Seminar Ireland, April 18, 2018.

Johan Aelterman

IDRIS Ltd: consulting in strawberries since 1983.
Representing CIV, Mazzoni & Salvi Clery, Joly, Capri, Murano......
Agenda

Fertigation CIV varieties

Fruit quality monitoring

Supply planning with everbearers
# CIV Varieties

<table>
<thead>
<tr>
<th>June bearers</th>
<th>Everbearers</th>
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<tbody>
<tr>
<td><strong>Clery</strong></td>
<td>early</td>
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<tr>
<td><strong>Joly</strong></td>
<td>organic production and direct sales</td>
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<tr>
<td><strong>Sibilla</strong></td>
<td>mid late</td>
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<tr>
<td><strong>Aprica</strong></td>
<td>very productive</td>
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<tr>
<td><strong>Capri</strong></td>
<td>excellent shelflife and storability</td>
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<tr>
<td><strong>Murano</strong></td>
<td>preferred variety of mainy retailers</td>
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<tr>
<td><strong>Majestic</strong></td>
<td>premium in UK (Sainsbury’s Taste the difference range)</td>
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Clery in Ireland and only in Ireland: everbearing character !!!!!!!

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Positioning of CIV varieties in market tiers

Premium, direct sales and organic: Majestic, Joly

Standard: Clery, Sibillia, Murano, Capri

Basic, Value: Aprica
Fertigation of CIV strawberry varieties

CIV strawberry varieties:
Technical note on fertigation, feed recipes and tip burn
Fertigation of CIV everbearers: Murano, Capri,…

CIV varieties need **less nitrogen, NO3** !!!!!
“Normal” NO3: loss of fruit firmness and flavour!

CIV varieties need **only in exceptional conditions ammonium NH4**

CIV varieties should be grown with **low EC**

In general: **EC in + EC out = 3**

**EC drain > 1,5:** risk for mildew
Basic nutrient needs for CIV varieties in general!!!

<table>
<thead>
<tr>
<th></th>
<th>Murano basic feed recipes, A &amp; B 1000 lit; 1/100; rainwater</th>
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<tbody>
<tr>
<td></td>
<td>NH4</td>
</tr>
<tr>
<td>Start till flowering</td>
<td>0</td>
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<tr>
<td>Flowering and harvest</td>
<td>0</td>
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Basic feed recipes

Basic nutrient needs  Water analysis

Software: GREEN-FERT - Greenhouse soil fertilization manager
University Pisa, Italy.
Feed recipe Murano from planting till flowering – RAIN WATER

Rain water
EC 1.5 mS/cm
100x concentrated

**A tank 1000 lit**
- Calcium nitrate (15.5 % N – 19 % Ca or 26.5 % CaO) 75.6 kg
- Iron chelate 3.5 % Fe DTPA 3.6 kg or 3 lit

**B tank 1000 lit**
- Monopotassium phosphate (35% K2O+52 % P2O5) 27.2 kg
- Potassium sulphate (50% K2O + 46% SO3) 21.8 kg
- Magnesium sulphate (16% MgO + 32%SO3) 30.8 kg

Micro-elements in B tank
- Manganese sulphate (31%Mn) 300 g
- Zinc sulphate (23 % Zn) 200 g
- Borax (11 % B) 100 g
- Cupper sulphate (25.3 % Cu) 18 g
- Sodium molybdate (39.5 % Mo) 12 g
Feed recipes need frequent adjustments

An everbearers is permanently changing from physiological stage: from vegetative to generative, from flower initiation/differentiation to production, from production to regrowth….

Hence the basic feed recipe has permanently to be adjusted, especially in K, Ca and N.

From flowering on and depending on the fruit charge, an important increase in K can be necessary. From mid-peak production towards end production peak, a decrease in K with an increase in Ca and N can be necessary.

Follow of substrate and drain analysis important to adjust. Drain analysis can be done on the farm for K, Ca and NO3,

Always consult your farm adviser for the correct recipe and adjustments.
Most frequent adjustments

K  From flowering on: increase K and follow up K in drain

Ca:  uptake only till green set fruit 10 mm
climate important for uptake and transport Ca

NO3  with everbearers: increase when harvest flush is over peak
and ctop needs revitalising
NH4 only in exceptional situations and when pH correction is necessary
A strawberry plant is able to take up the nutrients from the soil or feed solution within a quite large range.

But the plant can only do so if it has the condition to take up the nutrients!!!

A good root development, enough air in the root zone and generally a good evaporative climate is essential.
Factors preventing uptake of nutrients

• If the substrate is soaked, the roots will not take up nutrients.

• If the substrate is dry, the roots will not take up nutrients.

• If the tunnel/greenhouse is too humid, the plant will not evaporate and take up nutrients.

• If the tunnel/greenhouse is too dry, the stomata will close and the plant will not take up nutrients.
Tipburn: generally a Ca deficiency in leaves, flowers, fruits, calyx......

- generally not a shortage of Ca in feed recipe!!

- problem due to
  - uptake of Ca
  - transport of Ca in the plant
Measures to avoid tipburn:

Build up of sufficient root pressure - Activate climate during day

- Drip with a low EC: 1.2-1.3 mS/cm²
- Keep drain EC low: stay between 1.2 and 1.5 mS/cm².

First irrigation round needs to have sufficient drain, if not the day before irrigation has been stopped too early!!!

