

The origin of mangosteen: review and outlook

Tze Leong YAO | 4th AP-BON Web Seminar | 10 December 2020

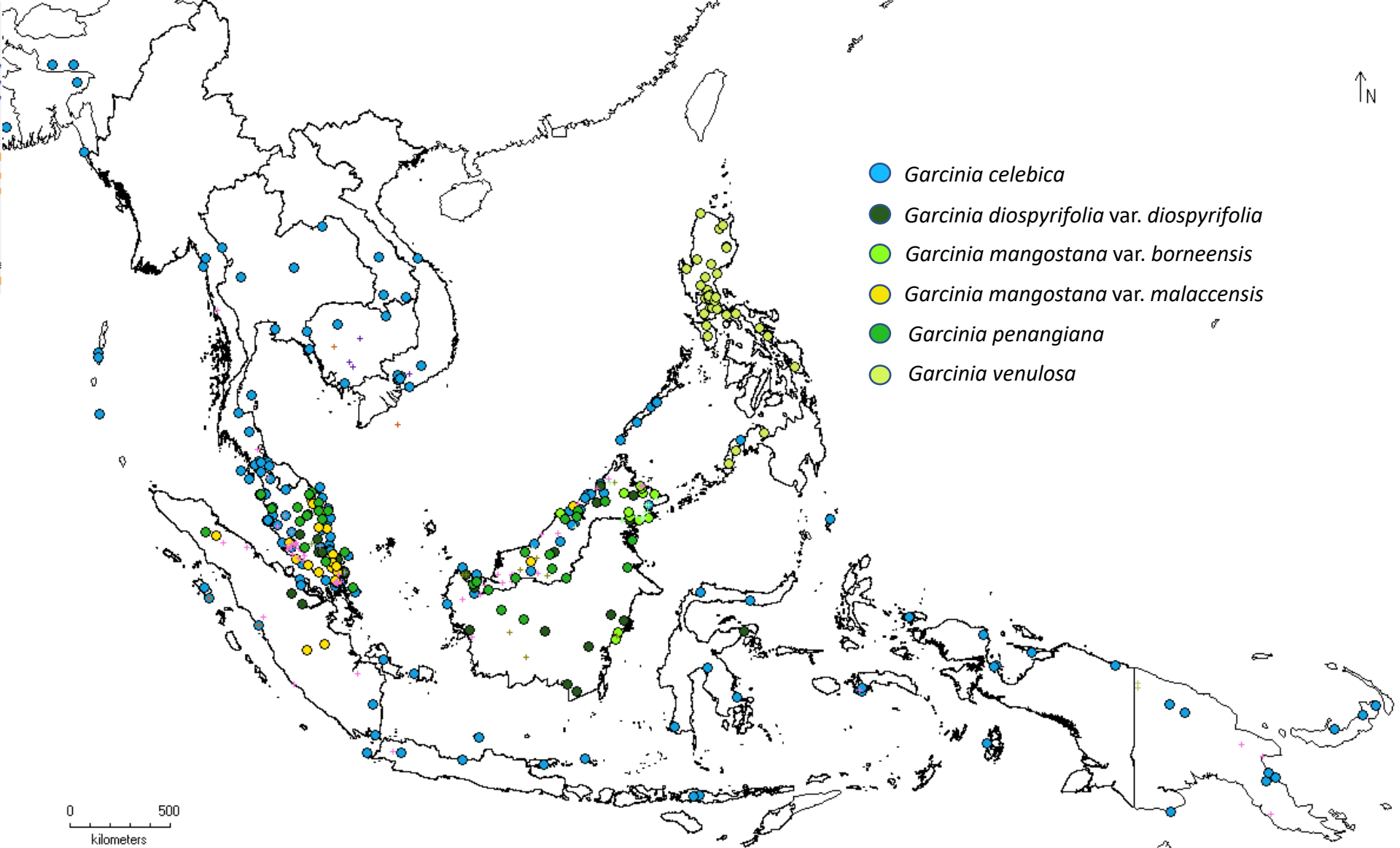


- Background
- Review
 - Biological origin
 - Historical records
 - Distribution and diversity
- Outlook

