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Biology Honors
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Growing Beyond Earth® Trial 2 Proposal

Research Question (100 Characters):

What is the optimal amount of red, blue, or green light in LED recipes to maximize the yield?

Hypothesis (100 Characters):

If we change the LED recipe to favor the use of Red (650 nm) and Blue (550 nm) light, we will be able to replicate the same sunlight conditions on Earth more accurately and, therefore, increase or maximize the amount of yield.

Justification – What inspired you to do this experiment? (100 Characters):

We are inspired by our ability to contribute to the next wave of human exploration in space. Furthermore, we hope that through our research on the different effects of varying wavelengths, we can contribute to research on making space more sustainable and habitable.

Variables (40 Characters Each)

Independent:

The Light combination. We will be changing the original code of the wavelengths, and instead be using a different combination of colors for our desired result.

Dependent:

All Growth metrics of the plants. We will be measuring height, width, and depth weekly like before. Additionally, we will measure the biomass of the plant, recording the final harvest which will include the stem and leaves and the root.

Materials: bulleted list (900 Characters)

- Chamber Hardware:
 - LED panel (top) (1)
 - Acrylic side panels (2)

- Acrylic front and back panels (2)
- Bottom panel (1)
- Corner connectors (4)
- Power supply (1)
- Light timer (1)
- Fan with power supply and finger guard (1)
- Screws (12)
- Science Resupply Kit:
 - Dicalite Aero-Soil Perlite and Horticultural Vermiculite mix (1:1 volume; 2.6 liters) (2)
 - Florikan Nutricote fertilizer, 18-6-8 T180 (40.0 grams) (1)
 - Hygrometer-thermometer, battery-powered (1)
 - pots, 4" square (6)
 - Water tray (1)
 - Wicking mat (1)
 - Plant tags (6)
 - Photo image card (1)
 - Growing Beyond Earth Research Protocol QR code (1)

- Selected seeds (3 packs)
 - GBE #218 Hybrid Round Radish, Donato F1
 - GBE #126 Round Radish, Easter Egg II
 - GBE #154 Specialty Radish, French Breakfast
- Extra materials:
 - Graduated cylinder
 - Mass scale (0.1 g resolution)
 - Ruler
 - Camera
 - Scissors
 - Mixing bin
 - permanent markers
 - Class lab notebook
 - Disposable gloves
 - forceps

Explanation of Methods (1650

Characters):

The first step is to plant the seeds. For this step, a mixing bin, 1 bag (2.6L) perlite: vermiculite mix, 20.0g fertilizer, tray, wicking mat, pots, seeds, plant labels, permanent marker, graduated cylinder, and gloves (optional) will be required. Begin by pouring the perlite: vermiculite mix into the bin slowly in a well-ventilated area. Take your scale and measure 20.0g of fertilizer. Pour the 20.0 g of fertilizer into the bin and thoroughly mix. Gradually add (approximately) 700mL of water, until the media mix is moist and clumping. If necessary, add more water, it is important to avoid a dry mix. Take the pot tags and label them with the GBE cultivar number, cultivar name, and date. An example would be to label pots 1 and 2 with “GBE #218: Hybrid Round Radish, Donato F1” with the date on the back, follow this with pots 3 and 4 using the second cultivator, and pots 5 and 6 using the third cultivator. Use the pots to scoop up the mix till it fills the line on the inside of the pot. The media should not be compacted in the pot. Once the pots are done prepping, take eight seeds of the designated GBE and evenly spread over the media surface of the pot. Cover the seeds with a 0.2mm layer of media. Be careful to not compact the media. Repeat this for each pot and its designated seeds. Place

the wicking mat in the tray with the mesh side up, then place the pots on the mat.

The pots will fit in the tray in a 3 x 2 matrix: A1, A2, A3, B1, B2, B3. Randomize the positions of the pot. Pour 700mL of water into the tray as the initial watering volume. Continue to maintain plants. Thin on day 14. Measure and collect data every week.

References (450 Characters):

<https://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=1614&context=honors>

<https://bioslighting.com/horticulture-blog/grow-light-spectrum-led-plants/>

<https://fairchildgarden.org/high-school-challenge-6/>