

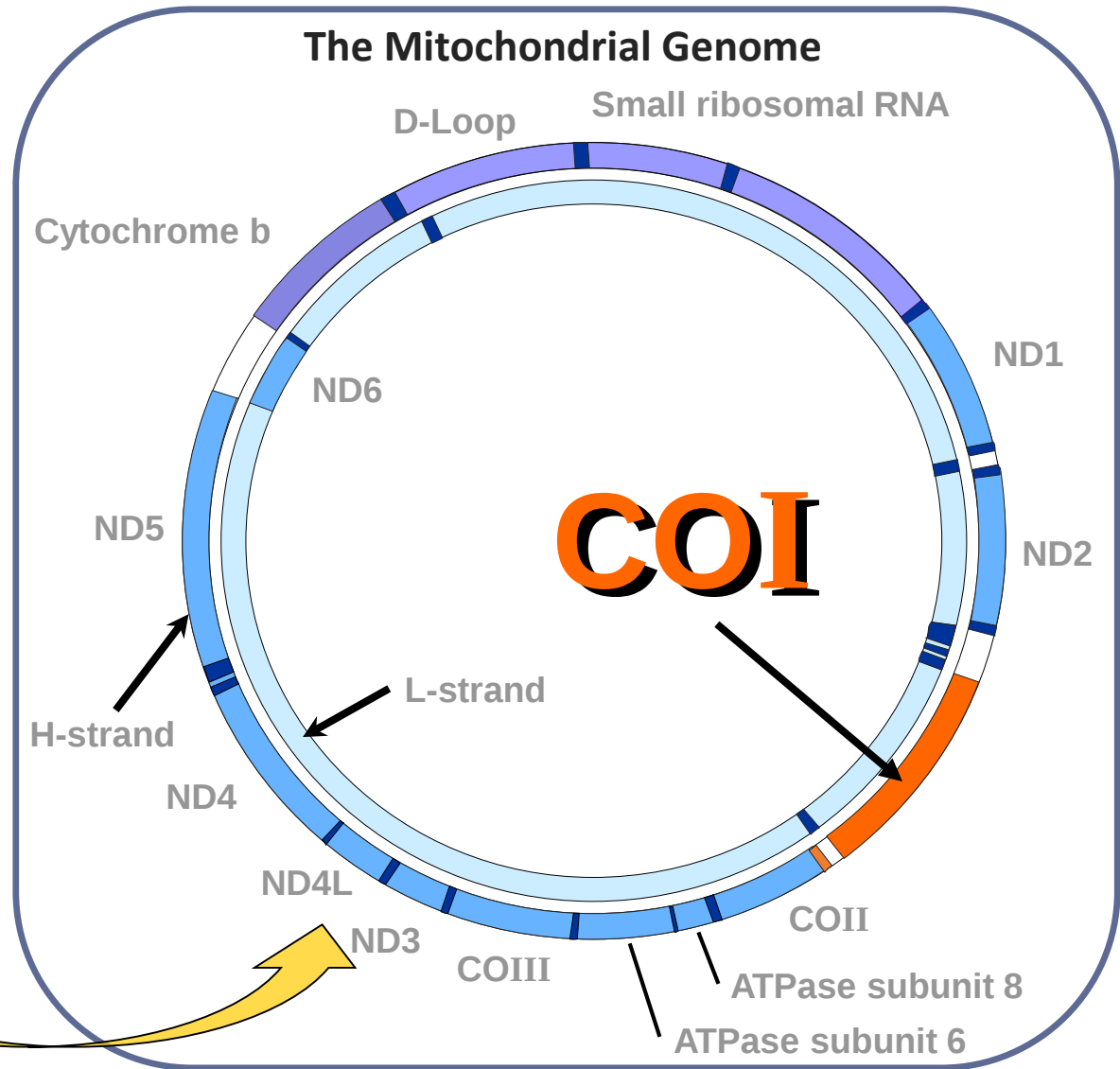
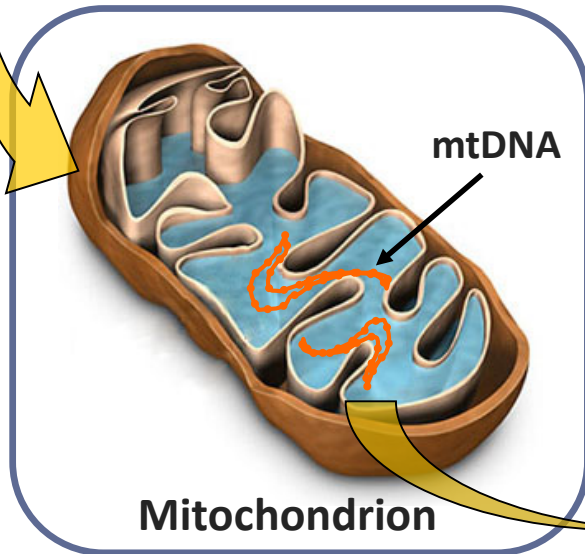
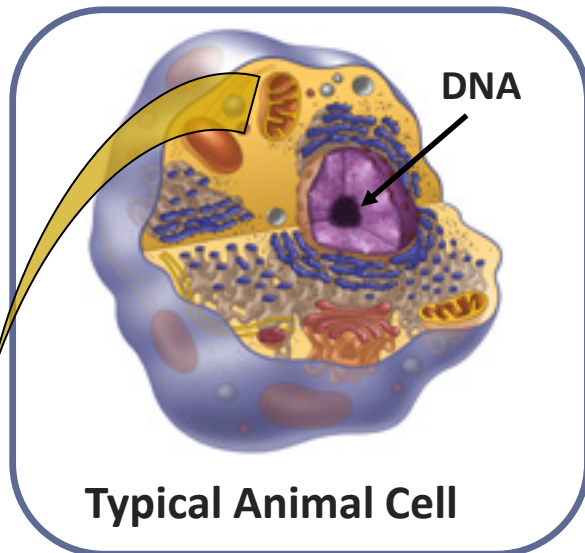
A chloroplast genomic strategy for designing taxon specific DNA mini-barcodes: A case study on ginsengs

董文攀 (wpdong@ibcas.ac.cn)