Background

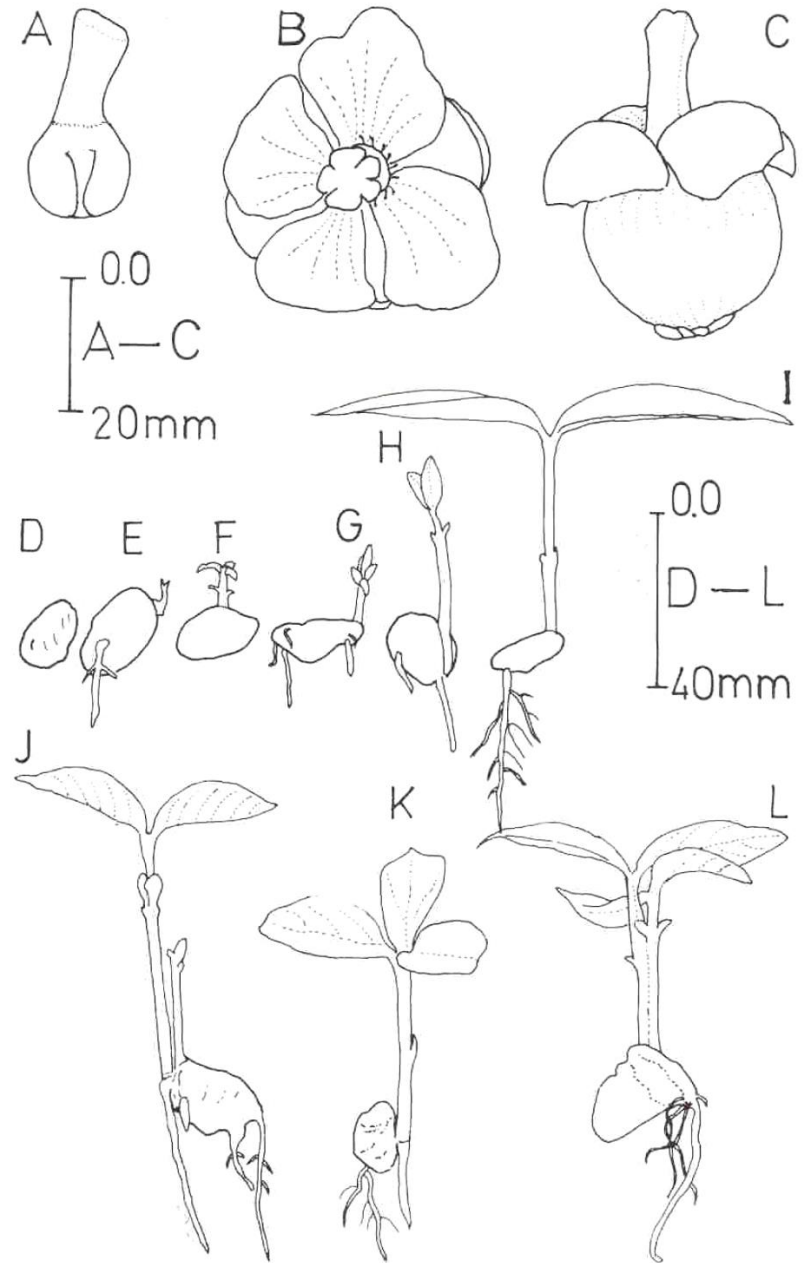
- Mangosteen (*Garcinia mangostana*, Clusiaceae)
- Wild progenitors and relatives are threaten
- Ancestry and specific area of origin remained debatable

- *Garcinia*: pantropical dioecious
- *Garcinia* sect. *Garcinia*
- Closely related wild relatives: *Garcinia hombroniana*, *G. malaccensis*, *G. opaca*, *G. penangensis* and *G. venulosa*



Distribution of sect. *Garcinia* species

- Agamosperous
- Staminodes on female flowers
- Tetrapolyploid



Male tree  exists?

