



Cambridge Upper Secondary Science Competition regional winner

Detection of adulterants in milk brands, famous among students

Judge's comments:

This report shows a real life problem which the group identified. They posed an appropriate research question and contextualised the issue to their own school environment.

The group used good design techniques – simple food tests applied to a real problem – to allow the collection of relevant data across a number of different foodstuffs. The technical approach was good and tests were carried out accurately. The group engaged with the data well.

The use of resorcinol to detect glucose may have been affected by the presence of naturally-occurring lactose in milk.

EFFECT OF LIGHT OF VARIABLE COLOURS ON PLANT GROWTH



Plant Grown In Sun Light



Plant Grown In White Light



Plant Grown In Coloured Light

Content	Page #
Introduction	3
Objective	4
Variables	4
Hypothesis	4
Prediction	5
Material Used	5
Procedure	6
Precautions	6
Observations	7
Interpretation Of Observation	8- 9
Conclusion	10
Further Implication	10
Further Improvisation	11
References	11

"EFFECT OF DIFFERENT COLOURED LIGHT ON PLANT GROWTH"

Introduction:

Due to increased threats of global warming and to encourage planting indoor plants, we analyzed effects of different spectrum of light on the plant growth. This was done to know if plants would survive the best in different light spectrum, other than sunlight.

For our experiment, we choose *Zinnia elegance*, commonly known as Zinnia plant. It is an annual plant, which grows fast and attains maturity in 45 days; blooms heavily with vibrant, beautiful flowers. It is native to Mexico and Central America, but is widely grown throughout the world, especially in areas where the weather is hot.

From our experiment, we would be able to highlight the artificial conditions needed to grow the plant effectively, even in the countries where sun does not shine much. The impact would be possibly productive as the vibrant flowers would not only assist to elevate mood of people in its vicinity but also beautify the surroundings while reducing the impact of global warming.

To make it a fair test, we made 7 groups of plants, containing two pots per group, which we kept in different spectrum of light- the independent variable. The control variables were species of plant, air, temperature,

volume of tap water and amount of a certain fertilizer that was kept same in every pot.

Objective:

To assess effect of light of variable spectrum on plant growth to choose best light which could be used alternative to sunlight for plant growth.

VARIABLE:

Independent Variables:

- Lights of six different colours
- Sunlight

Dependent Variables:

- Plant

Control Variables:

- Fertilizers
- Volume of water
- Duration of light exposure

Hypothesis:

As per our prediction, plant growth would be remarkably affected due to the varying light intensities; although plant would grow best in white, red and purple light.

Prediction:

According to the knowledge we gained from the book, whose author is 'Lam Peng', we predict that the best growth will be under red and blue light and the least growth will be under green light.

Material Used:

- Planted pots of Zinnia plant in early stage.
- Light Bulbs
 - Red
 - Yellow
 - Green
 - White
 - Blue
 - Purple
- Wires
- Fertilizers
- Carton Sheets
- Light Bulb Holders

Procedure:

- First of all, make circuit and connect bulbs of variable coloring series circuit.
- Set up the stage for the performance by making compartments to keep the plants in different color light.
- De-starch the plants for 48 hours, by putting them in the dark room.
- Keep the pots in the compartments of different color lights.
- And regularly turn on the light at 7 AM and turn off the lights at 6PM.
- Ensure that the plants are given the same amount of water on regular basis twice a day.
- Observing the plants every 4th day and record the readings.
- Calculate mean/average and draw bar graph on the basis of readings taken.
- Draw conclusion by interpreting the plant growth in different intensities of light.

Precaution:

1. Turn on and off the light on regular basis and on their specific time.
2. Make sure that the room is dark all over the day in order to accurate result.
3. Make sure that the card sheet, used as separator, does not allow any other light enter in the compartment of another plant.

