30 YEARS OF INTENSIVE ORCHARD PRODUCTION IN SOUTH TYROL

Extension Service for Fruit and Wine Growing, South Tyrol

Martin Thomann
SOUTH TYROL

Apple Production:
900,000 tons
16,300 ha
4,953 fruit growers
YIELDS IN SOUTH TYROL
(1970-2007)
CONTENTS

- Key success factors
  - The ideal young tree
  - Training and pruning
  - Crop regulation
- Problems to avoid
- Future development
THE IDEAL YOUNG TREE

The foundation of a modern orchard

Contents:

- rootstocks and planting material
- external tree quality
- internal tree quality
- conclusions
ROOTSTOCKS: CLASSIFICATION

M.9
Sel. Gelber Paradies von Metz

JUVENILE
Nikolai 29
Pajam 2
Fleuren 56

- thorny
- burrknots
- serrated leaves
- good root development

TRANSPORTIONAL
NAK-B T337
Burgmer 1
Fleuren 59

- transitional

ADULT
NAK-B T338
Pajam 1
EMLA

- thornless
- few burrknots
- unserrated leaves
- poor root development

M.26
M.16 x M.9

Supporter 4 (Pi.80)
M.9 x M.4 Pillnitz
## ROOTSTOCKS: CHARACTERISTICS

<table>
<thead>
<tr>
<th></th>
<th>Vigour in %</th>
<th>Productivity % kg/cm²</th>
<th>fruit quality</th>
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<tbody>
<tr>
<td></td>
<td>NL</td>
<td>F</td>
<td>CH</td>
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<tr>
<td>M.9 - T 337</td>
<td>100</td>
<td>100</td>
<td>100</td>
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<tr>
<td>M.9 – EMLA</td>
<td>102</td>
<td>120</td>
<td>123</td>
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<td>M.9 - Pajam 1</td>
<td>99</td>
<td>100</td>
<td>102</td>
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<td>M.9 - Pajam 2</td>
<td>114</td>
<td>120</td>
<td>120</td>
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<tr>
<td>M.9 – Ni.29</td>
<td>101</td>
<td>120</td>
<td>115</td>
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<tr>
<td>M.9 – Fl.56</td>
<td>91</td>
<td></td>
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<tr>
<td>M.26</td>
<td>130</td>
<td>125</td>
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<tr>
<td>Supporter 4</td>
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</table>
ROOTSTOCKS: CHARACTERISTICS

- smooth rootstock
- burrknots
- root suckers
## Rootstocks: Characteristics

<table>
<thead>
<tr>
<th>Rootstock</th>
<th>Root Suckers</th>
<th>Bulksnaps</th>
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<tbody>
<tr>
<td>M.9 – T.337</td>
<td>0.4</td>
<td>+</td>
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<tr>
<td>M.9 – EMLA</td>
<td>0.3</td>
<td>+</td>
</tr>
<tr>
<td>M.9 - Pajam 1</td>
<td>0.8</td>
<td>+</td>
</tr>
<tr>
<td>M.9 - Pajam 2</td>
<td><strong>3.6</strong></td>
<td>+</td>
</tr>
<tr>
<td>M.9 – Ni.29</td>
<td><strong>3.3</strong></td>
<td>++ (2x)</td>
</tr>
<tr>
<td>M.9 – Fl.56</td>
<td>1.6</td>
<td>+</td>
</tr>
<tr>
<td>M.26</td>
<td>0.3</td>
<td>+++ (3x)</td>
</tr>
<tr>
<td>Supporter 4</td>
<td>few</td>
<td>+</td>
</tr>
</tbody>
</table>

**Origin:**
- Origin Italy: More vigorous
- Origin Holland: Weaker
ROOTSTOCKS: CONCLUSIONS

- **non-spurs**
  - M.9 = standard rootstock
  - M.9 clones
    -> differences in vigour and other characteristics
    -> balance of variety and soil
  - ideal bud union height 20 – 25 cm
  - rootstocks have to be smooth

- **Spurs (Red Delicious)**
  - if M.9, use vigorous clones, e.g. Pajam2/EMLA
  - if M.26 see to smoothness of rootstock
  - Supporter 4 possible alternative?
  - ideal bud union height 10 – 15 cm
EXTERNAL QUALITY: KNIP TREE