Occurrence  in the wild?

Taxonomic varieties in *Garcinia mangostana*



var. *mangostana*

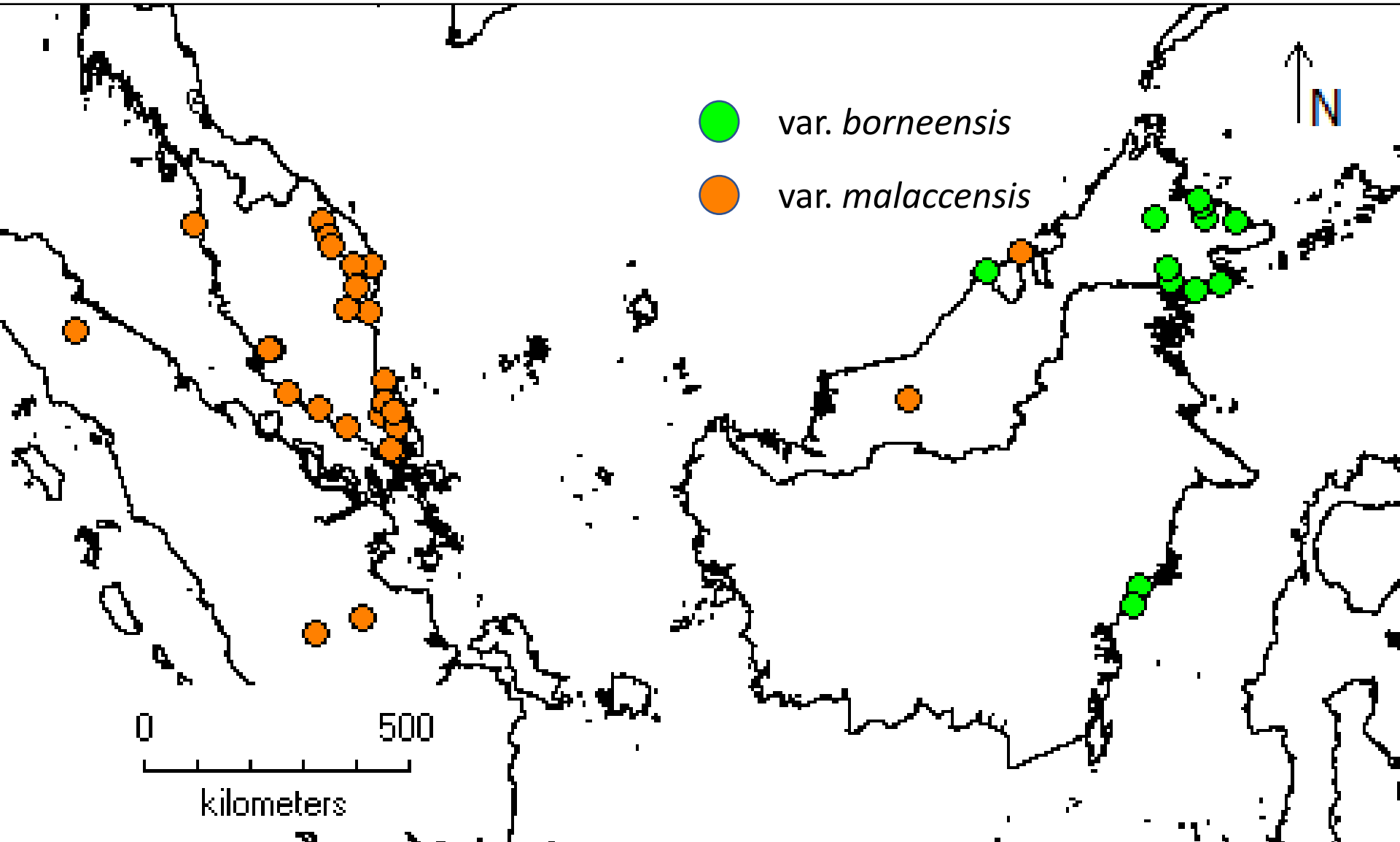


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var. *malaccensis*



var. *borneensis*



- Chromosome counts (56–130):

