Fruit breeding activities in Finland

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Finnish conditions are challenging to cultivars

- Hard winters, variable snow cover
- Frosts at blooming time
- Long-day conditions in summer
- Short growing seasons (170–130 d)
The importance of proper variety supply

Testing of foreign strawberry cultivars

Domestic breeding
Breeding programme for short-day strawberries

Main breeding aims:
- fruit firmness
- resistance to strawberry mildew and grey mold

Other important aims:
- winter hardiness
- taste
- colour, fruit size,
- growth habit
- other disease resistances

Strategy:

"climatic tolerance" × "fruit quality"
Strawberry breeding is based on hybridisation of cultivars/selections
• selection of best individuals

• seedlings are screened in field by natural inoculation for resistance to diseases

Powdery mildew: Natural inoculum on the field
Screening for disease resistance

• Grey mould (*Botrytis cinerea*):
  – Natural inoculum on the field, observations of rot prevalence at harvest and rot incidence post-harvest
  – Berry inoculations to test susceptibility for secondary infection
Screening for disease resistance

- Crown rot (*Phytophthora cactorum*):
- Two methods (tissue inoculation and hydroponics)
Selection process of strawberry breeding materials

1 year
- Crossings

2–3 years
- Seedling material
  - 5000–10000 plants
  - I selection

4–6 years
- Clone trial
  - 20–30 selections
  - II selection

7–10 years
- Clone trial with replications
  - 5–8 advanced selections
  - III selection

New variety

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The newest strawberry cultivars

• midseason ripening
• attractive fruits
• improved skin toughness and fruit firmness
• resistant to mildew
• good taste
• winter hardy

Parentage:
Polka x Emily

SUVETAR (2007)

Parentage:
Jewel x Senga Sengana

VALOTAR (2007)

Parentage:
(Kent x Polka) x ((Hiku x Bounty) x Camarosa)

LUMOTAR (2013)
Selections for *early* varieties are on the way, the final clone test established 2017
Everbearing strawberry cultivars for extended season:

- Cultivar trials of foreign everbearing varieties
- Creating a breeding population

- Research on the genetic regulation of everbearer character of strawberry (Helsinki University)
Breeging remontant cultivars

REMONTANT × SHORT-DAY

Remontant characteristic

Fruit quality, climatic tolerance
Final clone trials finished

2 new varieties will be released, now in elite plant production process
Red currant breeding

• Final testing of selections suitable for cordon training system
Sea buckthorn breeding

Breeding goals:
Climatic adaptation
Moderate growth habit
Sten canker resistance

Final testing of advanced selections
Apple breeding programme 1993-

Main breeding aims: ● fruit quality
● resistance to scab (*Venturia inaequalis*)

The breeding involved crossings between material known to be scab resistant

**MTT SELECTIONS**
- Lobo x Antonovka
- Antonovka x Lobo
- Lobo x Yläkautto
- Yläkautto x Lobo
- Lobo x Huvitus

**CRABAPPLES**
- Dolgo
- Rescue
- Martha

**FOREIGN SELECTIONS**
- BM 41497 (from Sweden, M. floribunda in pedigree)
- NY 18491 (USA, Antonovka in pedigree)
- NY 53079 (USA, Antonovka in pedigree)

**VARIETIES**
- Aroma
- Ma2
- Åkerö
- Wealthy
- Sünsisdessert
- Red Baron
- Katja

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SCAB INOCULATION

In greenhouse when seedlings were 10–15 cm high
• infected leaves collected in autumn
• stored outdoors till spring
• leaves on moist base, +8 ºC
  ↓
ascosporas

inoculation: +18-20 ºC, high humidity
• About 60% of the material was discarded
• 2200 seedlings were planted in the field
• ca 75 selections → ca. 10 advanced selections
• 2016: Cvs. Valtti, Kymppi, Hertta
• At least one new variety to be released later

Nordapp project: Crosses between cultivars with disease or storage rot resistance (Tuuli Haikonen)
Pear breeding

Main breeding aims:
• adaptation to Finnish climate
• cropping
• fruit size, taste
• storability
• growth habit
Pear breeding - Hybridisation

Mainly Baltic pear varieties crossed with some Russian varieties or Finnish strains

Seedling selection under work

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<tr>
<th>Cultivar used in crossings</th>
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<td>Alvita</td>
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<td>Americana</td>
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<td>Beloruskaya Pozdnaya</td>
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<td>Lukna</td>
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40 berry and 30 apple cultivars, 6 rootstocks from Luke’s previous breeding programmes
Genetic resources of fruit and berries

- Collection of local apple varieties
- Field collections at Luke Piikkiö and Jokioinen
- Cryopreservation at Luke Laukaa

Genomic research of fruit, berries and nuts

- Projects on different species
Genomic studies of woodland strawberry

University of Helsinki,

Molecular and environmental regulation of flowering and vegetative reproduction through runners in woodland strawberry (*Fragaria vesca*)

NaPPI – the National Plant Phenotyping Infrastructure
Breeding needs

Strawberry (raspberrry):
• Root disease resistance / tolerance

Raspberry:
• Fruit size, firmness
• Winter tolerance
Thank you!