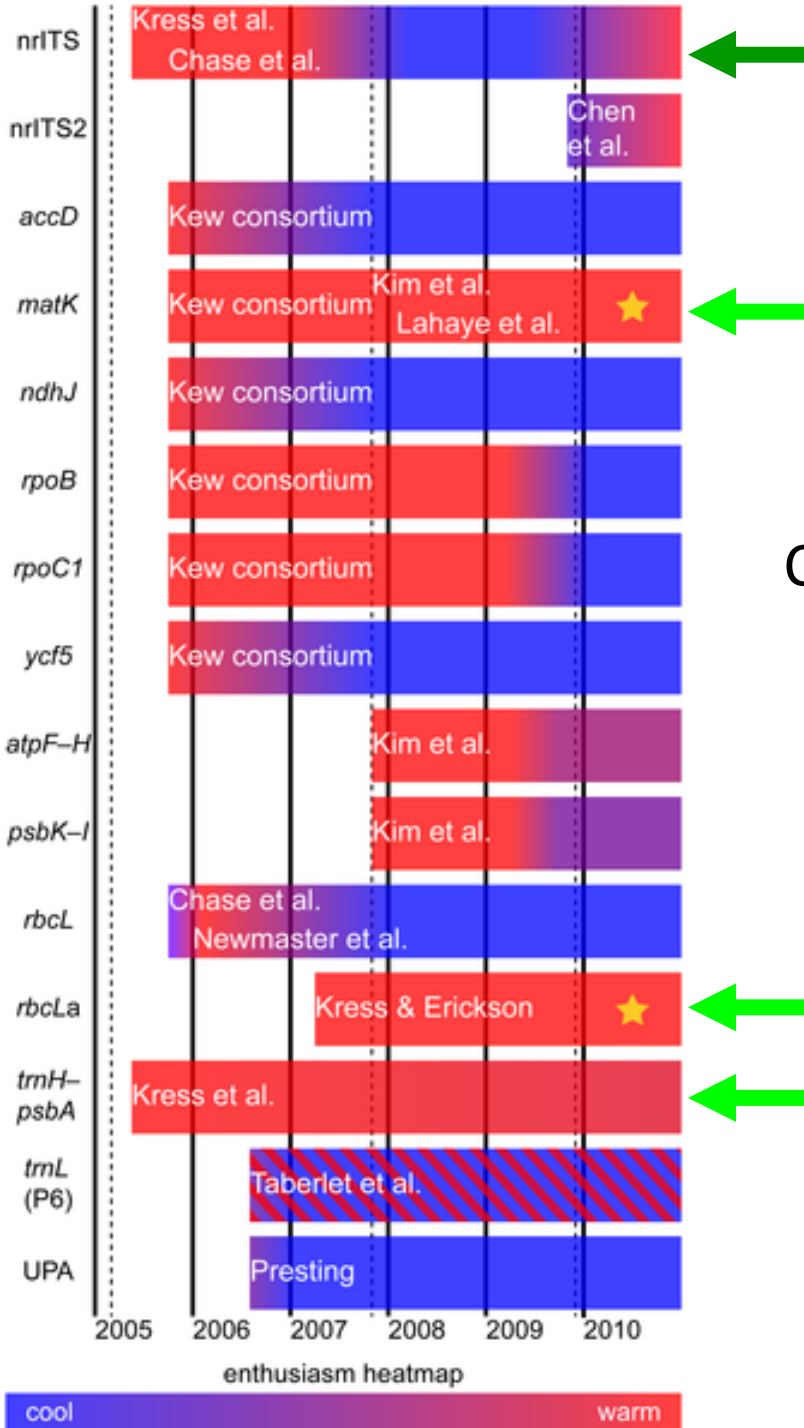
中国科学院植物研究所 系统与进化植物学国家重点实验室

2014.08.15

DNA 条形码标记

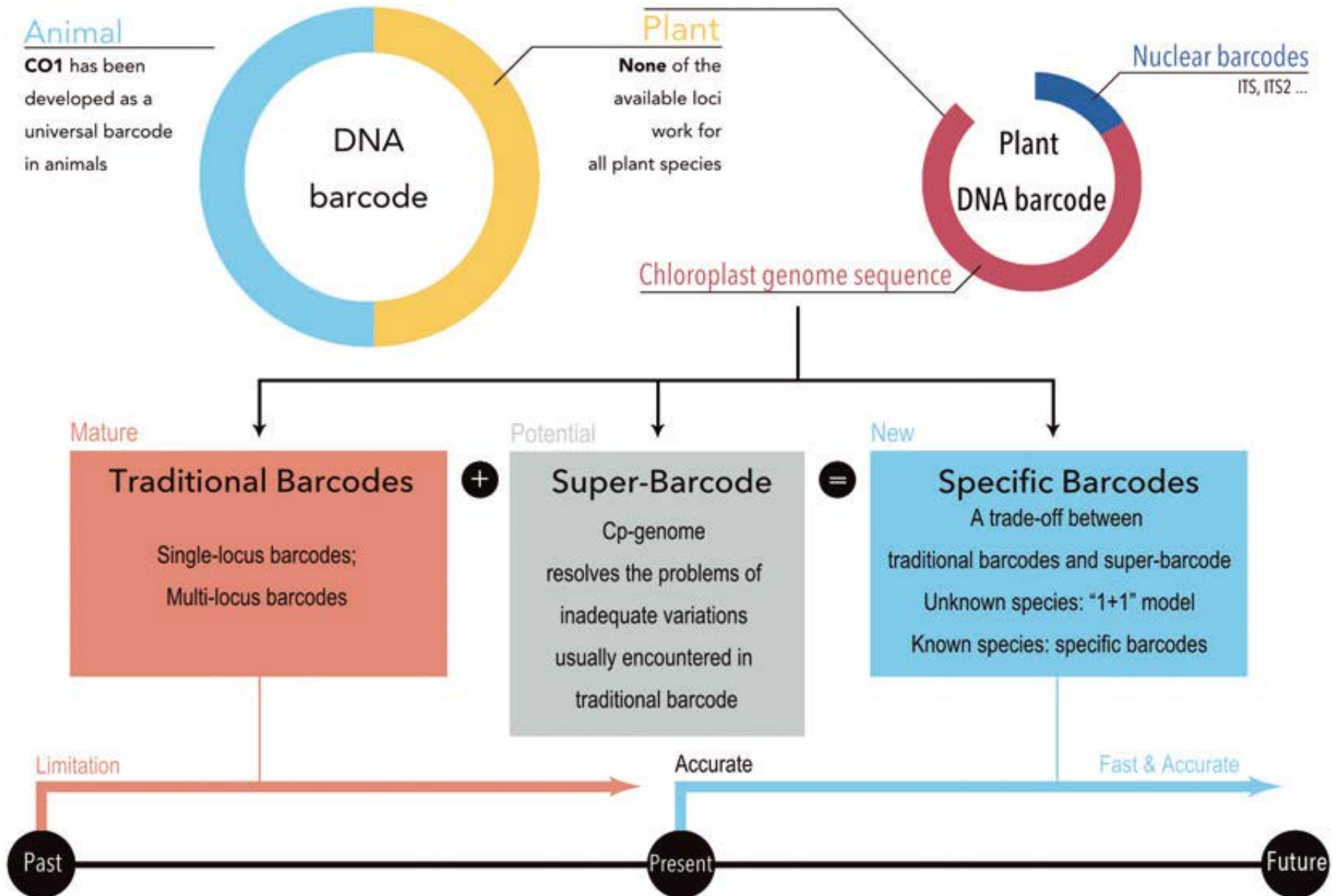


植物DNA条形码



Colours (red = warm; blue = cool) represent an informal measure of enthusiasm among DNA barcoding researchers in the systematics community for CBOL and iBOL adoption of different markers.

Plant DNA barcoding: from gene to genome



(Li et al. 2014)

DNA条形码的原材料



Herbal materials



1. DNA受损;
2. DNA 降解;
3. PCR抑制剂

Mini-barcode

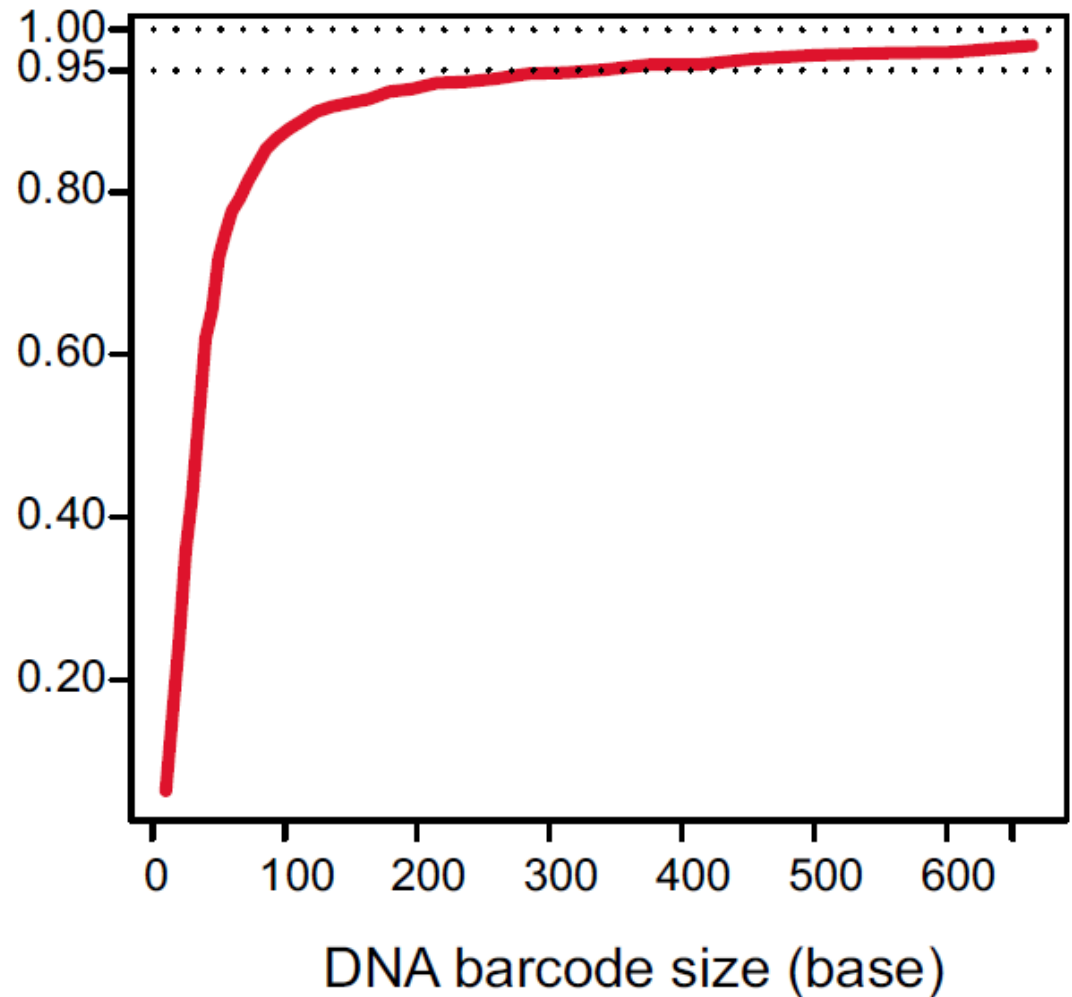


Figure 1
Short DNA barcode sequences (less than 150 bp)
provide efficient taxonomic sequence tags. Increase in
species resolution with increasing sequence length of cyto-
chrome c oxidase I.

