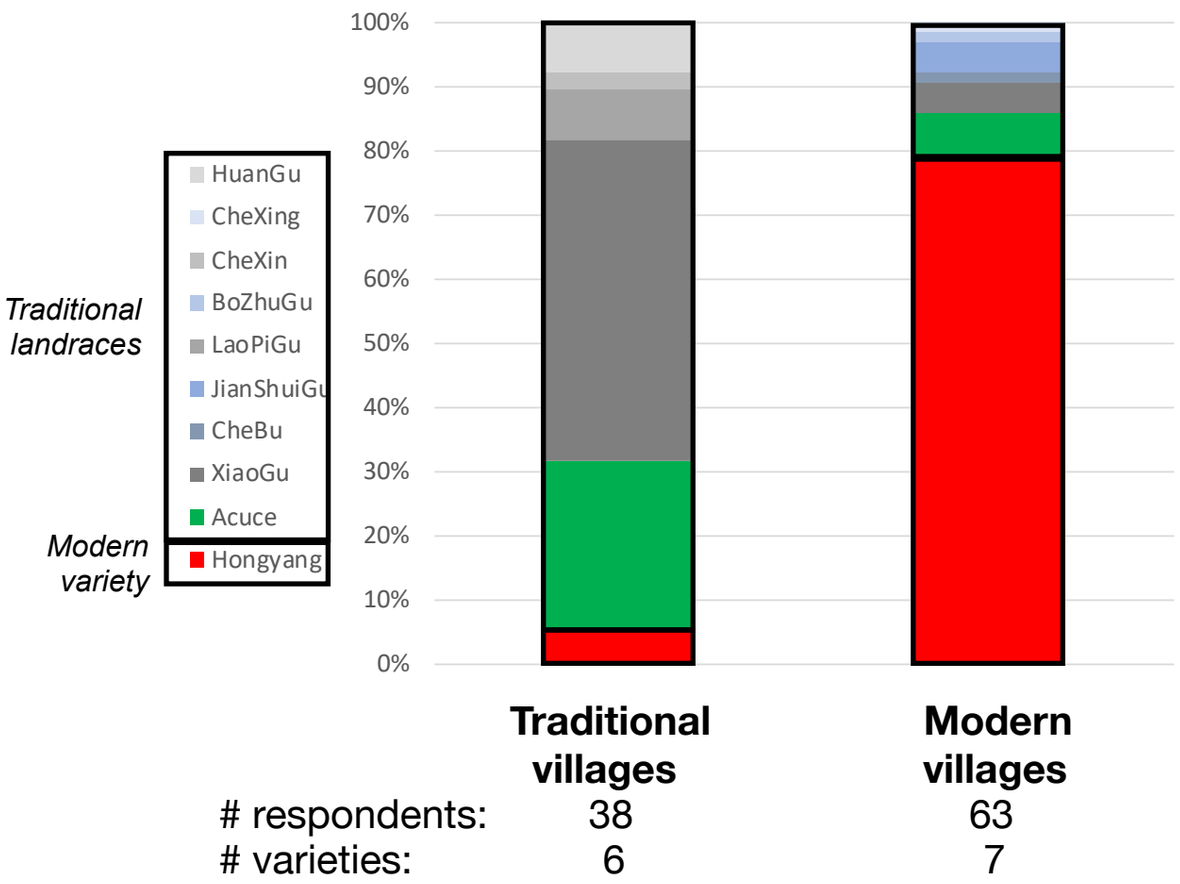
Variety use and diversity



	Traditional villages	Modern villages
# respondents:	38	63
# varieties:	6	7

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Surveys of farmers in 9 villages of YYT in 2015

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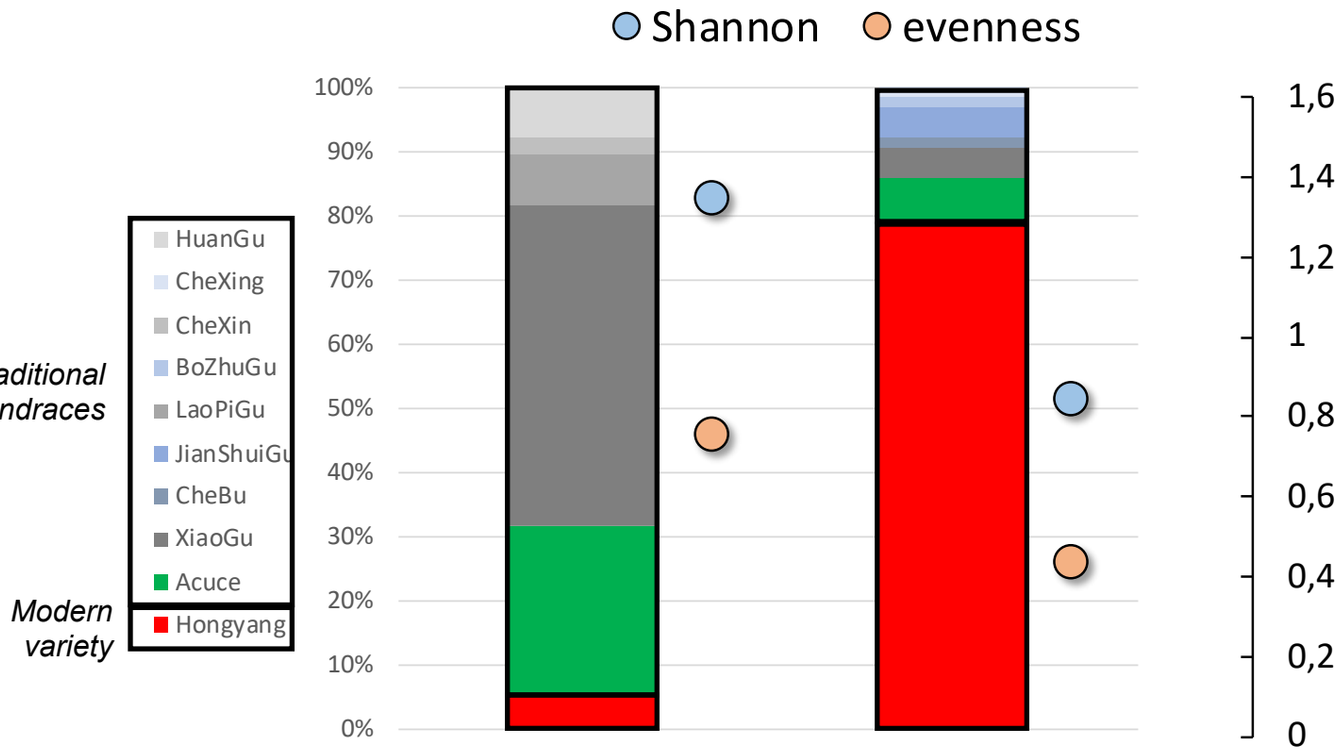

