swiss center for business and technology intelligence
centredoc

Fruit Breeding Innovation: What Patent Analysis Reveals

Presenter: Emmanuelle Flatt
Data analysis and Presentation prepared by: Jean-Baptiste Porier

April 7, 2025

Image generated by AI

Fruit Breeding Challenges

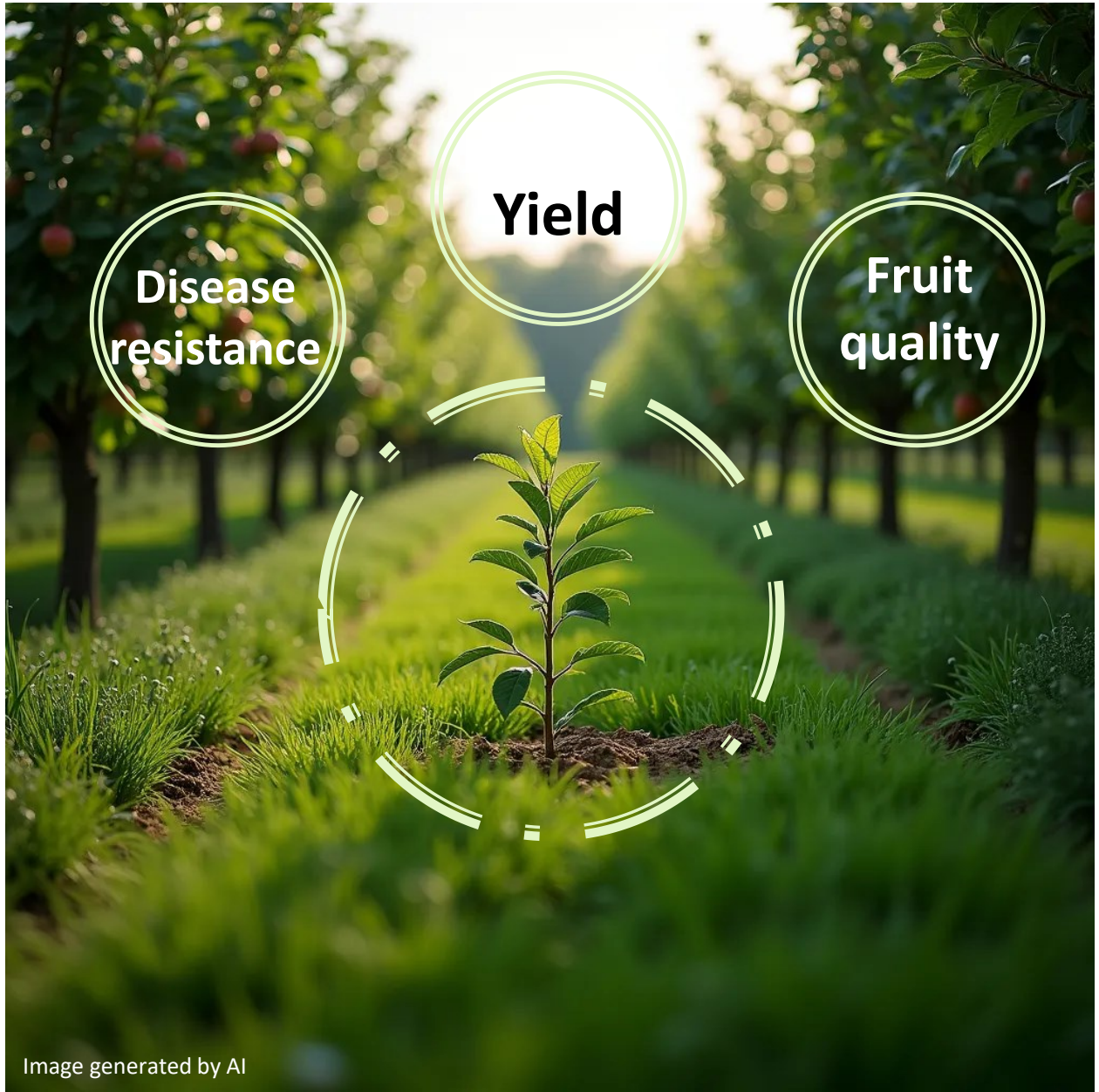


Image generated by AI

Patents: More Than Just Legal Documents - A Goldmine of Innovation Insights for Plant Breeders

Image generated by AI

Patents & Plant Breeding - Let's Connect the Dots

Understand Emerging Trends

- **See where innovation is heading in apple, pear, and apricot breeding.**

Identify Key Players & Competitors

- **Know who the active researchers and organizations are, globally and in specific areas.**

Discover New Techniques & Approaches

- **Learn about cutting-edge breeding methods being patented (like CRISPR) and their applications.**

Spot Collaboration Opportunities

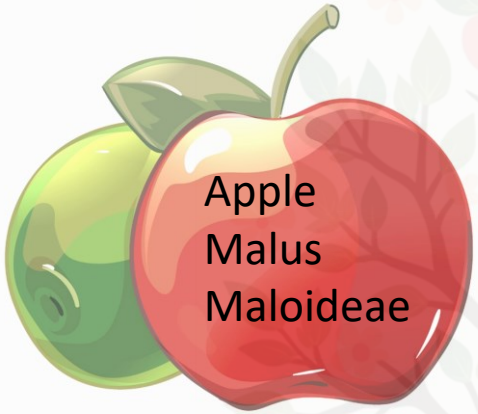
- **Identify potential partners based on co-patenting activity.**

Avoid Redundancy & Focus Your Research

- **See what's already patented to guide your own innovation directions and avoid reinventing the wheel.**

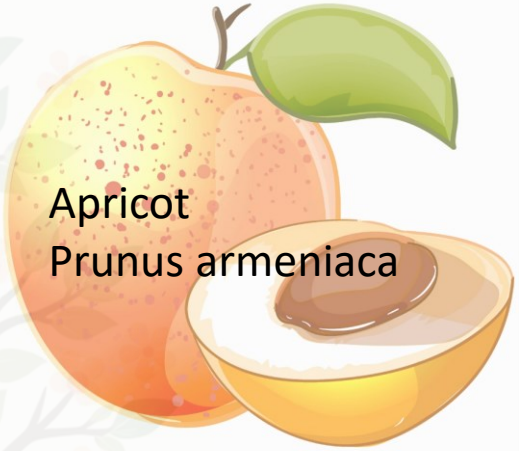
Patent Analysis: Turning Data into Actionable Intelligence

