New Rootstocks from the GiSelA® and PIKU® Series

THE CDB® TRADEMARKS:
The CDB®, an association of German nurseries, holds the rights for the GiSelA® and the PIKU® cherry rootstocks. The CDB® was originally founded to take over the promising Giessen breeding material from the university and to introduce it to the market.

Today, the CDB® offers a broader spectrum of rootstocks for fruit trees:

- **GiSelA®**(S) cherry rootstocks with clones 3 Gi2091(S), 5 Gi1482(S), 6 Gi1481(S), 12 Gi1592(S), 13 Gi14813(S) and 17 Gi31817(S)

- **PIKU®** cherry rootstocks with clones 1(S), 3(S) and 4(S)
Consortium Deutscher Baumschulen

- Pyrodwarf®(S) rootstock for pears

- Wavit® Prudom(S) rootstock for apricots and plums

The CDB® has licensees worldwide: Several countries in Europe, Turkey, U.S., Chile, Iran, China, South Africa, Australia and New Zealand. More informations you find on our homepage:  www.cdb-rootstocks.com
The GiSelA® rootstocks

The GiSelA®(S) clones are the first successful and economically important dwarfing rootstocks for sweet cherries in temperate conditions worldwide.

They arise from a breeding program at the university of Giessen (Germany) to produce size-controlling, precocious and productive rootstocks for cherries. Within the huge material of hybrids of different origin there was a broad spectrum of size control: from very dwarfing to very strong, from suitability for intensive high-density cultivation under cover to vigorous types for extensive cultivation and replant soils.
The GiSelA® rootstocks- First Wave

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

- GiSelA® 5 Gi1482(S) is well known, wide-spread and regarded as semi-dwarfing standard cherry rootstock.

- GiSelA® 6 Gi1481(S) gained importance in the semi-vigorous range

- GiSelA® 3 Gi2091(S) is the most important dwarfing rootstock for cherries
The GiSelA® rootstocks- Second Wave

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

- GiSelA® 12 Gi1592(S) semi-vigorous,
- GiSelA® 13 Gi14813(S) semi-vigorous,
- GiSelA® 17 Gi31817(S) vigorous,

These new clones are in the focus of my presentation.
Common advantages of all 6 GiSelA® rootstocks

- Good compatibility -> healthy (certified) budwood provided
- Precocity
- 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
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® 5 Gi1482(S)

is a semi-dwarfing rootstock, highly productive and precocious. It is regarded as standard tree size-reducing rootstock for sweet cherries, with a tree size about 50% compared to Prunus avium rootstock. With several millions of trees planted worldwide in the temperate zone, and positive experiences with a great range of cultivars, GiSelA® 5 Gi1482(S) is the best known and most reliable rootstock in this vigor range. In Germany, about 80% of the new intensive commercial orchards are planted on GiSelA® 5 Gi1482(S).

GiSelA®5 Gi1482(S) is recommended for good soils and different growing intensities, including cultivation under cover. It needs intensive cultural measurements, especially regular intensive pruning. GiSelA® 5 Gi1482(S) is not adapted to hot and dry conditions.

It originates from the crossing Prunus cerasus x Prunus canescens and has a triploid genetic condition. GiSelA® 6 Gi1481(S) and GiSelA® 3 Gi2091(S) are siblings of GiSelA® 5 Gi1482(S).
GiSelA® 5 Gi1482(S) Fruiting on SSA education
GiSelA® 6 Gi1481(S)

Is a semi-vigorous rootstock. It induces stronger growth than GiSelA® 5 Gi1482(S), but also a very early beginning of cropping and high yields. In the Pacific Northwest of the U.S., GiSelA® 6 Gi1481(S) is the most frequently planted GiSelA® type. Demands to soil, water, and cultural management are less than for GiSelA® 5 Gi1482(S). GiSelA® 6 Gi1481(S) may have problems at windy sites (not enough stability) and at sites with high natural precipitation (susceptibility to Pseudomonas = bacterial canker).
Bellise on GiSelA® 3 Gi2091(S)

Is the weakest clone of the GiSelA® series, only about 80% of the vigor of GiSelA®5 Gi1482(S) and is classified as dwarfing. In this range of size-reduction it is today the most proved and tested commercial rootstock. It is adapted to high-density, intensive cherry cultivation under cover. Due to requirement of best conditions and very intensive cultural management, this rootstock is only recommended for absolutely experienced cherry growing specialists. Because of its high fruitfulness, it should not be combined with self-fertile cultivars.
New GiSelA® clones

Where as GiSelA® 3 Gi2091\(^{(S)}\) and GiSelA® 5 Gi1482\(^{(S)}\) are very well established and successful in their respective class of vigor, the CDB® exploited the material from Giessen for new clones with stronger vigor.

