

Research progress and prospects of kiwifruit breeding

Zhong Caihong Huang Hongwen*

Wuhan Botanical Garden, the
Chinese Academy of Sciences

Sept. 2013



Outline

- Domestication history
- *Actinidia* germplasm resources and breeding progress in Wuhan B.G., the C.A.S
- Kiwifruit breeding progress in china
- The future resources discovery and breeding goals



Domestication history of kiwifruit 1904—2013

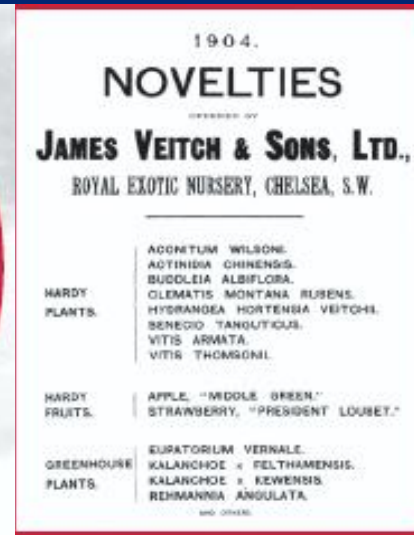
Introduction, domestication, commercial cultivation
and industry worldwide in nearly 110 years



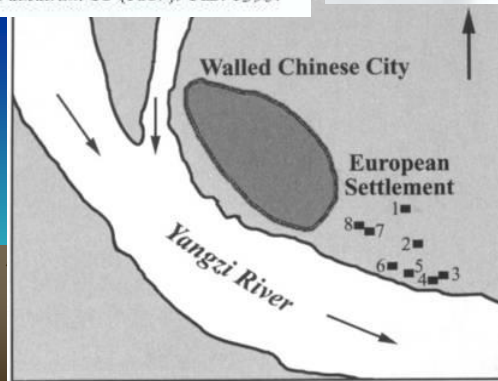
Actinidia chinensis, Hooker's *Icones Plantarum* 16 (1887): Tab. 1593.



E. H. Wilson.



Isabel Fraser.



The domestication history of kiwifruit in China 1959-2013

Introduction, domestication, commercial cultivation and national industry
in more than 50 years



The National Survey of *Actinidia* resources and elite cultivar selection from wild in early stage



1980's

1990's

2000's

2010's

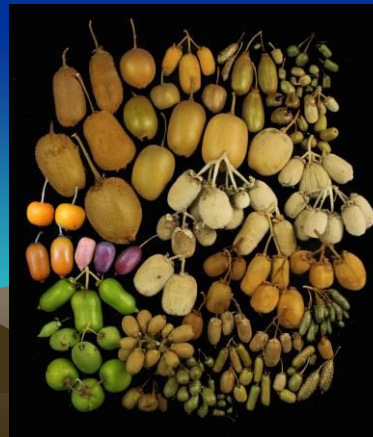
Development of main commercial cultivar in China



A. Germplasm repository in Wuhan BG., the Chinese Academy of Sciences

- 57 species and varieties
- 25 forms
- > 1000 accessions, collecting from 60 different geographic regions of 20 provinces
- c. 100 varieties or elite lines
- > 30.000 breeding seedlings by hybridization

Established the richest germplasm repository in the world and designated as 'National kiwifruit germplasm repository' by MOA in 2010.



Breeding progress

- **Selection from the wild:** ‘Jintao’, ‘Tongshan No.5’, ‘Jinzao’, ‘Wuzhi No.3’, ‘Jinxia’, ‘Moshan No.4’ (male cultivar) etc.



