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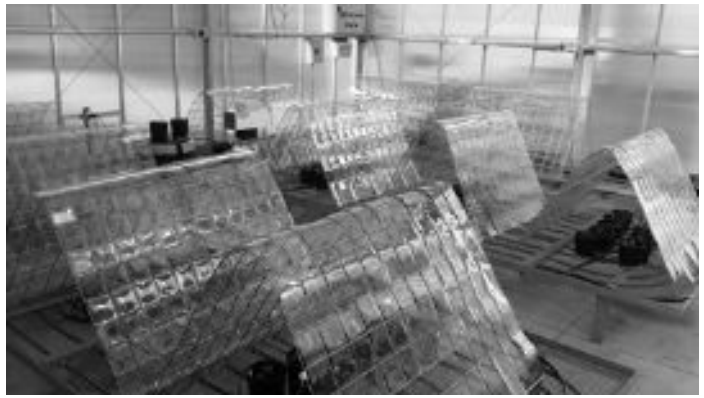
NEW TECHNOLOGY FOR IMPROVING PLANT PROTECTED CROPPING



NEED FOR INNOVATION IN THE FOOD PRODUCTION INDUSTRY

CHALLENGES FACED BY GROWERS

- **POPULATION GROWTH**

  Increasing local and global populations place pressure on growers to produce more food at a high standard

- **CLIMATE CHANGE**

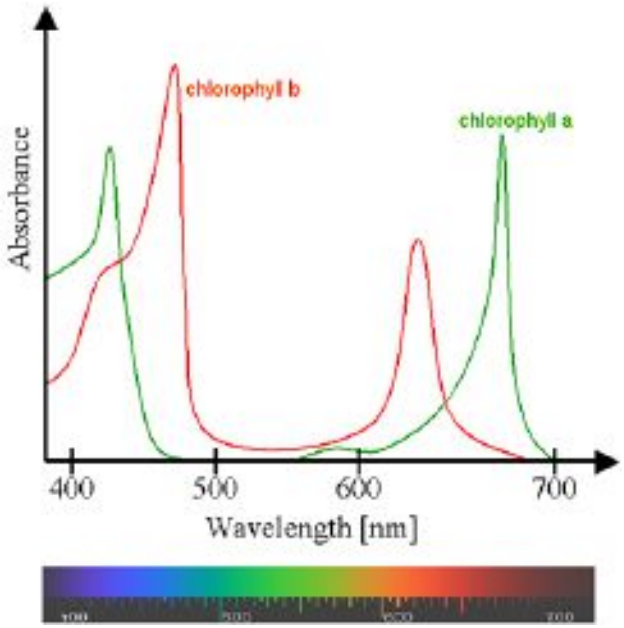
  More intense and more frequent extreme weather events place unprotected crops at risk of damage

- **PRODUCTION COSTS**

  High production costs mean growers need sustainable and cost effective methods of increasing yields

CHANGING THE LIGHT ENVIRONMENT

LIGHT QUALITY AND PLANT GROWTH



- **NOT ALL LIGHT ENERGY DRIVES PHOTOSYNTHESIS EFFICIENTLY**

  Plants use light in the red and green regions of the visible spectrum most efficiently for photosynthesis & energy production

- **LIGHT QUALITY INFLUENCES PLANT FORM AND DEVELOPMENT**

  Plants use light to sense and respond to their environment
  Light can control germination, flowering, growth patterns etc.

- **CAN THE LIGHT ENVIRONMENT BE MANIPULATED TO IMPROVE PRODUCTION OUTCOMES?**

  PAS materials alter natural sunlight & increase the ratio of light in the most photosynthetically active regions.
  This effect could improve yields but must be tested to understand the full impact of altered light environments on plant growth.

AIM

DO PAS MATERIALS IMPACT PLANT GROWTH?