- As alternative to GiSelA® 6 Gi1482\(^{(S)}\) in the **semi-vigorous** range, clones GiSelA® 12 Gi1592\(^{(S)}\) and GiSelA® 13 Gi14831\(^{(S)}\) were plant patented.

- A rootstock stronger than GiSelA® 6 Gi1481\(^{(S)}\) – in the **vigorous** range – had been lacking in the CDB® portfolio. This gap was closed by clone GiSelA® 17 Gi31817\(^{(S)}\).

With the 3 „old“ and the 3 „new“ clones, the grower has a good choice and can choose the clone, which best fits to the environment and intended cultural intensity.
Illustration of size-control of 6 GiSelA clones in comparison to *Prunus avium*

**Note:** The GiSelA rootstocks are propagated in-vitro. This produces homogenous plant material of high quality with initial strong growth, which is reduced to the clone-specific level with the beginning of cropping.
GiSelA® 12 Gi1592\(^{(S)}\) – a new clone in the semi-vigorous group

This rootstock has gained increased importance in the last years, especially in the U.S. and South America. With vigor in the range of GiSelA® 6 Gi1481\(^{(S)}\), it shows better adaption to windy sites, to high natural precipitation and less susceptibility to Pseudomonas (bacterial canker). GiSelA®12 Gi1592\(^{(S)}\) has been classified as tolerant to viruses PDV and PNRSV.

**Origin:** GiSelA® 12 Gi1592\(^{(S)}\) is an offspring of the crossing *Prunus canescens* x *Prunus cerasus* ‘Leitzkauer’.

**Compatibility:** The grafting compatibility is very good. In later years, strong overgrowth at the union may occur, but the grafting union remains solid.
GiSelA® 12 Gi1592(S) – a new clone in the semi-vigorous group

**Vigor and vegetative characteristics:** Anchorage is good, as GiSelA® 12 Gi1592(S) roots deeper than GiSelA® 6 Gi1481(S). The crown structure is open and in later years even broader than on GiSelA® 6 Gi1481(S). Suckers are not produced. After pruning, new shoots are easily formed.

**Yielding potential:** GiSelA® 12 Gi1592(S) induces precocity. Less fruitfulness compared to GiSelA® 5 Gi1482(S) or GiSelA® 6 Gi1481(S) is assessed as positive, as even in combination with self-fertile cultivars no overcropping results and good fruit sizes can be achieved without thinning measures.

**Favorable growing conditions:** Beside good winter hardiness, GiSelA® 12 Gi1592(S) also has an adaptation to hotter climates. Good soil conditions are recommended, very heavy soils should be avoided.
**GiSelA® 13 Gi14813(S) – a new clone in the semi-vigorous group**

With a similar size-control, this new rootstock is regarded as an alternative to GiSelA® 6 Gi1481(S), as it performs well under less favorable environmental conditions and is very well suited for self-fertile cultivars.

**Origin:** GiSelA® 13 Gi14813(S) is a hybrid of the crossing *Prunus cerasus* ‘Schattenmorelle’ x *Prunus canescens* (same crossing as GiSelA® 3 Gi2091(S), GiSelA® 5 Gi1482(S) and GiSelA® 6 1481(S))

**Compatibility:** Grafting problems have not been reported. There is only little overgrowth at the grafting union.
GiSelA® 13 Gi14813(S) – a new clone in the semi-vigorous group

**Vigor and vegetative characteristics:** Size-control of GiSelA® 13 Gi14813(S) is comparable to GiSelA® 6 Gi1481(S). It induces stronger growth than GiSelA® 5 Gi1482(S). Anchorage is good. Suckers are not built.

**Yielding potential:** GiSelA® 13 Gi14813(S) induces an early begin of cropping. Even under less favorable growing conditions and in combination with self-fertile cultivars, high yields and good fruit qualities are achieved.