Meusnier I *et al.* (2008). *BMC Genomics* **9**, 214.

Performance (percentages in parentheses) of *rbcLa* and *rbcLb* in identifying families, genera and species using the BLAST method based on independent data sets

Plant group	<i>rbcLa</i>			<i>rbcLb</i>		
	Family	Genus	Species	Family	Genus	Species
Chlorophytes	53 (100)	203 (99.84)	615 (73.48)	53 (100)	195 (99.75)	556 (67.81)
Charophytes	15 (100)	59 (100.0)	392 (76.74)	15 (100)	59 (100.00)	392 (80.07)
Bryophytes	176 (100)	633 (99.81)	1932 (85.50)	175 (100)	613 (99.92)	1775 (90.89)
Lycophytes	3 (100)	7 (100.0)	199 (69.58)	3 (100)	7 (99.69)	197 (66.47)
Ferns	44 (100)	303 (99.79)	2764 (66.23)	44 (100)	304 (100.0)	2761 (69.36)
Gymnosperms	13 (100)	84 (99.89)	738 (24.58)	13 (100)	84 (100.0)	649 (36.67)
Angiosperms	424 (100)	6832 (99.88)	22 489 (49.58)	424 (100)	6218 (99.95)	16 063 (71.42)

Dong W, Cheng T, Li C, *et al.* (2014). *Molecular Ecology Resources*.

DNA mini-barcode for land plants

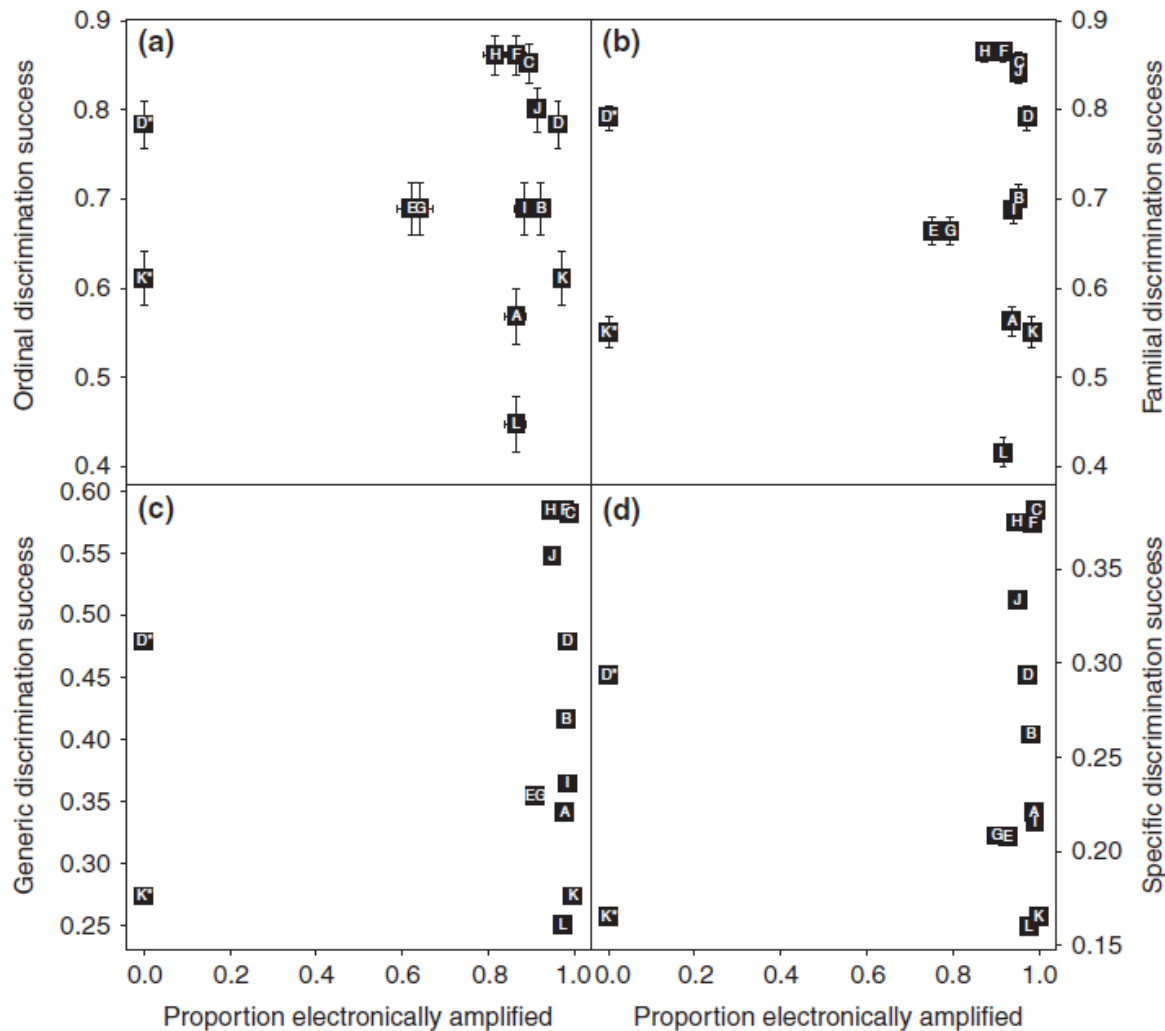
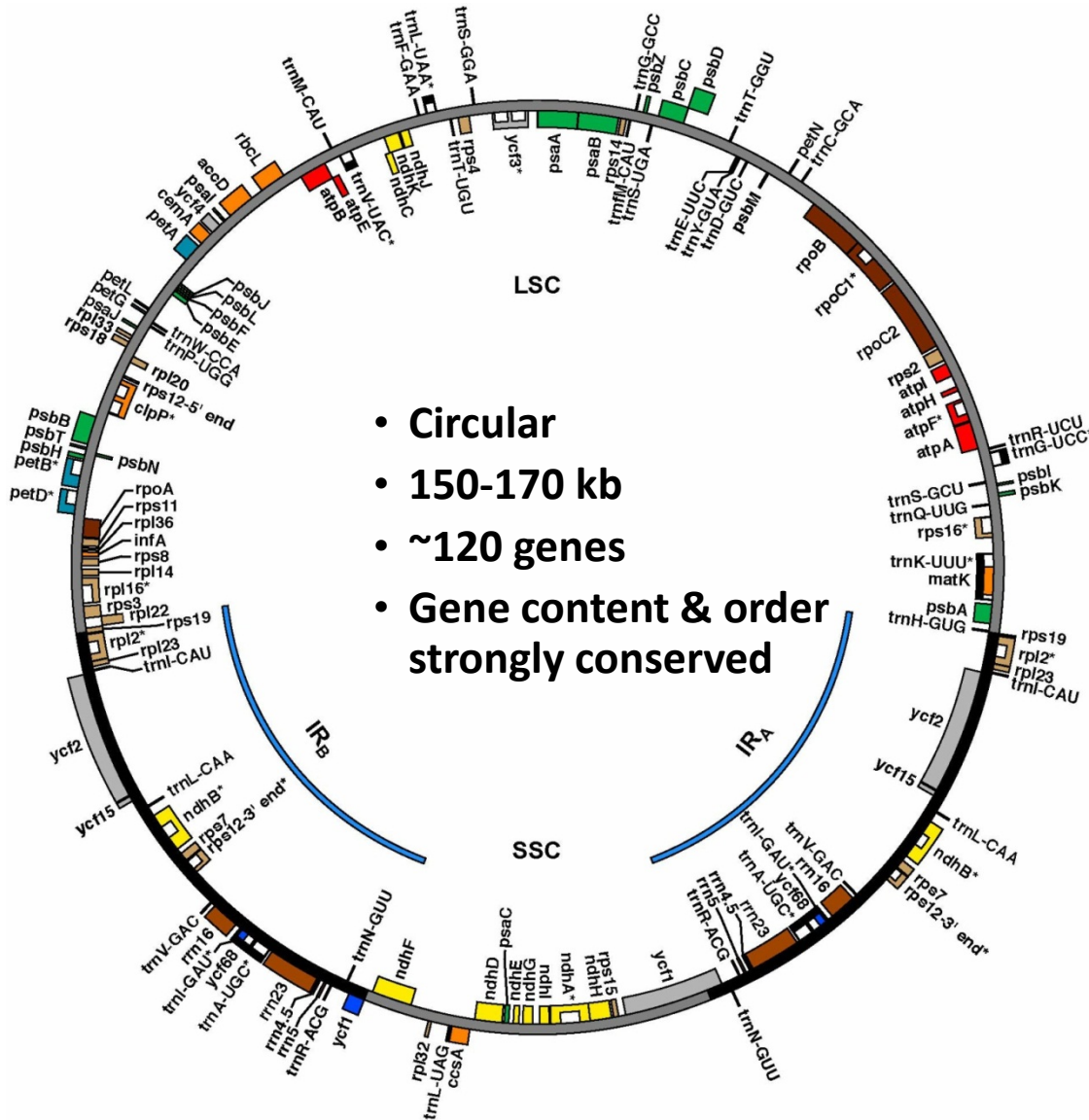


