

How to Market the GSPC beyond Botanical Gardens?

— GSPC linkages to poverty alleviation and
sustainable development

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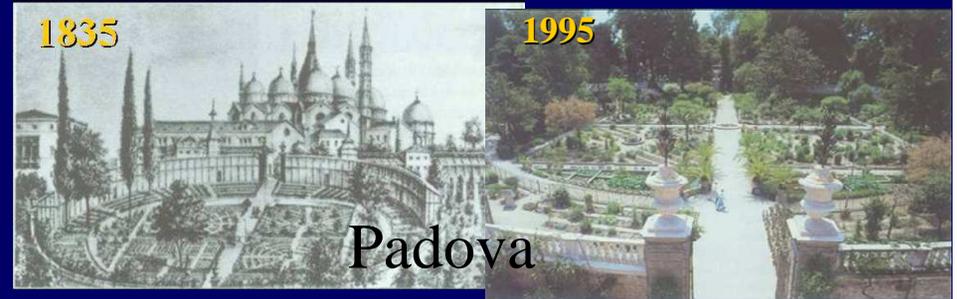
*South China Botanical Garden/South
China Institute of Botany, CAS*

Historical Role of BG

- Long tradition of plant introduction and research for sustainable use in BGs
- Historically significant contribution to agriculture and food industries
- >100 years, BG practices in plant conservation and sustainable use contributing significantly to rural development and poverty alleviation



Chinese Ancient Garden, Dated back Xia dynasty (2100-1600 BC)



BG role for poverty alleviation (examples)

- Many successful cases of sustainable uses in Chinese botanical gardens
- Plant introduction , ex situ conservation and germplasm evaluation was oriented for plant varieties and products benefiting to farmers and rural development

CAS Beijing BG



Natives

Europeans



New cultivars

S. China BG



Santalum album



Perfume Industry

Xishuangbanla BG



Dracaena cochinnensis



Dragon blood Industry

CAS BG network



Dioscorea zingiberensis
National survey and evaluation
And extensive research



A new cardiopathy drug Industry

New BG strategies driven by Economic and social development

- GSPC-Target 3 urged for development of models with protocols for plant conservation and sustainable use
- A BG guideline “Consolidate quantity, Improve quality, Strengthen discovery and Enhance sustainable use” for botanical gardens collection
- **R**esource, **R**esearch, and **R**esolution, **3R** Model” has been developed
- 3R model integrates studies on population – individual - cell-genome - gene discovery
- Development of property right of new plant gene, agricultural variety and natural medicine contributing poverty alleviation and rural development

What we learned? a case of 100 years of kiwifruit domestication

- All original seeds from Ichang (Yichang), Hubei, first to UK, USA, then to New Zealand
- New Zealand kiwifruit industry originated from a single introduction of seeds in 1904
- Worldwide kiwifruit industry developed
- Unfortunately much earlier to Europe, not developed industry



Kiwi



Kiwifruit? Chinese Gooseberry?



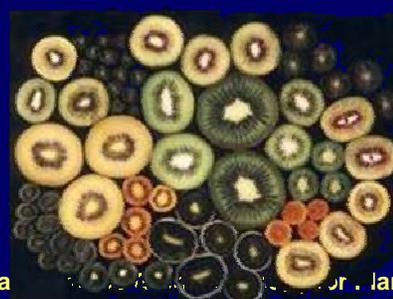
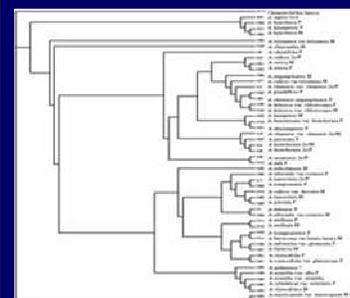
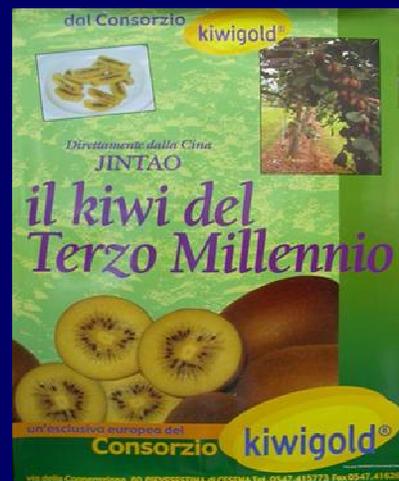
100 years of kiwifruit (*Actinidia*) introduction and domestication