Jintao



Jinzao



Wuzhi No.3



Jinxia



- **Seedling Selections:** Mantianhong、Donghong



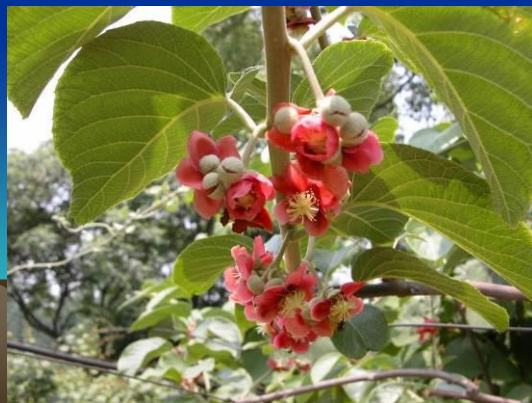
Mantianhong



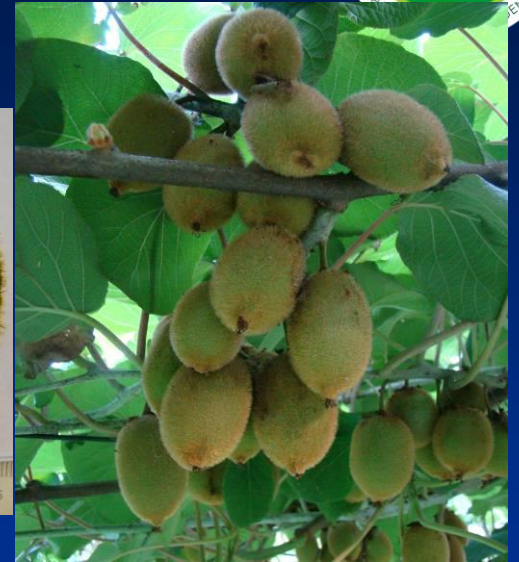
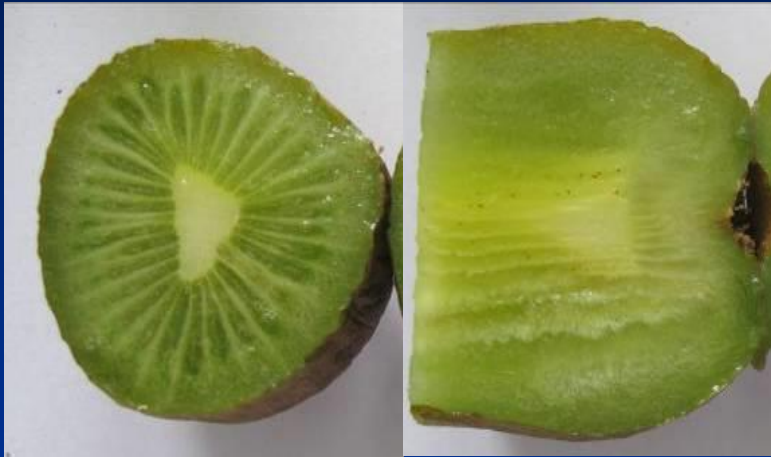
Donghong

Interspecific Crosses (since 1984) :

- *A. eriantha* (♀) × *A. chinensis* (♂) — ‘Jinyan’ (fresh fruit cultivar)、 ‘Chaohong’ (ornamental cultivar)
- WZ No.3 (*A. chinensis*) × *A. eriantha* — ‘Jiangshanjiao’ (ornamental)
- Jinyan (*A. eriantha* × *A. chinensis*) × *A. chinensis* var. *rufopulpa* — Jinyuan、 Jinmei (both yellow flesh with or without red fruit core)



New selections:



Seedless selection

A. chinensis var. *deliciosa* (yellow flesh and high sugar)-A.D-815 (ripe at early in August)



Two new *A. argute* selection in Wuhan

Breeding progress in China

1978-1992:

Wild genotype screening and elite cultivar selection: selected >1450 individuals from wild, 57 varieties developed, including 46 *A. chinensis* and 11 *A. deliciosa*. Such as Qinmei, Miliang No.1, Guichang, Jinfeng, Kuimi, Lushanxiang and Wuzhi No.3.

W.B.G. C.A.S. carry out the interspecific cross breeding since 1984.



Jinfeng



Kuimi

Lushanxiang



Mingliang No.1



Qinmei



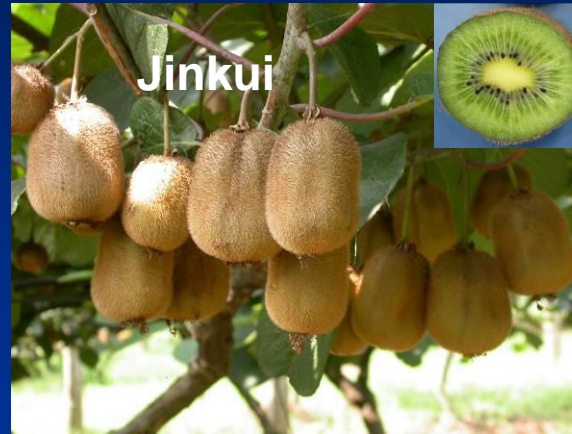
Guichang



Cultivar traits: Big size, high quality and productive, yellow and green flesh. But poor storage and short shelf life.

1993-2002:

Selection from the wild and seedling selection, such as Jinkui, Xuxiang, Hongyang, Jinnong and Cuiyu.



Cultivar traits: rich flavour, red, yellow and green flesh, storage and shelf life of fruit greatly improved except Hongyang.

