



# Latest news from **AGROSCOPE's** apple and pear breeding program



**Simone Bühlmann-Schütz & Team**

EUFRIN 2024 - Graz



# Fruit Breeding at AGROSCOPE



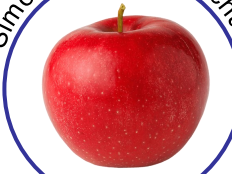
## Breeding

## Variety Testing



Head FG  
«Fruit Breeding»  
Andrea Patocchi

Simone Bühlmann-Schütz



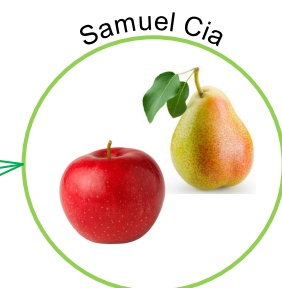
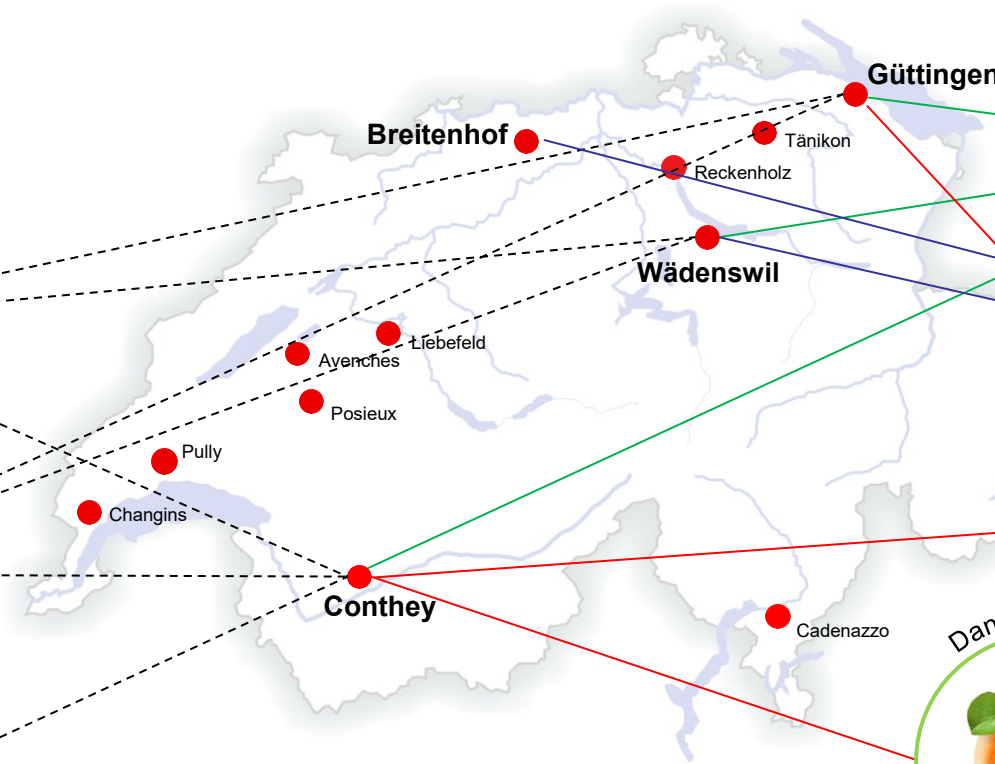
Damien Tschopp



Danilo Christen



Head FG «Fruit crops in the Alpine region»



Samuel Cia



Moritz Köhle



Louis Sutter



Danilo Christen



# Renewed intensification of the pear breeding program at AGROSCOPE



- **Spring 2023** 26 cross combinations, more than 7'000 flowers pollinated in three different locations
- **Autumn 2023** more than 5'000 seeds extracted
- **January 2024** more than 3'200 seeds sown
- **February 2024** more than 2'600 seeds germinated  
→ germination rate of 80%
- **Spring 2024** new crosses are planned

**Contact: Damien Tschopp**

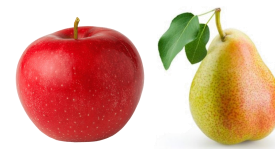
**[damien.tschopp@agroscope.admin.ch](mailto:damien.tschopp@agroscope.admin.ch)**







