LIGHTING THE PATH TO URBAN FARMING

By Luke Nutt and Xavi Branford

What are Microgreens?

Microgreens are young vegetable or herb seedlings usually harvested after just over one week from germination. Microgreens are rich in **antioxidants** and include many essential **nutrients** such as **potassium, iron, zinc, magnesium** and **copper**.

Microgreens can be grown quickly and cheaply indoors with little soil and water, providing an **affordable** and **sustainable** food source for those living in cities.

We are investigating the effects of **light colour** on the **growth** of microgreens to provide a solution for those wanting to optimize their microgreen growth.

Our Experiment

There were many variables to consider within our experiment such as:

The **Independent** variable: LED light colour Red, Green, Blue and White.

The **Dependent** variable: Height of microgreens after 10 days of growth.

The many **controlled** variables: Same type of seeds, same weight of seeds used, same watering schedule, same temperature and the same amount of light exposure.

We also wanted to keep our experiment as sustainable as possible. We reused old seedling trays and used homemade compost.

Hypothesis

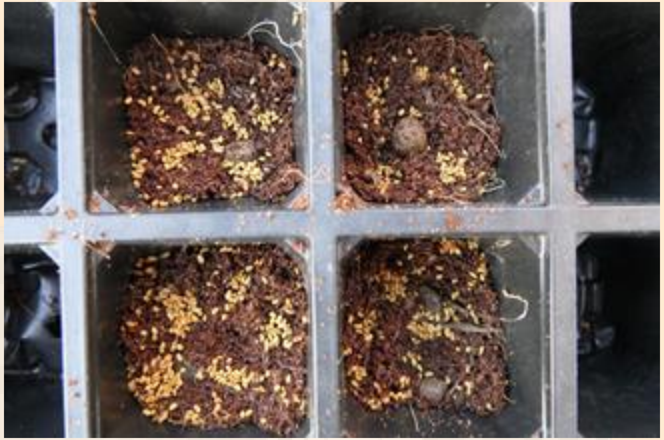
Our hypothesis was that microgreens exposed to **green** lights would perform the worst. This is because green light is largely reflected off the leaves rather than absorbed. Our research showed that chlorophyll absorbs light most efficiently in the warm color spectrum particularly between **dark yellow to red.**

Based on this we determined that **red light** would be the most effective, with **blue just behind**, and that it would provide optimal light conditions for microgreen growth. Our control variable, **plain white** was also expected to perform better than green light as it allows for greater absorption and less reflection.

Step 1, Setup

We tested the effects of light growth on **Alfalfa**, **White Mustard, Red kale and Ripany** Seeds. We took two of the seeds each to grow.

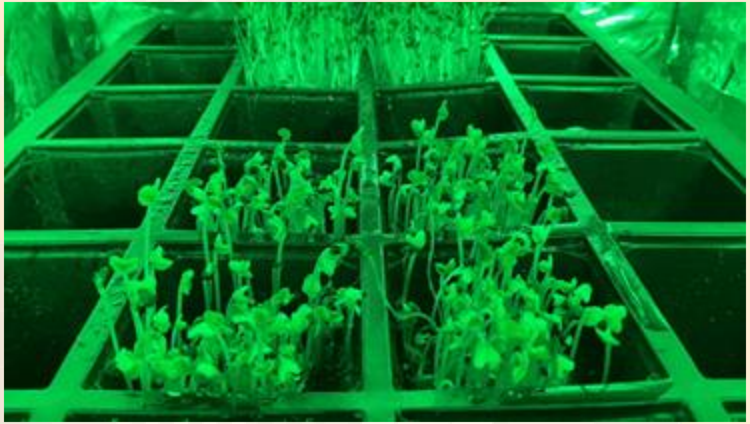
Firstly, we filled a seedling tray with **2.5cm** of soil, flattening lightly. We then sprinkled the microgreen seeds on top, ensuring that the same **weight** of seeds were used each time, with a similar density and that each species of seeds were kept separate.



Step 2, Growth

Next we sprayed the seeds with water and placed the seeds in a dark area with a damp paper towel over the seeds, spraying daily to create a dark and humid environment.

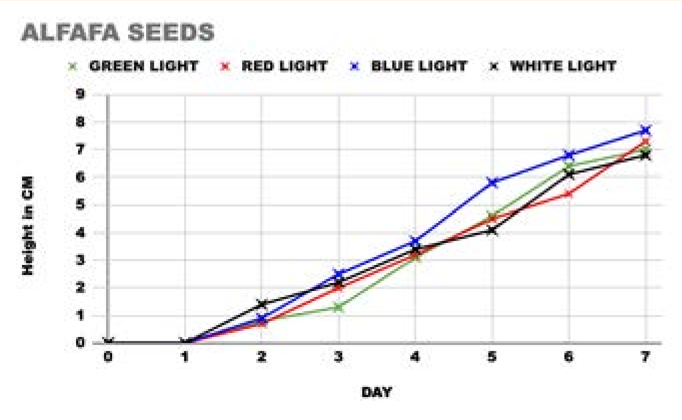
After **3 days** the microgreen seeds had germinated and were ready for light. We placed the seeds inside a cupboard which we had transformed into a growing chamber and positioned an LED light over the microgreens which was turned on **all day** every day.

