



International Rootstocks Symposium

Guidelines, breeding projects and new rootstocks

Session 3

Stone Fruit Rootstocks

Thursday 9 May 2024

CONSORTIUM DEUTSCHER BAUMSCHULEN

CDB

(ASSOCIATION OF GERMAN NURSERIES)

Johannes Feldmann (Managing Director CDB)

Formation of the CDB

- The CDB, founded as a club with 11 German dendro rootstock producers in 1979 to take over the promising cherry rootstock material bred at Giessen (Germany) university. The aim was to exploit this comprehensive breeding material, to introduce the best clones to the worldwide modern cherry industry and to manage the marketing.
- In the 1980's contracts between the CDB and the university of Giessen were signed. 16 years after the start of the program, 17 clones of the Giessen material were released for trials.
- 1997 Handing over of rights on the complete breeding material from the university Giessen to the CDB. With 9 nurseries a limited company was founded.
The payment of the CDB was brought into the foundation 'GiSela' of Giessen university. The interest is distributed for sponsoring of young German scientists, working on rootstocks, cultivars or their interactions in fruit or grape.

Portfolio of the CDB

- **GiSela**[®] rootstocks with 6 different varieties, vigor types today
- **PiKU**[®] 3 cherry rootstocks clones bred at Dresden-Pillnitz(Germany)
- **Wavit**[®] plum and apricot rootstock selected at Schreiber Nursery(Austria)
- **Pyrodwarf**[®] pyrus rootstock for pears bred at Geisenheim (Germany)
- **Malia**[®] apple rootstock bred at the federal institute Ahrensburg
- **Refia**[®] 2 pyrus rootstocks selected by Michael Petruschke from ViruTherm

Rootstock for apricots and plums

- Wavit® Prudom^(S) is a vegetatively propagated type, which was selected from a seedling population of *Prunus domestica* 'Wangenheim' at nursery Schreiber in Austria. It combines the well-known qualities of 'Wangenheims Seedling' with excellent uniformity and is not only an excellent rootstock for plums, but has proven to be one of the best rootstocks for apricots in Middle Europe. In addition, the good compatibility with all types of plums and apricots speaks in favor of Wavit® Prudom(PVP).
- Trees on Wavit® Prudom^(S) are robust, healthy and long-living.
- Wavit® Prudom^(S) is assessed as medium-strong and induces less vigor than 'St. Julien A' and 'Brompton'. Trees on Wavit® Prudom^(PVP) do not need support.
- Wavit® Prudom^(S) has only little demands to growing sites and is very well suited for heavy and medium-heavy soils as well as for slightly calcareous soils; ideal with irrigation also for lighter sites. The rootstock is very winter hardy.

- Regular, low alternating yields with good fruit size are advantageous. Excellent uniformity in the nursery and orchard saves at least 15 to 20% or more pruning costs due to its growth reduction.

Induces early yields; variety dependent; modern varieties from 2nd leaf onward with very good fruit sizes.

The combination with very fertile/self-fertile varieties is in general very favorable, especially for 95% of apricot varieties very good, a few varieties overhang e.g. “Lady COT”





- The grafting unions are hardly visible and the stability is good to very good. In contrast to many other plum rootstocks, Wavit® Prudom^(S) has no to very little tendency to sucker. One of its positive traits is the good compatibility with all types of plums and apricots. Wavit® Prudom^(S) is not suited for combination with peaches.

The GiSela® rootstocks- First Wave

These 3 clones were released in a first wave (together with some other, now unimportant clones).

- **GiSela® 5 Gi1482** is well known, wide-spread and regarded as **semi-dwarfing** standard cherry rootstock in moderate climate.
- **GiSela® 6 Gi1481^(S)** gained importance in the **semi-vigorous** range
- **GiSela® 3 Gi2091^(S)** is the most important **dwarfing** rootstock for cherries