Fig. 2. Electronic PCR amplification versus discriminatory power of *rbcL_a* mini-barcode for (a) orders, (b) families, (c) genera and (d) species. Mini-barcode names correspond to those in Table 2. CoDeHOP primer mixtures are indicated by an asterisk. Error bars indicate 95% confidence intervals. Indistinguishable mini-barcode names are plotted as single points.

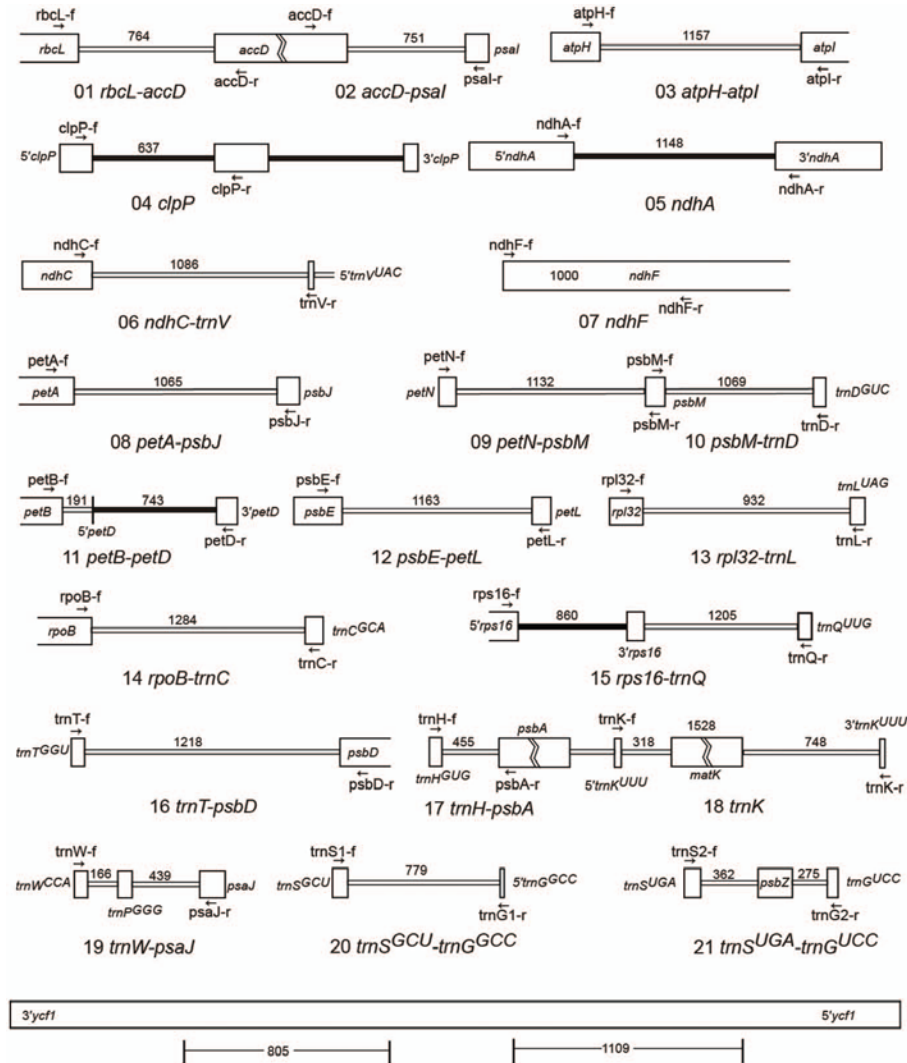
Chloroplast genome

- Circular
- 150-170 kb
- ~120 genes
- Gene content & order strongly conserved



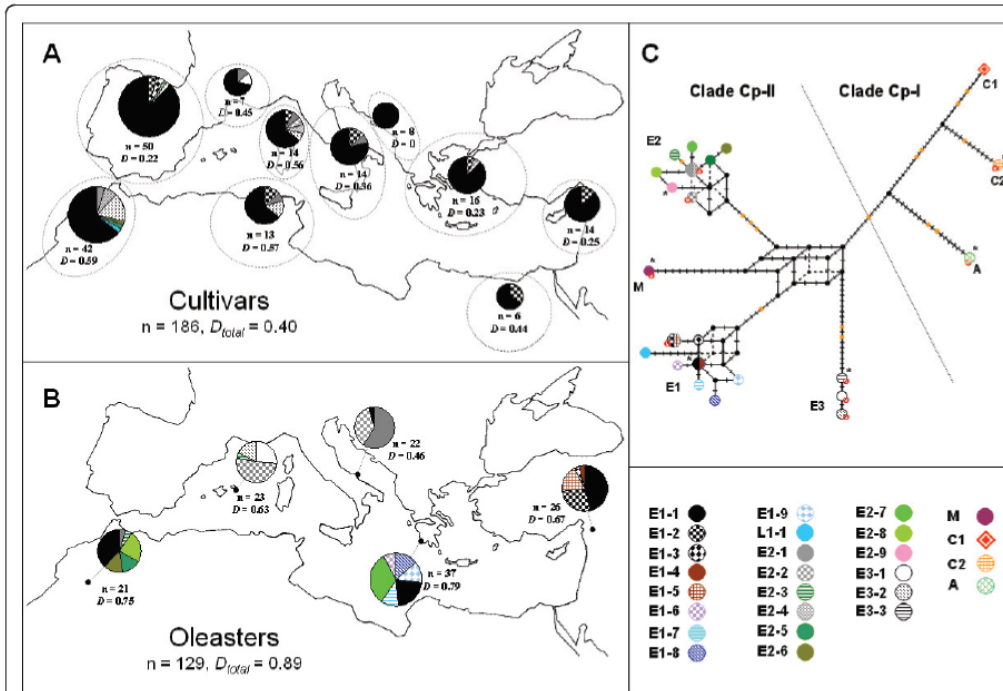
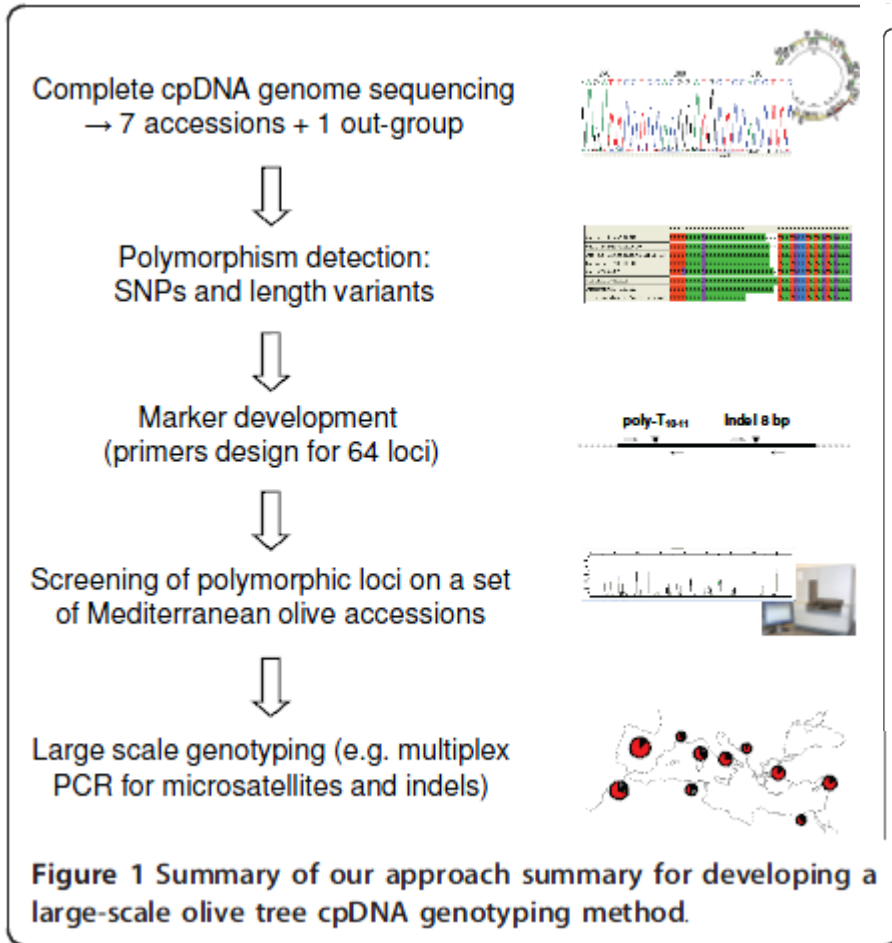
Highly Variable Chloroplast Markers for Evaluating Plant Phylogeny at Low Taxonomic Levels and for DNA Barcoding

Wenpan Dong^{1,2}, Jing Liu^{1,3}, Jing Yu^{1,3}, Ling Wang², Shiliang Zhou^{1*}



Dong W, Liu J, Yu J, Wang L, Zhou S (2012). PLOS ONE 7, e35071.