- c 1905 : Chinese gooseberry seeds raised for first time
- c 1924: Hayward Wright developed “Hayward” variety
- 1950 : Widespread orchard planting in Bay of Plenty region
- 1952 : First export trade
- 1959 : Name “kiwifruit” first used for marketing in US
- 1970s: Worldwide planting
- 1988 : NZ production up five fold in 5 years and rest of world production exceeds NZ production
- 1978: China’s National survey of *Actinidia* germplasm
- 2000s: Large producer in world
- Many rural areas developed in China



A case protocol in WBG

- 3R model was proposed for conservation and sustainable use of genetic resource in Wuhan BG
- This provide a general guide to BG research and *ex situ* conserved **germplasm** benefiting rural development and poverty alleviation in China and the world



Resolution ← Research ← Resource

Diversity in *Actinidia*

- 66 species and 125 taxa, in the world
- 62 species in China
- Most species: edible fruits
- Two species are in commercial production: *A. deliciosa*, *A. chinensis*



Extensive research in *Actinidia*

- Morphological variation (horticultural and commercial traits)
- Nutritional variation
- Gender variation
- Ploidy variation
- Most importantly, breeding programs for new varieties needed by kiwifruit industry benefiting to grower in mountain and rural regions

Skin color and indumentum 果皮颜色及果毛



Flesh color 果肉颜色



Nutritional value and flavor 营养成分、风味变异

- Vitamin C content: 10 mg - > 1000 mg
- Flavor: bitter, astringent, numb - desirable sour-sweet
- Soluble solids: 2 - 22%



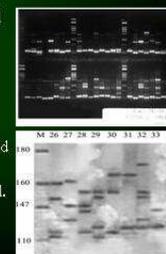
Gender variation 性别变异

- Functional dioecism
- Male-inconstant male-neuter-inconstant female-female-hermaphrodite



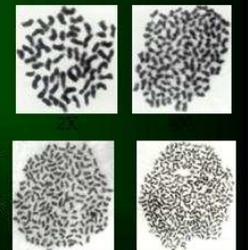
Genetic diversity by RAPDs, SSRs, cpDNA and mtDNAs

- 90.70% gene diversity at the generic level in inter-taxa and an average of 76.68% in intra-taxon
- In *A. chinensis* / *A. deliciosa* complex, 97.83% and 2.17% genetic diversity occurred within and between species.
- Uniquely, cpDNA is strictly paternally and mtDNA maternally inherited
- Evolutionary significant Units (ESU) of *A. chinensis* and *A. deliciosa* were identified for conservation



Ploidy variation 染色体倍性变异

taxa variation:
 $n = 58$; $2n = 4x = 116$
 $n = 174$; $2n = 8x = 232$
 taxon variation:
A. chinensis: 2x, 4x, 6x, 8x
A. macrosperma, *A. kolomikta*, *A. chinensis*: 2x, 4x
A. chinensis: 2x, 4x
A. chinensis: 4x, 6x



JINTAO, a novel, hairless, yellow-fleshed cultivar

- **Jintao**: a novel yellow-fleshed kiwifruit (*A. chinensis*) developed from the breeding program at the Wuhan BG
- Patented in Europe, then South America, recently rest of the world. The propagation right was licensed for 28 years
- Benefiting kiwifruit growers in remote regions for efforts in poverty alleviation worldwide



Significance of novel genotype

(Industry Impact, rural development and poverty alleviation)



Dice il saggio:
se il giallo migliole vuoi trovare
il **jintao** devi piantare.

la nuova proposta in giallo

Jintao

caratteristiche agronomiche



Jintao è una selezione di actinidia Chinensis a polpa gialla ottenuta nel 1981 dall'Istituto di botanica di Wuhan in Cina e sperimentata all'Università di Udine dal 1997 al 2001.