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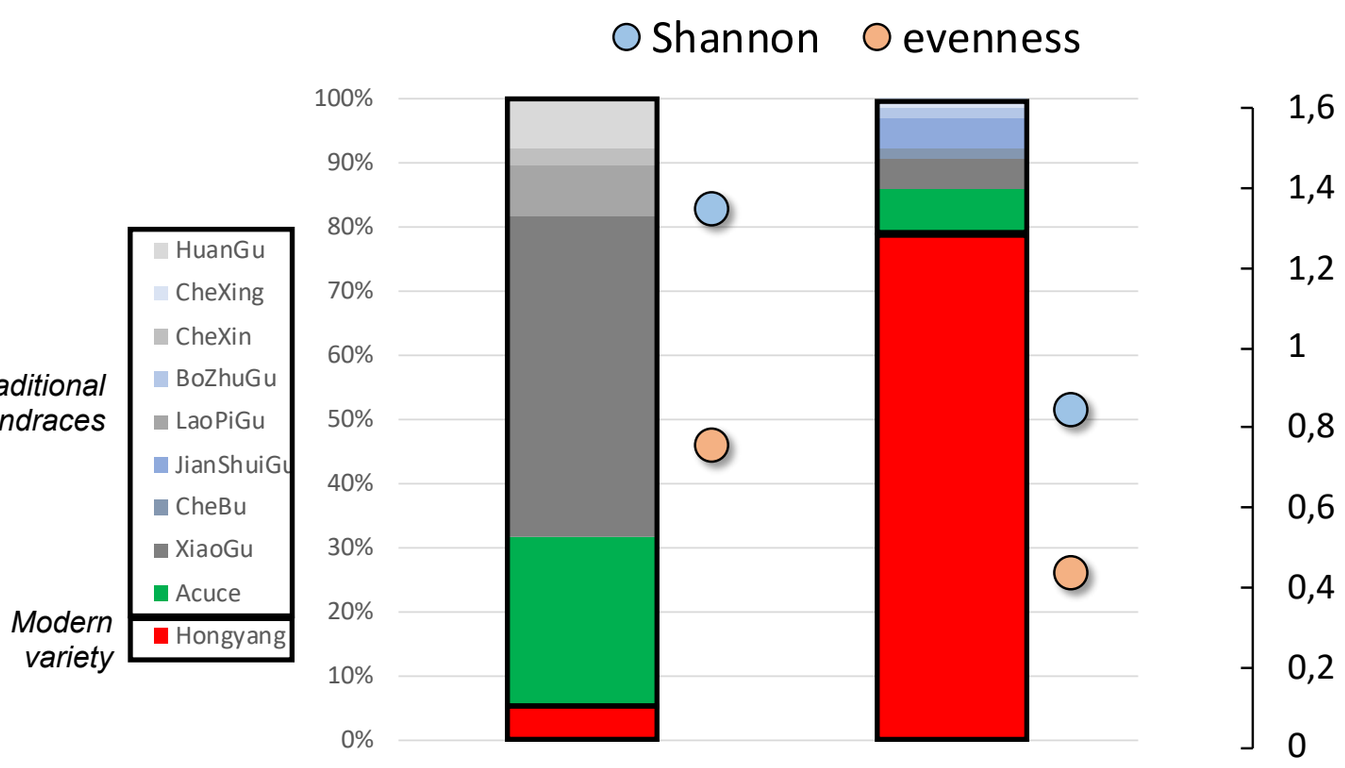

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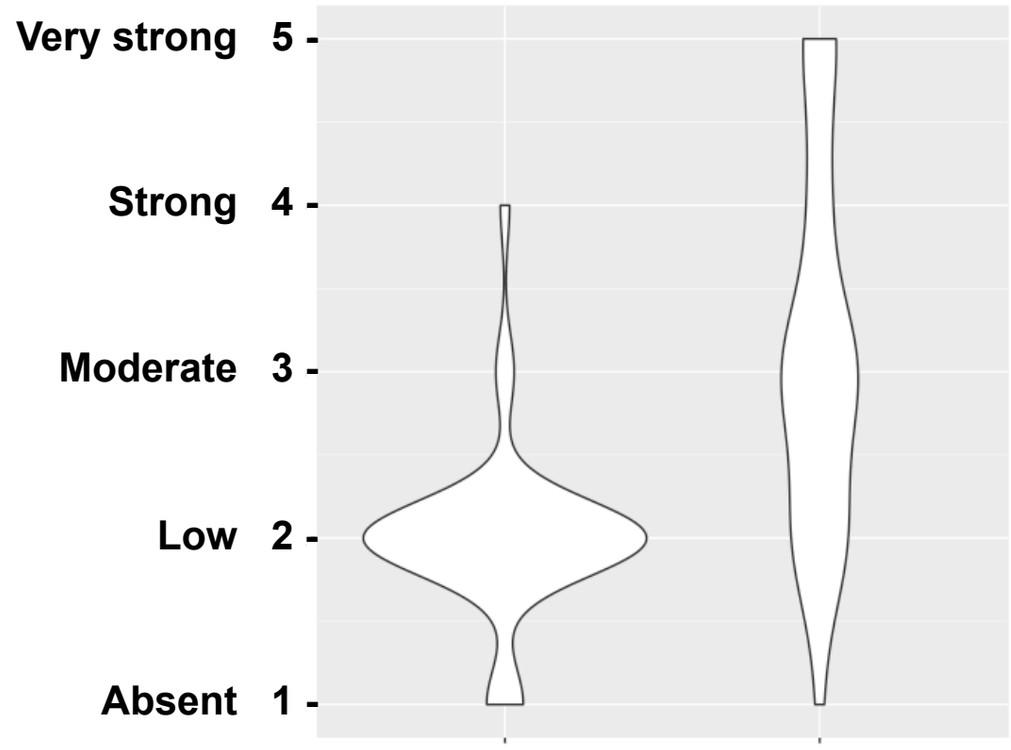

