

Symptoms Variation and Sequence Analysis of Different *Banana bunchy top virus (BBTV)* Isolates in the Philippines

Maricel C. Gonzales, Fe M. dela Cueva,
Lavernee S. Gueco and Olivia P. Damasco

Crop Science Cluster-Institute of Plant Breeding (CSC-IPB),
College of Agriculture, University of the Philippines Los Baños
(UPLB), College, Laguna, Philippines 4031.



Introduction

Banana

- 4th largest produced crop in the Philippines
- 9,083,929 metric tons in 2015 (PSA, 2016)
- Export value and high nutritive value

Introduction

● Banana production

- hindered by natural calamities

● Banana Diseases

- Moko/Bugtok
- *Fusarium* Wilt
- Sigatoka
- Banana Freckle
- Banana bract mosaic
- Banana mosaic
- **Banana bunchy top**

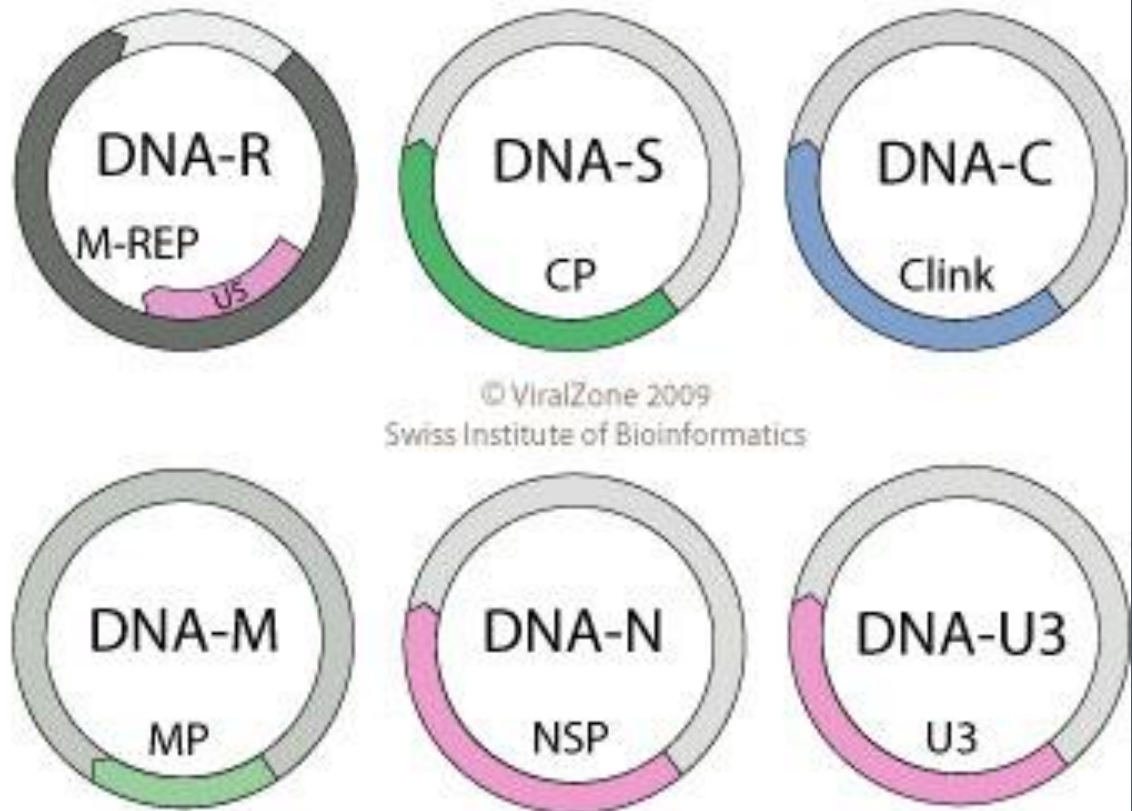
Banana Bunchy Top Disease

- Most destructive viral disease of banana
- Widespread
- Yield reduction up to 100%
- ***Banana bunchy top virus (BBTV)***

Banana bunchy top virus (BBTV)

- Family *Nanoviridae*
- Genus *Babuvirus*

BBTV genomic components



Control

Short term

- ⦿ virus-free plants through tissue culture
- ⦿ exclusion (quarantine)
- ⦿ eradication of infected plants

Long term

- ⦿ BBTV-resistant varieties

Control

- no banana cultivar fully resistant to BBTV
- banana cultivars with the B genome (AAB and ABB) are said to be tolerant
- In Malawi, 22 banana cultivars were all susceptible but differ in symptom severity
- In Cameroon, 16 Musa genotypes also expressed varied BBTV symptoms
 - Williams (AAA) and PITA 23 (AAB)
 - Gros Michel (AAA) and Pisang Awak (ABB)