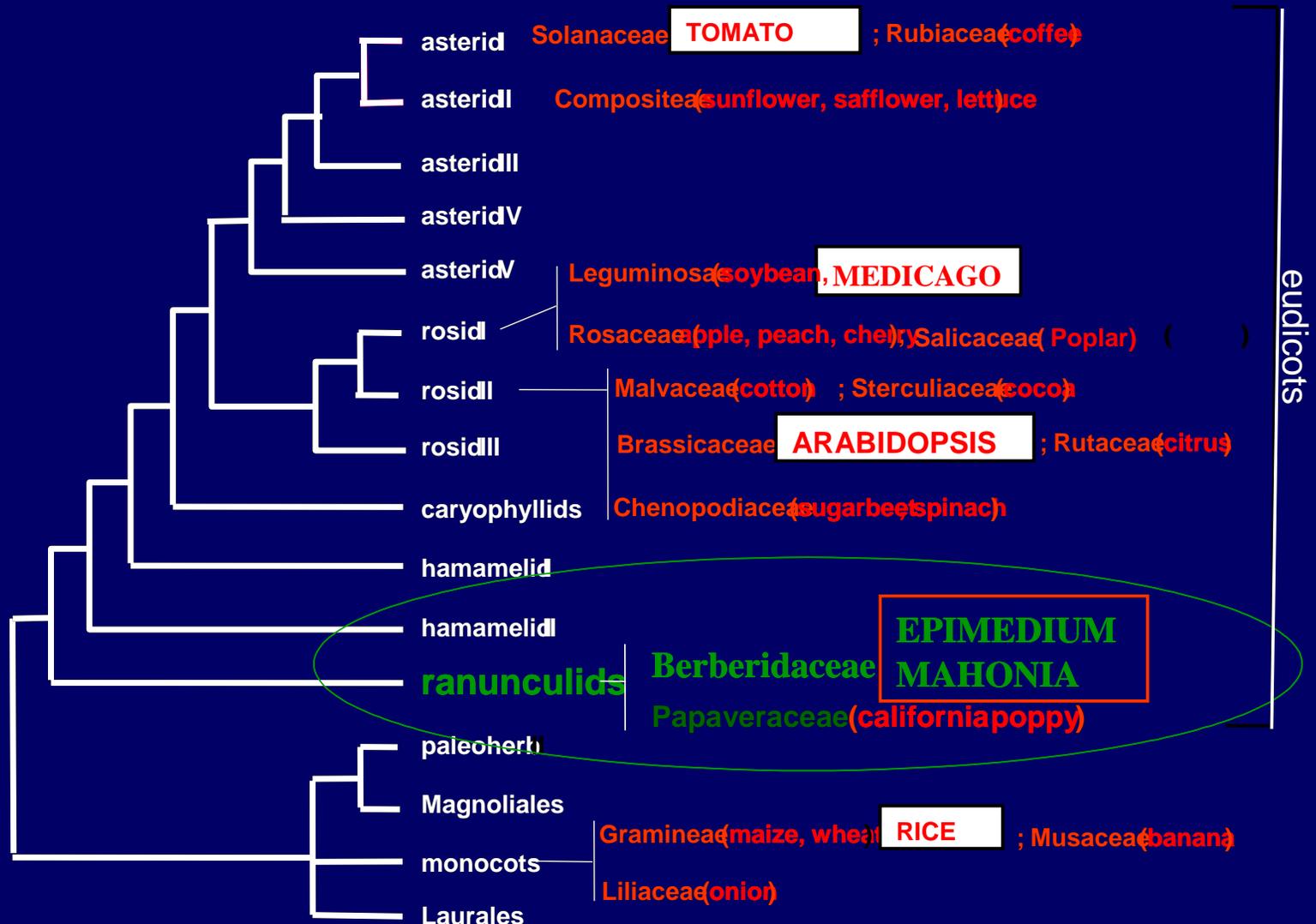
La pianta si presenta con una minor vigoria rispetto a Hayward, con un risveglio vegetativo e fioritura anticipate di 5 giorni nel 2005 a Castelbolognese (RA).

Porta generalmente fiori singoli ed una elevata fertilità dei tralci produttivi. Per garantire una buona impollinazione l'Università di Udine ha selezionato una pianta maschile denominata Belén con fioritura contemporanea.



Medicinal Plant—model species

Epimedium?



Traditional Chinese Medicine

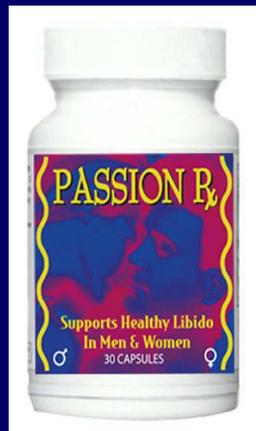
"Horny Goat Weed"

Aboveground parts:

- Sexual stimulating effect
- Cure cardiovascular failure
- Stimulating immune system
- Antiaging
- Supressing cancer growth

Underground parts:

- Treating rheumatic arthritis and asthma



Natural diversity of *Epimedium*

➤ 47 (of 57) species native to China; Flower morphology (size, color, petal, sepal)



