Research progress and prospects of kiwifruit breeding

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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
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

Development of main commercial cultivar in China

- **1980’s:** Qinmei
- **1990’s:** Jinyan
- **2000’s:** 海沃德
- **2010’s:** 红阳
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.
• **Seedling Selections**: 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.

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.

**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)

- Berries: 1.5%
- Oranges: 12.5%
- Grapes: 13.2%
- Apples: 12.3%
- Kiwifruit: 0.2%
- Bananas: 14.2%
- Other deciduous: 15.9%
- Other citrus: 9.1%
- Other tropical: 21.1%
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