# Our breeding strategy for

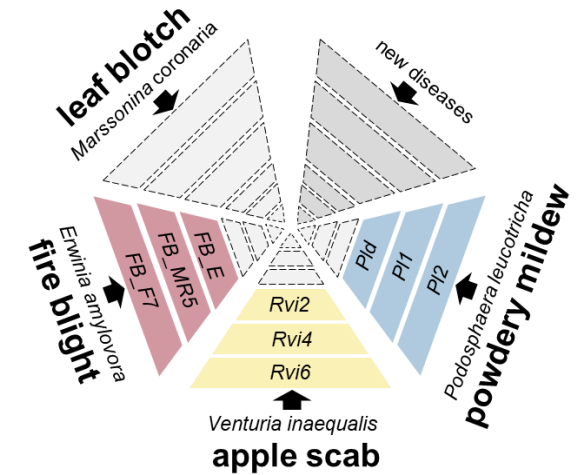


- stable fruit quality
- stable productivity
- good storability & shelf-life
- high level of resistance / tolerance to diseases and pests

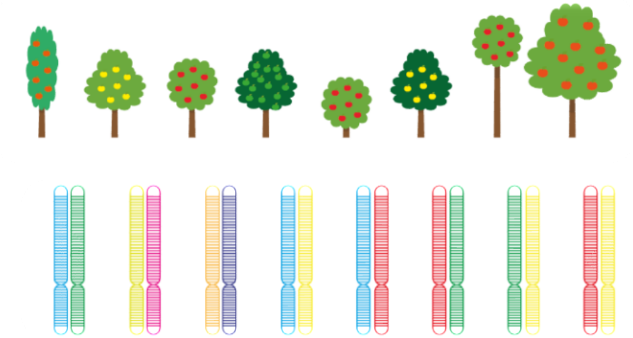
sources used:

- related wild species with major *R*-gene
- heirloom varieties with high level of resistance / tolerance
- modern cultivars with high level of resistance / tolerance
- constant integration of new findings from breeding research

## stacking & combining



## phenotypic & genomic selection

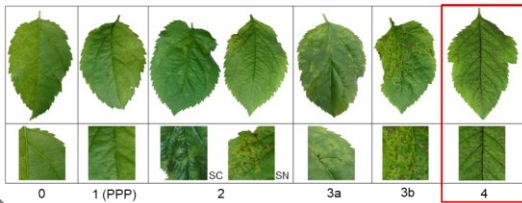


## national & international collaborations





# Disease screening – artificial inoculation



**scab**



→ search for possible sources of resistance



**Bull's-eye rot**  
(*Neofabraea spp.*)



**shoot test in the greenhouse**

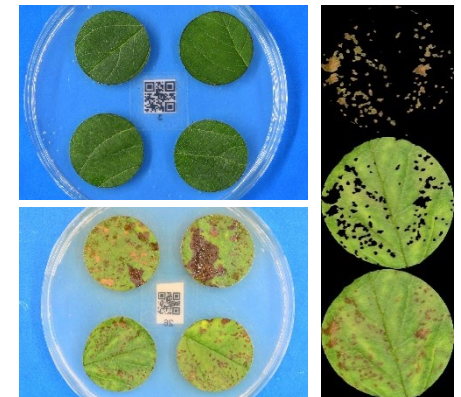


**flower test under field conditions**

**fire blight**



→ test development and search for possible sources of resistance



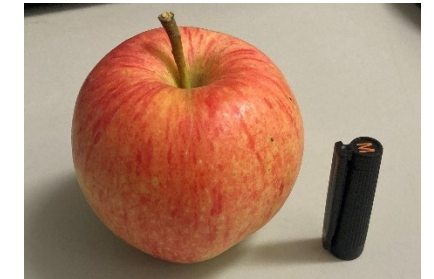
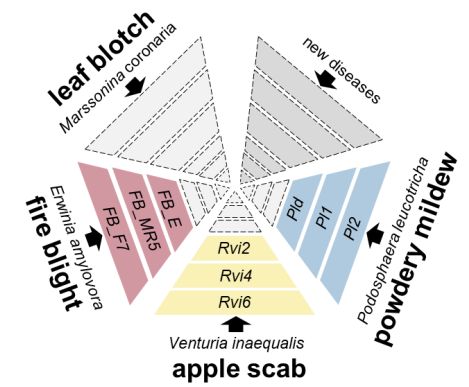
**apple blotch**  
(*Diplocarpon coronariae*)