Rosaceae



Apple
Malus
Maloideae

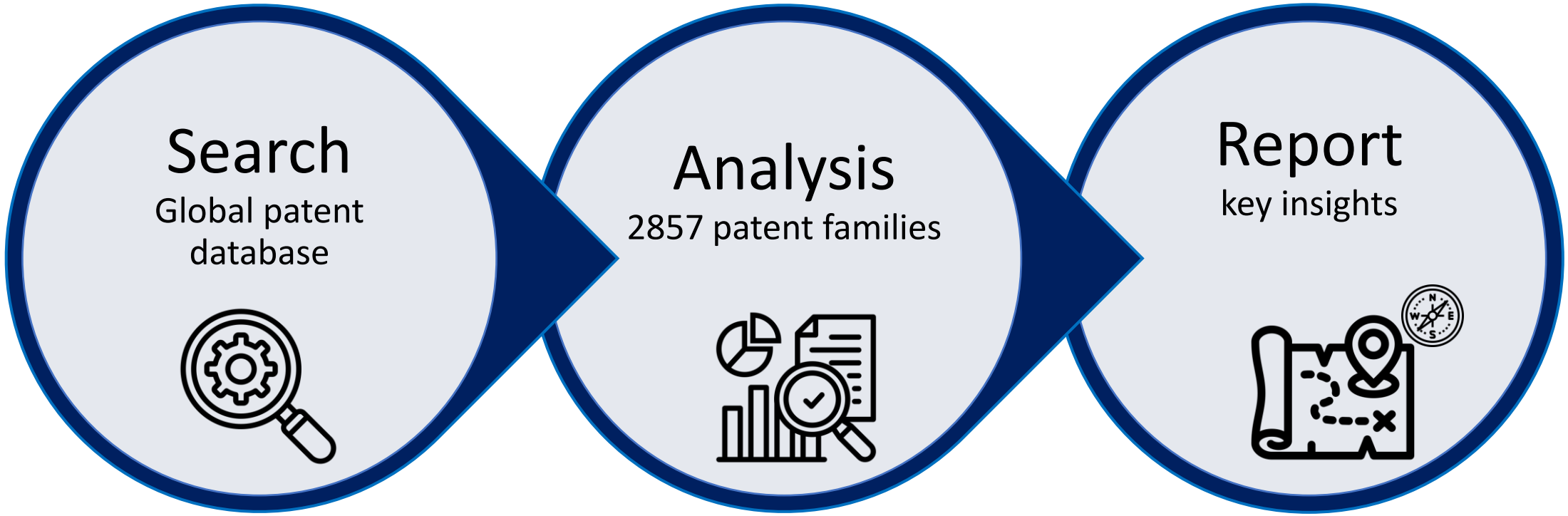
Pear
Pyrus



Apricot
Prunus armeniaca

Breeding
techniques

Patent Analysis: Turning Data into Actionable Intelligence



Our Journey Today: Key Sections of the Patent Analysis Report

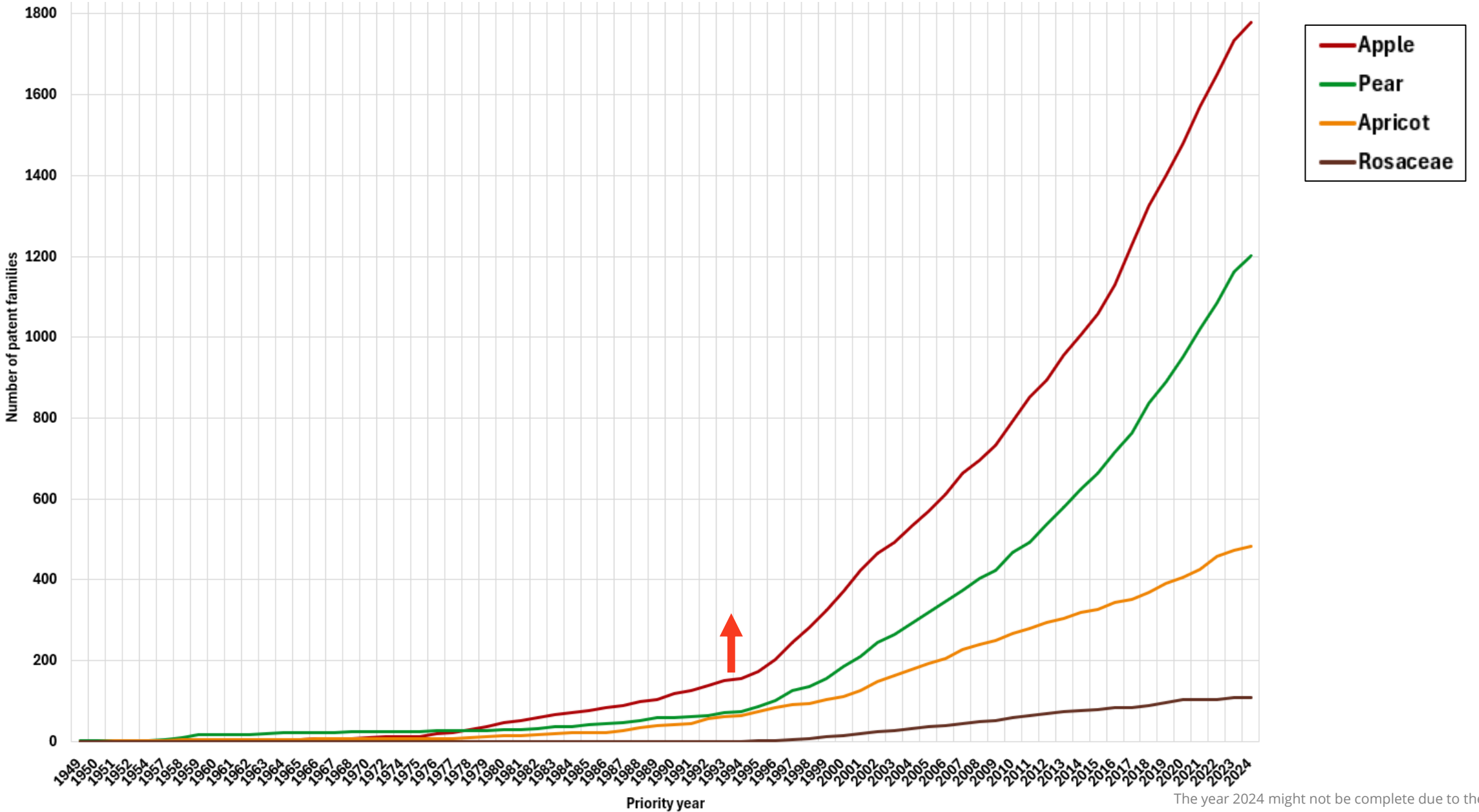
- General Overview
- Worldwide activity
- Chinese activity
- Focus on CRISPR
- Holistic innovation
- Focus on apple scab resistance
- Overall key take-aways

General overview

- **Overview of the global fruit breeding patenting activity**

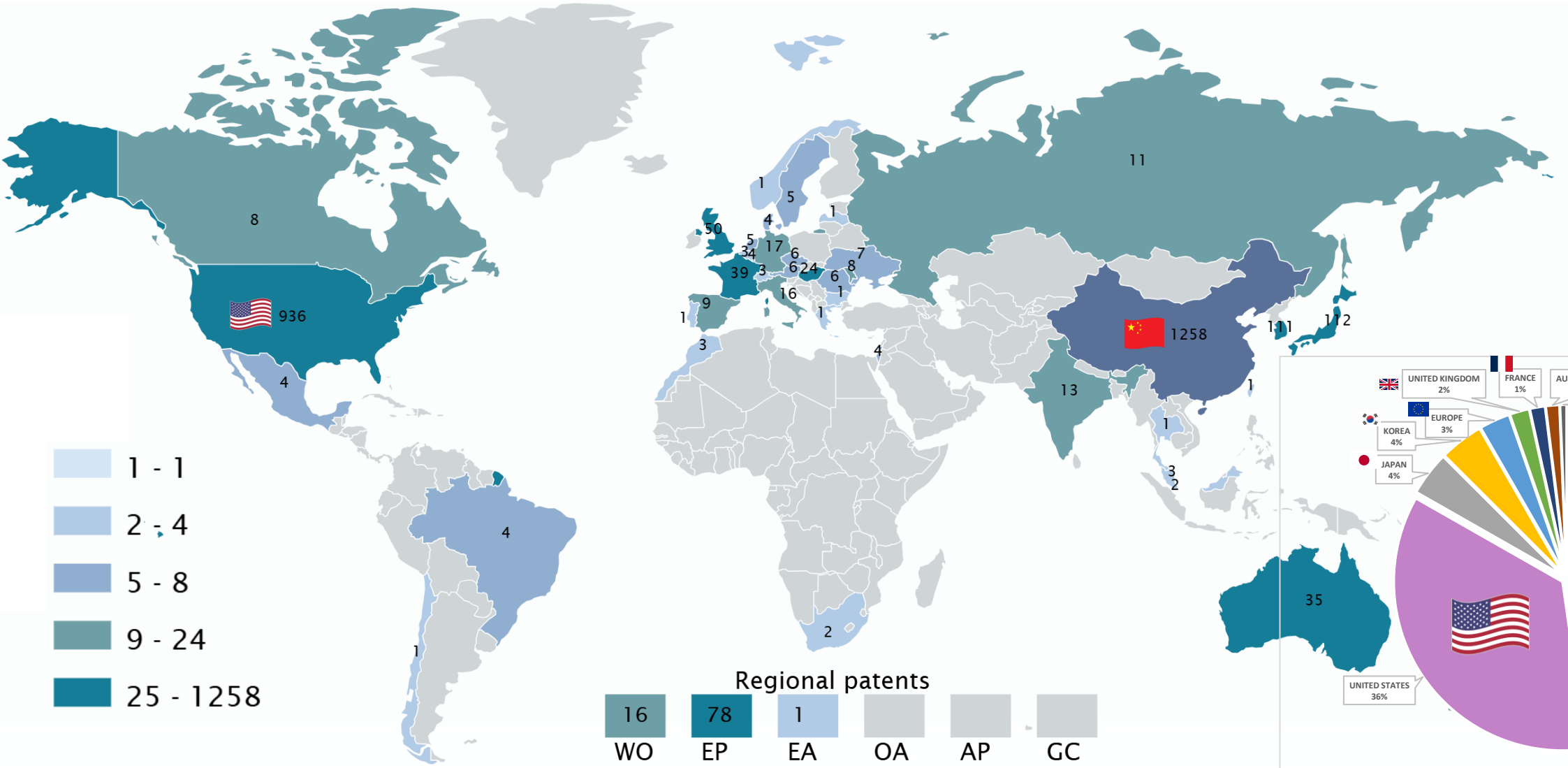
Image generated by AI

Apple breeding is a primary focus worldwide!

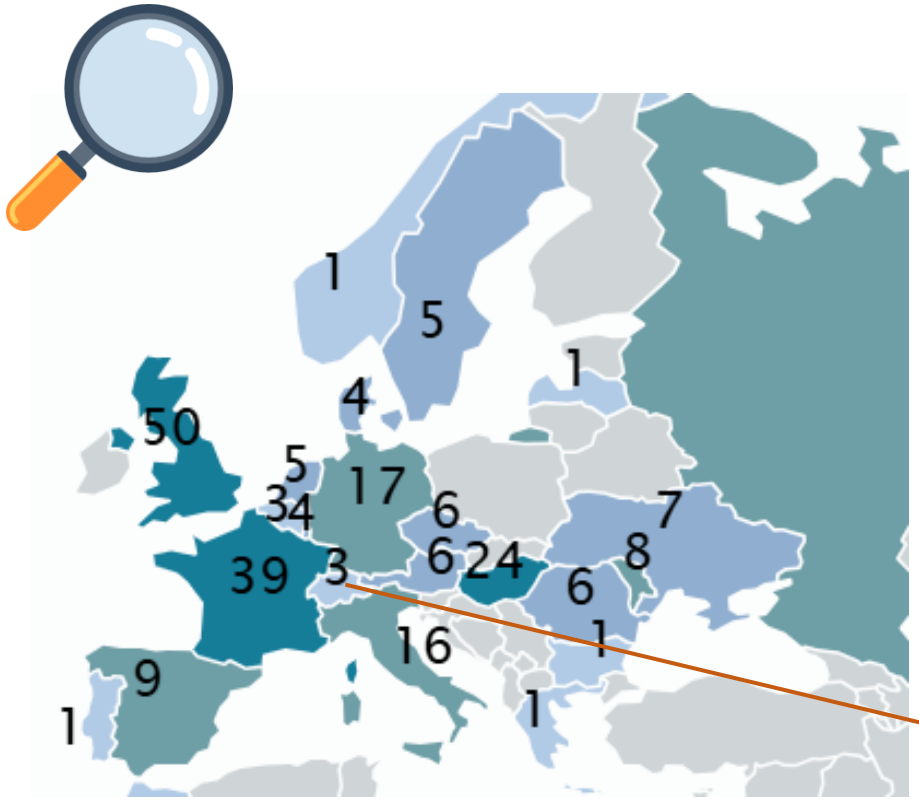


The year 2024 might not be complete due to the delay of publication

Innovation is Global!