A too low moisture level in the substrate has a very negative effect.

Rooting after planting is very important: make sure at planting there’s a good contact with the substrate, also by sides of the containers and in corners!!
Fruit quality monitoring

Drops in fruit quality in ever bearers
- less fruit firmness causing bruising
- reduced shelf life
- loss of flavour and brix
Causes of loss of fruit quality in ever bearers

NITROGEN!!!!! Especially in CIV varieties: Capri, Murano, …..

Weather conditions: indirect !!
- low evaporative conditions (to high humidity)
- hot weather causing fast ripening

Too high fruit load----ripening too fast----negative energy balance

Too high plant density

Too low K level !!!!!!! Drain analysis important!!!!
Fruit quality monitoring
Objective: Consistency in Fruit Quality

Fruit quality (everbearers) can show dips due to

- weather conditions
- feed out of balance
- crop charge out of balance

From 2018:

Fruit quality monitoring by grower with app

Feed back to grower
Drain analysis important in everbearers

K potassium !!! For fruit quality

N: generally low, but increase at start and at end production flash
**Monitoring and Early Warning necessary**

**Early warning growers**

**Too often too little too late**

<table>
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<tr>
<th>Actual</th>
<th>Early warning</th>
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<tr>
<td>Weather forecast</td>
<td>Ventilation management</td>
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<tr>
<td>Analysis substrate, drain</td>
<td>Drip and drain adjustments</td>
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<tr>
<td>Production forecast</td>
<td>Feed recipe adjustments</td>
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<td>Plant balance</td>
<td>Truss removal</td>
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Production/supply planning with everbearers
Production/supply planning with everbearers

How to match an everbearer production planning to a retailer demand curve?

A case study
Outline

• Demand curve for a supermarket chain (or direct sales, supply window, farm labour planning, ……)

• With a June-bearer

• With an everbearer

• Manipulating growing degree hours

• Other techniques
PRODUCTION JUNEBEAKERER : TRAYFIELD IN NURSERY

PRODUCTION EVERBEAERER: GROWER DURING SEASON (FIRST FLUSH IN NURSERY)

WITH AN EVERBEAERER A SMALL FRIGO B PLANT AND A HEAVY TRAY PLANT CAN SHOW THE SAME YIELD AT THE END OF THE SEASON!
Removal of second flowering: second peak shifts from August to September

-PCH 2016
-begin juli 7-8 bloemtakken weggensomen
GDH FROM FLOWER INITIATION TILL FRUIT

- Flower initiation: 12500 GDH
- Truss height 8-10 mm: 5000 GDH
- Flowering: 7500 GDH
- Picking: 25000 GDH
Flower initiation in everbearers

Flower initiation in everbearers optimal when:

Daylength $> 16$ h

Temperatures $15 \rightarrow 25 \, ^\circ C$

In summer: a truss removed from a Murano plant will always be replaced immediately by a new truss
Removal trusses Murano in summer

Delaying a production peak

Avoiding production peak (and smaller fruit and lower prices) due to heat wave

Reducing labour peak

Increasing fruit size and increasing picking efficiency
Demand Curve for a supermarket

- % demand per week
- 85% of total demand
- 50% of total demand

Week number vs. % per week of yearly demand

- Week 20 to 24: 85% of total demand
- Week 25 to 29: 50% of total demand

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With a June-bearer

- Flower mapping → production potential
- Consecutive plantings of cold-stored plants
- Combining growing systems
With an everbearer – more complex

- Flower mapping:
  Only 1st peak is ± known
- Development new flowers:
  soon after planting
- Influencing factors:
  Fertigation
  Water supply
  Temperature
  Light
  Plant load
  ...

Source: PCH 2016
Cropping profiles: Idris data base

- Cropping data of Murano: from growers and research centers
- In different growing systems, different growing conditions
- Compare data based on growing degree hours (GDH)
Filling up the demand curve – example NL

• Minitray
• Multiple planting dates
• Different growing systems:
  - table top (cool)
  - (heated) glasshouse
Some problems

• Shortage in May
• Over-production in August
• Shortage in September

• Plant earlier?
Plant earlier?

• Outdoor: how much earlier? a shift of 1 week in production is not achieved with a shift of 1 week in planting

• Assuming 12500 GDH between planting (st. 6) and first picking
Manipulating GDH

- Fleece
- Tunnels
- Glasshouse
- Heating
- Ventilation
Some problems

- Shortage in May
- Over-production in August
- Shortage in September
- Plant earlier?
- Use a lighting strategy?
Lighting strategy

- Research PCH
- Pre-harvest night interruption
- Cvs. Charlotte, Portola, Capri
- Starting 3rd week after planting
- Min. 2 weeks
- Early in season - glasshouse

→ 2nd production peak earlier
Some problems

• Shortage in May
• Over-production in August
• Shortage in September

• Plant earlier?
• Use a lighting strategy?
• Remove flowers?
Remove flowers?

- Research PCH
- Murano table top in tunnel 2016
- All flower branches of 2nd peak removed
- Production shift from August to September
- Little loss of yield

- What about removing 2 – 3 – 4 ... branches?
- Further research!!
Acknowledgements

Strawberry Research Team of Research Centre Hoogstraten (PCH)

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Thank You,

For Your attention

And for working with

Our Idris Teams

in the challenging 2018 strawberry business.