**Favorable growing conditions:** This clone has performed very well - with high yields and good fruit sizes - under conditions suboptimal for GiSelA® 5 Gi1482(S) and on replant soils.
**GiSelA® 17 Gi31817(S) – a new clone in the vigorous group**

GiSelA® 17 Gi31817(S) is the most vigorous of all GiSelA®-clones, and induces a tree size 70-80% of *Prunus avium*. Cropping starts much earlier than on *Prunus avium*. It is very robust and healthy, and can cope with inferior environmental conditions and extensive cultural management. It is the rootstock of choice for “beginners”, for growers, who used conventional rootstocks before, are not yet familiar with high-density cultivation, prefer greater plant distances, and for sites with only medium quality or no irrigation possibility. GiSelA® 17 Gi31817(S) facilitates the transition from vigorous to size-reducing rootstocks. Because of good compatibility and health, this rootstock is an alternative to ‘Maxma 14‘.

**Origin:** GiSelA® 17 Gi31817(S) originates from the crossing *Prunus canescens* x *Prunus avium* ‘Mazzard’. The genetic condition is diploid. Due to *Prunus avium* being one of the parental species, GiSelA® 17 Gi31817(S) has a genetic basis for stronger vigor than all other GiSelA®-clones.

**Compatibility:** Compatibility is very good and the grafting union is smooth.
GiSelA® 17 Gi31817(S) – a new clone in the vigorous group

**Vigor and vegetative characteristics:**
Trees on GiSelA® 17 Gi31817(S) will reach 70-80% the size of trees on ‘F12/1’. The anchorage is good, no support is needed. GiSelA® 17 Gi31817(S) does not build suckers. Negative characteristics or tree losses haven’t been reported.

**Yielding Potential:**
Despite of the relatively strong growth, this clone induces early cropping. Noticeable good fruit sizes were achieved on GiSelA® 17 Gi31817(S). As there is little danger of over-cropping, it is possible to combine this rootstock with self-fertile cultivars.

**Favorable growing conditions:**
GiSelA® 17 Gi31817(S) is less demanding to soil and climatic conditions and intensity of cultural measurements than GiSelA® 5 Gi1482(S). This rootstock is very robust and adapted to replant conditions.
Bellise on GiSelA® 17 Gi31817("S")
Outlook

At Giessen university, a second breeding cycle was started in 1979 to produce new rootstocks for sweet cherries, possibly even improved ones.

Among over 1000 new hybrids, the most interesting offspring of this second breeding cycle are

- hybrids between *Prunus cerasus* x *Prunus canescens* and reciprocal (similar parentage as GiSelA® 3 Gi2091(S), 5 Gi1482(S), 6 Gi1481(S), 12 Gi1592(S), 13 Gi14813(S)), but involving new forms of *Prunus cerasus*
- 3-way-hybrids with *Prunus cerasus* as female and a hybrid (*Prunus canescens* x *Prunus avium* or reciprocal) as male parent.

9 new selected clones, are planted in spring 2019 at several European trial stations.
PIKU® rootstocks

The CDB® also markets the PIKU® rootstocks for cherries. The PIKU® rootstocks originate from a breeding program at Dresden-Pillnitz (Germany). 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®(S), PIKU 3®(S) and PIKU 4®(S).

All 3 clones are

- tolerant to viruses PDV and PNRSV
- compatible with sweet cherry cultivars
- self-supporting
- robust
**PIKU® rootstocks**

**Vigor and vegetative characteristics:** All PIKU® are classified as vigorous, with PIKU® 1\( ^{(S)} \) being the weakest, PIKU® 4\( ^{(S)} \) medium, and PIKU® 3\( ^{(S)} \) the strongest clone. There is uncertainty about the vigor of PIKU® 1, as under some conditions, it is even weaker than GiSelA® 5\( ^{(S)} \).