Modest number of european patents target multiple traits —no single-fruit focus; limited Swiss contribution



📌 **78 patents filed in Europe first, including:**

- **Fungus-resistant plants** and their uses
- **Modification of gene expression** in transgenic plants
- **Fruit flavour**–related genes and their applications
- Method for **inducing viral resistance** into a plant
- Plants with an **increased production of hyaluronan** II
- Plants with **increased yield**

🧬 All documents mention apple, pear, or apricot among other fruits, but none focus exclusively on one species.

📌 **3 old (1990) patent families co-filed by Syngenta and Novartis**

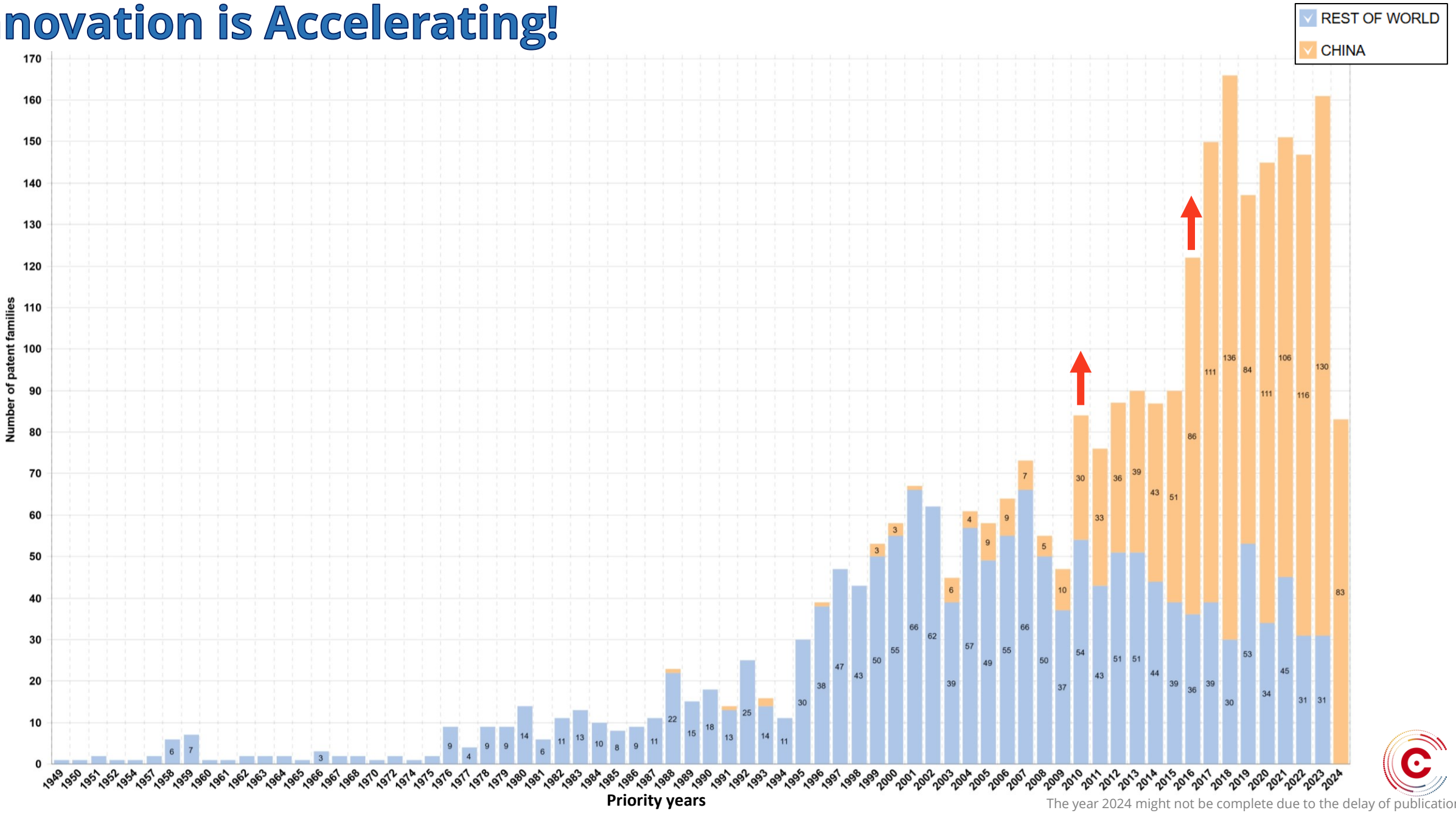
- Method of **controlling pests in crops of transgenic** useful plants
- Genetic engineering methods to **develop inducible virus resistance in plants**
- Method for the **transformation of plant protoplast.**

Opportunities to innovate

There are few active patents in Switzerland on apple, pear or apricot breeding — you're free to explore and innovate.

If a patent is expired or not active in your region, its technologies can usually be used freely. Patents can also inspire new ideas.

Innovation is Accelerating!



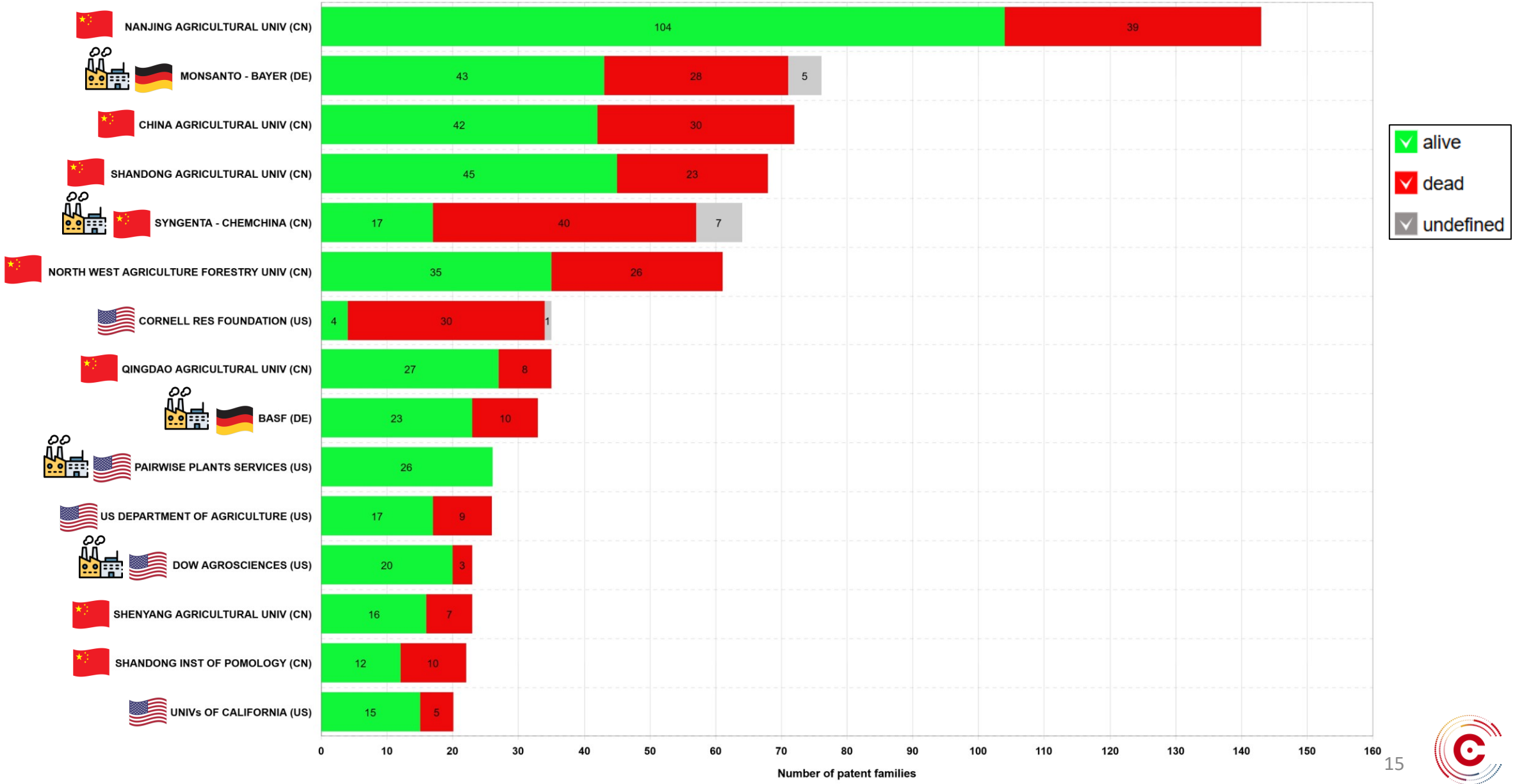
The year 2024 might not be complete due to the delay of publication