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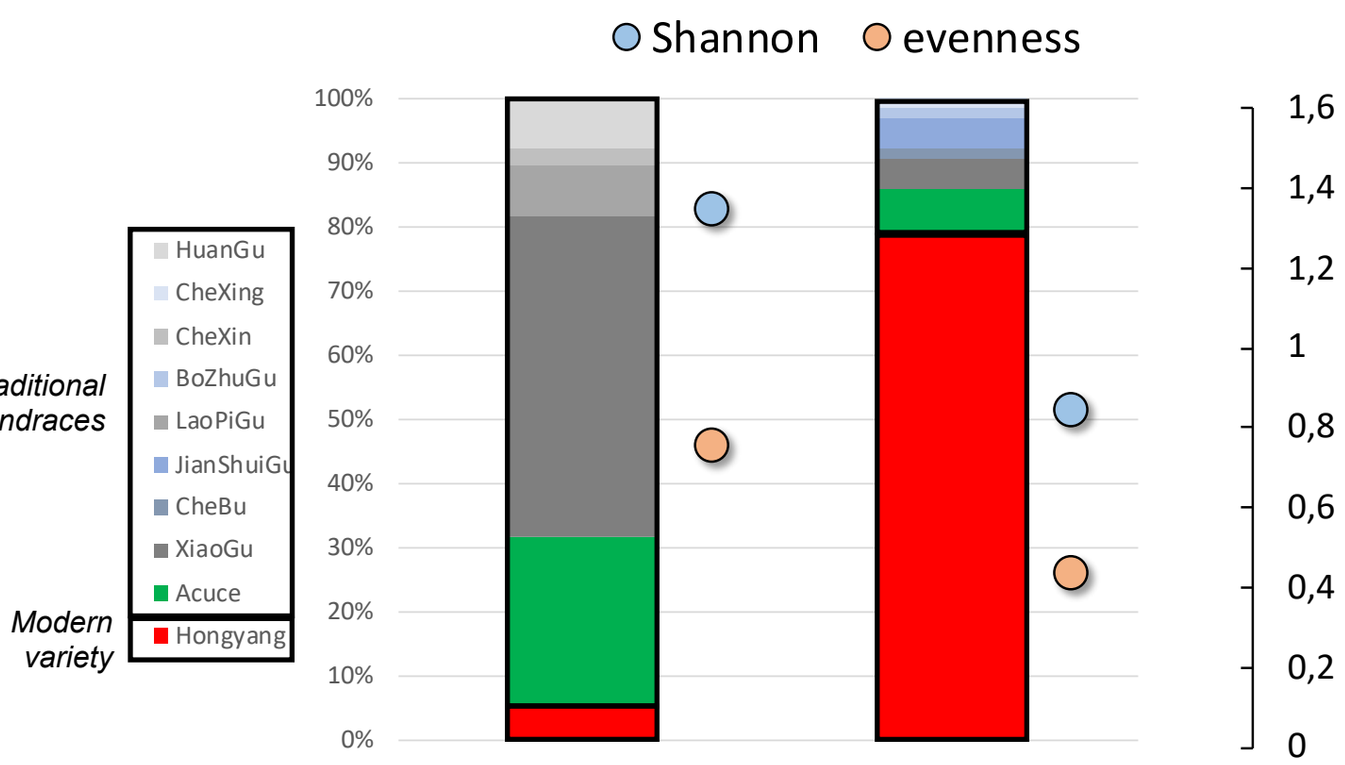

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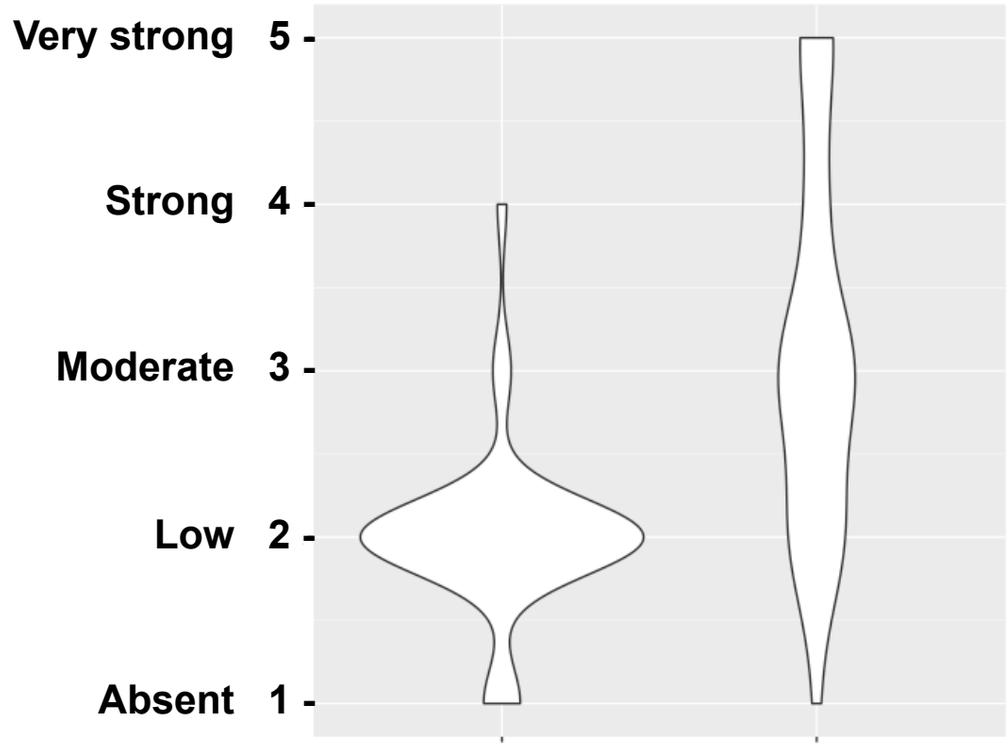

