RASPBERRY PLANT PHYSIOLOGY AND IMPACT ON CROP PRODUCTION

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TWO GROUPS OF RASPBERRY CULTIVARS WITH DIFFERENT LIFE CYCLES:

Short-lived shoots on a long-lived root system

1. Biennial fruiting cultivars, where the canes have a 2-year life cycle

2. The annual fruiting (primocane) cultivars, where the canes have a 1-year life cycle
WHAT IS THE YIELD POTENTIAL OF A RASPBERRY CANE?

Cane height (cm): 160
# Buds/cane: 27
Internode length (cm): 5.9
Fruiting buds (%): 76
Non-breaking buds (%): 24
Lateral length (cm): 80
Yield (g/cane): **3853**
Berry size (g/fruit): 6.7
Saleable fruits/cane: 574
Yield (kg/m row): 15.4

ANNUAL GROWTH CYCLE OF BIENNIAL-FRUITING RASPBERRY

Breaking of dormancy
Flower and dormancy initiation
Flower differentiation
Flowering and new shoot growth
Fruit development and ripening
Winter
Spring
Summer
FLOWER INITIATION IN RASPBERRY CULTIVARS

- Flower initiation happens in parallel with growth cessation
- All buds are potential flower buds

TEMPERATURE AND PHOTOPERIOD INTERACTS IN REGULATION OF GROWTH CESSATION AND FLOWER INITIATION

<table>
<thead>
<tr>
<th>Photoperiod</th>
<th>9-12°C</th>
<th>15-16°C</th>
<th>&gt;18°C</th>
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<tbody>
<tr>
<td>Short day (≤15h)</td>
<td>100</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Long day (&gt;15h)</td>
<td>100</td>
<td>0</td>
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Day length as a function of latitude and season
TEMPERATURE AND PHOTOPERIOD INTERACTS IN REGULATION OF
GROWTH CESSION AND FLOWER INITIATION

Shoot growth (A) and flower initiation/differentiation (B) as means of 6 raspberry cultivars grown in growth rooms

Hodnefjell et al. (2018)
SHOOT LENGTH IS IMPORTANT FOR A GOOD YIELD!

9°C  15°C  18°C  21°C

DORMANCY IN BIENNIAL RASPBERRY BUDS

Forcing of single-node cuttings of 12 cultivars from 8 locations
BREAKING OF BUD DORMANCY IN RASPBERRY

- Temperatures from -5 to 7°C are optimal and efficient

Correlative inhibition between buds along the cane:
- 1500 h chilling contra 2500 h (at 4°C)
- 12 weeks cooling (< 7°C)?

CANES OF 2 CVS. AFTER 14 WEEKS OF COLD STORAGE
DORMANCY IN ‘GLEN AMPLE’ RASPBERRY

LENGTH OF CHILLING AFFECTS THE LENGTH OF LATERALS (ALSO A QUANTITATIVE EFFECT OF CHILLING)
BUD DORMANCY VS. FROST DAMAGE

– Over-wintering capacity not necessary connected to dormancy
– But, higher risk of frost damage after periods of milder temps. followed by frost when dormancy is broken
– Cvs. with stable dormancy are more winter hardy

EXSAMPLE FROM A CULTIVAR TRIAL AT 59°N
ACCUMULATED TOTAL YIELD (G/M ROW)
YIELD (G/M ROW) PER WEEK

CULTIVAR TRAITS FOR ‘WIDE ADAPTATION’ TO THE SCANDINAVIAN GROWTH CONDITIONS

Shoot growth (A) and flower initiation/differentiation (B) in ‘Glen Ample’ (in red inc.) compared to 6 other cultivars (in black inc.) grown in growth rooms for 8 weeks

Hodnefjell et al. (2018)
FLOWERING AND FRUITING OF ANNUAL RASPBERRIES

ANNUAL FRUITING RASPBERRY

– Cultivars with fruits on one year shoots

– Shoots from buds on roots in spring, grows to normal height (100 – 150 cm)

– Initiation of flowers, bud break, flowering and ripening on laterals throughout late summer/autumn
GROWTH OF ANNUAL FRUITING RASPBERRY

7 weeks in short days (10 h)

7 weeks in long days (20 h)
EFFECTS OF TEMPERATURE AND DAYLENGTH ON FLOWERING IN ‘POLKA’ RED RASPBERRY PLANTS

"PLANT ARCHITECTURE" OF ‘POLKA’ PLANTS GROWN UNDER DIFFERENT TEMP. AND DAYLENGTH CONDITIONS
THANK YOU!