# Selections with combined resistance



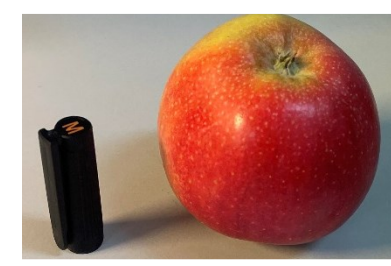
28960 Rvi2-4-6-PI1-FB\_F7

ACW 28914  
Rvi2-4-6-PI1-FB\_F7

ACW 27747 Rvi2-4-6-PI1

ACW 30078 Rvi2-4-6

ACW 27742  
Rvi2-4-6-PI1



ACW 28938  
Rvi2-4-6-PI1-FB\_F7

ACW 28953  
Rvi2-4-PI1

ACW 24954  
Rvi2-4-6-PI1-2-FB\_F7

ACW 30143  
Rvi2-4

ACW 27741  
Rvi2-4-6-PI1

# Ongoing projects

## Project AZZ

«Apfelzukunft dank Züchtung»  
«Apple future thanks to breeding»



- Genomic selection
- Fast Track Breeding
- Neofabrea resistance screening

## Description and use of Swiss Apple Genetic Resources



## Project RESO

«Resiliente Obstproduktion für einen nachhaltigen Anbau»  
«Resilient fruit production for sustainable cultivation»

- Resilient fruit production with adapted varieties
- Reduced crop protection with adapted varieties
- Fruit quality for the point of sale (stone fruit only)



## NUBIG 2023-2026 «Use of the Swiss pear gene pool»

**FRUCTUS**   **Agroscope**



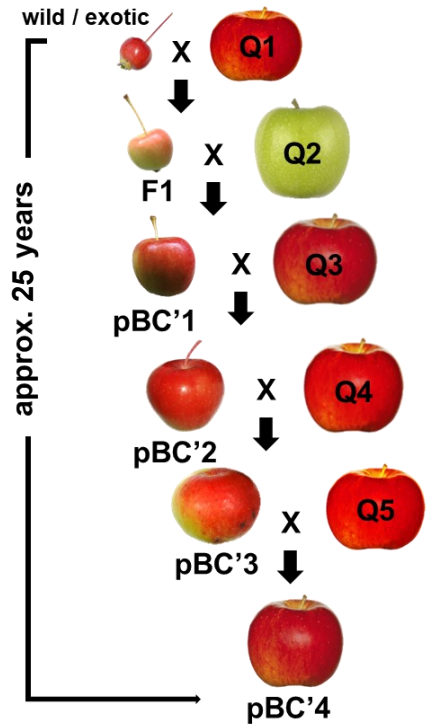
- Swiss Pear Core Collection (SPCC)
- Planted 2019 in Boezberg (CH)
- 155 accessions / 4 trees per genotype



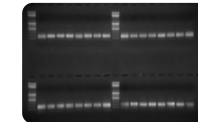


# Accelerated generation cycle «Fast Track» Breeding at Agroscope

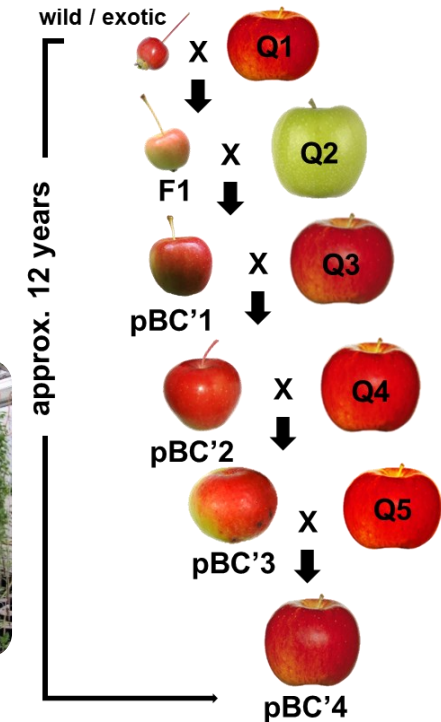
## classical breeding



- classic breeding without GMO techniques
- strong resistance from wild apples or exotic material
- marker-assisted selection
- controlled conditions in a normal greenhouse
- artificial winter dormancy in a cold room at 3 to 4 °C
- at Agroscope since 2008
- Reduction of the generation time from 4 to 5 years in classical breeding to approx. 2 ½ years with Fast Track