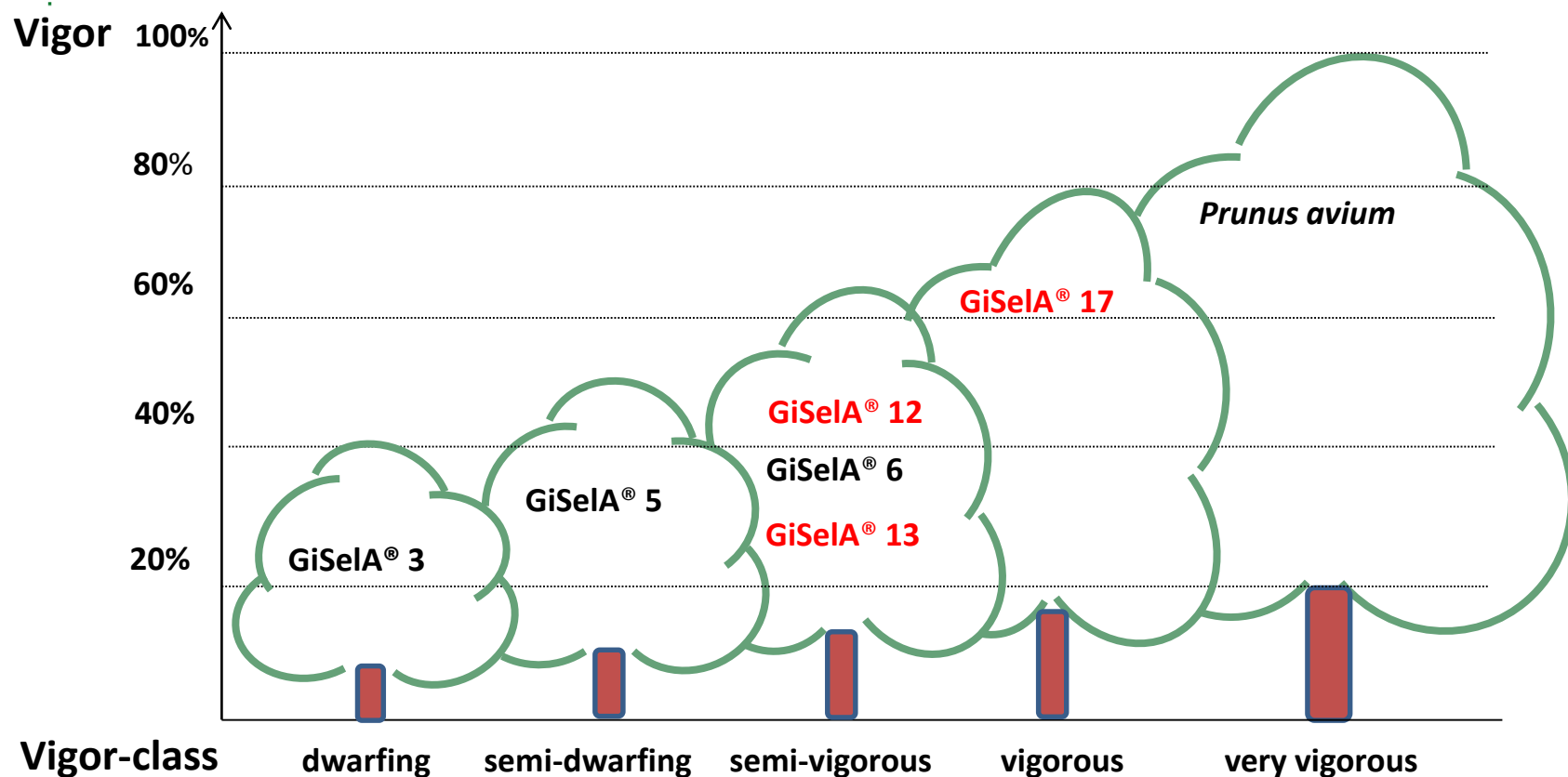
The GiSeIA® rootstocks- Second Wave



More recently, in a second wave, the CDB® released 3 other clones from the Giessen material:

- **GiSeIA® 12 Gi1592^(S)** semi-vigorous,
- **GiSeIA® 13 Gi14813^(S)** semi-vigorous,
- **GiSeIA® 17 Gi31817^(S)** vigorous,

Illustration of size-control of 6 GiSela® clones in comparison to *Prunus avium*



Common advantages of all 6 GiSeIA[®] rootstocks



- ❖ Good compatibility ->healthy (certified) budwood provided
- ❖ Precocity with high productivity
- ❖ Broad adaptability to soil and climatic conditions
- ❖ Flat branching and broad growth habit
- ❖ No suckering tendency
- ❖ Excellent winter hardiness
- ❖ Tolerance to pollen born viruses
- ❖ All **GiSeIA**[®]'s are to combine with sour cherries aswell

Cultural management of cherries on size-reducing rootstocks



- ❖ Cultural management methods have to be adapted to the needs of the GiSela® rootstocks and are more intensive than with cherries on *Prunus avium* rootstocks.
- ❖ In general, the more dwarfing the clone, the higher the requirements to soil and environment and the more intensive the cultural management.