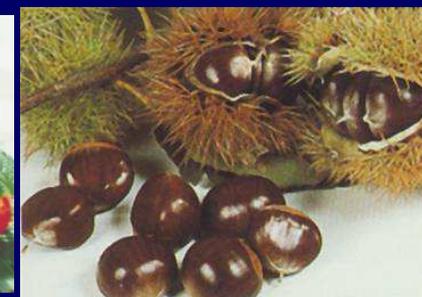
Recently: Drug discovery (medicinal plant initiative)

- “Thunder of God Vine” (*Tripterygium wilfordii* Hook F.), or “Lei Gong Teng” in Chinese, is a plant that has been used as traditional Chinese medicine for years, ... anti-prostate cancer...
- GAP standard cultivation protocol is underway for cultivation benefiting to rural development, etc



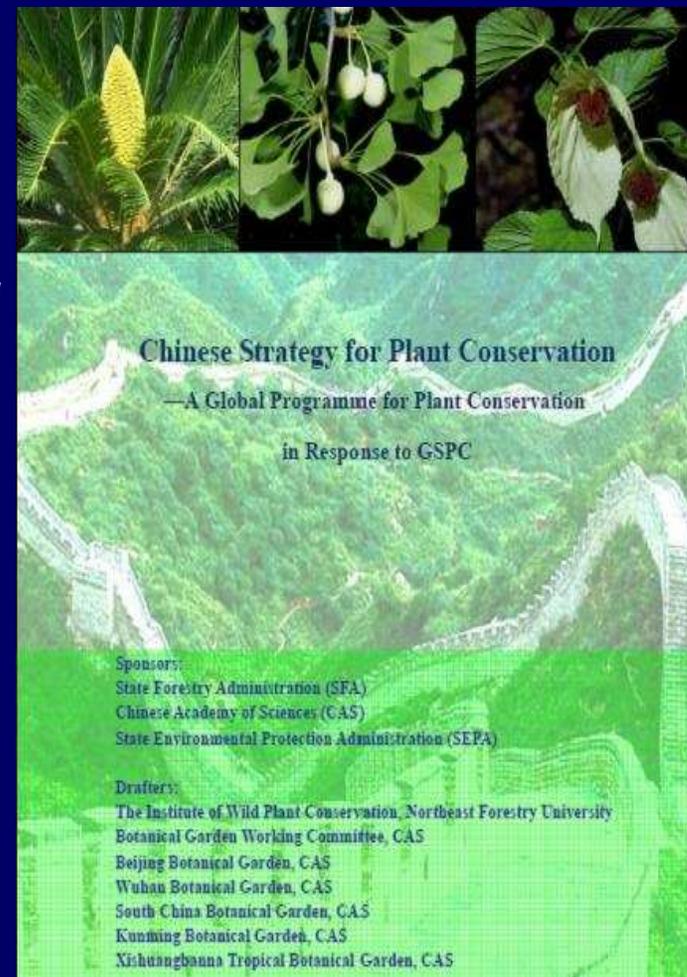
Chinese BG Strategic Planning (5 years, 2006-2010)

- An integrated research and sustainable development system of National BG ex situ conservation
- Strengthen selection, and sustainable utilization for bio-industry based plant source and explore China's economic important plants
- The 5-year strategic plan emphasize source plant discovery and sustainable development



China's Strategy for Plant Conservation launched

- China is globally important in plant diversity conservation
- BGCI organized a *Global Leadership for Plant Conservation – China Workshop on implementation of GSPC* in Beijing, November 2006
- Coordinated efforts between the SFA, SEPA, CAS and other organizations brought the *Chinese Strategy for Plant Conservation*, as China's response to the GSPC
- The *CSPC* will play an important role in proportionally contributing to implementation of GSPC



Future roles of BG contributing poverty alleviation and sustainable development

- **Response to GSPC-Target 3 urged for development of models with protocols for plant conservation and sustainable use**
- **Address challenges facing to BG management of huge collection and contribution to poverty alleviation**
- **Germplasm evaluation and domestication of new cash crops for contribution to National and international campaign of rural development**
- **Strengthen safeguard biodiversity, also food and water safety, for MDG and challenges identified by MEA**
- **Contribution to health care in rural regions by enhancing sustainable use of Herbal Medicine or Ethno-medicine**



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- State Environment Protection Administration (SEPA)
- CAS Botanical Gardens Working Committee
- HSPC

Thank You!