Worldwide activity

- **Focus on the major assignees patenting worldwide (China included)**

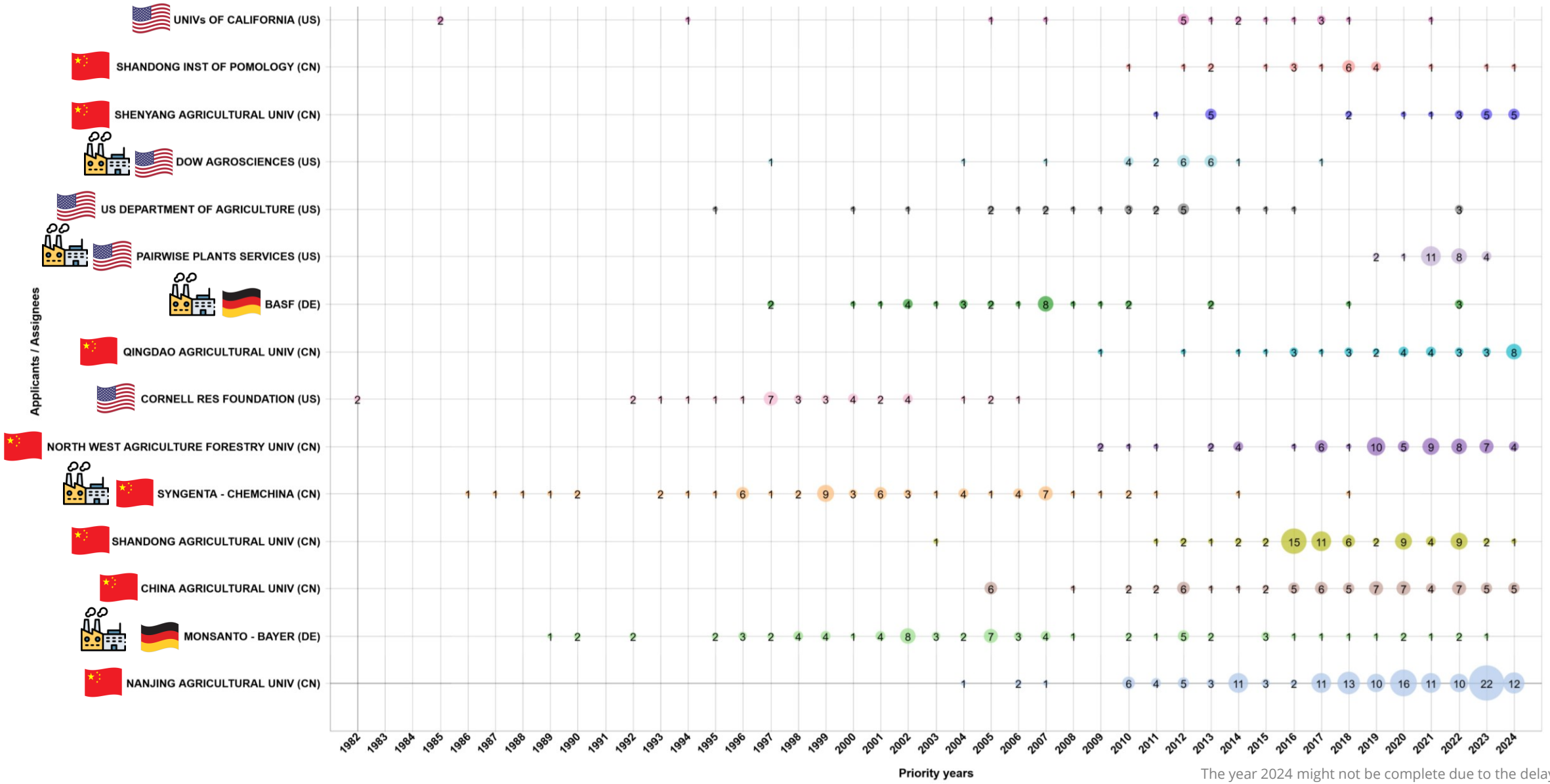
Image generated by AI

Chinese universities drive global innovation!



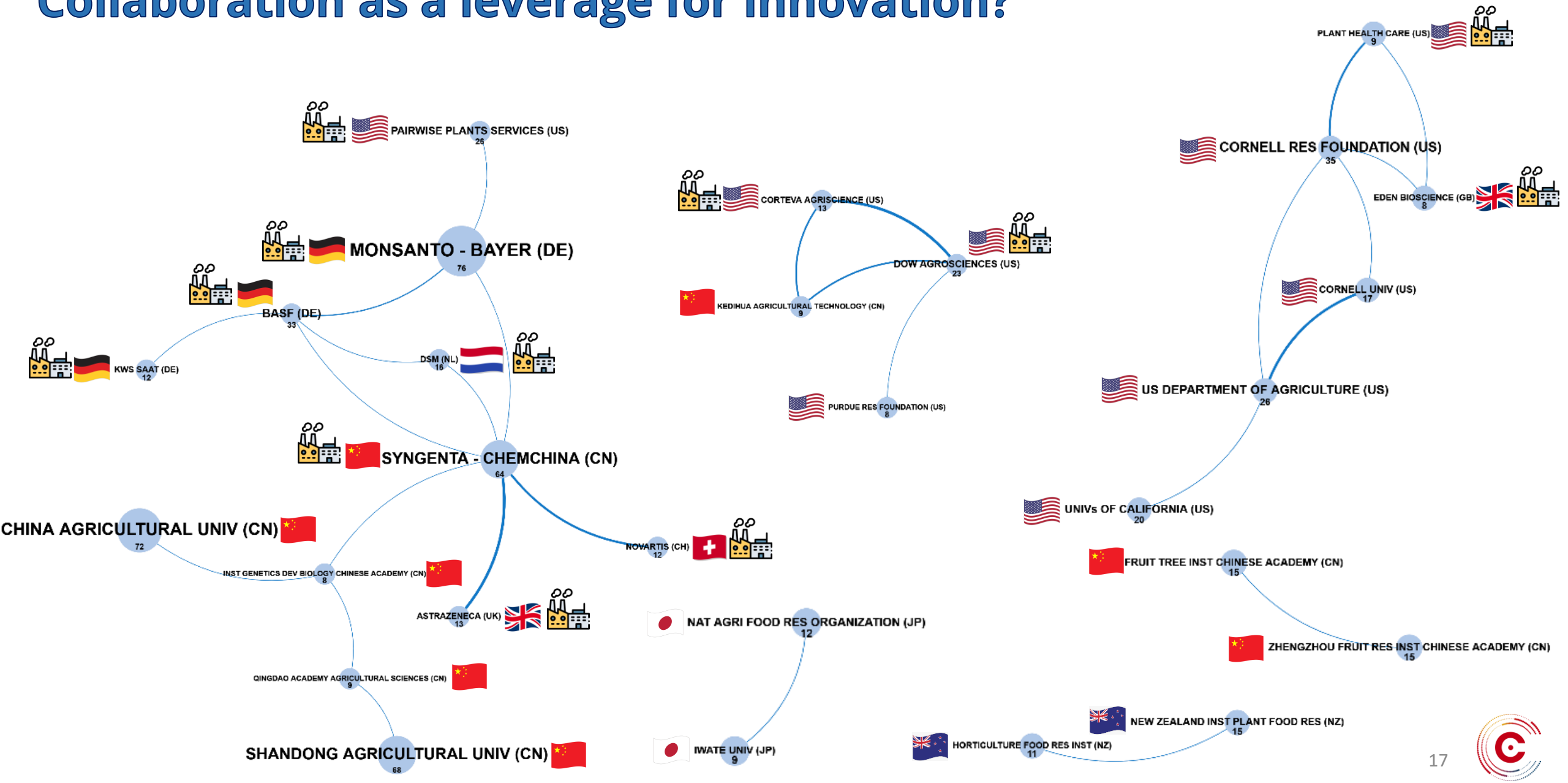
*Note: an active patent family is a family comprising at least one active patent member (e.g. pending patent application or in force granted patent).

China’s eager to innovate has gained momentum over the last decades!

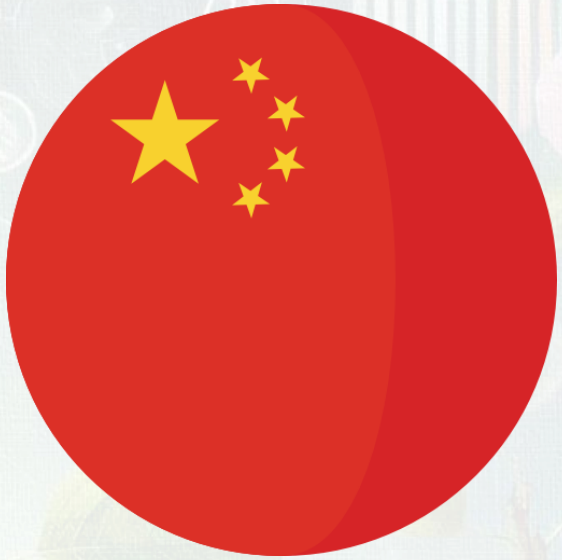


The year 2024 might not be complete due to the delay of publication

Collaboration as a leverage for innovation?