利用叶绿体基因组开发高变的marker

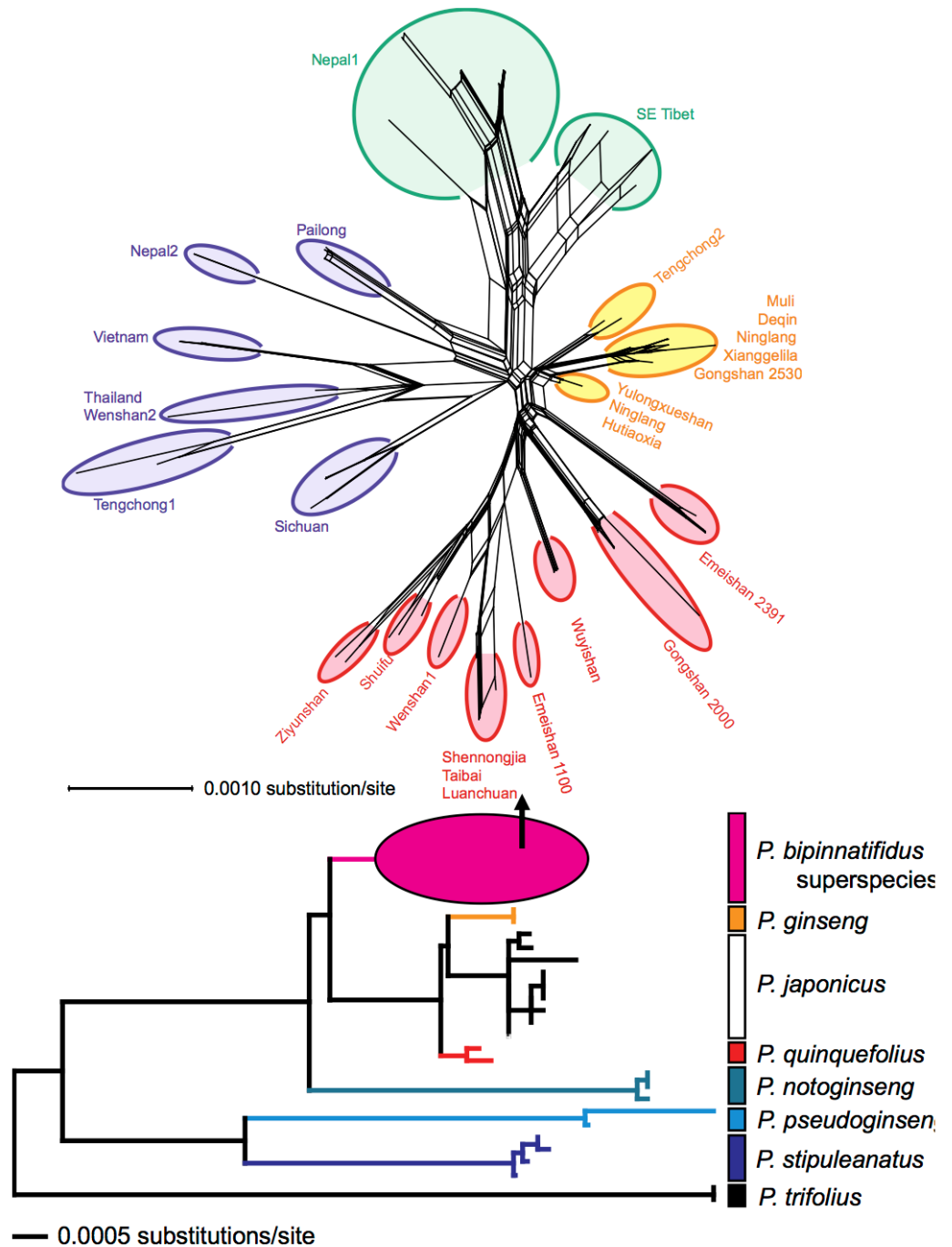


Besnard G et al.(2011).BMC Plant Biology 11, 80.

Taxon specific DNA mini-barcodes for ginsengs

1. 测定三七的叶绿体基因组
2. 开发人参属叶绿体基因组中的高变区
3. 设计适合人参属物种鉴定的mini-barcodes

Tree of *Panax*



中药材或者药材制剂



人参，三七，西洋参



叶绿体基因组测定

Kim KJ and Lee HL (2004). 测定了人参的叶绿体基因组，本研究采用 short-PCR 的方法测定三七的叶绿体基因组

Sequencing Angiosperm Plastid Genomes Made Easy: A Complete Set of Universal Primers and a Case Study on the Phylogeny of Saxifragales

Wenpan Dong¹, Chao Xu^{1,2}, Tao Cheng^{1,2}, Kui Lin³, and Shiliang Zhou^{1,*}

¹State Key Laboratory of Systematic and Evolutionary Botany, Institute of Botany, Chinese Academy of Sciences, Beijing, China

²University of Chinese Academy of Sciences, Beijing, China

³College of Life Sciences, Beijing Normal University, Beijing, China

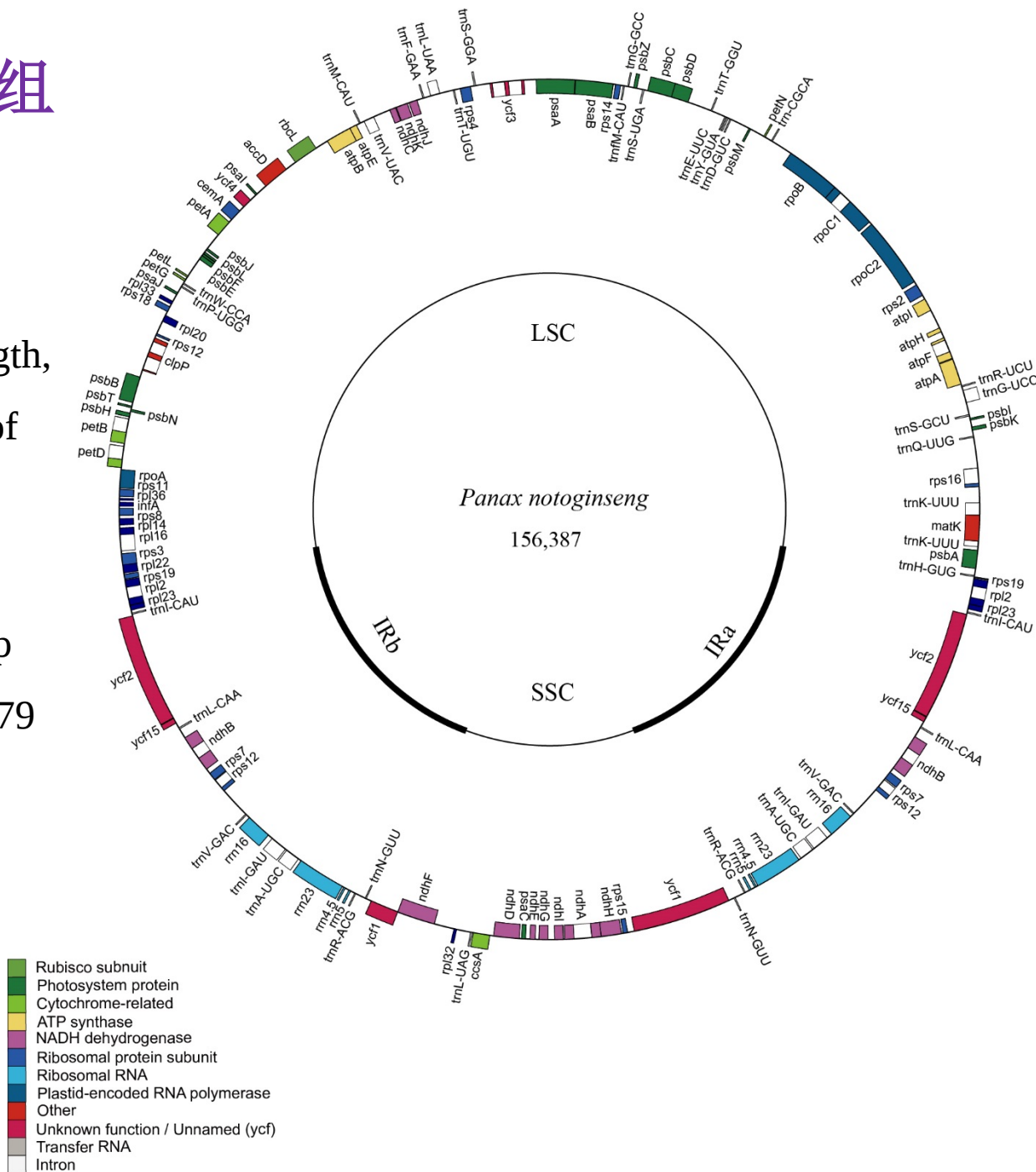
*Corresponding author: E-mail: slzhou@ibcas.ac.cn.