2003-2012:

The main breeding method is seedling selection and intra- or inter specific hybridization, such as Jintao, Jinxia, Donghong, Cuixiang and Mantianhong (Seedling), Jinyan and Jinyuan (hybrid). Especially Jinyan, planted area is expanded rapidly because of its strong storage and long shelf life in short several years.



Jintao



Jinyan



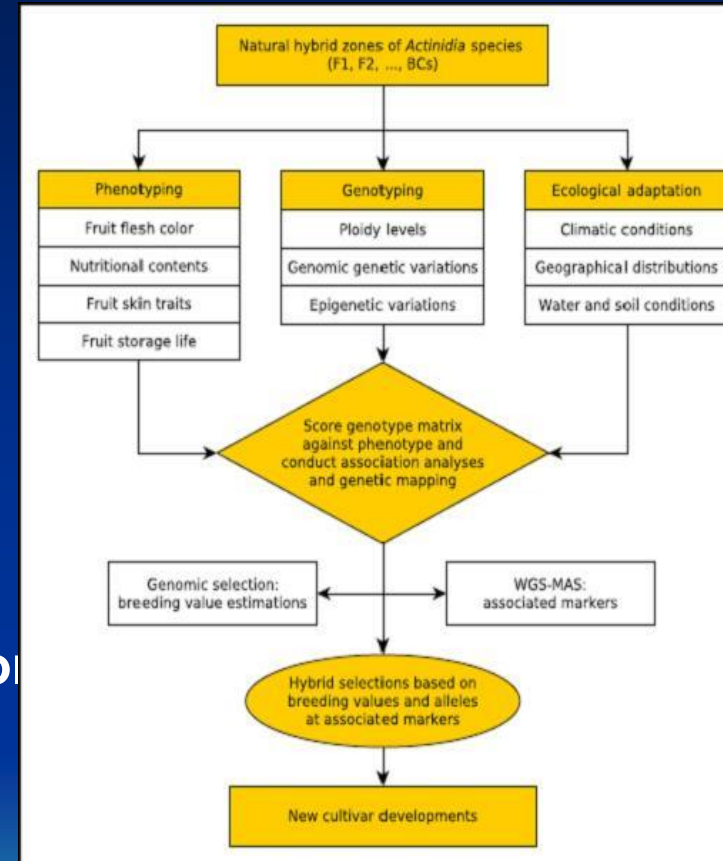
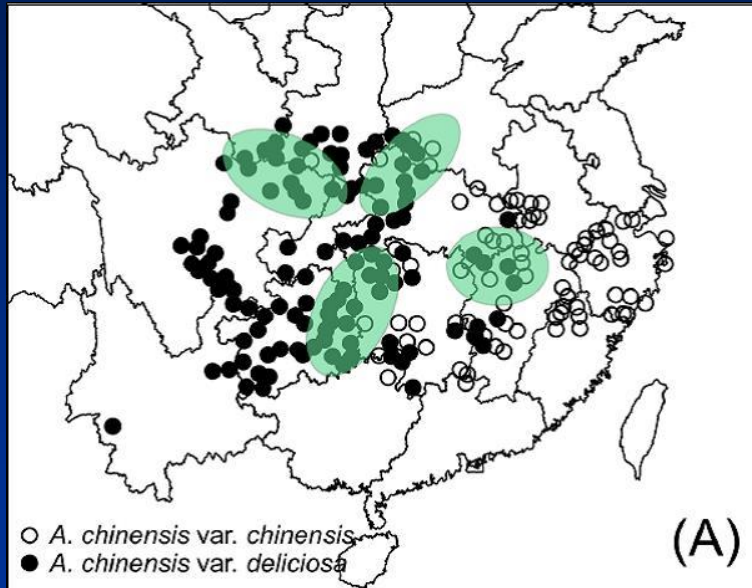
冷藏7个月金艳切
面照2013.5.31

Cultivar traits: strong storage and very long shelf life. Especially Jinyan, shelf life of fruit is 5-6 months in cold temperature for the best.