## Fast Track

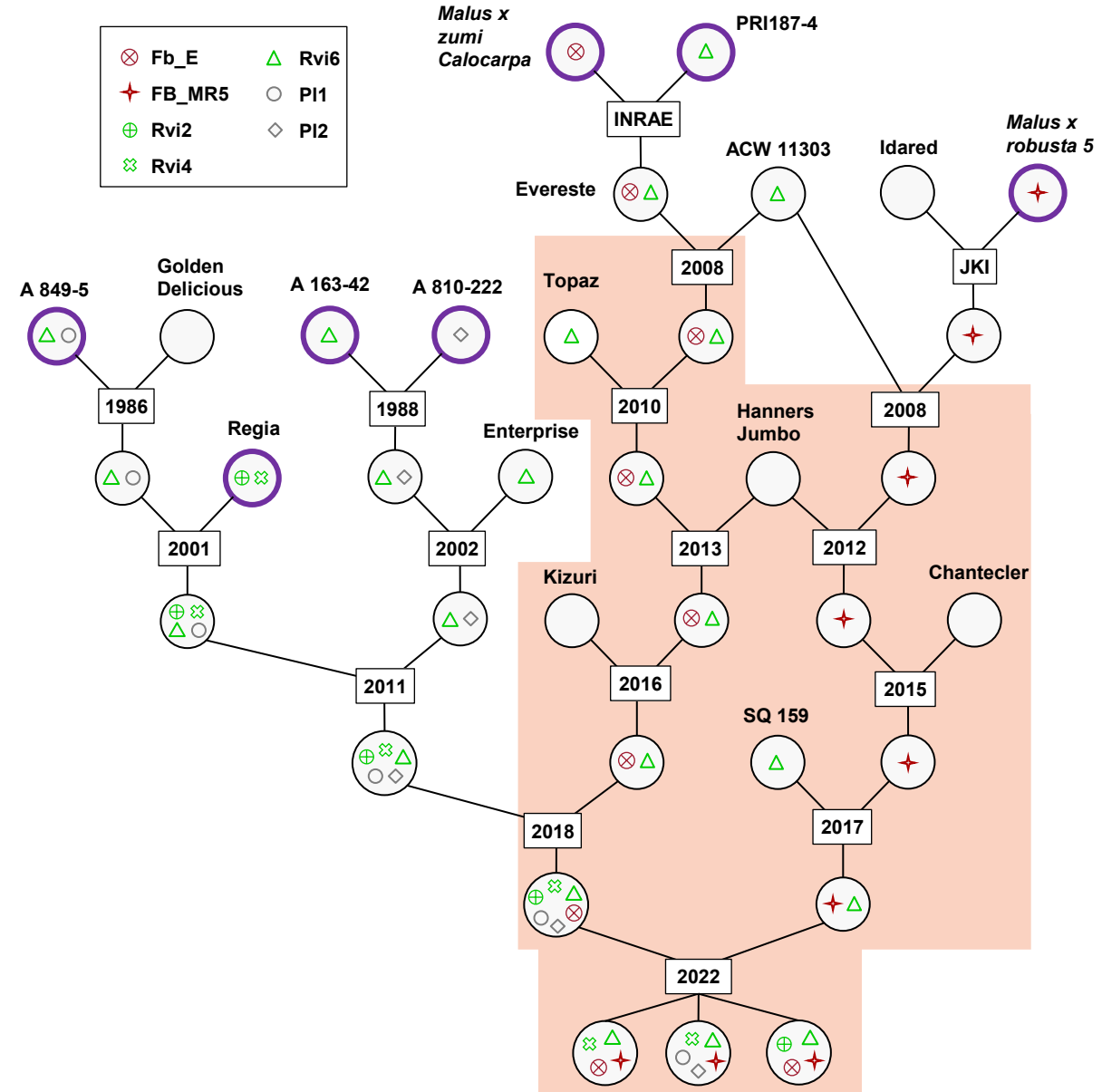






# Latest results «Fast Track»

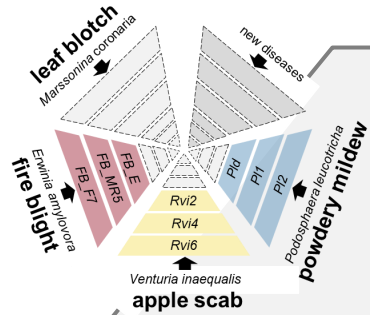
- Breeding selections with stacked fire blight resistance genes *Fb\_E* from “Evereste” and *FB\_MR5* from *Malus x robusta* 5 obtained in the fifth and sixth generation
- In addition: stacked *R*-genes for several diseases - *Venturia inaequalis* (*Rvi2*, *Rvi4* and *Rvi6*) and *Podosphaera leucotricha* (*PI1* and *PI2*) and *Erwinia amylovora* (*Fb\_E* and *FB\_MR5*) in different offspring populations
- 2023/24 fourth generation of the fire blight resistance gene (*FB\_Mfu10*) from the wild apple *Malus fusca* obtained








Crosses made using the “Fast Track” method are indicated in the orange box.





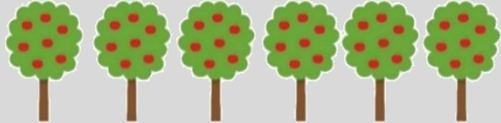
# Strategies for durable resistance / tolerance



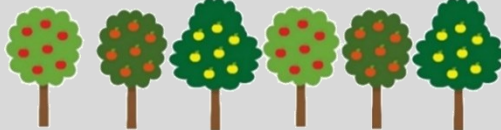
**diversity / tolerance / combination of major and minor resistances**

**adapted crop protection strategy**

mono- vs mixed culture



**site adapted combination of varieties and cultivation techniques**



# Three new apple varieties for the processing industry

- Application for Plant Variety Rights for Switzerland November 2023
- Tested for the production of high and low stem
- Juice production trials for several years
- New 2023/24 - pure variety trials for cider, distillate, dried slices and apple sauce



**ACW 11303**

**juice super sweet**

robust to powdery mildew/fire blight /  
*Rvi6/Vf* apple scab resistance