- ❖ Early starting, regular pruning has to assure, that each year sufficient shoot growth and leaf area are built up for fruit nutrition. Additionally, higher and more frequent fertilization (compared to trees on conventional rootstocks) and irrigation or fertigation are necessary or beneficial.
- ❖ With such adapted cultural management, the high productivity on the GiSela® rootstocks is maintained over many years and fruit size is not negatively influenced. Early reports on smaller fruit sizes have been explained in the meantime: they were not induced by the rootstock, but resulted as a consequence of too little pruning, insufficient fertilization, and lack of irrigation.

GiSela® 6

Is a **semi-vigorous** rootstock. It induces stronger growth than GiSela® 5, but also a very early beginning of cropping and high yields. In the Pacific Northwest of the U.S., **GiSela® 6** is the most frequently planted GiSela® type.

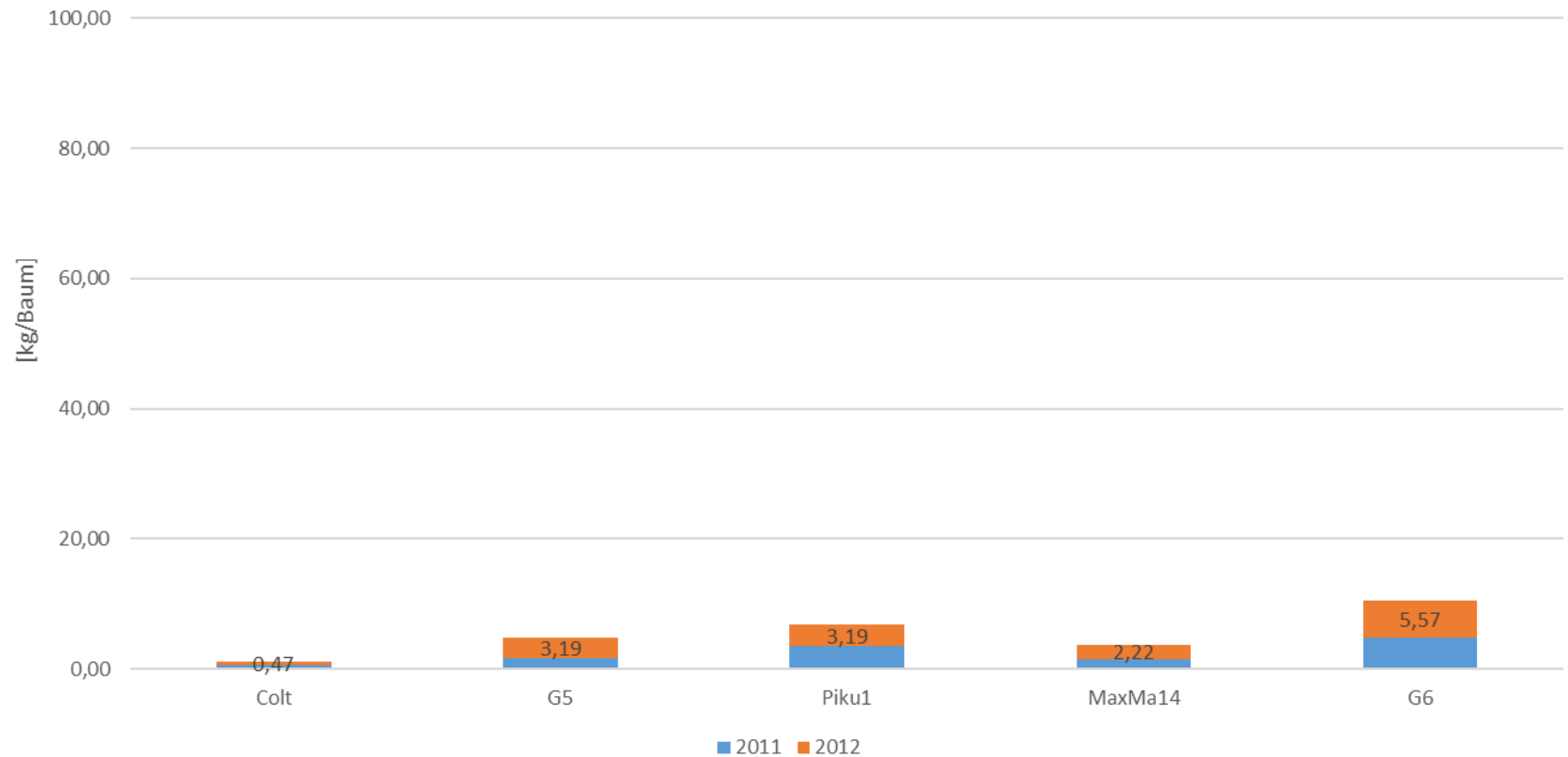
Demands to soil, water, and cultural management are less than for GiSela® 5. **GiSela® 6** may have problems at windy sites (not enough stability) and at sites with high natural precipitation (susceptibility to *Pseudomonas* = bacterial canker).