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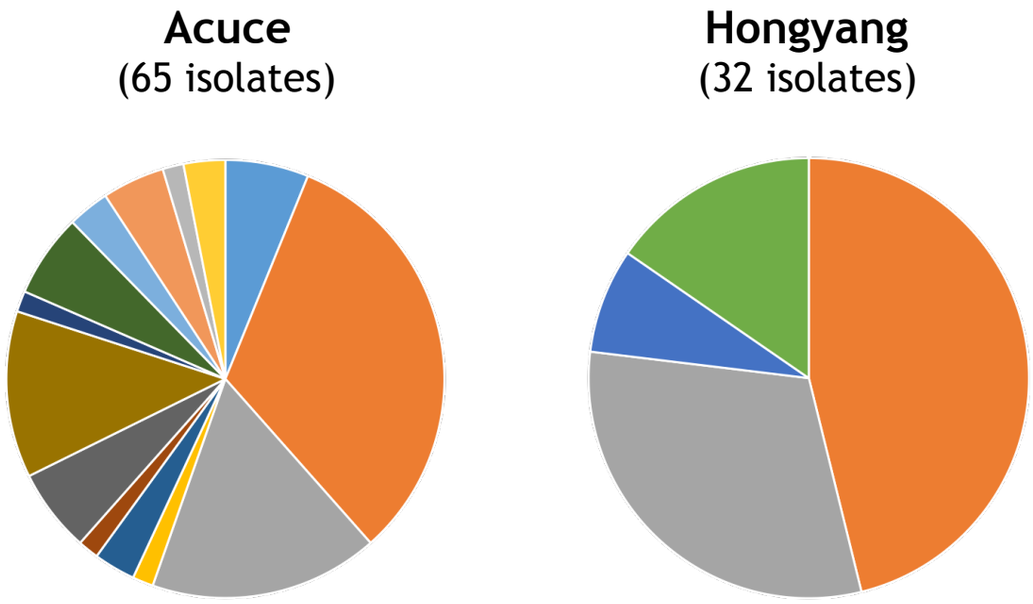
- Diversity cold spots
- Impact on rice diseases

2. Introduction of a modern variety in the area

Distribution of *P. oryzae* genotypes on traditional « Acuce » and modern « Hongyang »

Genotyping with 13 micro satellites



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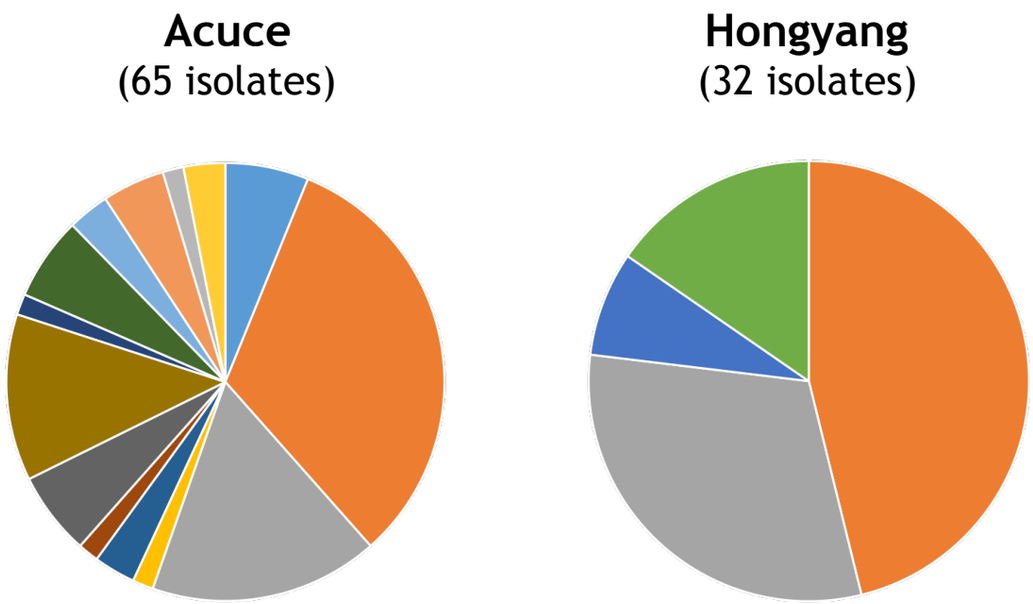
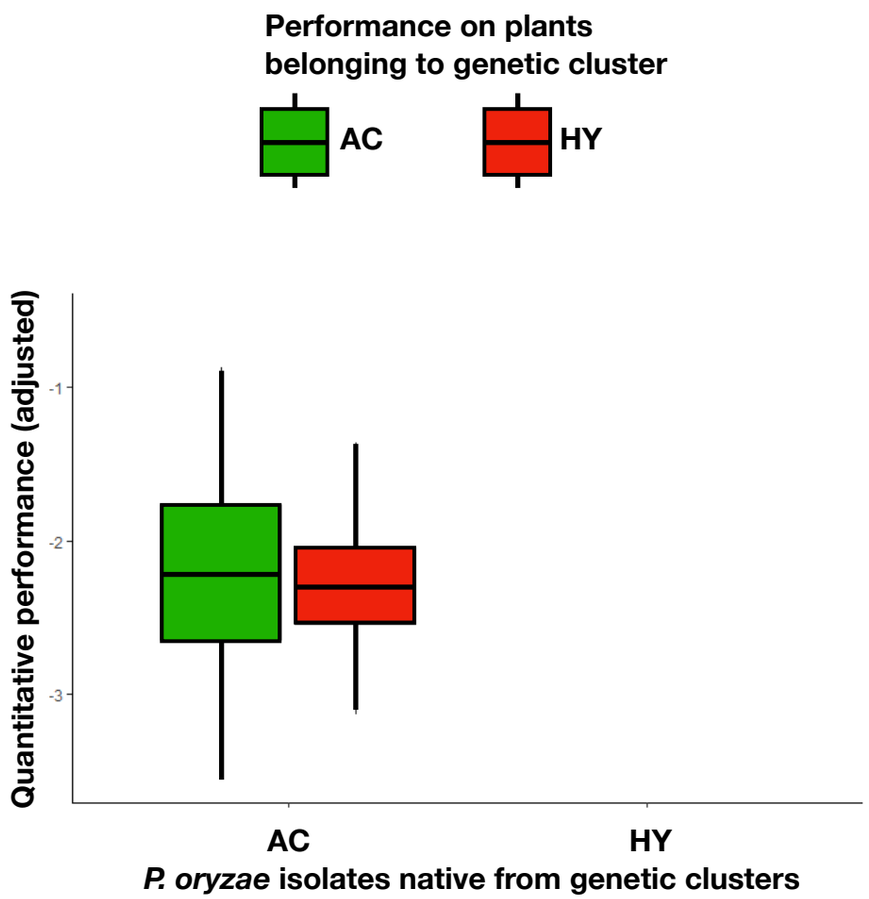