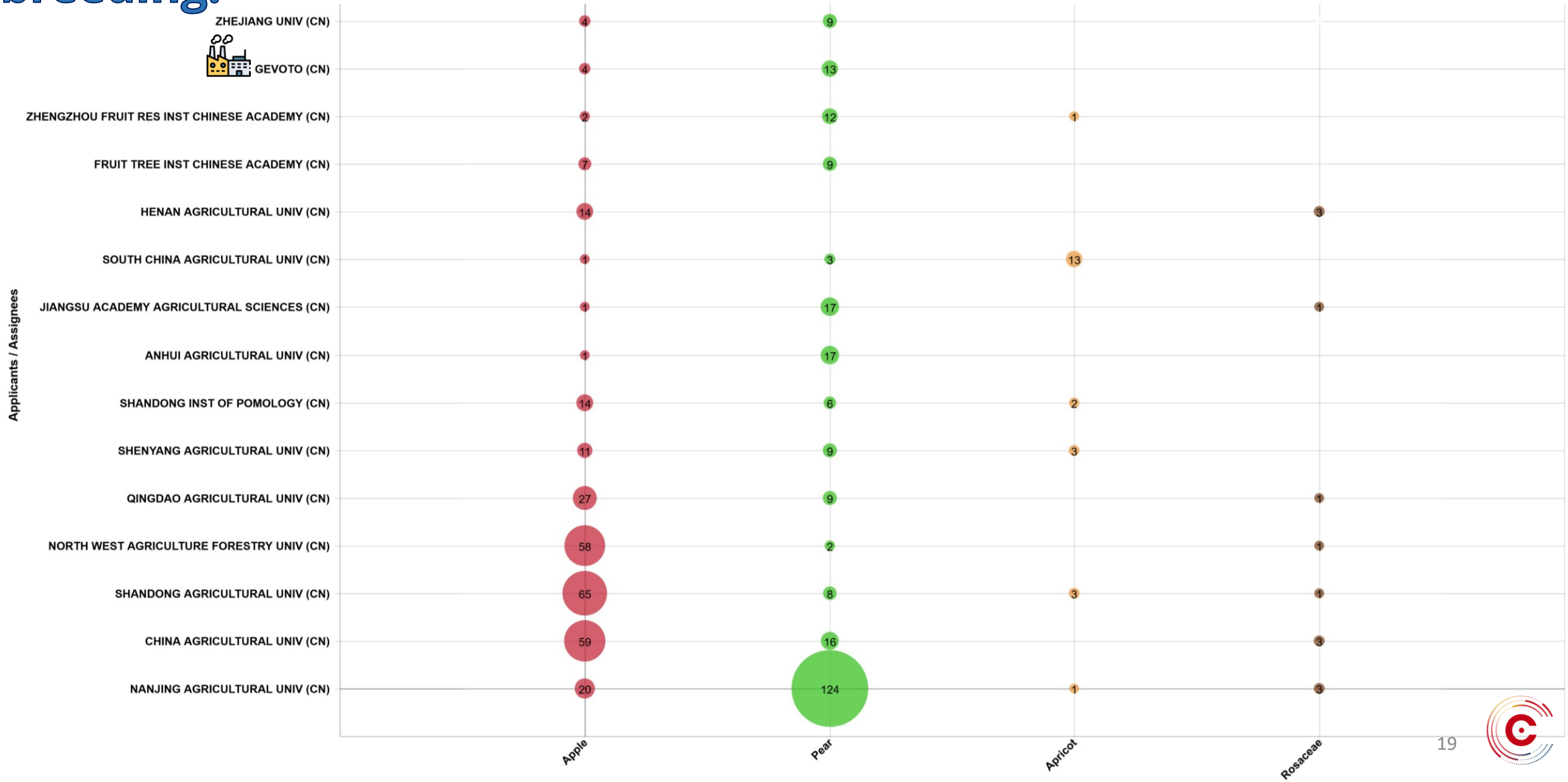
Chinese activity



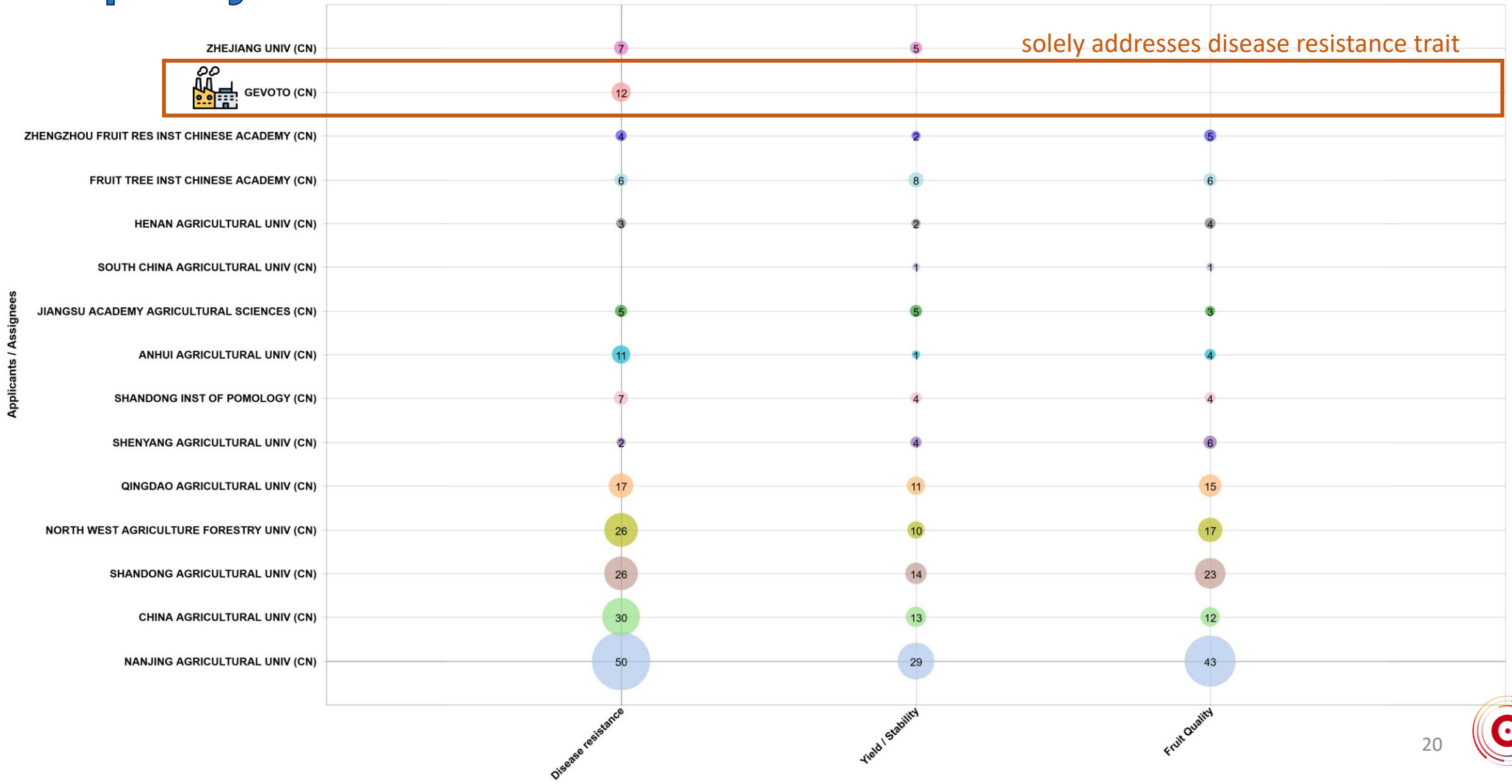
- **Focus on the major assignees patenting in China and their domain of interest**