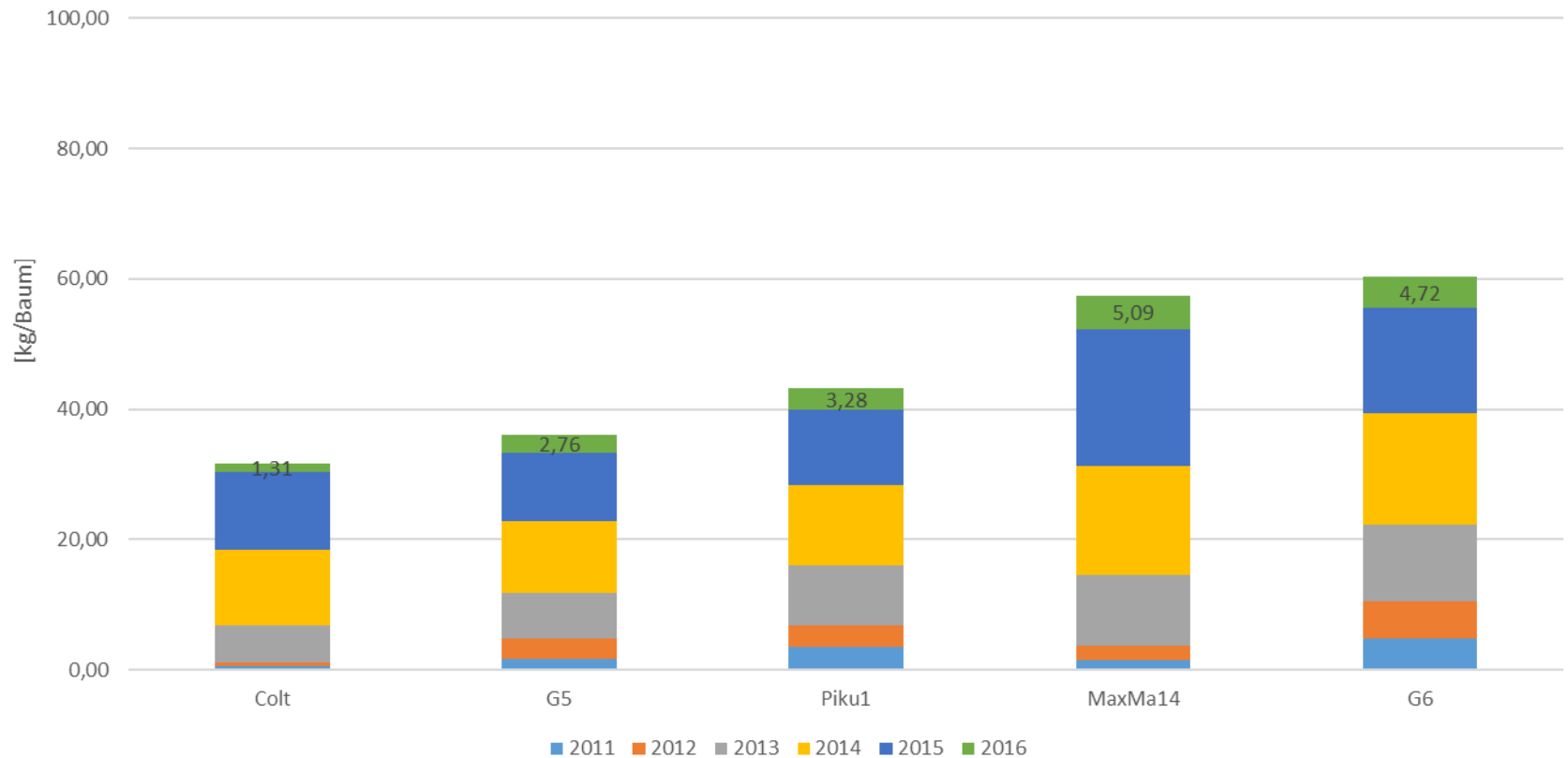
Replant Trial Fragsburg by Giacomo Gatti

- **Question: Are stronger growing rootstocks more suitable than Gisela 5 in replant situations?**
- Planting year: 2008
- Variety: Kordia
- **Rootstocks:** Gisela 5, Gisela 6, PiKu 1, Colt, MaxMa 14
- Distance between rows: 3,50 m
- ***Replant Trial Sweetcherries***
- Location: Fragsburg (700 m over M/M) Alto Adige