Quantitative interactions

Cross-inoculations of paired samples



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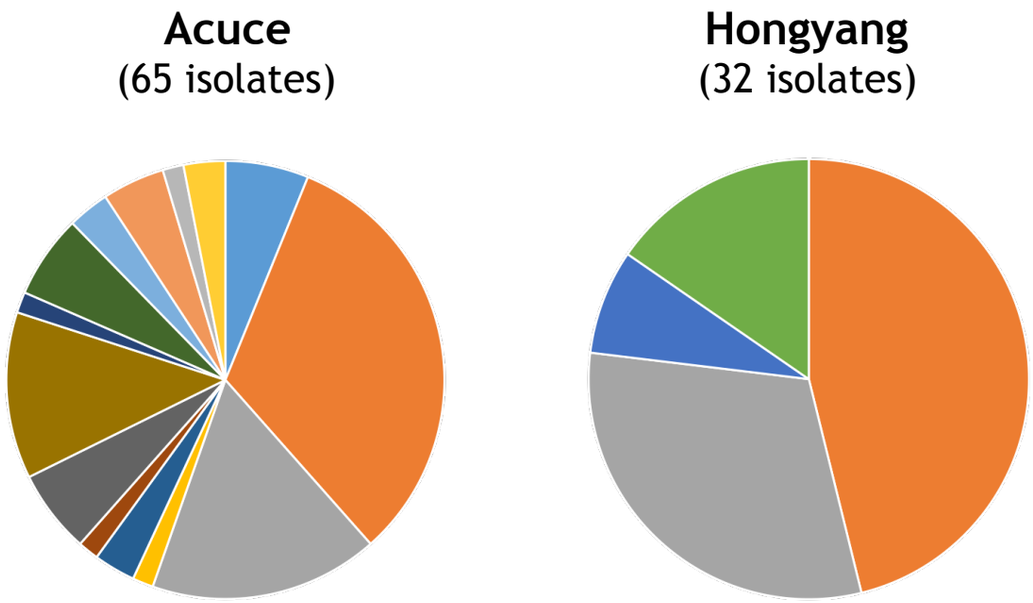

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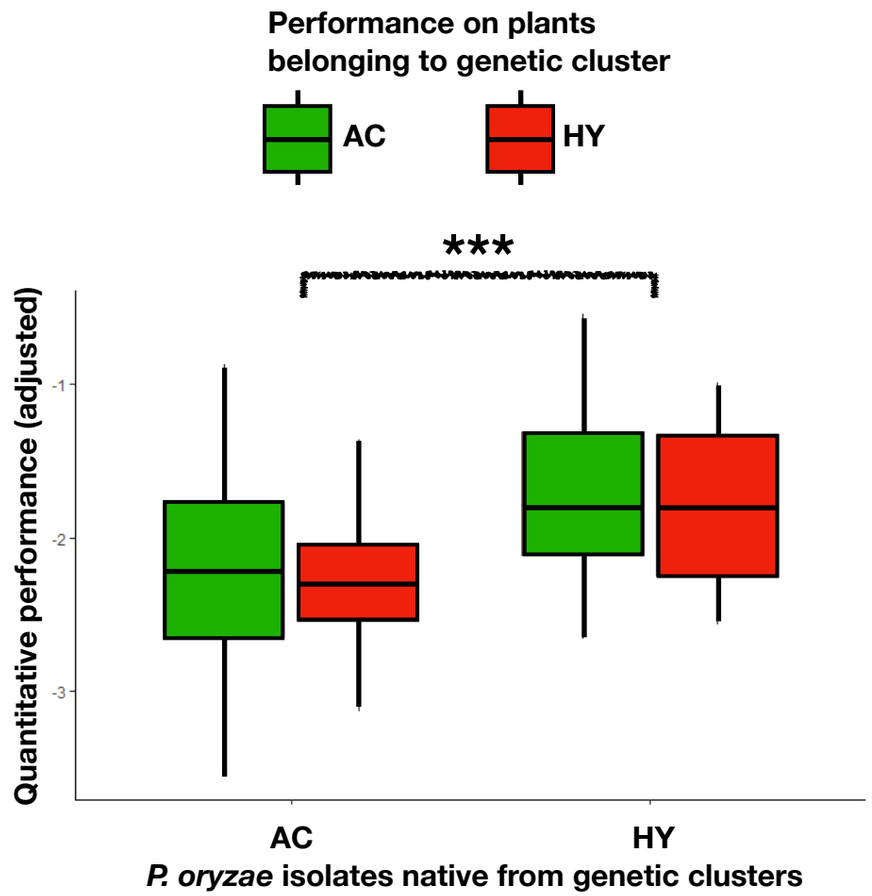