Advantages
- well-feathered
- ideal height of side branches
- wide crotch angle
  - therefore less bending
- good wood maturity

Disadvantages
- higher price
- often weak base
  - apical dominance
EXT. QUALITY: ONE-YEAR-OLD TREE

Advantages
- price
- strong base

Disadvantage
- often basal branches too low
- steep crotch angle
  - therefore labour intensive
NL trials '88 - '92

- Horst Elstar+Golden: 48 kg/tree, 50 kg/tree
- Numansdorp Elstar+Golden: 54 kg/tree, 59 kg/tree
- Geldermalsen Cox+Jonagold: 44 kg/tree, 51 kg/tree
- Zeewolde Cox+Jonagold: 78 kg/tree, 82 kg/tree

One-year-old tree compared to knip tree.
EXT. QUALITY: 9-MONTH-OLD TREE

Advantages
- price
- prompt availability of new varieties

Disadvantages
- basal branches often too low
- often too few feathers
- steep crotch angle
  - therefore labour intensive
- immature wood
- tree quality often not uniform

[Images of good and bad specimens]
EXT. TREE QUALITY AND RETURNS


variety: Jonagold
planting distance: 3.0 x 1.3m

Conditions

tree price: unfeathered tree 3.20 Euro
well-feathered tree 3.90 Euro

same planting costs
same costs of tree care
same grading method and price/kg: 37 Cent
annual interests: 5 %
hail insurance: 6 %
EXT. TREE QUALITY AND RETURNS

NL trial  Jonagold

difference 18,548 €

€

unfeathered  well-feathered
General demands
(2,500 – 4,000 trees/ha)

- at least 8 feathers
- lowest branches 80 cm above ground
- shoot length at base 40 – 50 cm
- wide crotch angle
- short central leader with many dards
- mature wood
- tree height 1.7 - 2.0 m
  - depending on variety and spacing
EXT. QUALITY: IDEAL TREE

Demands on variety

- **Gala**
  - strong base desirable
  - short central leader

- **Fuji**
  - not too big trees
  - avoid too strong branches

- **Braeburn**
  - look for wide crotch angles
  - look for mature wood

- **Red Delicious**
  - not too big trees
  - look for equal strength of branches
INTERNAL QUALITY

- Phytosanitary aspects
  - virus infections
  - phytoplasmososes
  - bacterial diseases
  - fungal diseases

- Trueness to variety

- Stability of colour sport (mutation)
  - problem with instable varieties
INTERNAL Q.: PHYTOSANITARY ASPECTS

Planting material must be:

- at least: virus tested
- better: virus free
The ideal young apple tree is:

- Ready for early production
- Free of pests and diseases
- True to variety and sport
- Certificated
Planting distances

2.500 – 4000 trees/ha

• < 2.500 trees/ha
  - the conopy is not filled
  - lower yields

• > 4000 trees/ha (Superspindel):
  - High planting cost
  - Higher yields until 5th leaf, later light penetration and quality decrease
  - Shorter life cycle
  - Higher labour costs (pruning, bending, vigour control)
Support system
Row wire tension

AUFBAU EINES DRAHTRAHMENS mit Bambus

9x9 18 Dr.
2,7 mm Z-AL- Drähte
2 mm
2,7 mm
1,1 m
Bambusstäbe a 2,4 m
0,8 m
3 m
7x7 12 Dr.
6-7 m

Stahlseil 6-8 mm
2 m
1,3 m
40-50 cm Platte

0,8 m
Row wire tension
Cross tension
TRAINING AND PRUNING

Achieving a balance of growth and cropping!
GOALS

- Calm trees
- Early production
- Regular and high yields
- Good internal and external fruit quality
- Orchard life at least 15 years
START WITH OPTIMAL PLANTING MATERIAL

- 8 or more equally strong feathers
- Wide crotch angle
- Length 40 – 50 cm
- Lowest branches > 80 cm above the ground
- Numerous dards above the branches
- Central leader < 50 cm
HANDLING THE CENTRAL LEADER