Accepted: April 12, 2013

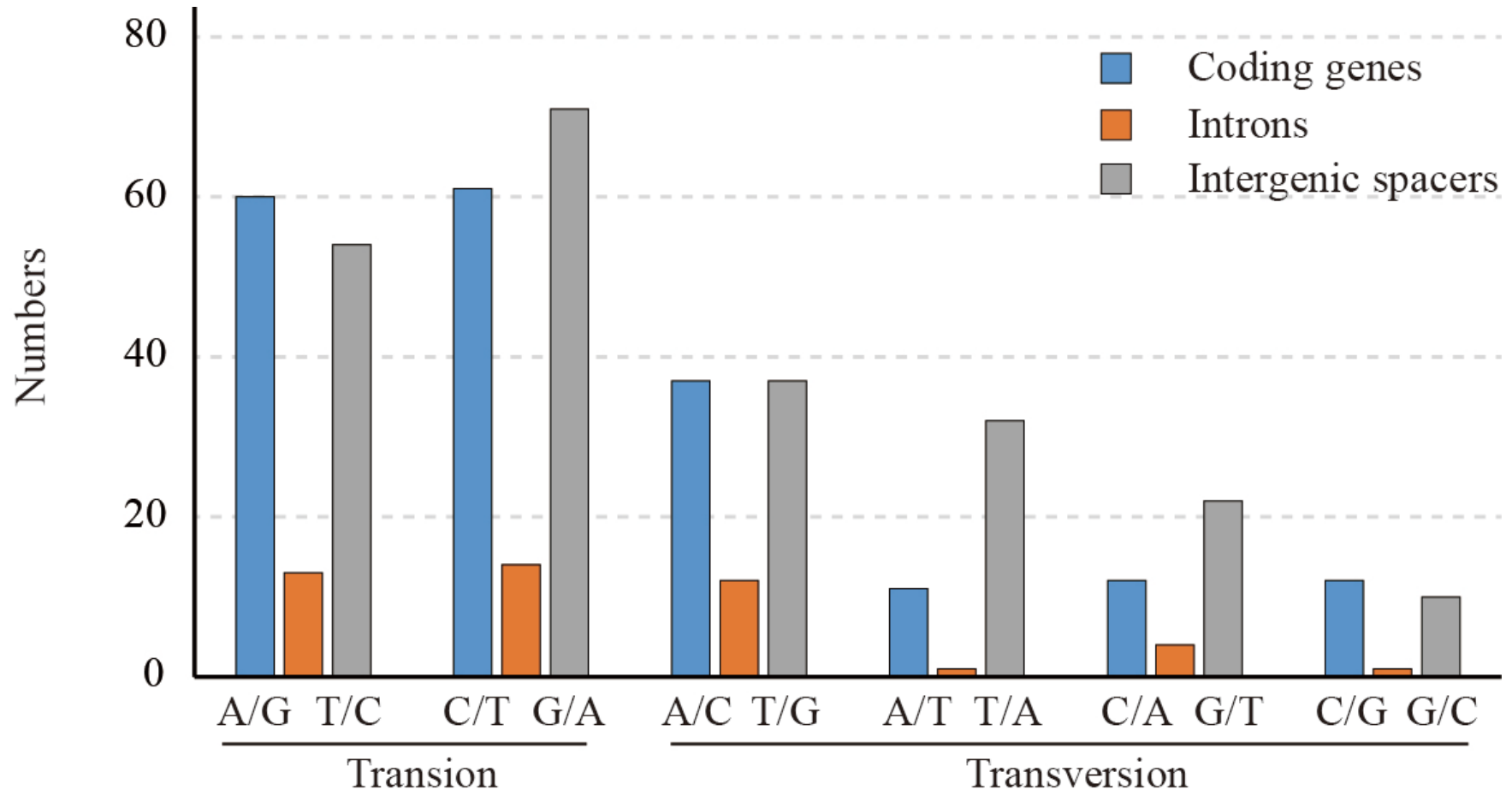
Data deposition: This project has been deposited at GenBank under the accession numbers JX427551, JX4336155, KC588388, and KC737241–KC737544.

三七的叶绿体基因组

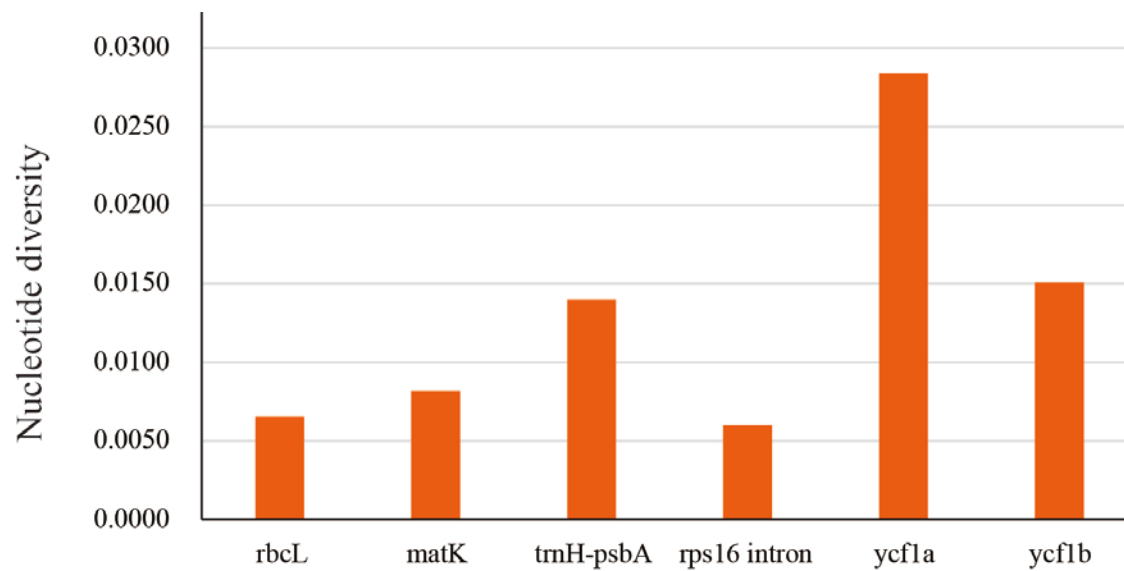
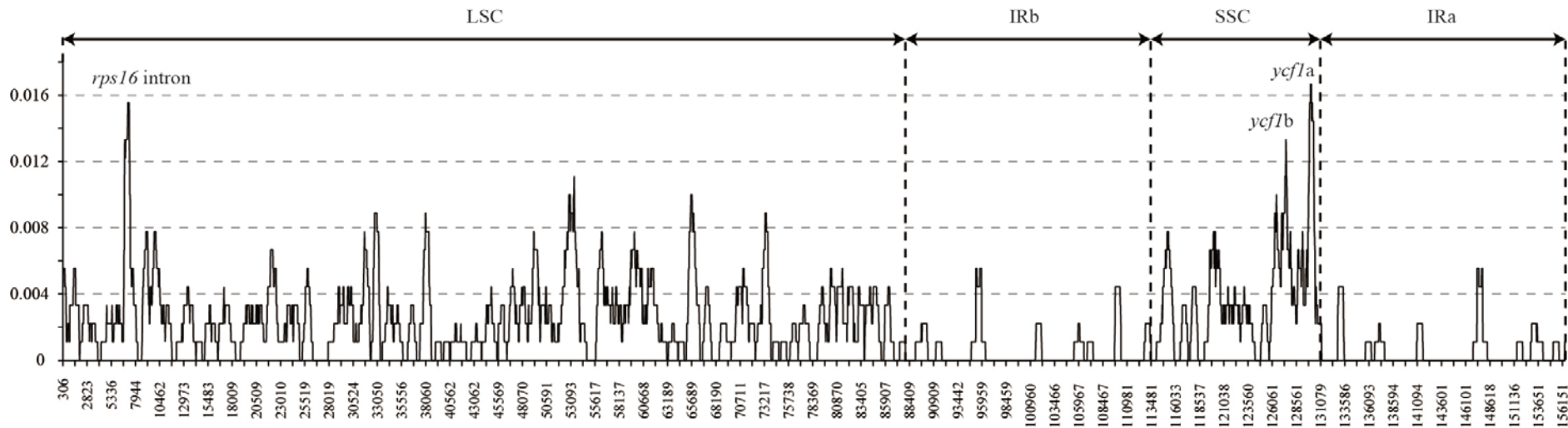
The chloroplast genome of *P. notoginseng* is 156,387 bp in length, slightly longer than the genome of *P. ginseng* which is 156,318 .The length of IR regions is 26,126 bp each. The LSC region is 86,111bp and SSC is 18,024 bp. There are 79 protein-coding genes, 30 tRNA genes, and 4 rRNA genes