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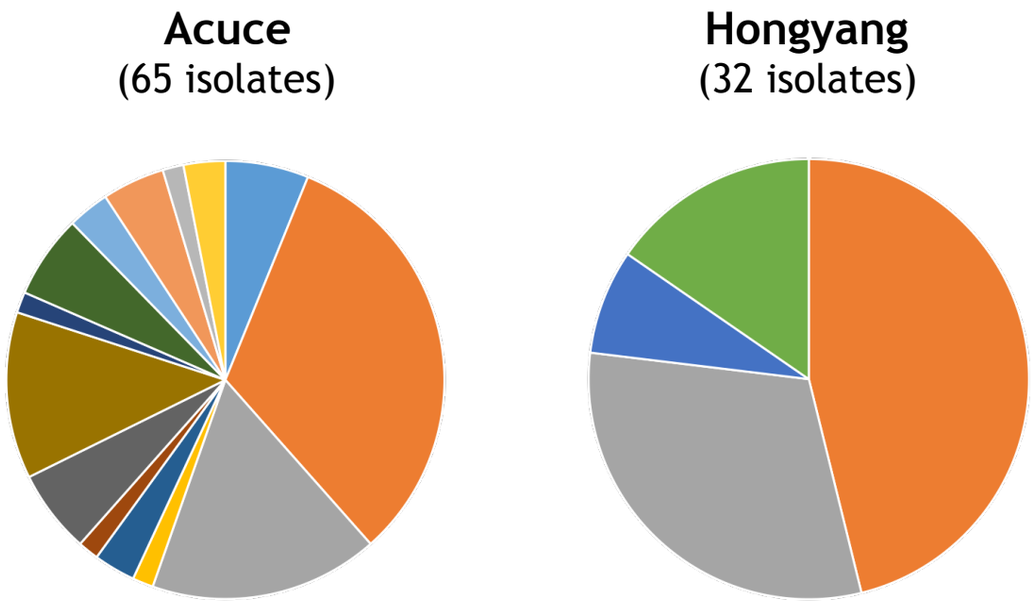

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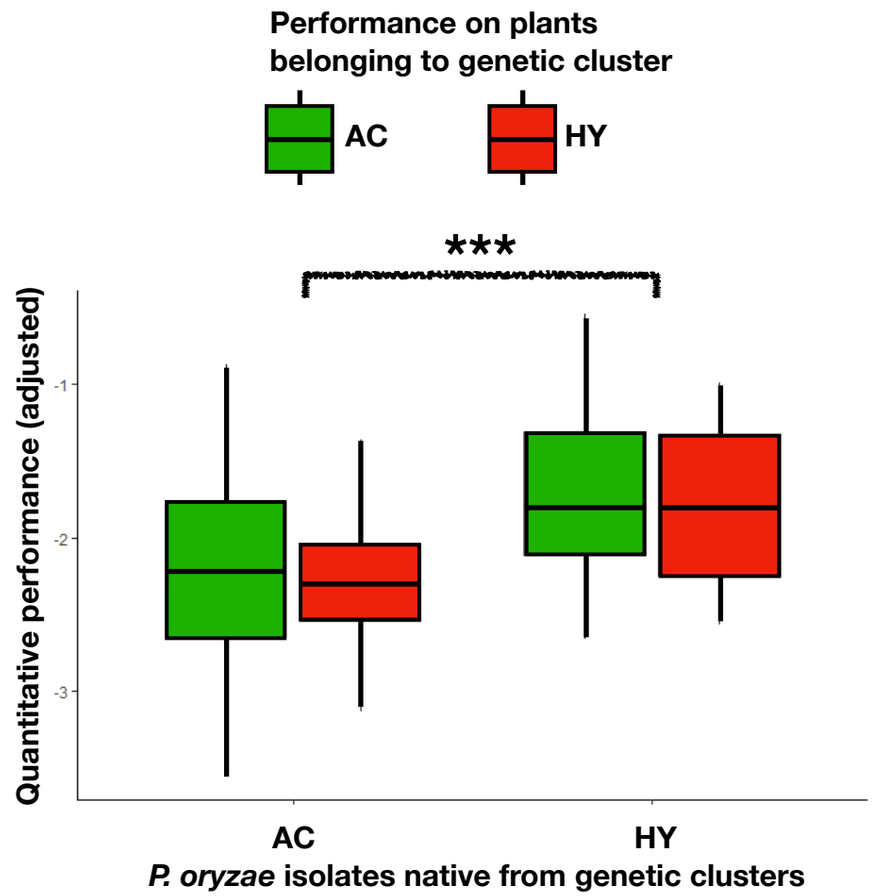


- Shrinking of *P. oryzae* diversity on the modern variety
- Selection of more aggressive genotypes