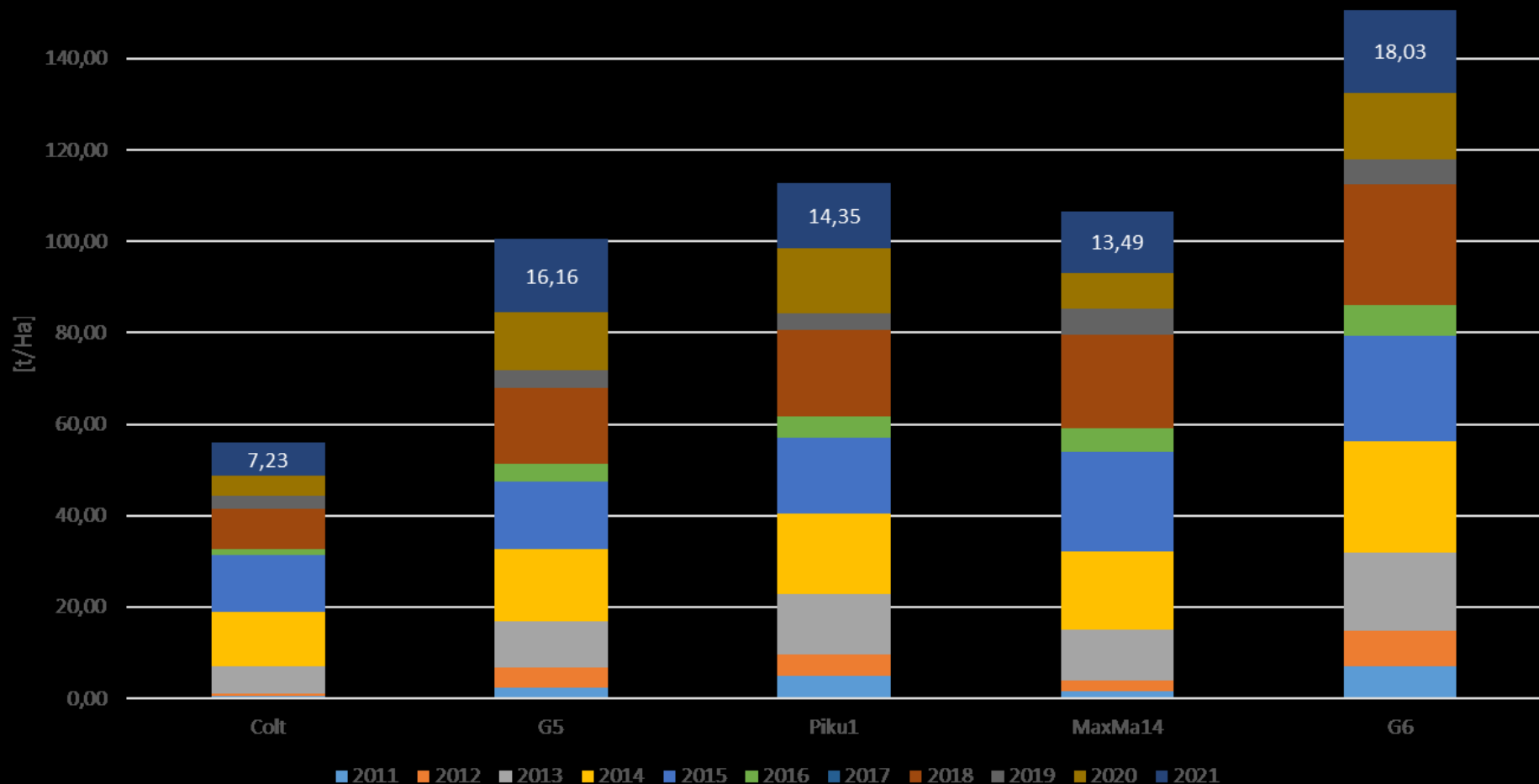
Yield in kg/tree, 5th year/leaf



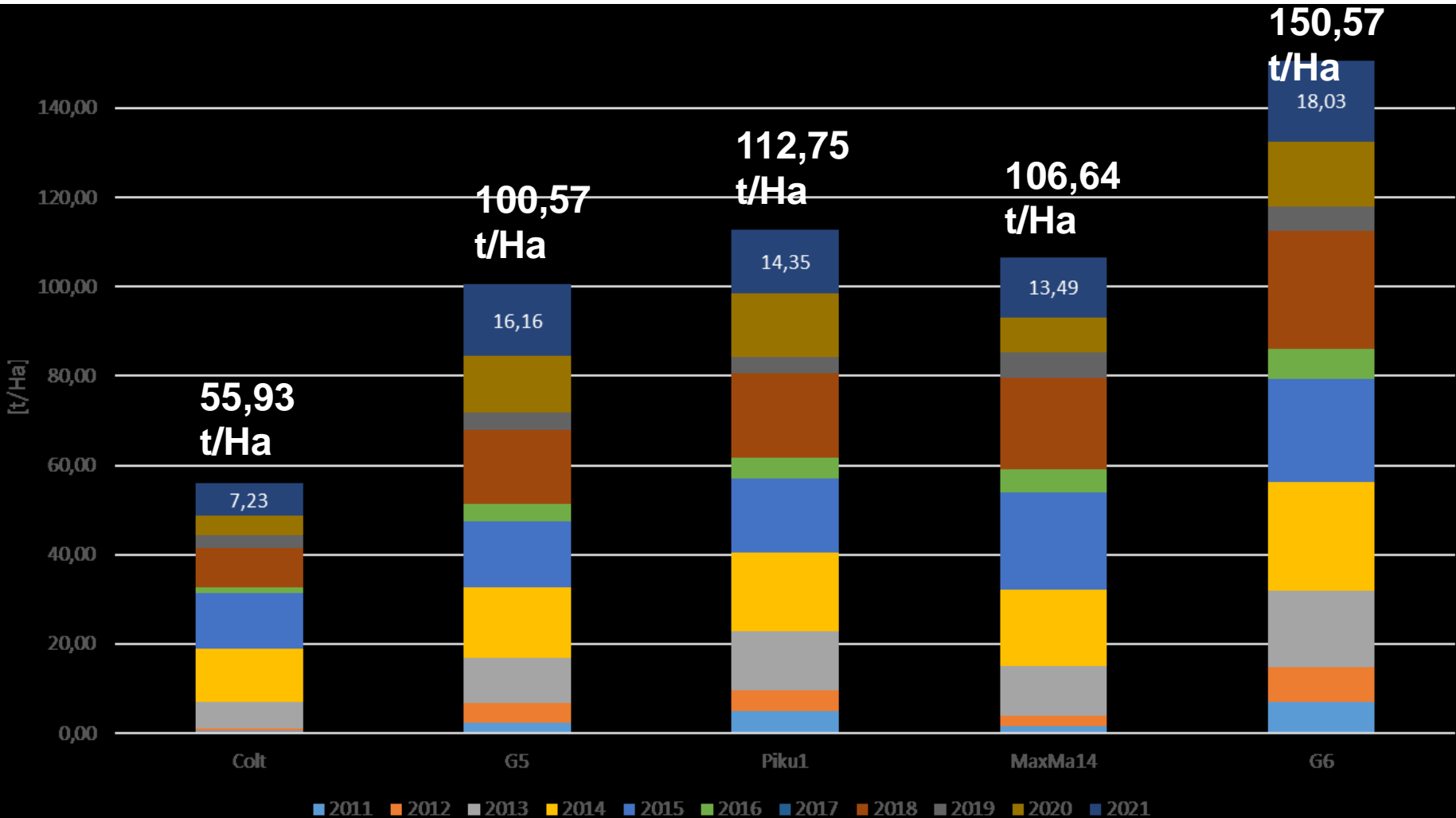
Yield in kg/tree, 9th year/leaf