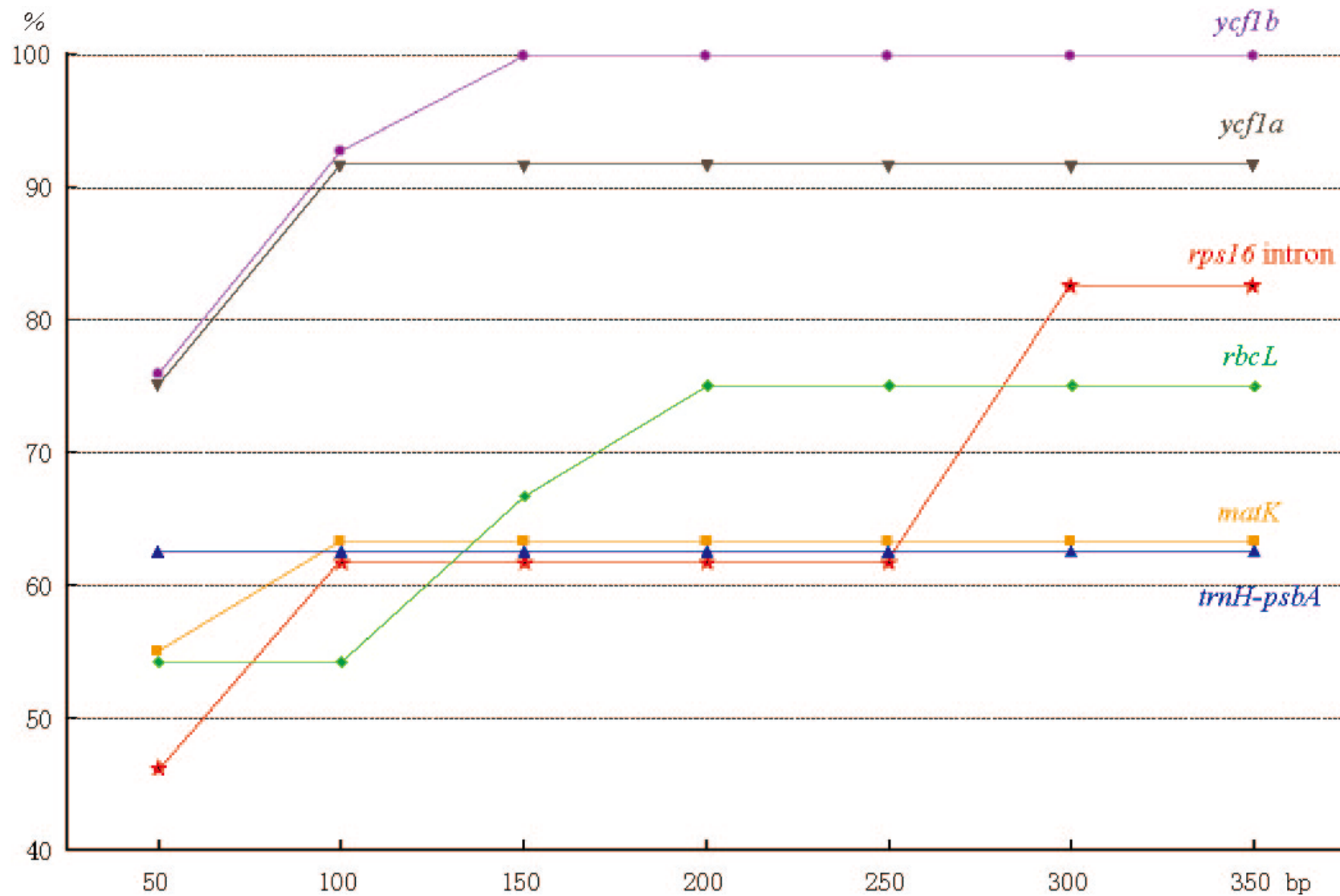
Comparison of the entire chloroplast genome sequences of *P. notoginseng* and *P. ginseng* revealed 464 nucleotide substitutions, including 273 transitions (Ts) and 191 transversions



Variability through the chloroplast genomes



DNA mini-barcode for *Panax*



The shortest length for a candidate barcode to reach the maximum discrimination success using genetic distance method

Markers	Maximum discrimination success (%)	Shortest length (bp)
rbcL	91.67	480
matK	62.5	90
trnH-psbA	62.5	50
rps16 intron	83.33	280
ycf1a	91.67	60
ycf1b	100	110