Summary

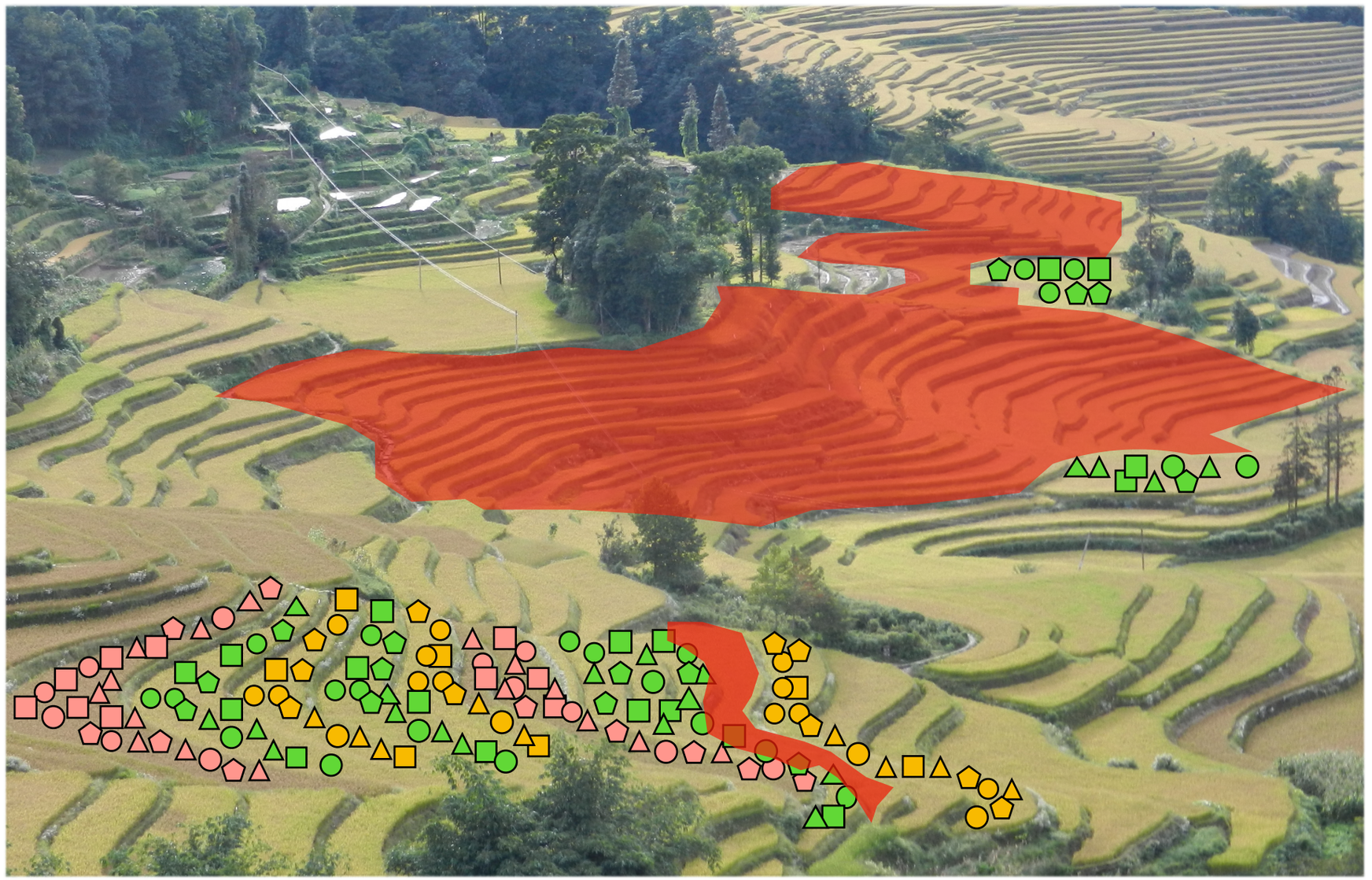
Summary

huge diversity in indica landraces

↓

maintenance of generalist *P. oryzae* genotypes with moderate performance

Summary



huge diversity in indica landraces

↓

maintenance of generalist *P. oryzae* genotypes with moderate performance

decrease of diversity following the introduction of a modern variety

↓

emergence of adapted genotypes

People involved

UMR BGPI
Biologie et Génétique des Interactions Plante-Parasite

Jean-Benoît MOREL
Henri ADREIT
Pierre GLADIEUX
Didier THARREAU
Sébastien RAVEL
Sandrine CROS-ARTEIL
Aurélie DUCASSE
Joelle MILAZZO
François BONNOT

SADAPT
SCIENCES ACTION DÉVELOPPEMENT - ACTIVITÉS PRODUITS TERRITOIRES

Mourad HANNACHI
François COLENO

Yunnan Agricultural University

Huichuan HUANG
Jinjing LIAO
Baihui JIN
Xiahong HE

INRAE

Thank you for your attention. Questions ?