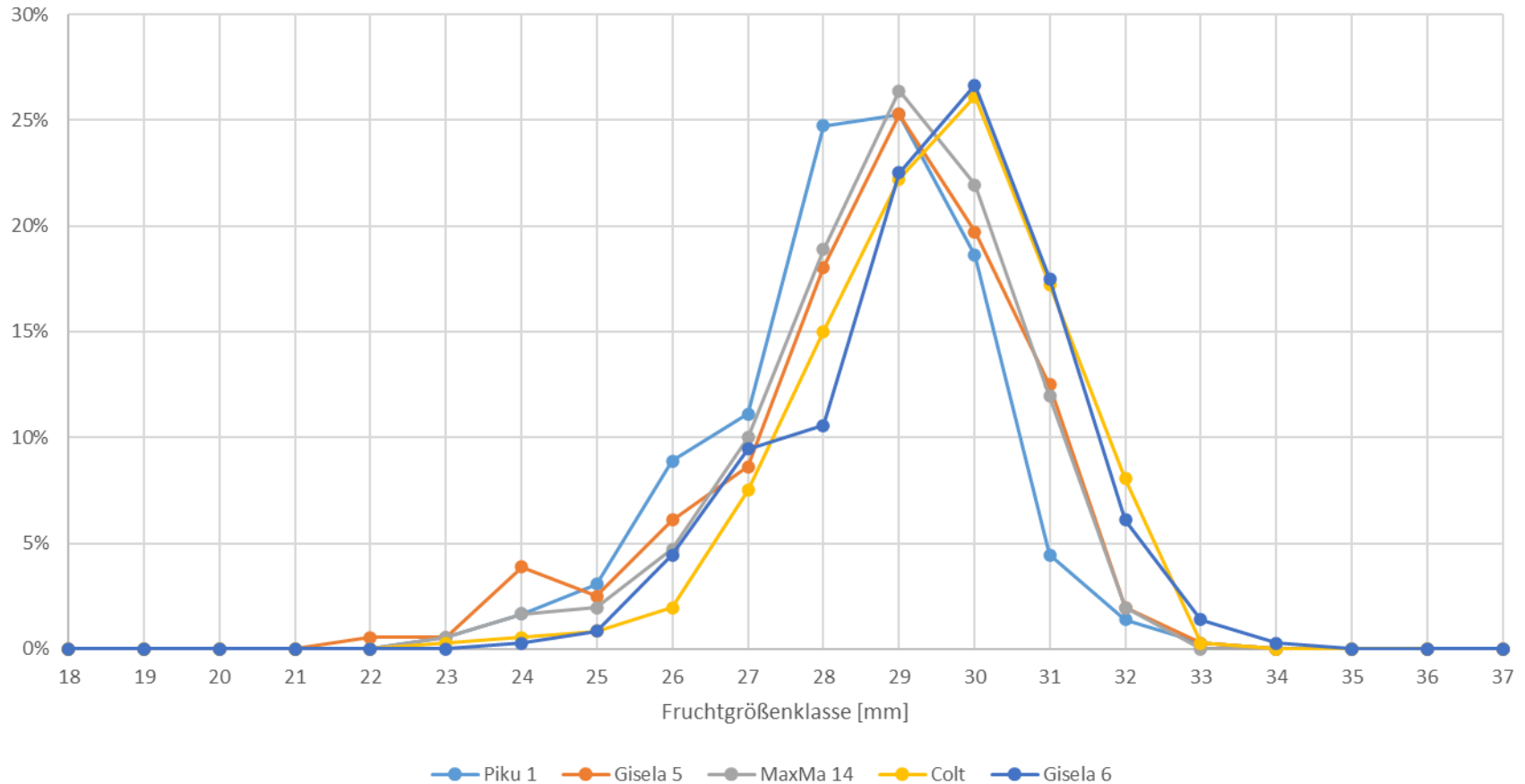
Yield in kg/tree, 14th year/leaf



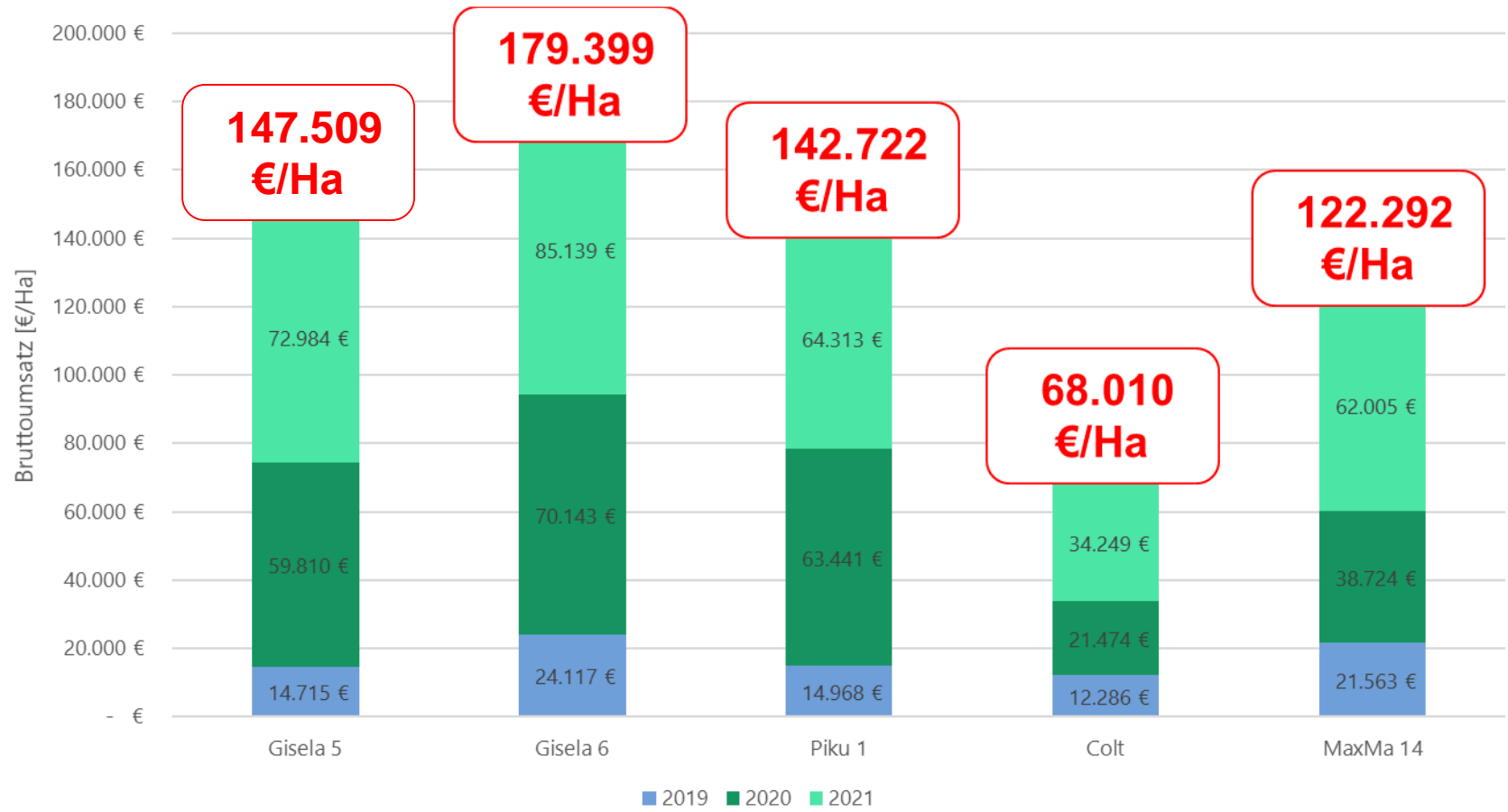
Cumulative yield in t/Ha, 14th year/leaf



