UiT

THE ARCTIC UNIVERSITY OF NORWAY

Climate laboratory Holt/Tromsø Influence of climate on quality and productivity of plants

Laura Jaakola

Climate laboratory Holt

UiT The Arctic University of Norway & NIBIO

NIBIO
NORSK INSTITUTT FOR BIOØKONOMI

UNIVERSITY OF TROMSØ

Climate laboratory Holt, UiT & NIBIO

- Location 69° 39’ N
- 6 day light and 4 x2 dark phytotrons for controlled experiments
- Focus on effect of climate factors on quality, productivity and adaptation of plants

Climate laboratory Holt

We can control:

- Temperature
  - +6 - 40 °C (+3-24 °C winter time) day light rooms
  - +0,5 - 27 °C in dark rooms
  - Automatic switching between day and night temperature
  - Accuracy ±0,5 °C
- Light
  - Irradiation
  - Photoperiod
  - Light spectrum (light quality)
  - Direction
- Air humidity (10% of relative humidity)
- Soil composition, nutrition status
- Moisture
- CO_2 (in future)

Climate laboratory Holt

- Cold rooms (temperature between +0,5 – 6 °C)
- S3-room (for GMO)
- Freezers for controlled freezing experiments (3)
- Greenhouse for plant growing
- Laboratory
  - Steril laminar
  - Molecular biological analyses
  - Etc. basic laboratory instruments

Climate laboratory Holt - collaboration

- Co-operation with UiT, NIBIO, Framsenter (NINA), Nofima, Tromsø Museum, Tromsø botanical garden
  - Research projects
  - Courses (UiT)
  - PhD students
  - Public
- National co-operation
- International co-operation
  - NordPlant
  - SIU Norway-Armenia
  - Blueberry/NZ

Climate laboratory Holt - Research

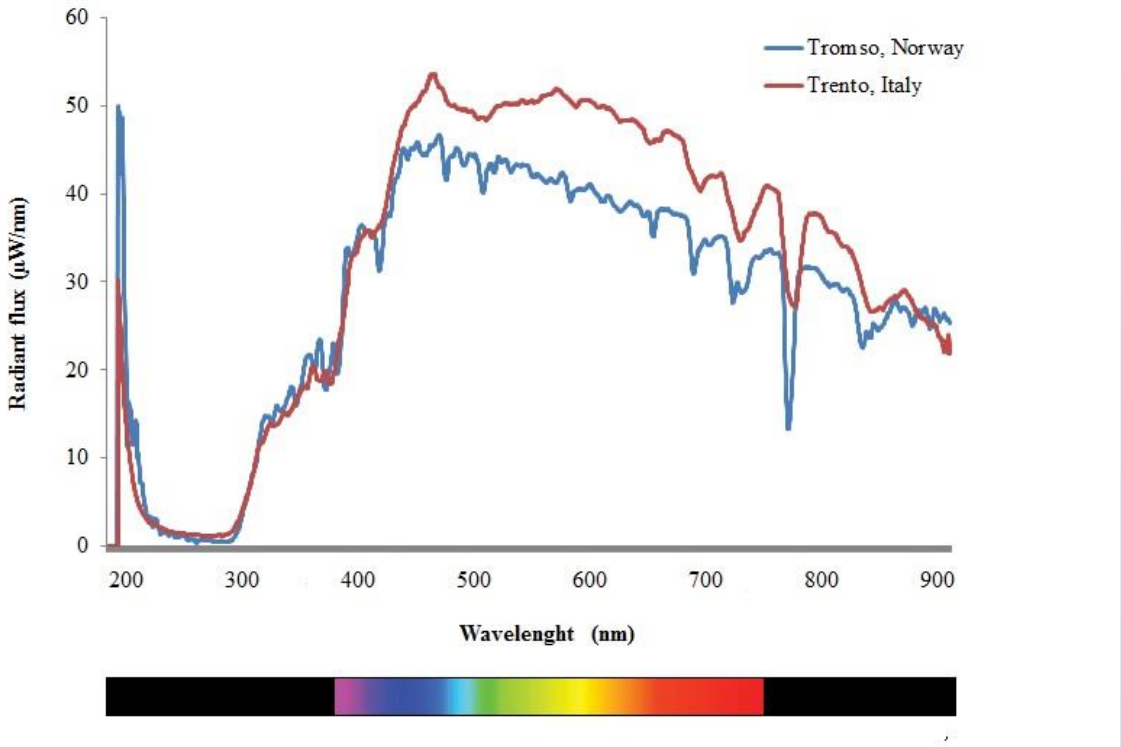
- The most important research topics:
  - Effect of climate factors on quality of food plants
  - Adaptation of plants on different growth conditions
  - Climate change
  - Morphogenetic responses to light conditions



Light in North

- Special light conditions in the North during the growth season:
  - No dark period
  - Lower light intencity
  - Light quality: more blue light and more far red light during the summer night hours
- Light conditions effect on growth and quality of plants together with temperature