This project aim to determine the effect of PAS materials on:

- Plant growth (e.g. biomass, yield)
- Plant form (e.g. branching, leaf area)
- Plant developmental timing (e.g. flowering time, fruiting)
- Chemical composition of plant products (e.g. sugars, phenolic compounds)

Experiments with two horticultural crops:
Cherry tomato & Basil

CHERRY TOMATO
Lycopersicon esculentum

BASIL
Ocimum basilicum

METHOD

IMPACT OF PAS ON GROWTH OF TWO HORTICULTURAL CROPS

GREENHOUSE CONDITIONS

- Plants grown at 23°C/17°C day/night and 75% humidity
- 7 different PAS materials provided by Zero Discharge
- Drip irrigation, fertilized, rotated weekly

MEASUREMENTS

- Growth
- Developmental Timing
- Chemical Composition

DESIGN

- **Cherry Tomatoes:**
  Treatments (PAS) = 8
  N = 10 or 20
  110 plants
- Over winter
- **Basil:**
  Treatments (PAS) = 7
  N=10
  70 plants
- Over summer

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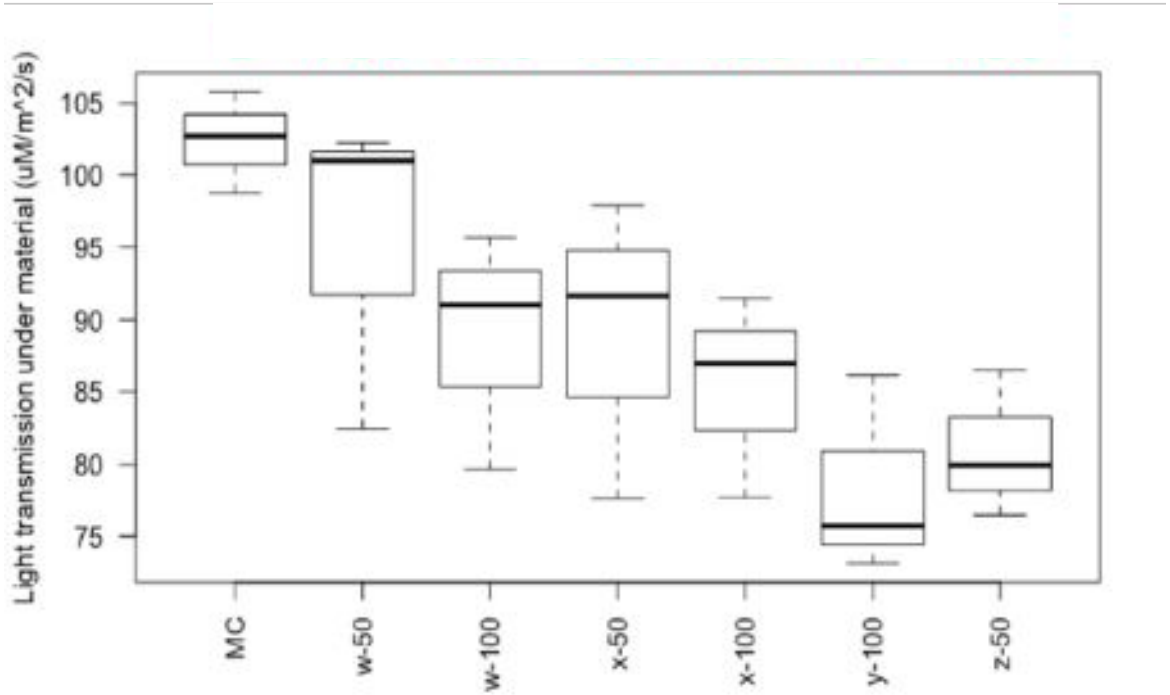
LIGHT TRANSMITTANCE

REDUCTION IN PAR

- Depending on the dye used, and time of day, light underneath the PAS technology can be reduced 5-20%
- Despite reduction in light quantity, no reduction in plant biomass or yield observed under any PAS material



DEVELOPMENT AND CHEMICAL COMPOSITION

CHERRY TOMATO

- Reduce time to fruiting
- Some increase number
- Small increase in fruit weight

- An increase in BRIX Indicates higher sucrose content and implies increased sweetness
- A slight increase in pH Indicates reduced acidity and tartness
- An increase in specific macro and micronutrients

BASIL

- No differences observed –leafy vegetable, grown over summer

CONCLUSIONS

CAN PAS MATERIALS BE USED TO IMPROVE GREENHOUSE PRODUCTION OUTCOMES?

- **POTENTIAL FOR PAS TECHNOLOGY TO INCREASE PRODUCTIVITY OF SOME CROPS THROUGH IMPACTS ON:**
  flowering time
  fruit yield
  photosynthetic rate
- **INDICATIONS OF IMPROVED QUALITY**
  Early results suggest impacts on flavour through sugar content
  Potential benefits to nutrient content
- **SPECIES SPECIFIC**
  Further investigation on wider range of crops needed to determine extent & impact of PAS technology

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