Control

● Current Strategies

- Pathogen Derived Resistance (PDR)
- RNA interference (RNAi)
- Mutation breeding using gamma-irradiation

Control

● Philippines

- Gamma-irradiation coupled with in vitro technology was utilized in cv. Lakatan (AAA)
- 29 mutant lines with BBTV resistance
- attributed to the aphids' non-preference to colonize and reproduce
- Information on the occurrence of diversity of the virus is important in the deployment of these promising irradiated lines

BBTV Diversity

- from different countries revealed two distinct lineages with ~10% nucleotide difference
 - Pacific Indian Oceans (PIO) group
 - South-East Asia (SEA) group
- within country is very low
- a relatively greater BBTV diversity was observed in India

BBTV Diversity

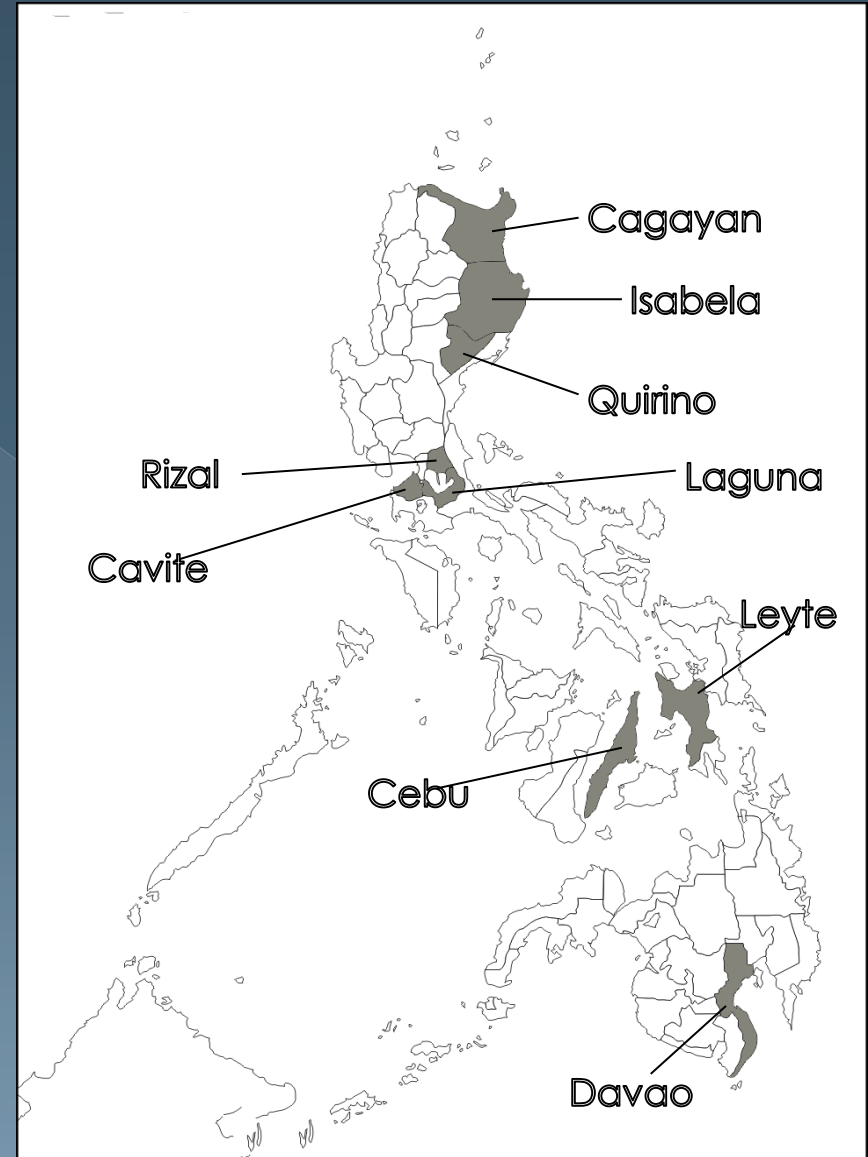
- Occurrence of BBTV strains in the Philippines is still unknown.