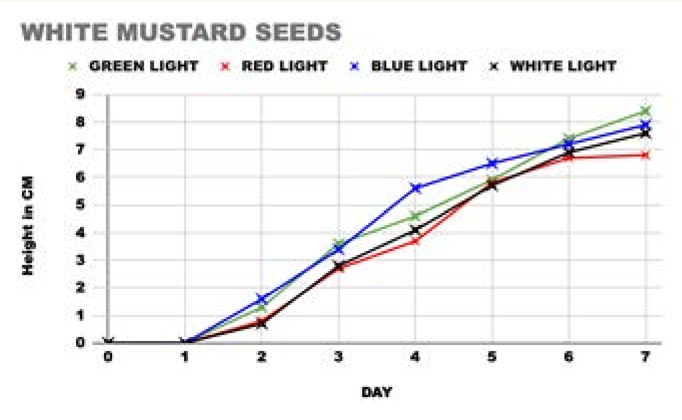


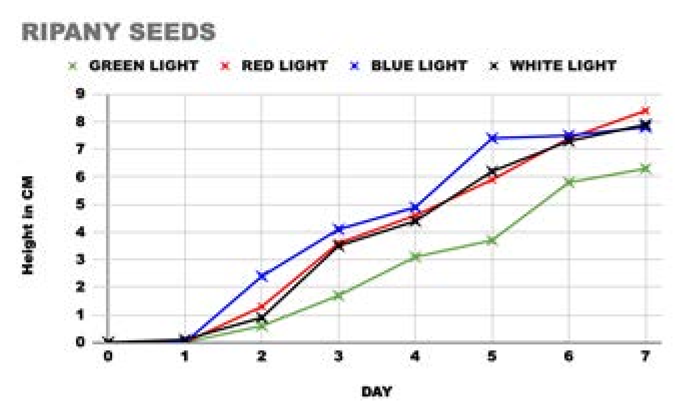
Step 3, Measurements

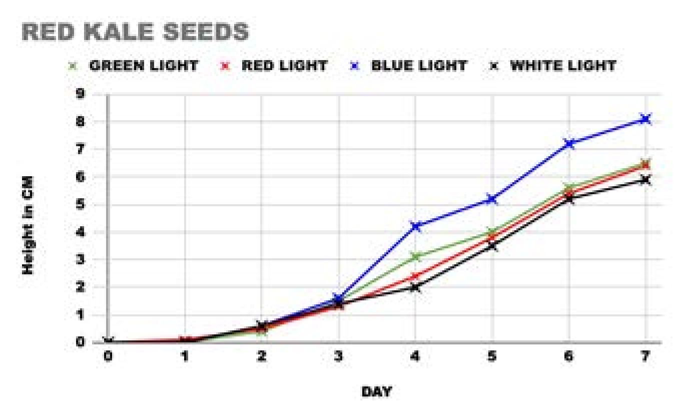
At the same time everyday we measured the microgreens using a **30cm Ruler** with a resolution of **1 mm** and recorded the results on a spreadsheet.

When we reached the **7th** day of growth, we harvested the microgreens, emptied the trays and repeated the process until we had data for all four light colours.


ALFAFA SEEDS
GREEN LIGHT
RED LIGHT
BLUE LIGHT
WHITE LIGHT
Height in CM
DAY


WHITE MUSTARD SEEDS
GREEN LIGHT
RED LIGHT
BLUE LIGHT
WHITE LIGHT
Height in CM
DAY


RIPANY SEEDS
GREEN LIGHT
RED LIGHT
BLUE LIGHT
WHITE LIGHT
Height in CM
DAY


RED KALE SEEDS
GREEN LIGHT
RED LIGHT
BLUE LIGHT
WHITE LIGHT
Height in CM
DAY

Evaluation of experiment

Contrary to our hypothesis, red light did not result in maximum growth in any microgreens. This was likely due to the fact that the red light struggled to penetrate deep into the plants tissue as it is absorbed closer to the surface of the leaves, a problem, considering microgreens are so dense. The green, and particularly the blue lights penetrated far more effectively. Therefore the findings of this experiments are, blue light is the most effective for microgreen growth due to its ability to penetrate and also the higher levels of absorption, followed shortly by green light, with white light and red light performing very similarly.

If we were to repeat this experiment, we would repeat each growth 2 more times to get a more accurate result and we could also experiment with the density of microgreen seeds to attempt to find a balance between seed density and light colour.

White Mustard: Green light produced the most growth (8.4 cm), contradicting the hypothesis. Blue (7.9 cm), and White (7.6 cm) performed similarly. However, red light only reached (6.8cm) tall.

Ripany: Red light led to the highest growth (8.4 cm), supporting the hypothesis. Red light was very closely followed by Blue light at (7.8cm) tall. Green light (6.3 cm), performed moderately.

Alfalfa: Blue light achieved the most growth (7.7 cm), followed by red (7.3 cm).

Red Kale: Blue light performed best (8.1 cm), surpassing red (6.4 cm).

Microgreens for the Next Generation

According to the 2018 Revision of World Urbanization Prospects by the UN, approximately **2.5 billion** additional people will live in urban areas by **2050**. Though Microgreens will not solve the Urbanization crisis, they can certainly play a big part in improving the health and well-being of the next generation.

Microgreens, due to their exceptional ability to grow in small spaces with minimal resources, are **vital**, especially in densely populated areas where access to fresh, nutritious food may be limited.

References:

Seeds and growing instructions from **Verdant Republic**

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