The future

- 1、 **Hybrid introgressive breeding** (artificial hybridization and selections from natural hybridizing zones)
- 2、 **Genome data based breeding research**
 - High density genetic map
 - Genome (transcription factor) anatomy of the important traits and functional verification
 - Metabolism control of function genome and assistant breeding
 - Marker-assisted specific resource discovery.
 - Resistance breeding (such as PSA)

Elite lines discovery at the natural hybrid zone and new variety development



- Marker-assisted screening and identification of natural hybridization F1、F2、BCx
- Character correlation analysis and genetic map location
- Character selection effect and allele mapping
- Marker-assisted selection

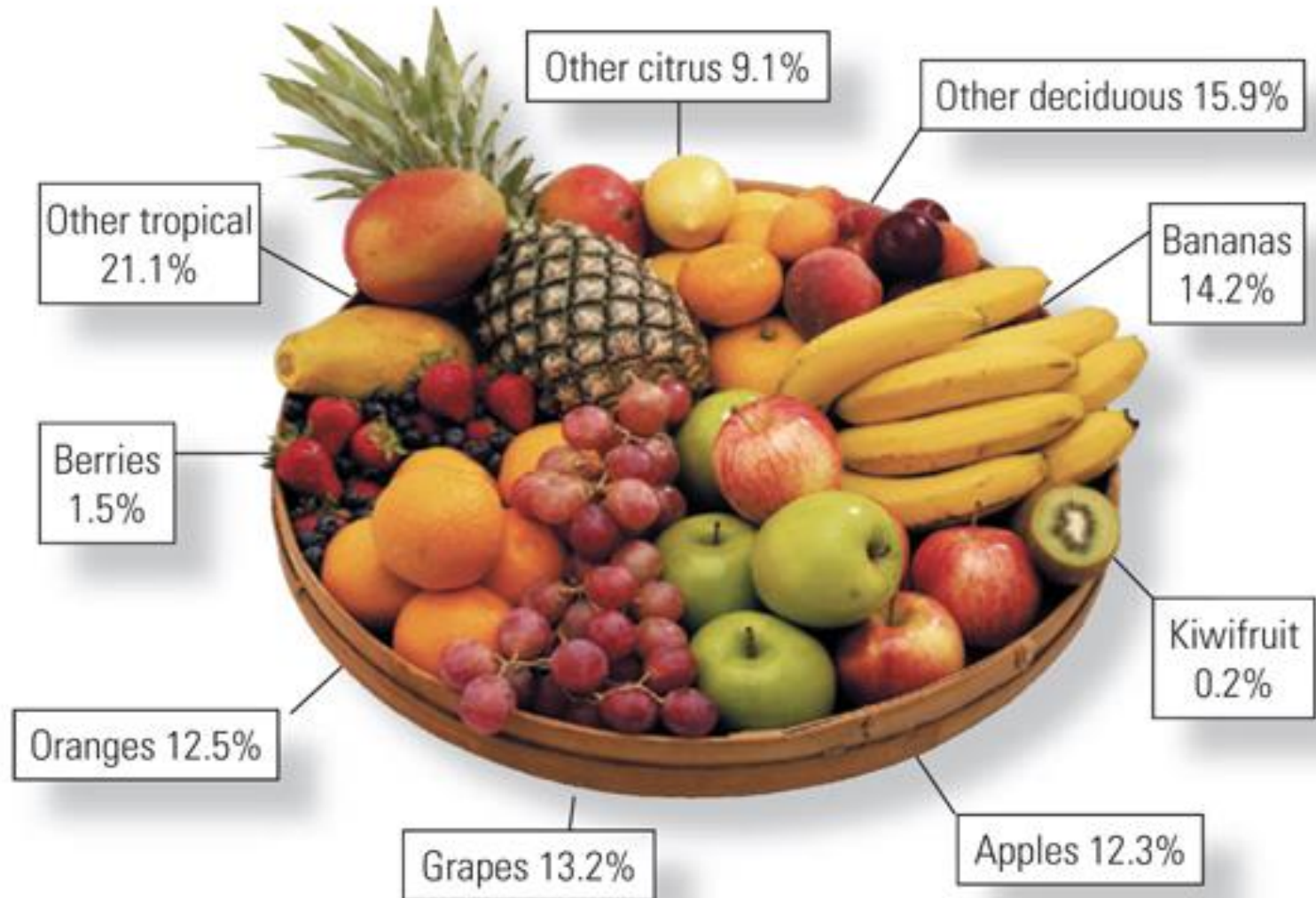
The new kiwifruit cultivar types in the future

- **Health and safety** : such as high content of Vitamin C and other antioxidants;
- **Pleasure**: delicious flavor
- **Convenience**: skin is edible, easy peeling
- **High storability and long shelf life** (four to seven months at 0-2°C)



The world's fruit bowl

(500 million tonnes/year)



acknowledgement

- My doctoral tutor- Prof. Huang Hongwen
- The death of the old breeding expert Pro. Wang Shengmei.
- My research team: Dr. Li Dawei, Dr. Li li and Dr. Zhang Qiong et al.
- My all cooperative partner





Thank you!