Objective

- To determine possible diversity of BBTV isolates based on symptom variations and nucleotide sequences of the DNA-R and DNA-M genomes

Survey and Collection

- 9 provinces
- 5 local banana cultivars
 - Lakatan (AAA)
 - Cavendish (AAA)
 - Latundan (AAB)
 - Saba (ABB)
 - Cardaba (ABB)



Symptoms

- marginal leaf chlorosis and necrosis, leaf narrowing, rosetting and stunting



Lakatan

Symptoms



Latundan

Symptoms

- rosetting without necrosis and death of infected plants



Saba



Cardaba

Sequence Analysis

DNA-R

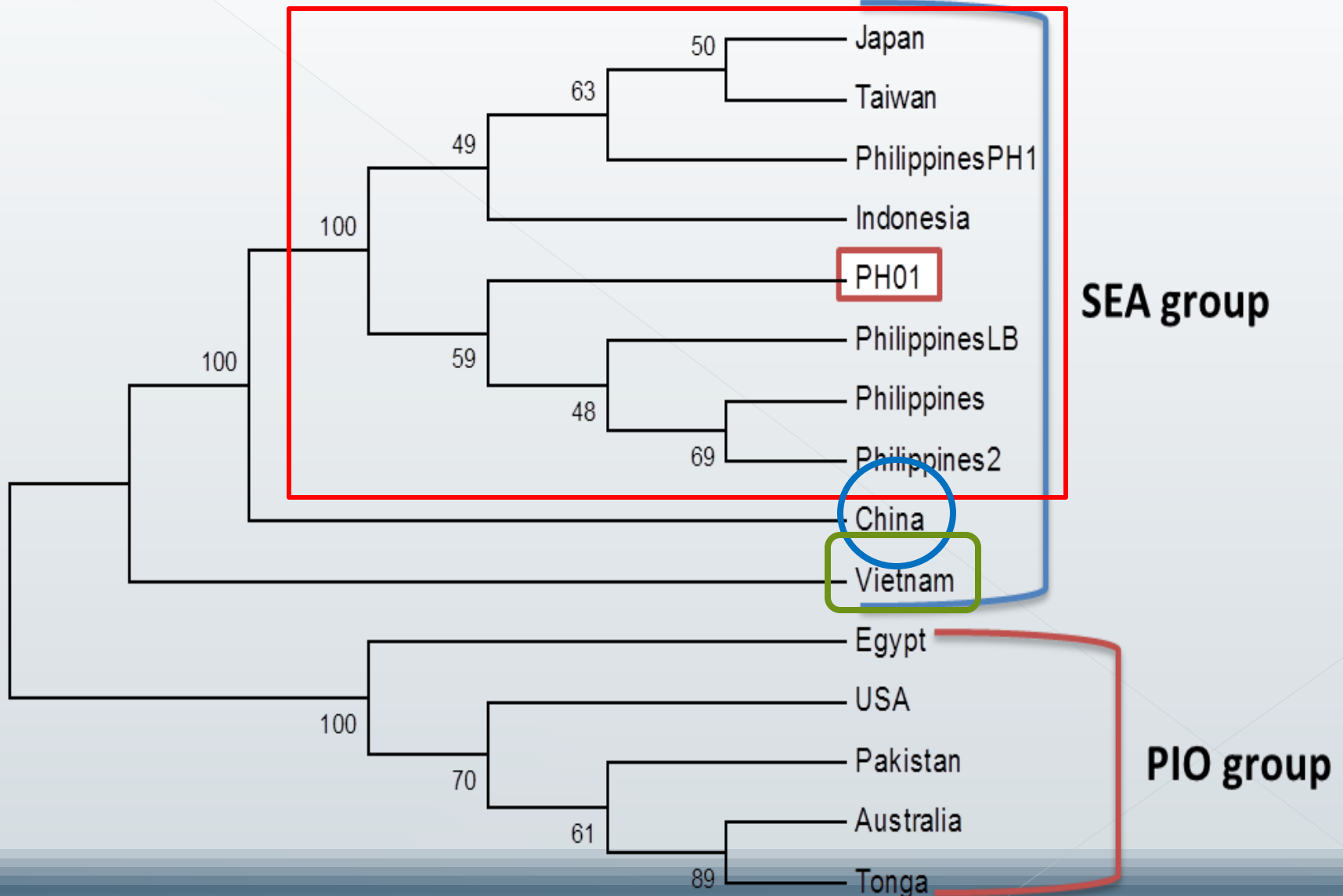
- 1104 bp
- 98.7-100% nucleotide sequence homology among Phil isolates
- 99-100% with SEA group
- 88-90% with PIO group

Sequence Analysis

DNA-M

- 911bp
- 99.2-100% nt homology among Phil isolates

Phylogenetic Relationship



Conclusions

- Symptom variation in different banana cultivars with banana bunchy top disease was not observed.
- BBTV induces symptoms such as marginal leaf chlorosis and necrosis, leaf narrowing, rosetting and stunting with the exemption of the cvs. Saba and Cardaba

Conclusions

- This study further infers that there is no diversity among BBTV isolates in the Philippines.
- **This implies that promising irradiated 'Lakatan' with resistance to the disease can be effectively deployed to different banana growing areas in the country.**
- This is the first report of genetic diversity analysis of BBTV isolates in the Philippines.

Thank you for listening.