Image generated by AI

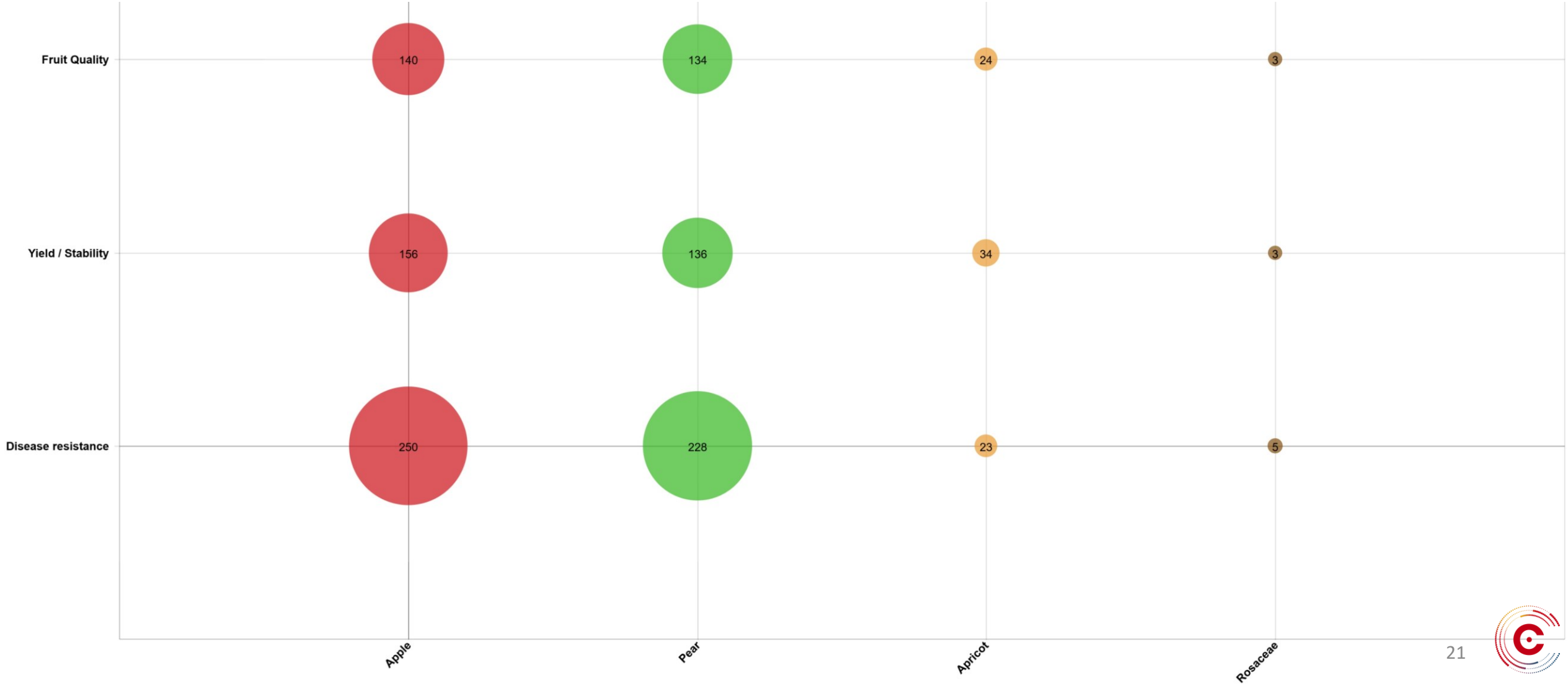
Chinese Universities - A powerful research engine in fruit breeding!



Chinese players mainly patent on disease resistance as well as fruit quality



Chinese research focuses mainly on fruit breeding techniques favoring disease resistance



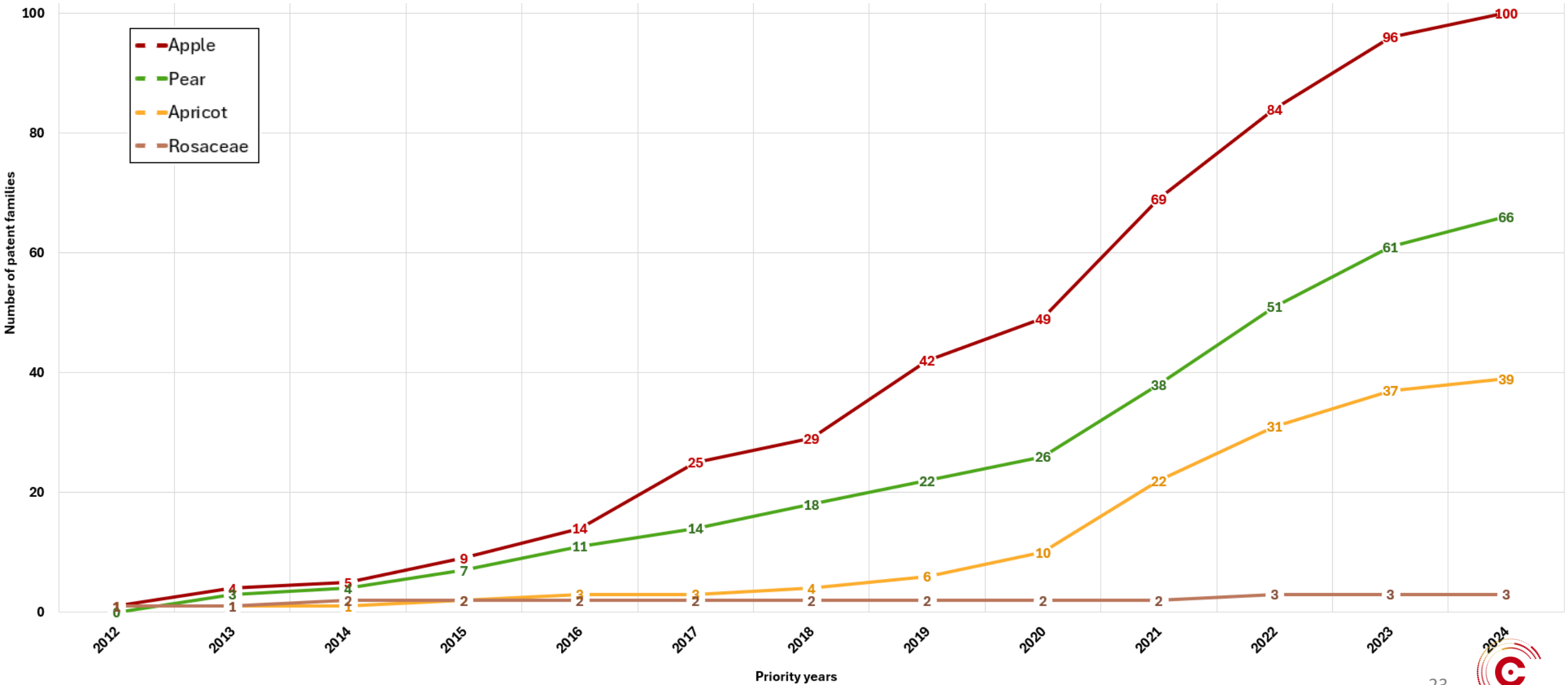
CRISPR techniques

- **Focus on the CRISPR techniques applied in fruit breeding innovation worldwide**


Image generated by AI

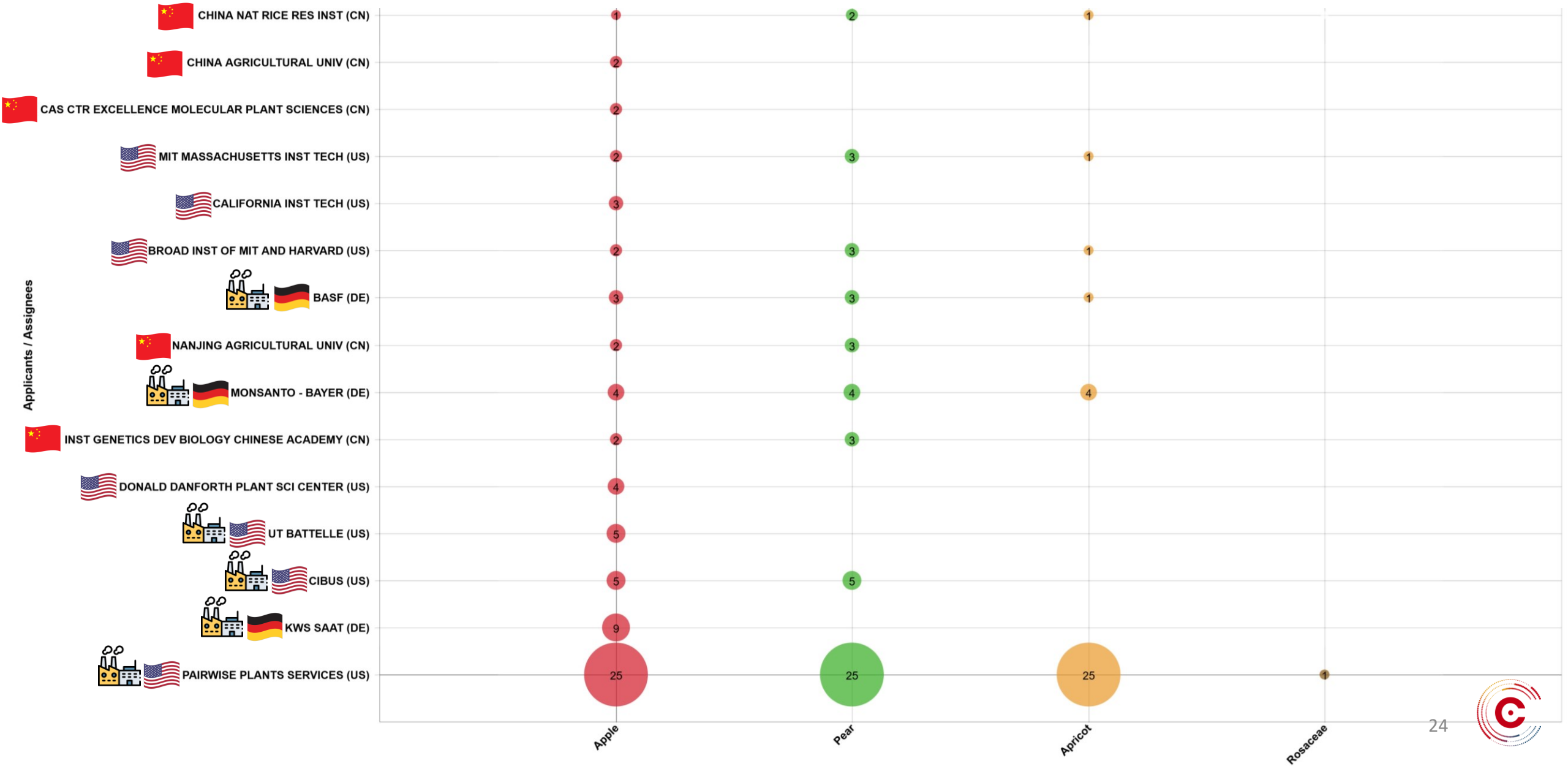
Image generated by AI

CRISPR techniques in fruit breeding is emerging!