Mini-barcode 应用



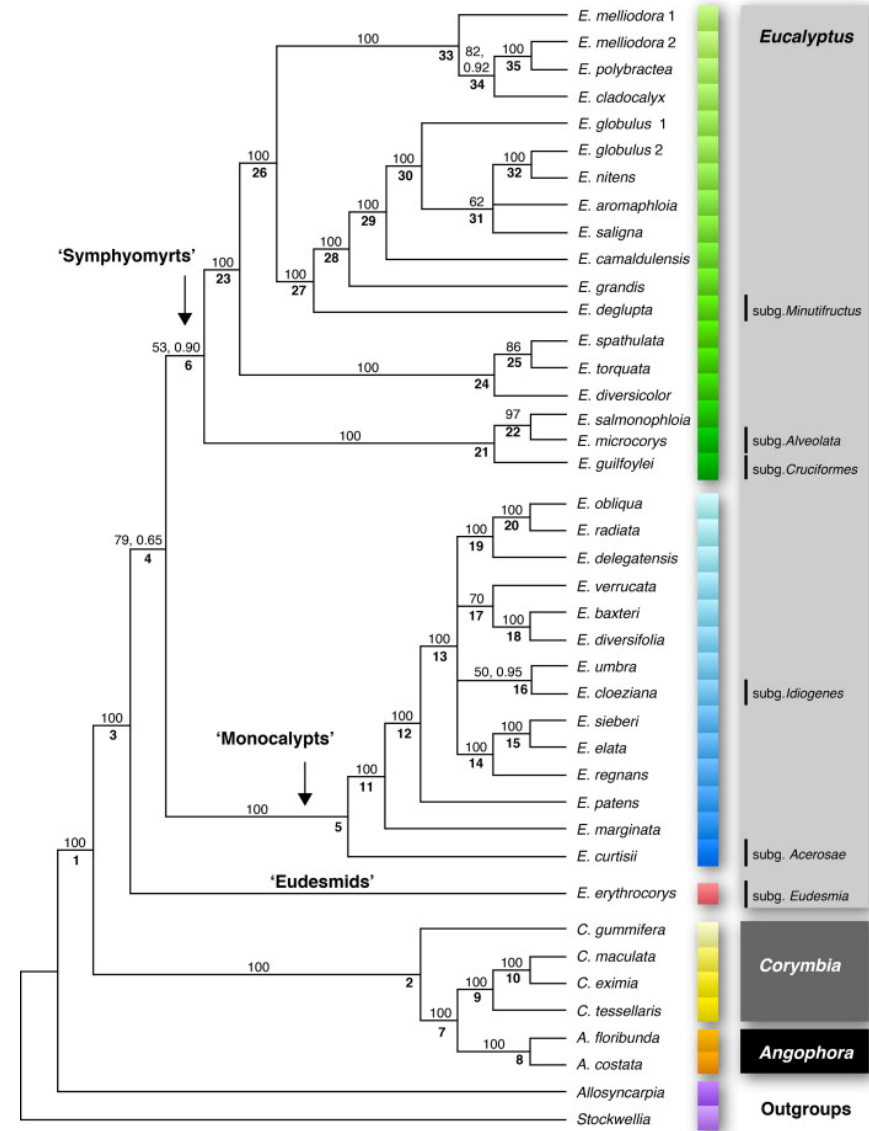
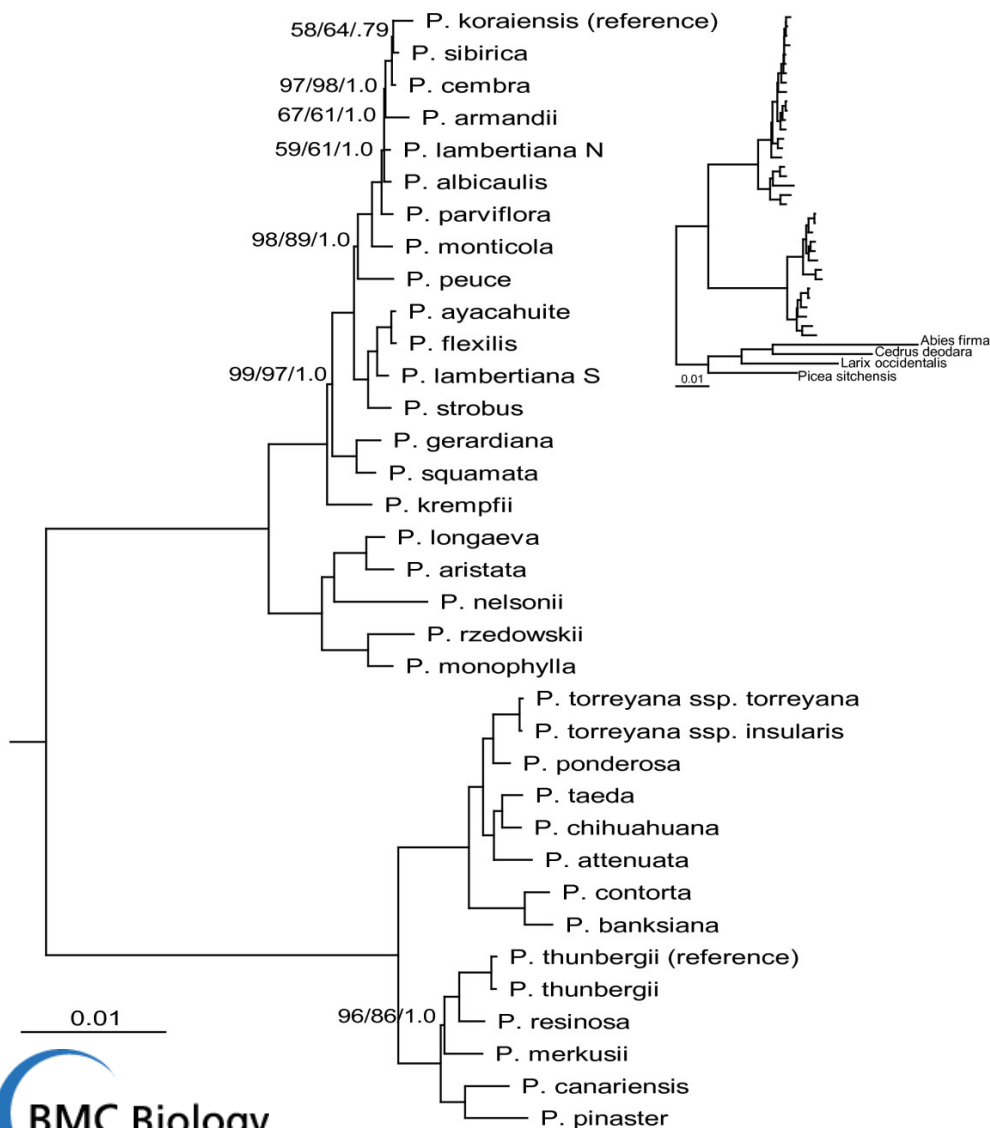
Powdered roots of *Panax notoginseng*



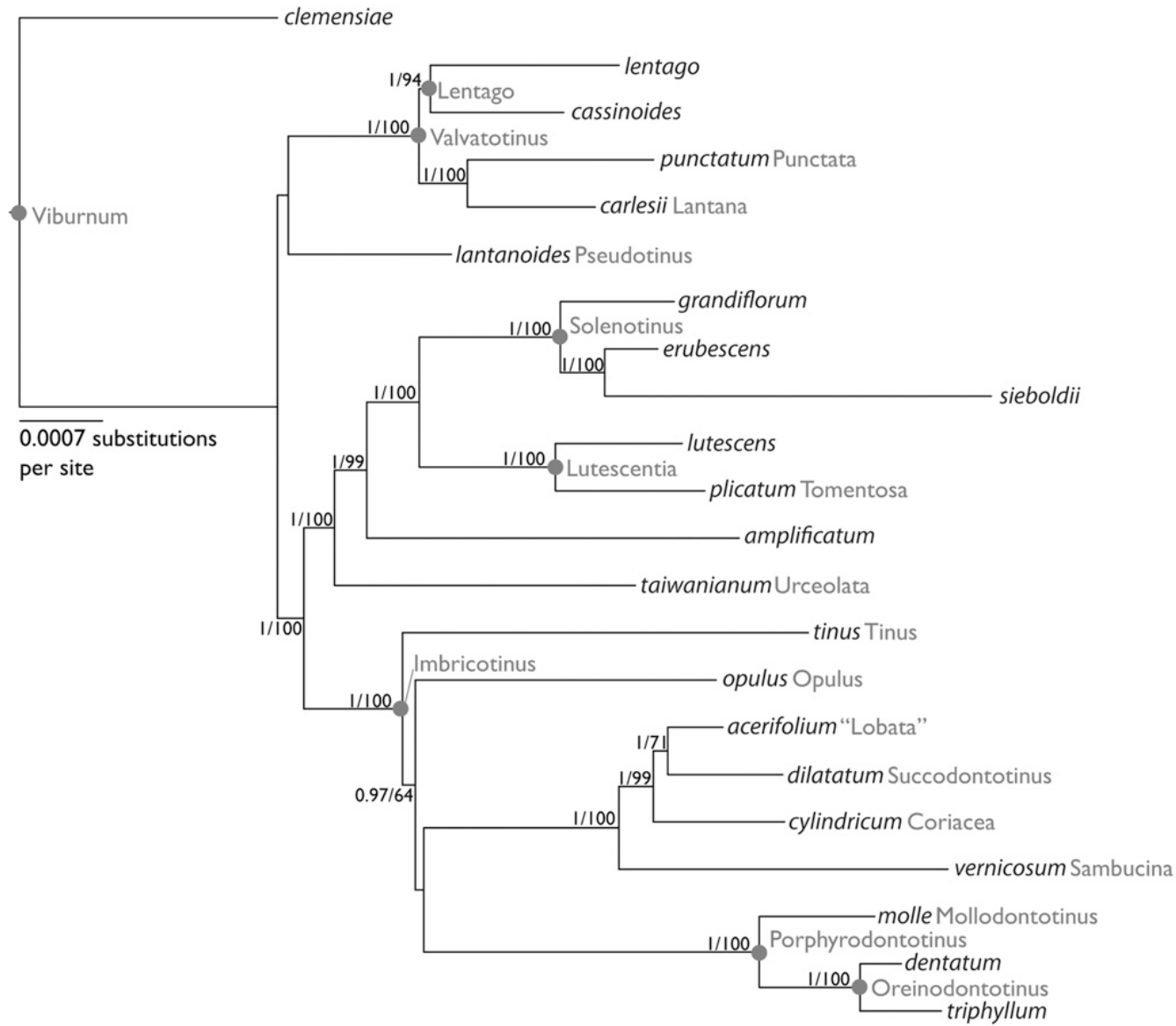
Steamed roots of *P. ginseng*

请批评指正， 谢谢

系统发育与DNA条形码



A chloroplast tree for *Viburnum* (Adoxaceae) and its implications for phylogenetic classification and character evolution



Phylogenetic Analysis of 47 Chloroplast Genomes Clarifies the Contribution of Wild Species to the Domesticated Apple Maternal Line