Elisabeth FOURNIER
INRAE
Montpellier, France

Alexander Calder, *Ballons and blue flower*

Co-culture of japonica and indica landraces

Genetic differentiation of *P. oryzae* populations

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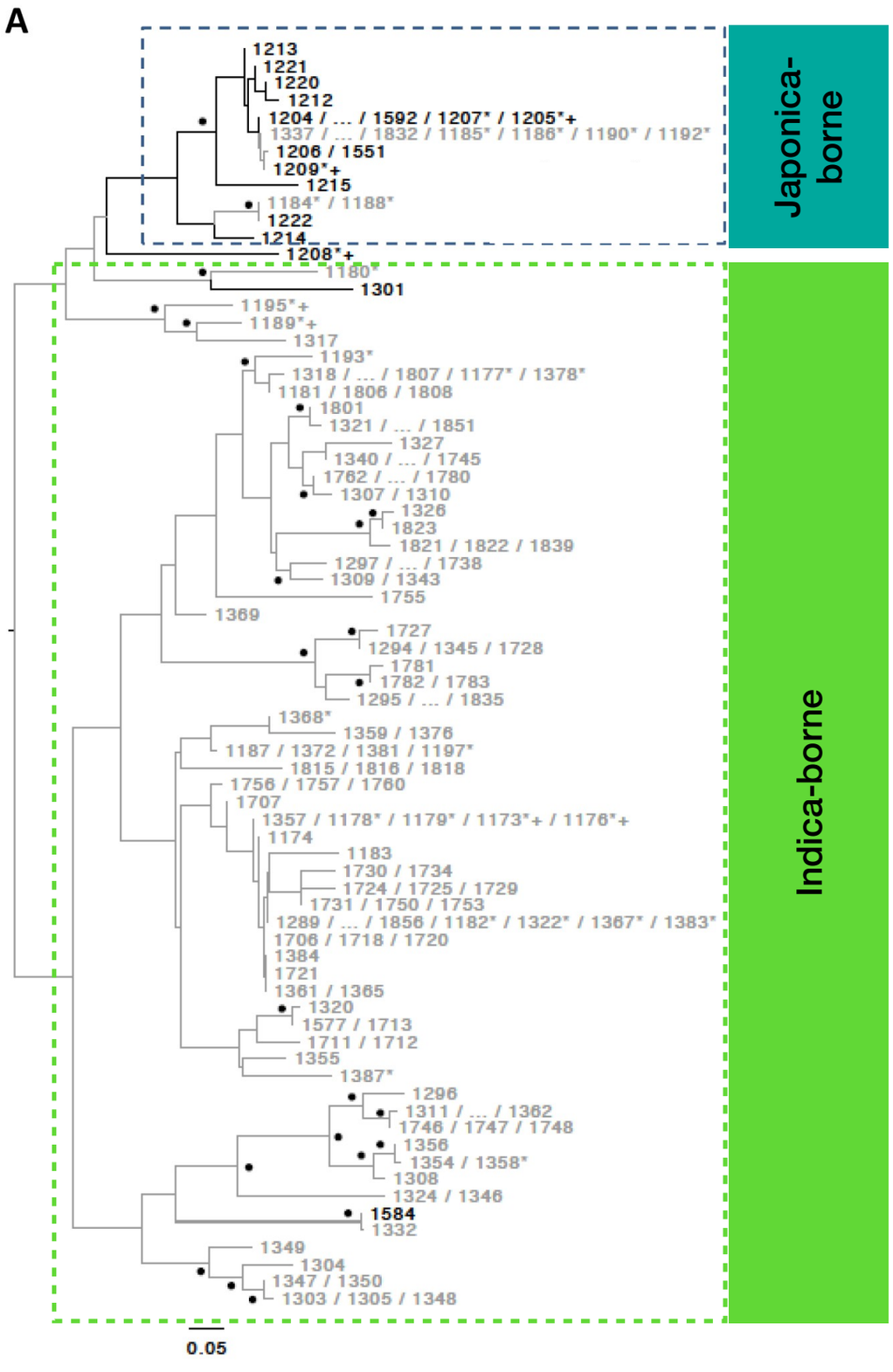
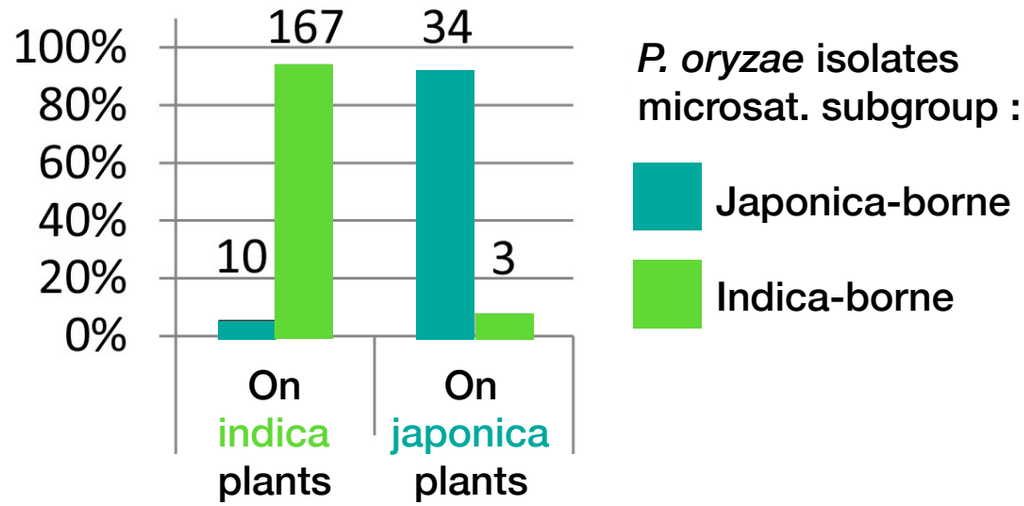


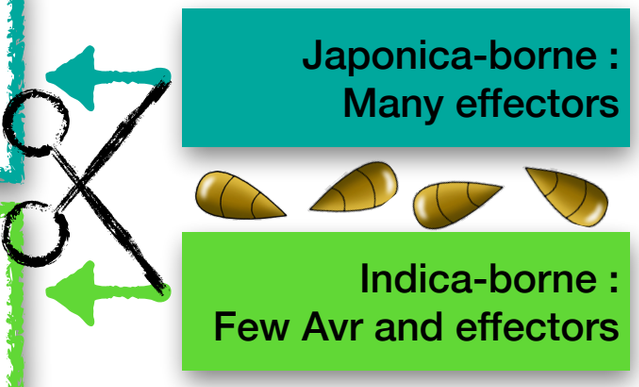
Specialization of *P. oryzae* on indica and japonica



Drivers : host immune system

Japonica plants:
- few R genes
- strong basal resistance

Indica plants:
- many R genes
- weak basal resistance



Japonica-borne : Many effectors

Indica-borne : Few Avr and effectors

- Specialization of *P. oryzae* to rice subspecies
- « Divide to reign » effect

***Liao et al. eLife 2016**. Pathogen effectors and plant immunity determine specialization of the blast fungus to rice subspecies*