



Advanced LED technology and photobiology – Much more than energy savings

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Presentation outline

Valoya approach

LED and Technology Research

Plant Light Response Research

Applications based on Valoya research

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Valoya approach

Beyond replacing HPS

Research based plant lighting

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Beyond replacing HPS

Light is a growth factor, which can and should be developed in horticulture in a comparable way to substrates, fertilizers etc.

We have taken a R&D approach to develop light as the important growth factor it is.

Our core technology is wide light spectra, patented in US, pending globally – delivered through proprietary LEDs.

Our customers are:

- Major plant breeding / seed companies
- Plant propagators
- Flower and vegetable growers
- Universities and research institutes
- Microalgae producers



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Research based plant lighting

The goal of all Valoya Research is to deliver the maximum value to our customers by

- Lowering costs associated to production processes
- Enabling more revenue

This can be achieved through

- Better light quality
- Long product life, low maintenance costs
- Practical and efficient applications with our versatile product family

Translating into

- Increased productivity
- Improved quality and/or
- Faster production cycles



Picture by Ville Kankaanhuhta

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LED and Technology Research

LED chips, materials, power units

Versatile products

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LED chips, materials, power units

LED and Technology Research focuses on

- New LED chips and inorganic materials
- Power units and electrical systems and new applications thereof

Aim is to make our LED fixtures and light installations

- Long-lasting
- Easy and efficient to use

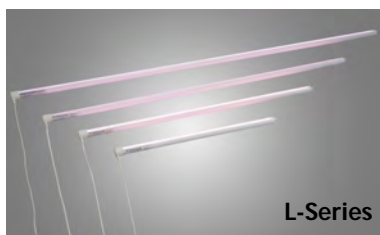
To be used in

- Growth chambers
- Walk-in rooms
- Greenhouses



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Versatile products



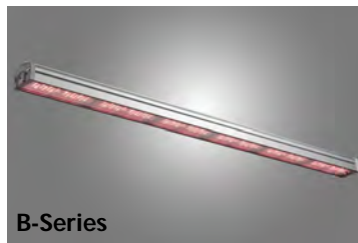
L-Series



C-Series



Bulb



B-Series



R-Series

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Plant Light Response Research

In-house experiments

Experiments with universities and research institutes

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Plant Light Response Research

Plant Light Response Research focuses on finding solutions for different plant types, production aims and applications.

This work has yielded light to be utilized to:

- Control vegetative and generative growth
- Increase yield (biomass)
- Enhance production of selected quality traits
- Enable growing without sunlight



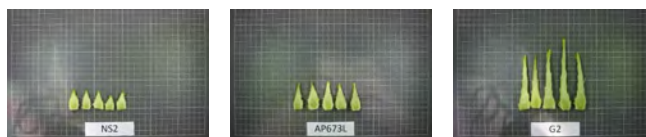
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Flowering induction

Arabidopsis thaliana



Green batavia lettuce



Begonia



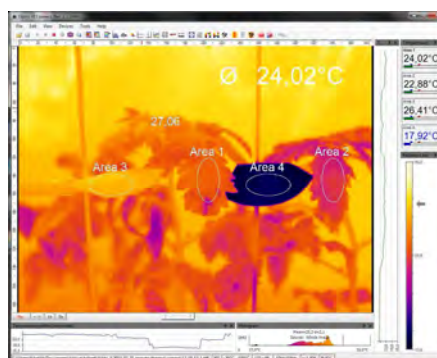
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Light quality & drought tolerance

The effect of light quality on drought tolerance was examined through stomatal conductance.

Blue waveband irradiation was associated with open stomata even during drought.

Yellow and green irradiation were associated with rapid stomatal closure, resulting in lower transpiration rate and smaller decrease in biomass, hence into best performance under drought stress conditions.



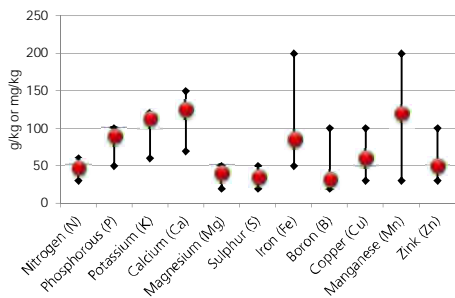
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Valoya university and research institute partners



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Growing lettuce without sunlight – meeting quality standards



HAMK
HÄMEEN AMMATTIKORKEAKOULU
UNIVERSITY OF APPLIED SCIENCES

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Strawberries in greenhouse

Inagro: 30% more yield per energy input under Valoya AP67 compared to HPS.

HAS Hogeschool: 12% more yield in total under Valoya AP67 compared to HPS and pollination more successful, shown as higher 1st class yield and lower industrial classified yield.

Both: Longer leaf petioles under Valoya AP67; important for adequate air circulation within the plant canopy, also making the berry picking easier.



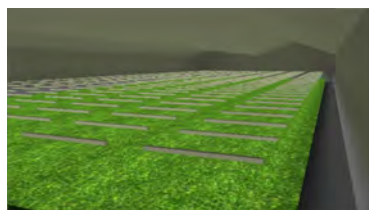
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Integrated research and learning from customers

The LED and Technology Research and the Plant Light Response Research are tightly integrated.

Detailed simulations and instructions ensure practical and efficient installations.

This combined with feedback provided by our customers ensures that the results from our R&D work concretely and immediately benefit our customers.



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Applications based on Valoya research

Conventional greenhouse production

Controlled environments

Integrated systems

Multilayer systems and “Plant factories”

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Conventional greenhouse production

Lack of light in winter limits productivity in conventional production.

Plant breeders need to be able to carry on their programs year around; outdoors off-site production is often replaced with on-site production in controlled environments.

Valoya products enable:

- Increased productivity
- Enhanced quality
- Faster cycles
- Energy savings



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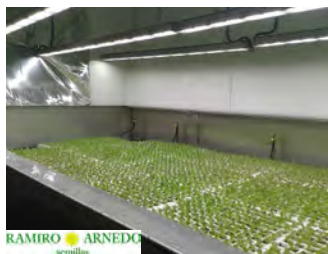
Plant breeding in controlled environments

Ramiro Arnedo, Spain

Developing cultivars (lettuce, tobacco) resistant to aphids, *Bremia* etc., using Valoya L- and B-series, AP67 and NS1 spectra.



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Universities doing research with Valoya lights

University of Potsdam, Germany:

Valoya B-series in research greenhouses with e.g. *Arabidopsis* studies.

University of Helsinki, Finland:

Valoya B-series in growth rooms, studying the interaction between photoperiod and temperature on wild type strawberry.



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Controlled environments - Integrated systems

Valoya provides the best spectra for integrated environments covering all plant growth phases.

Integrated Conviron / Valoya solutions offers various models ranging from small chambers to large walk-in rooms.

Valoya products enable:

- Solutions up to PAR 1500 μmol with various dimming options
- True integration enabling good climate control
- Extensive energy savings compared to traditional lighting



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Multilayer systems and "Plant factories"

The business case of the "plant factory" differs from greenhouses in terms of lighting, heating, cooling and logistics.

Valoya products enable:

- Multiple layers, as low/no directional heat allows close proximity to plants
- Long product life and low maintenance costs
- Extensive energy savings compared to traditional lighting



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Thank you for your attention!



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