- Central leader shorter than 50 cm
  - Leave it as it is

- Central leader longer than 50 cm
  - Bend it below the horizontal, as soon as the shoots on the upper side are approx. 10 cm long straighten the leader again.
HANDLING THE CENTRAL LEADER

<50 cm: don‘t touch it

>50 cm: straighten after bending
HANDLING THE LATERAL BRANCHES

- Remove:
  - branches below 80 cm from the ground
  - branches which are stronger than half the leader
  - too steep branches
  - superfluous branches

- Thin, weak and drooping basal branches are headed so as to stimulate growth

- Too long branches are headed back to approx. 50 cm and bent down steeply, if necessary
Planting material with
• too long,
• too steep and
• too many feathers
ORCHARD A: AFTER PLANTING

Before pruning and training

After pruning and training
ORCHARD A: 1st WINTER

Before pruning and training

After pruning and training
ORCHARD A: 2nd WINTER

Before pruning

After pruning
ORCHARD A: 3rd WINTER

Before pruning

After pruning
ADVANTAGES OF BENDING

- Conversion of vegetative growth into generative growth
- Reduction of vigour
- Containment of the tree to its allotted space
- Development of pendent fruiting branches
- Longer orchard life
Vigorous trees without bending after the 4th leaf
PRUNING THE BEARING TREE

- Increased light penetration through
  - elimination of entire branches
  - limitation of tree height to 3.5 m

- Pruning of fruiting wood
GOLDEN: YEAR 7

Before pruning

After pruning
GALA: YEAR 9

Before pruning

After pruning
PRUNING THE FRUITING WOOD

- Important for varieties with small-sized fruits
  - Head or remove thin, exhausted fruiting wood
  - Prune pendent fruiting branches with a seasonal growth of less than 15 cm

beratungsring.org
LIMITATION OF TREE HEIGHT
TOP: WRONG PRUNING WITHOUT BENDING
Prohexadion- Calcium Regalis
REGALIS

Only for trees with too strong vigour, not for young trees until the 4th leaf.

When: 1. treatment - Growth more 2 cm
   2. treatment - 1 month later

- Doseage: 0.75 - 1.2 kg/hectare
- Temperature: > 15°C
- Combination: Regalis + rootpruning for strong vigour orchard
PROBLEMS TO AVOID

- Before planting – improve the conditions for root development
- No compromise on planting material and support
- A balance of growth and cropping through the right pruning and training
- Crop regulation for regular yield and good quality
CONCLUSION

- Rootstock
  - M.9

- Planting distances
  - 2,500 – 4,000 trees/ha

- Tree shape
  - narrow, tall spindle

- Tree height
  - up to 3.5 m
Mechanisation
Knecht Öko
Hermes
Windegger
# Chemical Thinning

<table>
<thead>
<tr>
<th></th>
<th>Golden</th>
<th>Red Del.</th>
<th>Gala</th>
<th>Fuji</th>
<th>Cripps Pink</th>
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<tbody>
<tr>
<td>ATS</td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>ETHEPHONE</td>
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<tr>
<td>NAD</td>
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<tr>
<td>NAA</td>
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<td>CARBARYL</td>
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<td>Until 2008</td>
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<td>BA</td>
<td></td>
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</table>
## CROP REGULATION

### Optimal fruit number per tree

<table>
<thead>
<tr>
<th>Year</th>
<th>Braeburn Golden</th>
<th>Gala, Cripps Pink, Fuji</th>
<th>Red Delicious</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>30 – 40</td>
<td>25 – 30</td>
<td>20 – 25</td>
</tr>
<tr>
<td>3</td>
<td>50 – 60</td>
<td>45 – 50</td>
<td>40 – 45</td>
</tr>
<tr>
<td>4</td>
<td>70 – 80</td>
<td>60 – 70</td>
<td>50 – 60</td>
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</table>
FUTURE DEVELOPMENTS IN FRUIT GROWING

- Increase of yields and cost reduction will be limited in the future
- Choose suitable varieties and colour-sports
- Plant the different varieties on ideal locations and give them the best care
- Frost and hail protection will secure a steady income
- Organic production will increase
South Tyrolean Extension Service
for Fruit and Wine Growing

THANK YOU FOR YOUR ATTENTION