**ACW 15097**

**juice balanced**

robust to powdery mildew/fire blight  
*Rvi6/Vf* apple scab resistance



**ACW 16426**

**juice super sour**

robust to fire blight / *PI2* powdery mildew &  
*Rvi2/Vh2* apple scab resistance







# Latest release New Agroscope Varieties

Varicom

KSB - Konsortium Sudtiroler  
Baumschuler - Consorzio  
Vivaisti Frutticoli Altoatesini

ARTEVOS®

DALIVAL

## Ladina

Cross 1999  
Registered 2012



Topaz x Fuji

- scab resistance (*Rvi6*)
- fire blight tolerant
- approx. 1 week before Golden Del.
- medium vigour
- good and regular yields
- tropical taste
- very juicy
- limited shelf life

## Mariella

Cross 1982  
Registered 2013



Maigold x Arlet

- Harvest +/- equal to Fuji
- good and regular yields
- very crunchy & juicy
- well balanced taste
- very good storability

## Rustica

Cross 1994  
Registered 2014



La Flamboyante x H 23-10

- scab resistance (*Rvi6*)
- Harvest +/- equal to Braeburn
- good and regular yields
- very healthy tree
- more acid than sweet
- crunchy & juicy

## CH201-Fred®

Cross 2000  
Registered 2018



Harrow Sweet x Verdi

- 10 days after Conference
- good and regular yields
- crispy, very juicy

## Iori

Cross 1999  
Registered 2023



Topaz x Fuji

- scab resistance (*Rvi6*)
- approx. 3 week after Golden Del.
- medium vigour
- good yields
- intense flavour
- Storability under examination





**Thank you for your attention**

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An  
**APPLE**  
 a day keeps  
 the doctor away