2n	Reference
56–76	Soepadmo (1989)
74–110	Midin et al. (2018)
c. 76	Krishnaswamy & Raman (1949)
88–90	Ha (1978)
96	Tixier (1960); Chennaveeraiah & Razdan (1975)
120-130	in Othman & Tindall (1995), no authority quoted

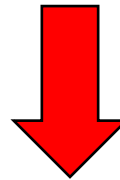
- Genetic markers developed:

Genetic markers	References
Isoenzymes	Mansyah et al., 1999
Random Amplified Polymorphic DNA (RAPD)	Mansyah et al., 2003
Internal Transcribed Spacer (ITS)	Yapwattanaphun et al., 2004
Randomly Amplified DNA Fingerprinting (RAF)	Ramage et al., 2004
RAF	Sandø et al., 2005
ITS	M. Nazre et al., 2007
RAPD	Sinaga et al., 2007
RAPD	Sobir & Poerwanto, 2007
Isozymes; Amplified Fragment Length Polymorphism (AFLP)	Sobir et al., 2009
Inter-simple sequence repeat (ISSR)	Mansyah et al., 2010
Simple Sequence Repeats (SSR)	Qosim et al., 2011
ISSR	Sobir et al., 2011
ITS; trnL-trnF, accD and psaL (cpDNA); microsatellite markers	Abdullah et al., 2012
ISSR	Sulassih et al., 2013
ITS	Nazre, 2014
Random Amplification of Polymorphic DNA (RAPD)	Mansyah et al., 2015
ITS; KNOX-1	Parthasarathy et al., 2016
<i>De Novo</i> genome sequence	Matra et al., 2016
AFLP	Matra et al., 2016
SSRs	Samsir et al., 2016
Genome size estimation	Midin et al., 2018
SSRs	Arias et al., 2020