Correlation of fruit size to rootstock

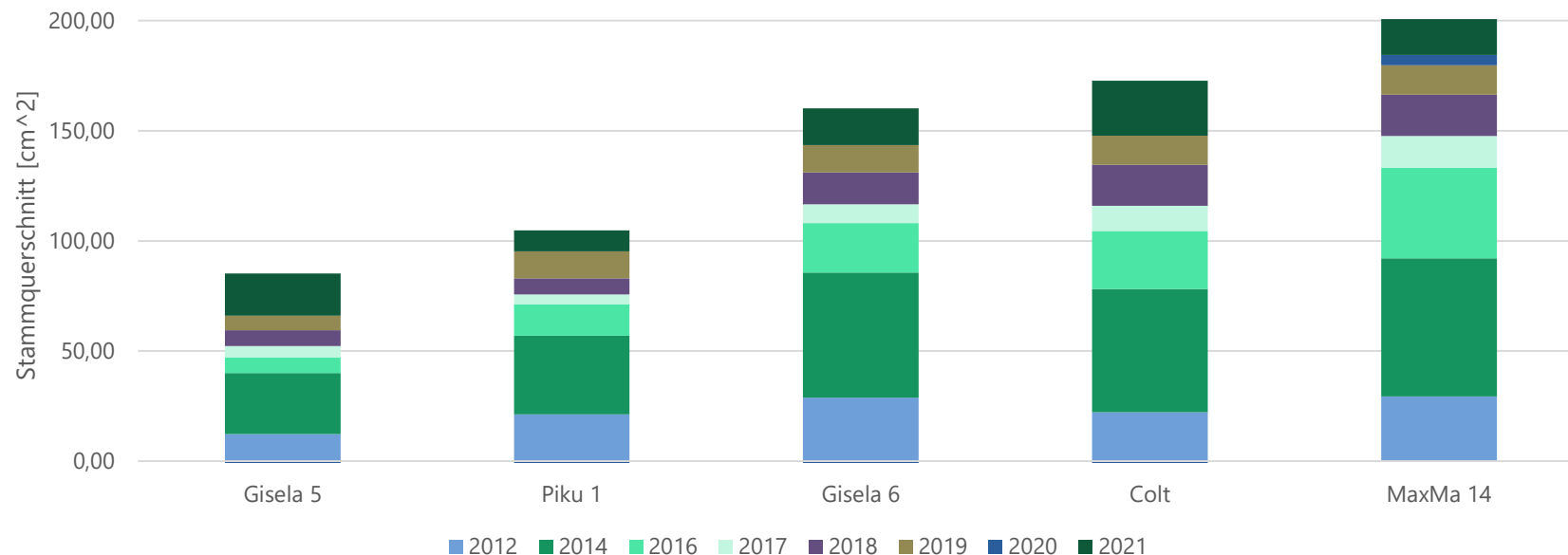


Cumulative yield €/hectare 2019 - 2021

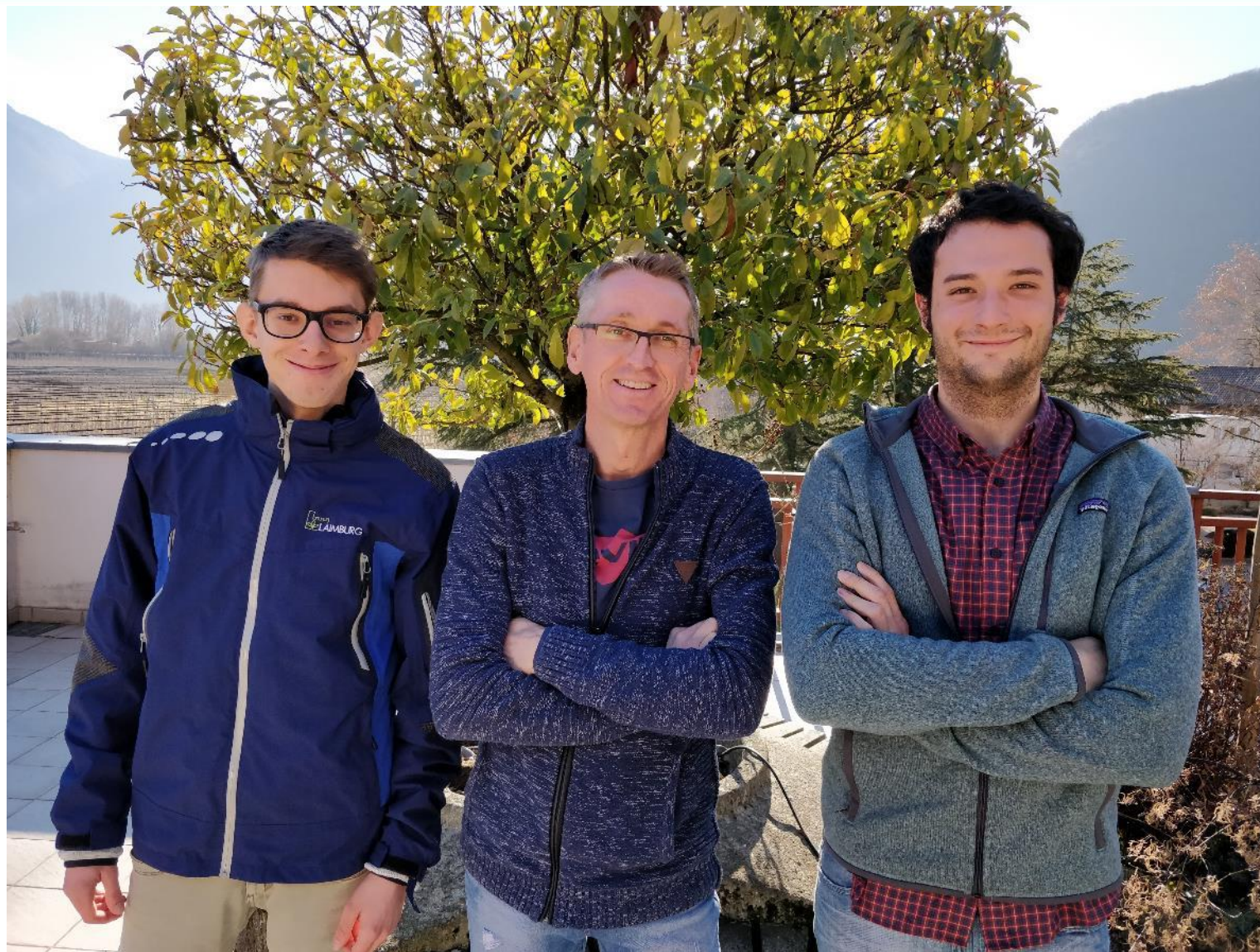


0% → G5	+22% → G5	-3% → G5	-54% → G5	-17% → G5
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Stammquerschnitt im 14. Standjahr



Many Thanks to the stonefruit team at Laimburg!



Current developments in the market

- **GiSela® 12** semi-vigorous, the alternative to **GiSela® 6**
- appr. 110-120% of **GiSela® 5**
- even more suitable for hotter conditions
- prefers lighter, poorer, sandy soils
- does **not** like heavy, **wet**, humid **cold** soils!
- suits well in south of France: ex. Trial station La Tapy or CTFL in Balandran/Nimes
- the most sensitive and difficult **GiSela®** rootstock in the young plant and juvenile stage => **best place in the nursery**
- good to combine with very fruitful and self-fertile varieties
- has significantly less drought stress and recovers faster than **GiSela® 5**
- compared to **GiSela® 6**, it can be grown without poling/fixing/trellis and is significantly more wind resistant.

Current developments in the market

- **GiSeIA® 13** semi-vigorous, the *'unpretentious, undemanding'*
- another alternative to **GiSeIA® 6** appr. 115-125% of **GiSeIA® 5**
- best combination with self fertile varieties, which tend to overcrop, very suitable to suboptimal conditions
- in Germany the choice for many replant situations with suboptimal conditions for **GiSeIA® 5**
- suits well in south of France: ex. Trial station La Tapy or CTFL in Balandran/Nimes
- It's the first **GiSeIA®** in spring to start vegetation => best for low chill regions!
- Good drought resistance requires as rootstock in the nursery only 35% of the irrigation amount of **GiSeIA® 5**
- **First GiSeIA® to start in early spring/latze winter => suitable for low chill areas!?!?**

Developments in the current market

- **GiSeIA® 17** vigorous, the alternative in the vigor class MaxMa 14
- with all the known GiSeIA® advantages, ca. 130-140% of **GiSeIA® 5**
- the simplest **GiSeIA®** => starter rootstock
- suits well in south of France: ex. Trial station La Tapy and CTFL in Balandran/Nimes
- **In thermotherapy it stands easily without any damage 2weeks of +40°C**
- very good anchorage

Outlook - Perspective

- As you heard before, the CDB took over all Giessen material => three crossing cycles
- Together with one of the remaining Giessen breeders and the trial orchard manager we selected more than 40 clones => from their point of view the most interesting ones!
- Next step: indicator graftings to determine the virus sensitivity to PDV and PNRSV which are in our point of view the most relevant and widely spread viruses
- Hypersensitivity could be very interesting in the future => mothergardens scion wood production!
- Currently we prepare trials with 5 new clones, one clone is hypersensitive to PDV and PNRSV
- **The goals compared to GiSela® 5 are:**
 1. vigor => with better heat/drought resistance,
 2. comparable or better fruit size,
 3. comparable or better fruit quality,
 4. comparable or better yield,
 5. suitable for more suboptimal conditions => more different vigor classes

PiKU® rootstocks



The CDB® also markets the PiKU® rootstocks for cherries.