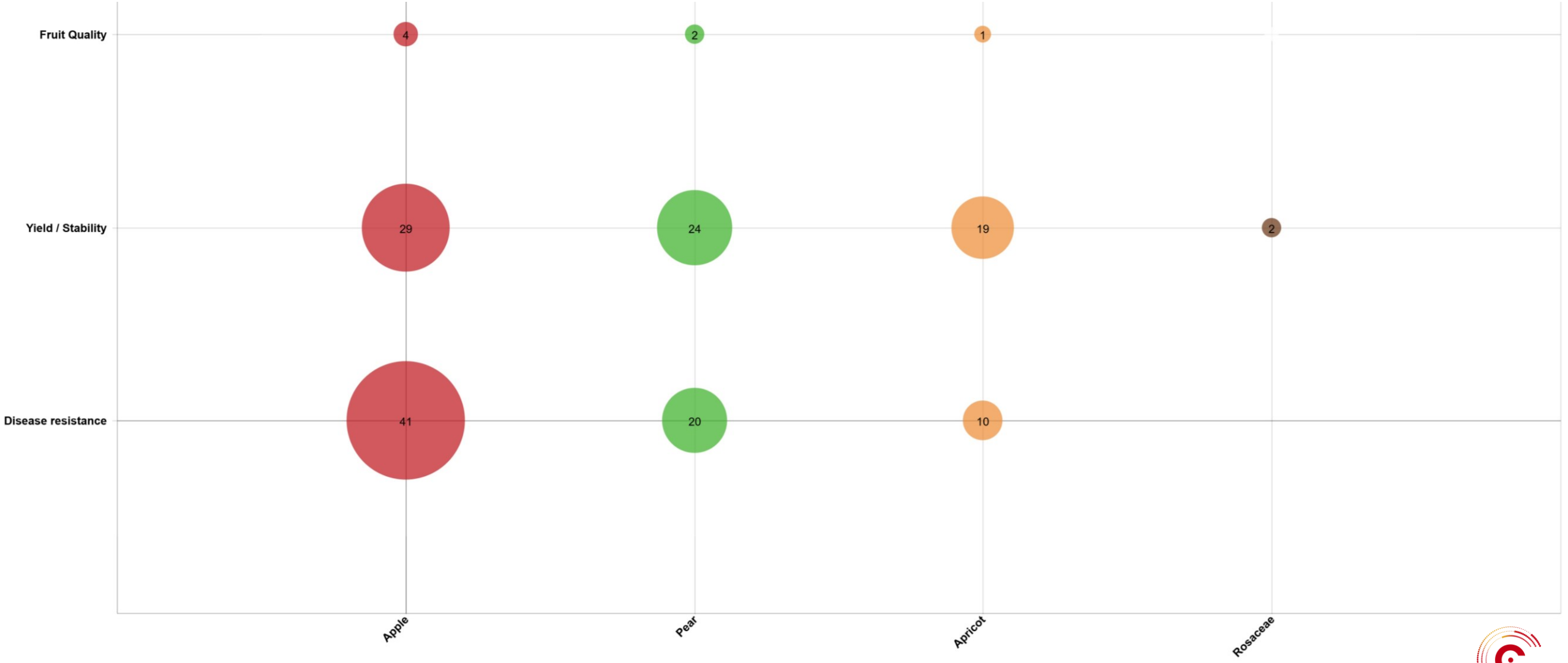


The year 2024 might not be complete due to the delay of publication

US and Chinese players lead the patenting race in this field



CRISPR techniques mainly applied for disease resistance and yield



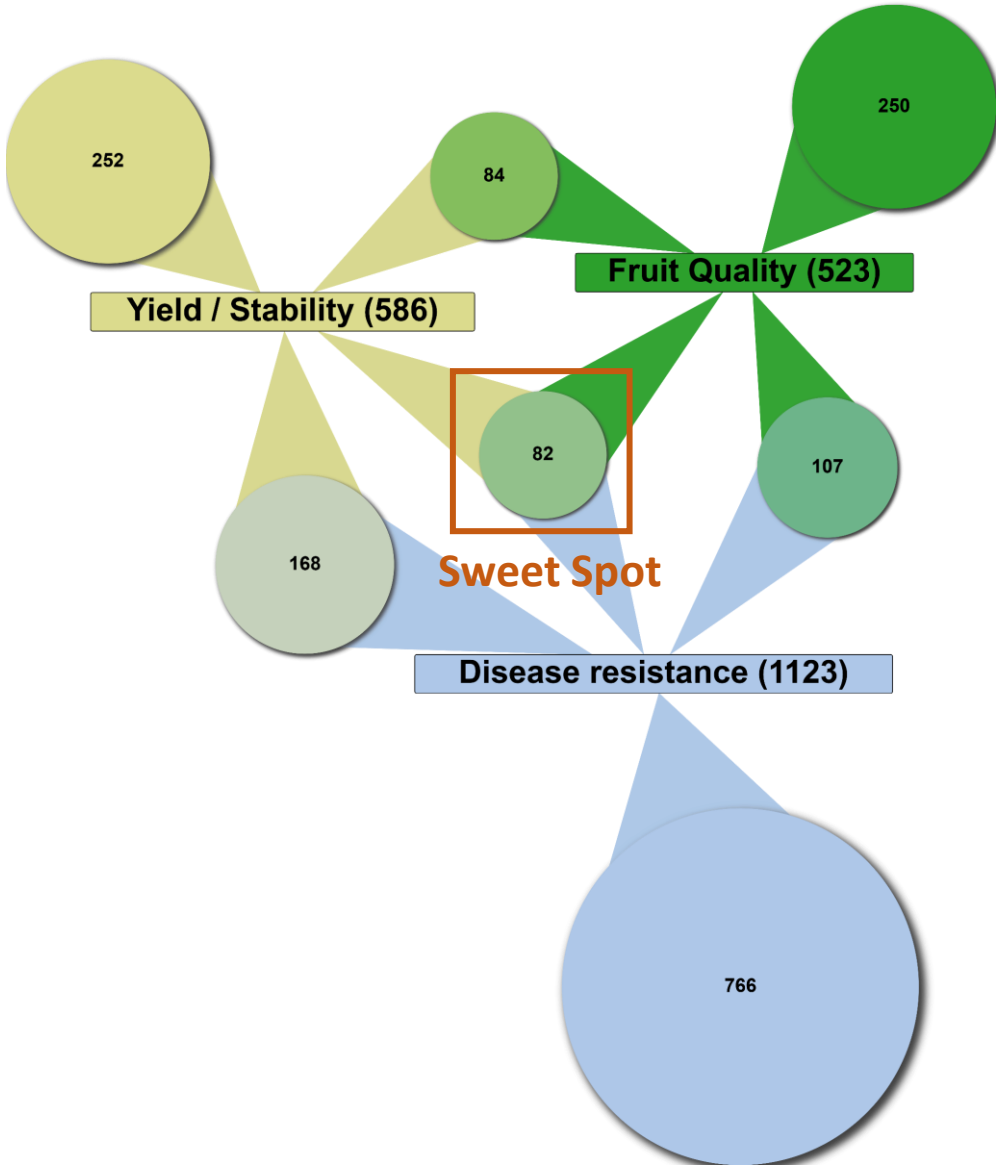
Holistic approach

- **Focus on the holistic innovation approach**

Image generated by AI

Image generated by AI

Meeting Multiple Breeding Goals– The Sweet Spot



Gene editing technologies for meeting several breeding goals concurrently

2024

QINGDAO AGRICULTURAL UNIVERSITY (CN)

- **Patent number:** CN118207225 **(ACTIVE)**
- **Patent Title**: Application method of **MdDWARF14 gene in enhancing low-temperature stress resistance of apple plant**
- **Abstract**: The invention provides an application method of an MdDWARF14 gene in enhancing low-temperature stress resistance of an apple plant, and relates to the technical field of plant genetic engineering. **[…] The method does not need to cultivate new fruit tree varieties for a long time and improves the yield and quality of plants in a short time.**

Goals targeted:
- ✓ Disease resistance
- ✓ Fruit quality

2023

FRUIT TREE INSTITUTE OF CHINESE ACADEMY OF AGRICULTURAL SCIENCES (CN)

- **Patent number:** CN116569838 **(ACTIVE)**
- **Patent Title**: Breeding method of early-maturing disease-resistant **pear variety**
- **Abstract**: The invention discloses a **breeding method of an early-maturing disease-resistant pear variety, […] a three-line hybridization method is used, so that the F1-generation hybrid has higher-level precocity, disease resistance, high yield and other character expressions, the hybridization effect is improved, the genetic diversity is increased, the hybridization parents A, B and C are matched respectively, the F1-generation hybrid has high heterozygosis advantage and genetic diversity, and a highly stable offspring variety can be obtained.**