Biological origin theories

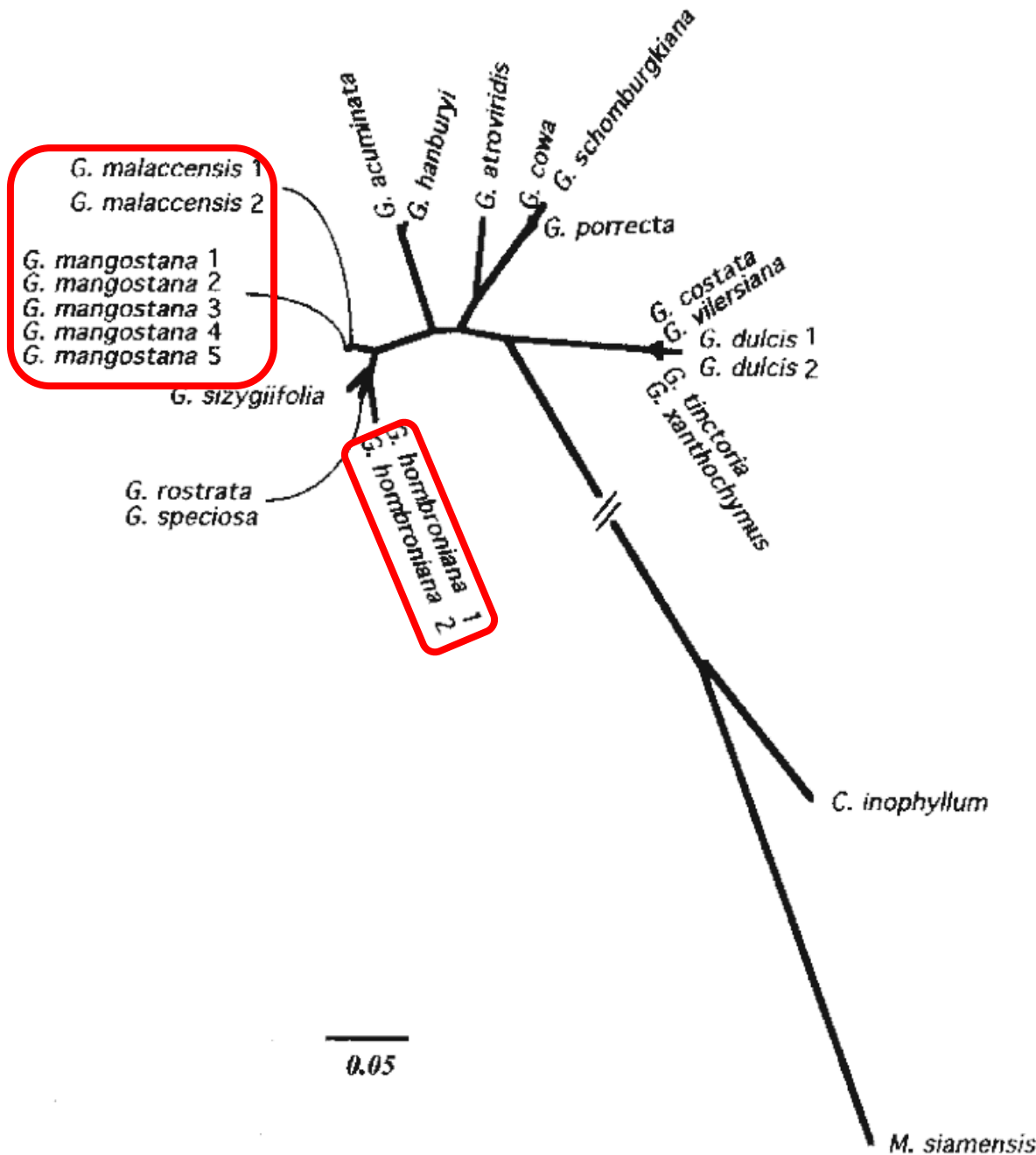


Garcinia sylvestris? *silvestris* Boerl.
(León, 1982; Zeveri & de Wet, 1982)