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

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<tr>
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<th>PIKU 1®(S)</th>
<th>PIKU 3®(S)</th>
<th>PIKU 4®(S)</th>
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<tbody>
<tr>
<td><strong>Origin</strong></td>
<td>Hybrid of the crossing <em>Prunus avium</em> x (<em>Prunus canescens</em> x <em>Prunus tomentosa</em>)</td>
<td>Hybrid of the crossing <em>Prunus pseudocerasus</em> x (<em>Prunus canescens</em> x <em>Prunus incisa</em>)</td>
<td>Hybrid of the crossing <em>Prunus cerasus</em> ‘Schattenmorelle’ x (<em>Prunus Kurilensis</em> x <em>Prunus sargentii</em>)</td>
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<tr>
<td><strong>Sizecontrol</strong></td>
<td>Class: SEMI-VIGOROUS&lt;br&gt;Normally, growth reduction amounts to 70% of <em>Prunus avium</em> seedling. However, sometimes trees are even weaker than on GiSelA® 5 Gi1482(S)</td>
<td>Class: VERY VIGOROUS&lt;br&gt;Only little size reduction in comparison to <em>Prunus avium</em> seedling (80 to 90% of <em>Prunus avium</em>).</td>
<td>Class: VIGOROUS&lt;br&gt;Growth reduction of about 20 to 40% in comparison to <em>Prunus avium</em> seedling.</td>
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<td><strong>Suckering</strong></td>
<td>Minor tendency</td>
<td>Minor tendency</td>
<td>Stronger tendency</td>
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Pyrodwarf ®(S) – Pyros rootstock for pears

Pyrodwarf®(S) is a Pyrus communis clone originating from the crossing 'Gute Luise’ x ‘Old Home’ conducted at the research institute at Geisenheim (Germany).

Compatibility: Pyrodwarf®(S) is compatible with all pear cultivars, interstocks are not required.

Vigor and vegetative characteristics: Pyrodwarf®(S) is assessed as medium-strong. Trees grafted on Pyrodwarf®(S) grow stronger than trees on quince, but less than on pear seedling. There is no need for support. Suckers are not or only rarely built. Compared to quince Pyrodwarf®(S) has an excellent winter hardiness.
Pyrodwarf ®(S) – Pyros rootstock for pears

**Yielding potential:** Early yields are achieved with weak growth on dry sites. The level of production on Pyrodwarf®(S) is satisfying, but does not reach ‘Quince C’. Yielding potential is dependent on the cultivar, with ‘Williams Christ’ (‘Bartlett’) being a very good cultivar for Pyrodwarf ®(S). This rootstock should be combined with cultivars with inherent good fruit size, to avoid reduced fruit sizes.

**Favorable growing conditions:** Pyrodwarf®(S) is especially suited for locations, which cause problems to quince rootstocks. It is recommended for alkaline soils, as it is not sensitive to lime induced chlorosis. Pyrodwarf®(S) has a good winter hardiness and presents only little heat damage on leaves in areas with high solar radiation. Irrigation is necessary on dry sites.
Wavit® Prudom\textsuperscript{(S)} - Rootstock for apricots and plums

Wavit® Prudom\textsuperscript{(S)} is a vegetatively propagated type, which was selected from a seedling population of \textit{Prunus domestica} 'Wangenheim' at nursery Schreiber in Austria. Wavit® Prudom\textsuperscript{(S)} combines the well-known qualities of 'Wangenheims Seedling' with excellent uniformity. It is not only an excellent rootstock for plums, but has proven to be one of the best rootstocks for apricots in Middle Europe. Trees on Wavit® Prudom\textsuperscript{(S)} are robust, healthy and long-living.

**Compatibility:**

One of the positive traits of Wavit® Prudom\textsuperscript{(S)} is the good compatibility with all types of plums and apricots. Wavit® Prudom\textsuperscript{(S)} is not suited for combination with peaches.

**Vigor and vegetative characteristics:**

Wavit® Prudom\textsuperscript{(S)} is assessed as medium-strong and induces less vigor than ‘St. Julien A’ and ‘Brompton’. Trees on Wavit® Prudom\textsuperscript{(S)} do not need support. The grafting unions are hardly visible. In contrast to many other plum rootstocks, Wavit® Prudom\textsuperscript{(S)} has very little tendency to sucker.
Wavit® Prudom(S) - Rootstock for apricots and plums

**Yielding potential:**
Trees on Wavit® Prudom(S) start cropping early and produce regularly high yields. Advantageous are the good fruit size and additionally an accelerated fruit ripening for some days.

**Favorable growing conditions:**
Wavit® Prudom(S) has only little demands to growing sites and is suited for light and heavy and also for slightly calcareous soils. The rootstock is very winter hardy.

On dry sites, irrigation is advantageous.
Gracie Mille!
Johannes Feldmann
Managing Director
jf@cdb-rootstocks.com
www.cdb-rootstocks.com