Goals targeted:
- ✓ Disease resistance
- ✓ Fruit quality

2023

NANJING AGRICULTURAL UNIVERSITY (CN)

- **Patent number:** CN116376927 **(ACTIVE)**
- **Patent Title**: **Pear PbELF4-like1 gene**, protein coded by same and application of PbELF4-like1 gene
- **Abstract**: The invention discloses a pear PbELF4-like1 gene, a protein coded by the pear PbELF4-like1 gene and application of the pear PbELF4-like1 gene. **[…] The method has important significance and practical application value for regulating and controlling pear flowering and improving the yield and quality of pears.**

Goals targeted:
- ✓ Disease resistance
- ✓ Fruit quality

Note: some of the patent families mentioned in this section have **multiple members**

Gene editing technologies for meeting several breeding goals concurrently

2024

QINGDAO AGRICULTURAL UNIVERSITY (CN)

- **Patent number:** CN118207225 (ACTIVE)
- **Patent Title**: Application method of **MdDWARF14 gene in enhancing low-temperature stress resistance of apple plant**
- **Abstract**: The
of an MdDWA
stress resistan
technical field
method does
varieties for a
quality of plan

Goals targeted:
- ✓ Disease resistance
- ✓ Fruit quality

2023

FRUIT TREE INSTITUTE OF CHINESE ACADEMY OF AGRICULTURAL SCIENCES (CN)

- **Patent number:** CN116569838 (ACTIVE)
- **Patent Title**: Breeding method of early-maturing disease-resistant **pear variety**

Goals targeted:
- ✓ Disease resistance
- ✓ Fruit quality

2023

NANJING AGRICULTURAL UNIVERSITY (CN)

- **Patent number:** CN116376927 (ACTIVE)
- **Patent Title**: **Pear PbELF4-like1 gene**, protein coded by same and application of PbELF4-like1 gene
pear PbELF4-like1
F4-like1 gene and
gene. **[...] The**
e and practical
controlling pear
quality of pears.

Goals targeted:
- ✓ Disease resistance
- ✓ Fruit quality

These patent families offer **valuable technical insights** and contain rich technical detail which might be relevant to your research goals, often **not found in scientific articles** — especially from industry sources.

Note: some of the patent families mentioned in this section have **multiple members**

Apple Scab Resistance

- **Focus on the fruit breeding innovation to improve the apple scab resistance**

Image generated by AI

Different approaches for treating apple scab disease

2023

NORTH WEST AGRICULTURE FORESTRY UNIV (CN), XI AN HUANG SHI BIOLOGICAL ENGINEERING (CN)

- **Patent number:** CN117551804 **(ACTIVE)**
- **Patent Title**: Primer and kit for detecting cladosporium cucumerinum and detection method thereof
- **Abstract**: The invention is applicable to the technical field of phytopathogen detection methods, and provides a primer, a kit and a detection method for detecting cladosporium cucumerinum, and an RPA primer and a CRISPR/Cas12a primer for detecting cladosporium cucumerinum. **The kit for detecting the apple scab fungi comprises the primer, Cas12 protein, T7 transcriptase, DNA polymerase and a Cas12/13 special nucleic acid detection test strip. […]**

Goals targeted:
- ✓ Disease detection

2020

MINNESOTA UNIV (US)

- **Patent number:** USPP33756 **(ACTIVE)**
- **Patent Title**: Apple tree named 'MN80'
- **Abstract**: A new cultivar of apple tree named 'MN80' that is characterized by its good winter hardiness in U.S.D.A. Zone 4, **its good resistance to apple scab in field observations with multi-gene resistance, its fruit with a long storage life, its fruit with a desirable skin color with a yellow base color and red overcolor, its fruit with a long storage life, and its fruit with a texture that is firm, crisp, and juicy, which is maintained during storage**.

Goals targeted:
- ✓ Disease resistance
- ✓ Fruit quality

2012

INOVA FRUIT (NL)

- **Patent number:** EP2740351 **(EXPIRED)**
- **Patent Title**: Gene and method for increasing disease resistance in perennial plants
- **Abstract:** This invention relates to method for increasing resistance against pathogen or parasites in a perennial plant, in particular an apple plant. **[…] In particular, this invention relates to a method for increasing resistance to apple scab by introducing Rvi15 (Vr2).**

Goals targeted:
- ✓ Disease resistance
- ✓ Fruit quality

Note: some of the patent families mentioned in this section have **multiple members**

Overall key take-aways

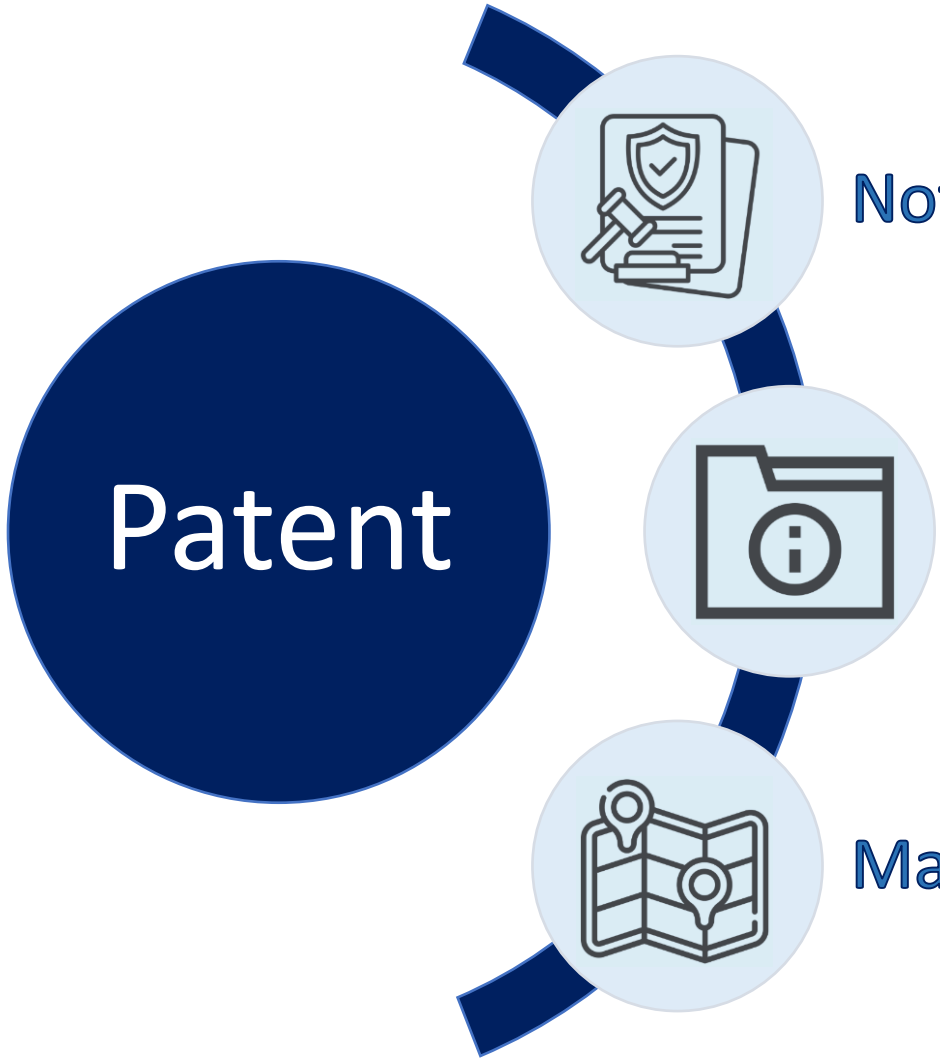
- **Focus on the key insights resulting from this patent analysis**

Image generated by AI

Patents: Another Path to Fruit Breeding Innovation

- Apple is the primary driver for fruit breeding innovation globally
- China and the US are the major patent contributors
- China has accelerated its patenting activity drastically over the last decades
- Universities are key players in the innovation race
- Assignees filing in China mainly patent on fruit breeding techniques for improving disease resistance
- The application of CRISPR techniques in fruit breeding innovation is emerging and dominated by industries
- Patents claiming the achievement of multiple breeding goals concurrently provide valuable technical insights
- The focus on patent publications about apple scab resistance reveals the different innovation approaches

Patents: Another Path to Fruit Breeding Innovation



Not just a legal document

Powerful source of technical information

Map for driving innovation

Patents: Another Path to Fruit Breeding Innovation

Strategic Direction

- ✓ Patent insights help you make informed decisions about your research focus and priorities.

Competitive Advantage

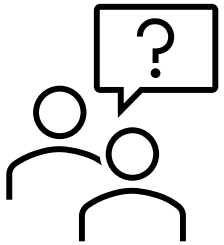
- ✓ Stay ahead of the curve by understanding the global innovation landscape and competitor activities.

Accelerated Innovation

- ✓ Identify opportunities, avoid redundancy, and potentially find partners to speed up your research and development.

Questions & Discussion

Image generated by AI



What distinguishes the patent landscape in fruit breeding from other agricultural domains?

A. It is dominated by public institutions and collaborative filings.

B. Most patents address broad goals like yield, stress tolerance, or disease resistance across multiple species.

C. It is highly concentrated on apple, with limited diversification across species.

D. Most patents focus on genome editing and advanced biotechnology tools.