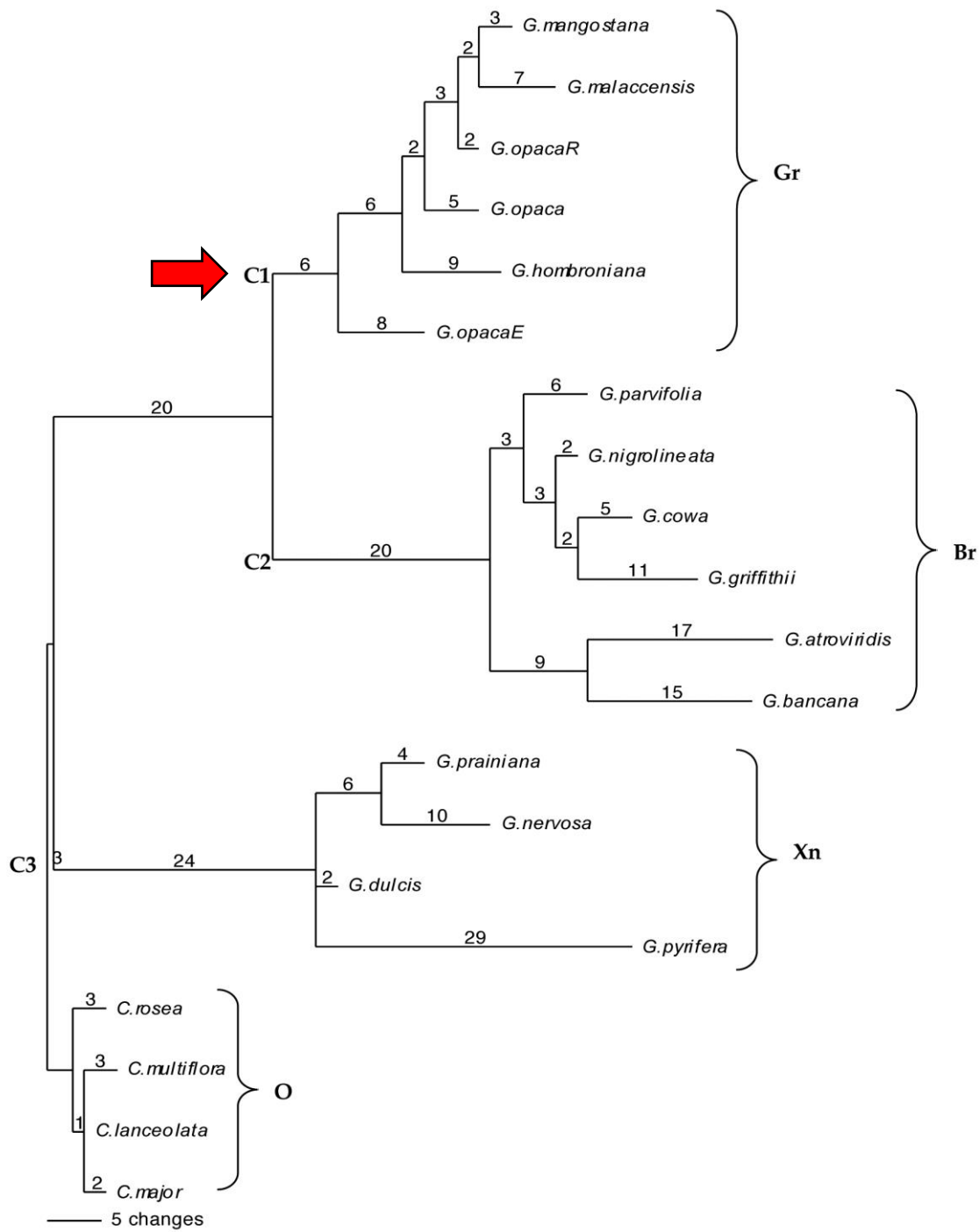




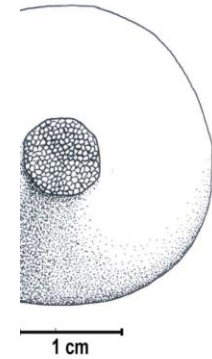
G. mangiana (2n=42)
))



? *G. pe*

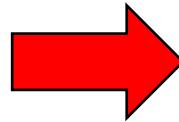


2012)