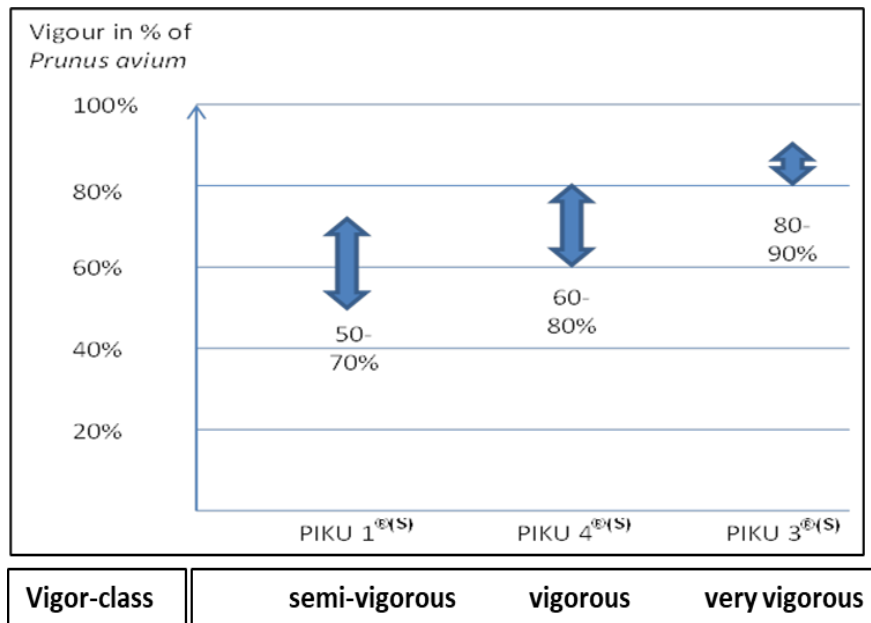
The PiKU® rootstocks originate from a breeding program at Dresden-Pillnitz (Germany) JKI. The aim was the production of rootstocks with good compatibility, less vigor than *Prunus avium*, high yields and early begin of production. Hybrids of different weak growing Asian *Prunus* species with each other and with *Prunus avium* and *Prunus cerasus* were produced. After long-term testing for suitability as rootstock with several cultivars, 3 clones were selected: PiKU® 1, PiKU® 3 and PiKU® 4.

All 3 clones are

- tolerant to viruses PDV and PNRSV
- compatible with sweet and sour cherry cultivars
- self-supporting
- robust

PiKU[®] rootstocks

- Vigor and vegetative characteristics: All PiKU[®] are classified as vigorous, with PiKU[®] 1 being the weakest, PiKU[®] 4 medium, and PiKU[®] 3 the strongest clone. There is uncertainty about the vigor of PiKU[®] 1, as under some conditions, it is even weaker than GiSela[®] 5. After initial strong growth, the typical level of size-reduction is only reached in later years.



Comparison to the GiSela[®] clones:

The GiSela[®] rank from dwarfing to vigorous, the PiKU[®] from semi-vigorous to very vigorous.

PiKU® rootstocks



Yielding potential:

The PiKU® clones induce earlier yields than *Prunus avium* rootstocks, but precocity not as pronounced as with the GiSela® clones. All 3 clones have a high yielding potential. Even without irrigation, good fruit sizes are achieved.

Favorable growing conditions:

The PiKU® rootstocks tolerate less favorable soil and climate conditions as well as less pruning effort than the dwarfing, semi-dwarfing and semi-vigorous GiSela® clones. They perform well on dry and sandy locations, where high crops and good fruit sizes are achieved. *Normally*, irrigation is not necessary. The PiKU® rootstocks are recommended for extensive cultivation and for replant conditions.

Very Important: All PiKU® clones should not be cultivated on heavy soils, prone to waterlogging.

PiKU[®] rootstocks => Outlook

- Currently the JKI is in the last evaluation phase for some new PiKU[®] clones
- Together with them we planted a trial with 5 new clones at 8/9 trial stations in Germany!

- **The goals compared to GiSelA[®] 5 are:**
 1. vigor => with better heat/drought resistance,
 2. comparable or better fruit size,
 3. comparable or better fruit quality,
 4. comparable or better yield,
 5. suitable for more suboptimal conditions
 6. => more different vigor classes

Apple proliferation resistant rootstock

- The variety D2212(S) was developed in the 1960s/70s from a breeding program for apple rootstocks at the then Federal Research Station Ahrensburg. The aim was to breed homogeneous, disease-tolerant, if possible generatively reproducible rootstocks by crossing the origine species. Hanna Schmidt, later one of the breeders of the Giessen breeding program, from which the cherry rootstocks GiSelA® also originated, was involved in the breeding.
- **Variety specific properties:**
 1. the only apple rootstock with resistance to apple proliferation and the fungus *Athelia rolfsii*
 2. no affinity problems (300 varieties tested)
 3. growth vigor like rootstock M 7, but no suckers
 4. high yield, good fruit size and fruit color
 5. mainly stronger roots, few fine roots
 6. suitable for all soil types, adapted to Central European climate, frost hardy to at least -25° C
 7. due to its stability, especially suitable for all columnar varieties, otherwise suitable for all varieties
 8. especially recommended for mothergardens, half trunks, cider fruit production varieties
- **CDB is exclusive licensee worldwide**

Refia® ViruTherm 1^(S) & 2^(S)

Pear decline resistant rootstocks



➤ General properties:

1. tested by LTZ Augustenberg, Karlsruhe and resistant to Pear decline
2. selected Petruschke in a trial at KOB Bavendorf, 2014
3. no pH-related chlorosis, compatible with all pear varieties, PVP applied by ViruTherm, Rheinstetten, so far in experimental cultivation (Central Europe)

➤ Refia® ViruTherm 1^(S) Variety specific properties:

1. Pyrus x michauxii, leaf narrow, elongated, fine root system, fibrous
2. growth vigor, about 20-30 % weaker than seedling, approximately similar to BA 29
3. for dry, sandy or gravelly sites, tolerates lime, but also on acid soils (up to pH 5.5)
4. tolerant to high temperatures, very good winter hardiness (-20°C)

➤ Refia® ViruTherm 2^(S) Variety specific properties:

1. Pyrus communis, leaf roundish, heart-shaped, few, strong roots
2. growth vigor, about 10 % weaker than seedling
3. for dry and sandy sites, tolerates lime
4. suitable for central European climate, very good winter hardiness (-20°C)

➤ CDB is exclusive licensee worldwide

Take home message...

Together with our propagation partners, nurseries and breeders of varieties we want to offer the best combinations for sustainable and fast economical returns of investment for fruit producers!

Grazie Mille!

- **Questions?**

- **Consortium Deutscher Baumschulen GmbH**

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