LED – the key for product design

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Future developments and their impact on horticulture

- Population growth
- **Trend towards healthy food**
- Sustainability
- Individualisation
- **Urbanisation**
- Green revolution
Urbanisation: Germany 74%

“Healthy food” market 160 bn US $

Data from Statistica
Government of Canada
LEDs create new possibilities in horticulture

• Targeted increase of health promoting ingredients

• “back to town”: Urban/Vertical farming in plant factories
Advantages of LEDs

- Spectrum can be changed
- Lighting can be optimised for each culture
- Targeted growth promotion
- No heat radiation
Red and blue lights promote growth. However, many colours make the shape...
Greenhouse lighting of the future

LED

Sodium vapour lamp
Greenhouse lighting of the future
Mitglied im

Optimised light increases the content of antioxidants

Rosmarinic acid

red and far-red light
Rosmarinic acid

- Abundant in herbs (Lamiaceae)
- Antioxidant
- Scientific evidence for health promoting effects:
  - Anxioloytic
  - Antimicrobial
  - Anti-inflammatory
Light increases anthocyanins

No light  LED 1  LED 2  LED 3
More examples from literature

- Red and blue light increases content of **carotenoids** and **antioxidants** in lettuce (Stutte 2009, Johkan 2010).

- Red und far-red increase **genistein** in soya seedlings (Kirakosyan 2006).

- Red light promotes **β-cryptoxanthin** in citrus (Ma 2012).

- Red light increases **β-carotene** content of peas (Wu 2007).
Light makes shape
LEDs open the door to

- Optimising the production
- Increase heath promoting compounds
- Growth of high quality plants

Do we actually need sunlight?

Basil produced without sunlight
Opportunities for the future

- Production in multilayer/vertical system
- Independent of sunlight
- Shifting production closer to customer in the city

Photos: Valoya, Ville Kankaanhuhta
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Please find more information at http://www.hswt.de/igb LED-Forschung