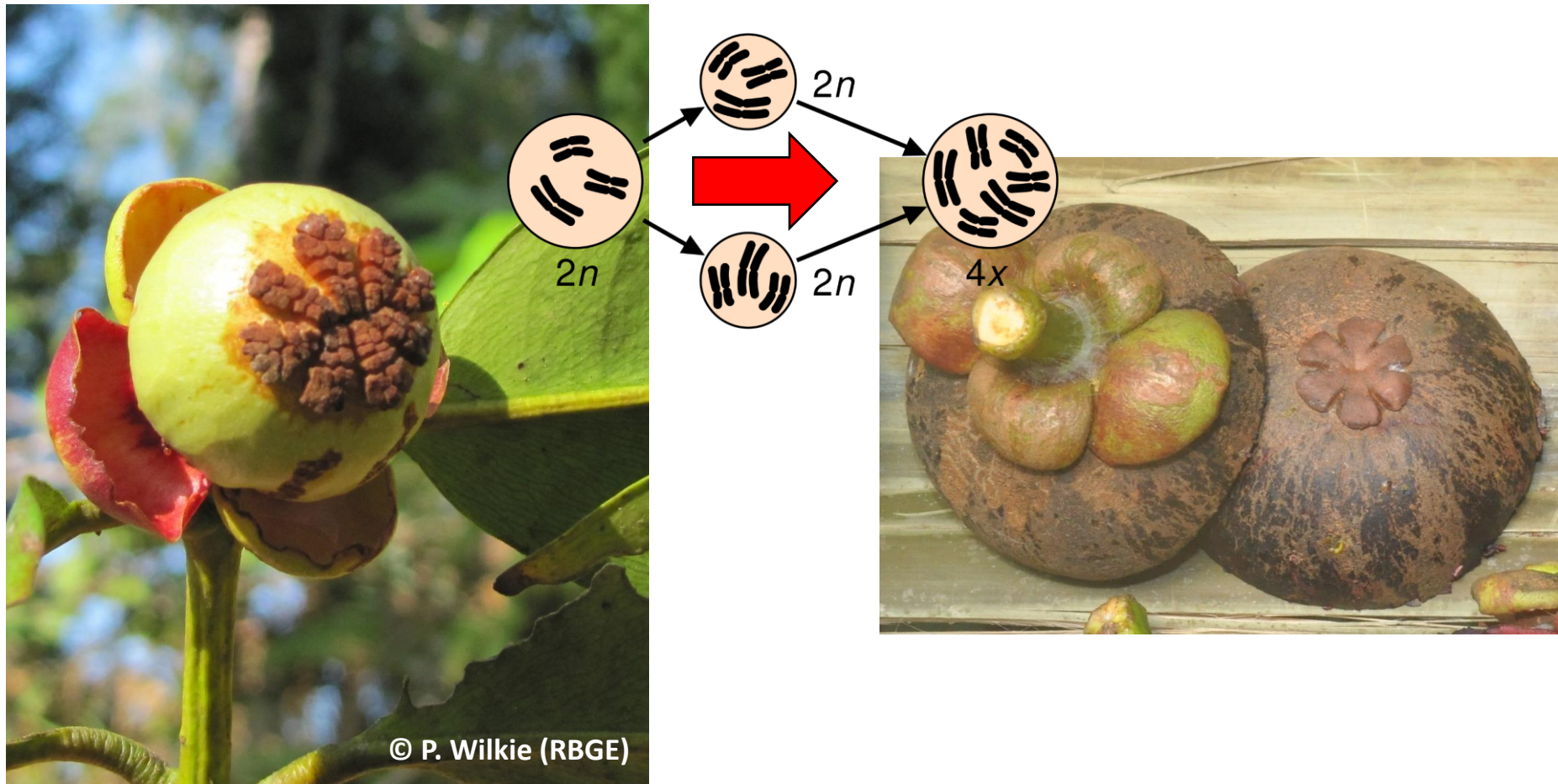


Superior selections *G. malaccensis* (Nazre, 2014)





autotetraploid of *G. malaccensis* (Hambali & Natawijaya 2016)



Evidence/disproof from cytological and molecular biology studies

- Allopolyploid VS Autopolyploid
- Speculative conclusion from cytological studies
- Small sample size in phylogenetic analyses
- Geopolitical regions restricted samplings
- Wrongly identified samples

Historical records

East Java and Aceh (1416)



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- ‘The Overall Survey of the Ocean’s Shores’: the first written record
- Transliteration to mǎng jí shì (莽吉柿)

Malacca (1563)



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- *'Colóquios dos simples e drogas da India'*
- ... ships from Malacca sending doriões and mangosteens to Portuguese Jaffna

Java (1669)



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growing by the highway in Java within the bush, like sloes (blackthorn)

Moluccas (1650's – 1690's)



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Herbarium Amboinense

Malacca (1692)



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brief description of mangosteen and other fruit tree species from Malacca

Moluccas (1733)



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‘The settling of a new genus of plants, called after the Malayans, Mangostans’