Light in North



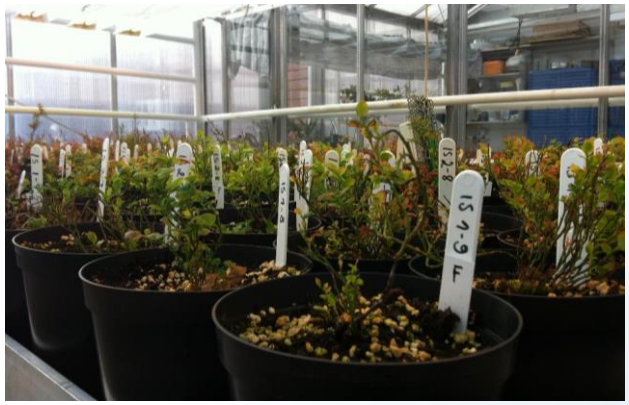
Zoratti L., Karppinen, K., Luengo Escobar, A., Häggman, H., Jaakola L. (2014) Light controlled flavonoid biosynthesis in plants. Frontiers in Plant Science, 5, 534.

Climate laboratory Holt – examples of earlier and ongoing research projects

- Effect of light and temperature conditions on quality of turnip (*Brassica rapa var. rapa*) (J. Mølmann, NIBIO)
  - Phytochemicals, taste -> cooler temperature gives better taste
- Better competance for norwegian potatoes (T. Johansen, NIBIO)
  - Quality of seed potatoes

Berry projects

- Quality and development of wild berries (L. Jaakola, A. Samkuram, K. Karppinen, F. Omole (UiT), I. Martinussen, E. Uleberg, A. L.Hykkerud, NIBIO)
  - *Vaccinium myrtillus* collections
  - *Fragaria vesca* collections
  - *Rubus chamaemorus* collections
- Arctic Berry Wax (NIBIO, UiT, UOulu and OAMK Oulu, Luleå Univ. of Technology)
- Teknobær (A. Sønsteby, I. Martinussen, A.L. Hykkerud; NIBIO)



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Article

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Effects of Temperature and Photoperiod on Yield and Chemical Composition of Northern and Southern Clones of Bilberry (*Vaccinium myrtillus* L.)

Eivind Uleberg,[†] Jens Rohloff,[‡] Laura Jaakola,[§,⊥] Kajetan Trôst,[∥] Olavi Junttila,[⊥] Hely Häggman,[§] and Inger Martinussen*[,†]

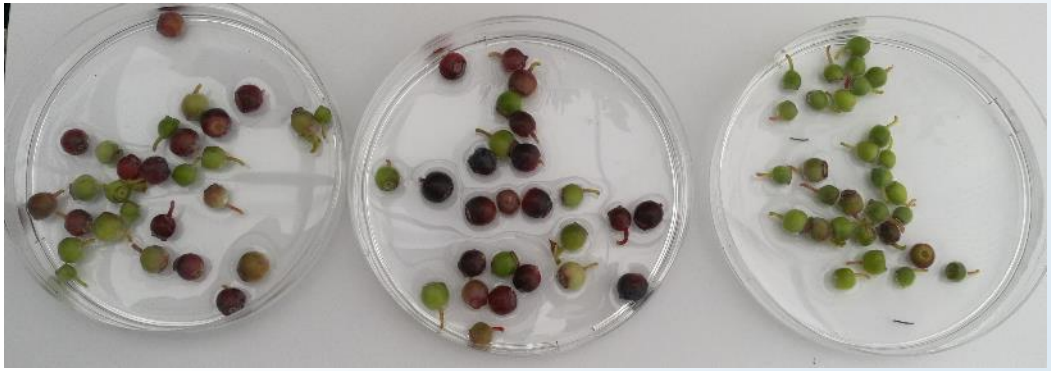
- 6 different growth conditions
  12h/24h light + red light, 12/18 °C

-> More anthocyanins in 18 °C
-> More delphinidins in 12 °C
-> More anthocyanins in 24h
-> More anthocyanins in northern clones

Light quality experiment/Amos Samkumar







*leaves, berries, deattached/ postharvest berries
* blue, red, far-red and natural light
* 2- 6 weeks, sampling regularly

Rhizosecretion of natural biologically active chemicals in aeroponics

- Project leader Dr. Ivan Paponov, NIBIO
- *Rhodiola rosea* and *Artemisia annua*
- Experiments on different light qualites and two different temperatures (+9/19°C), composition of the bioactive compounds and related gene expression is analyzed
- Results show temperature effect on production of bioactive compounds and light quality effect on growth




Climate change and adaptation of plants

- Adaptation of timothy cultivars to north Norwegian growth conditions (S. Dalmannsdottir, NIBIO)
- Winter disturbance and nitrogen deposition (J.W.Bjerke, NINA)
- Effect of ice formation on overwintering of grass (M. Jørgesen, NIBIO)
- Influence of flooding under different autumn temperatures on winter hardening of timothy (M. Jørgesen, NIBIO)

Microsoil (Kari Anne Bråthen and Karoline Aares UiT)

- How native/introduced soil affects growth of native versus introduced grasses and forbs?
- The research is conducted using soil and seeds from 6 different sites following a latitudinal gradient from the Atlas Mountains in Morocco, to the Sierra Nevada mountain range in Spain, the French Pyrinees, the Swiss Alps, Varanger in Norway, and Adventdalen in Svalbard.
- The seeds are planted in all different soils, to detect soil effects on plant growth.


Thank you for your attention!
Ilkka Jaakola