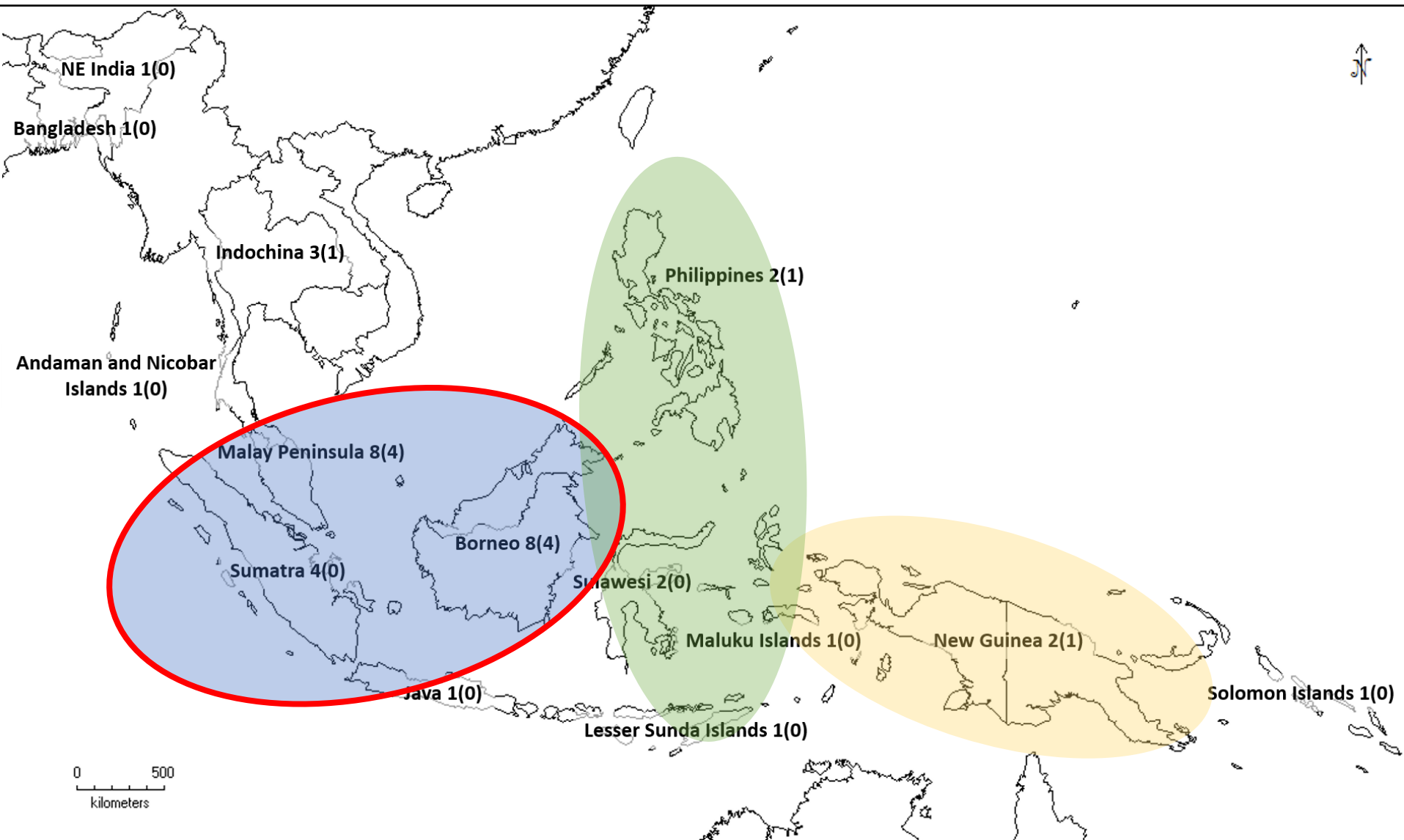
Java (1753)



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Name after Garcin but mentioned Java as 'habitat'

Distribution and diversity



Outlook

- Integrated morphology and genetic approach
- SSR and chloroplast SNP
- Species distribution modelling

Thank you!

FRIM

Agropolis-UPM-SEARCA

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“If there were more of this fruit on the earth, there would be need for neither churches nor jails, for there would be no sin.”

**Anna Forbes (1887),
“Insulinde: Experiences of a naturalist's wife
in the Eastern Archipelago”.**