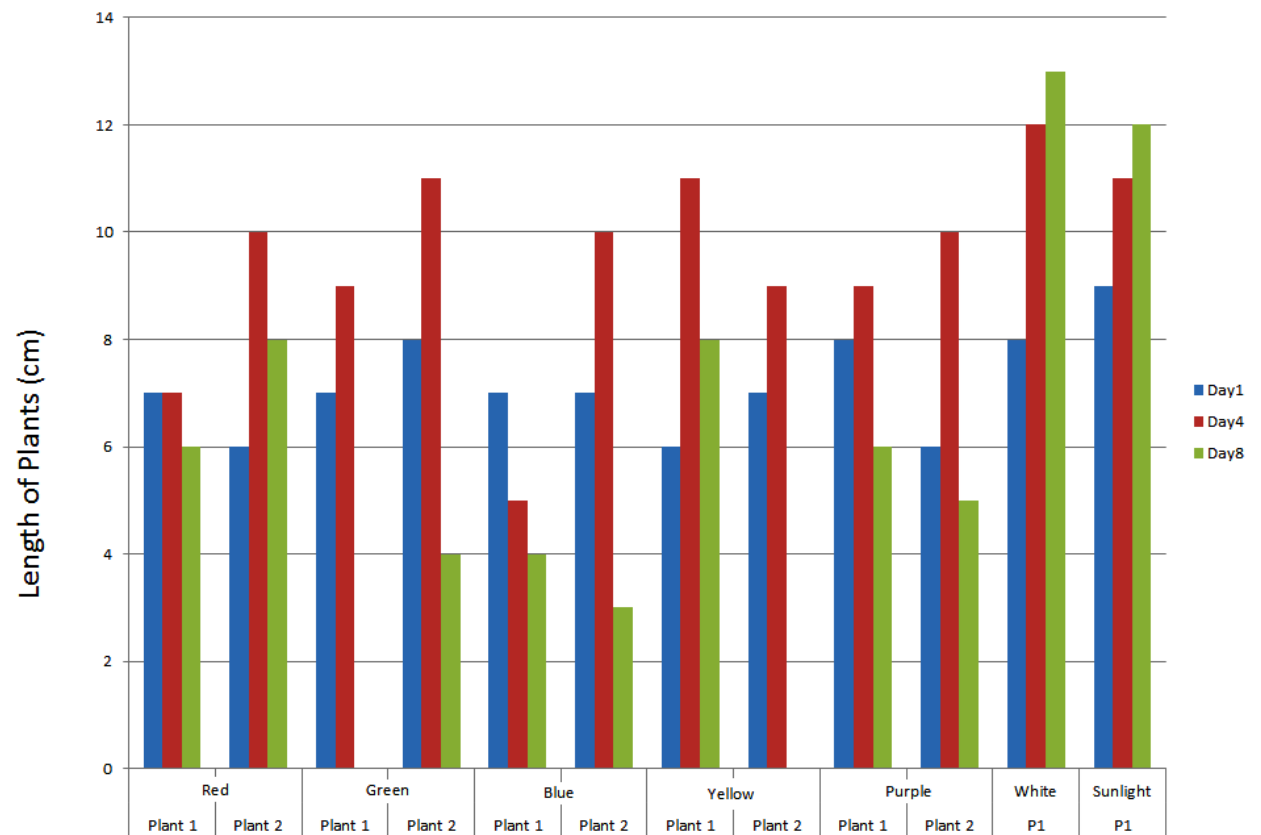
Observation:

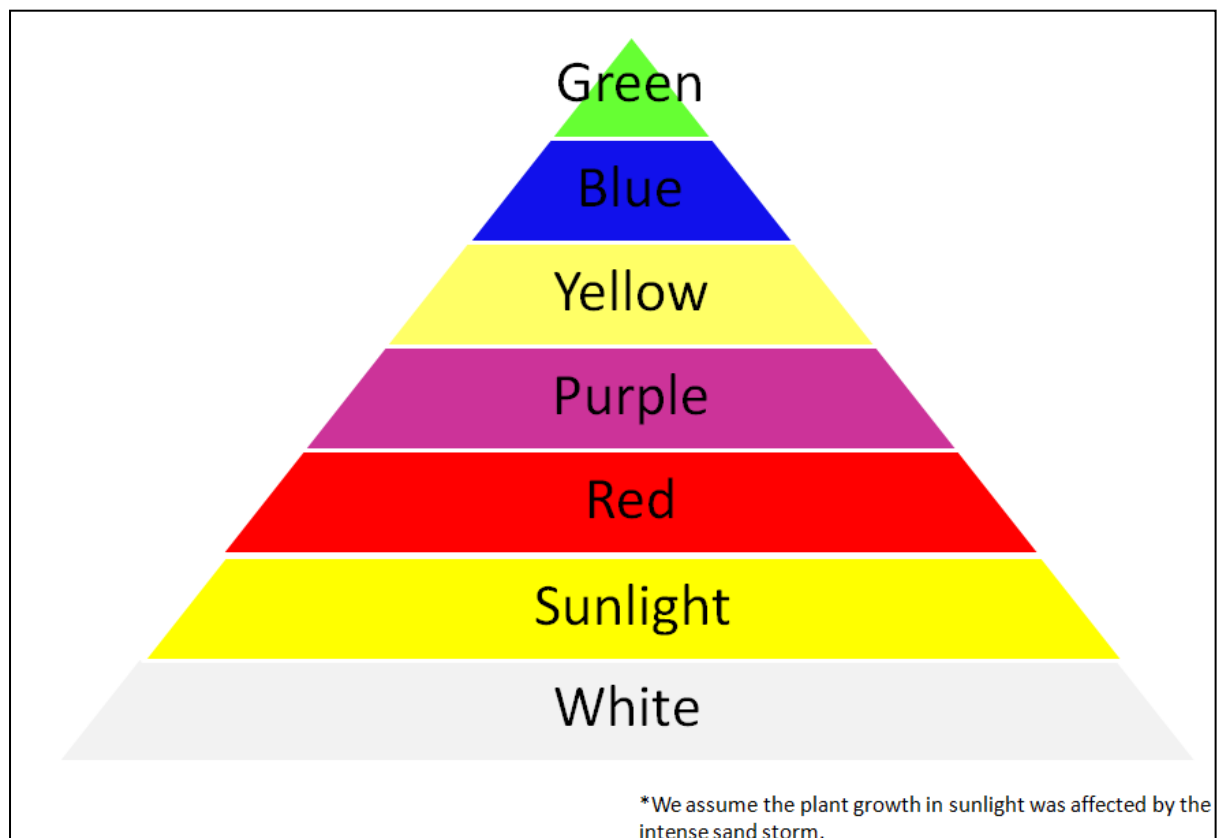
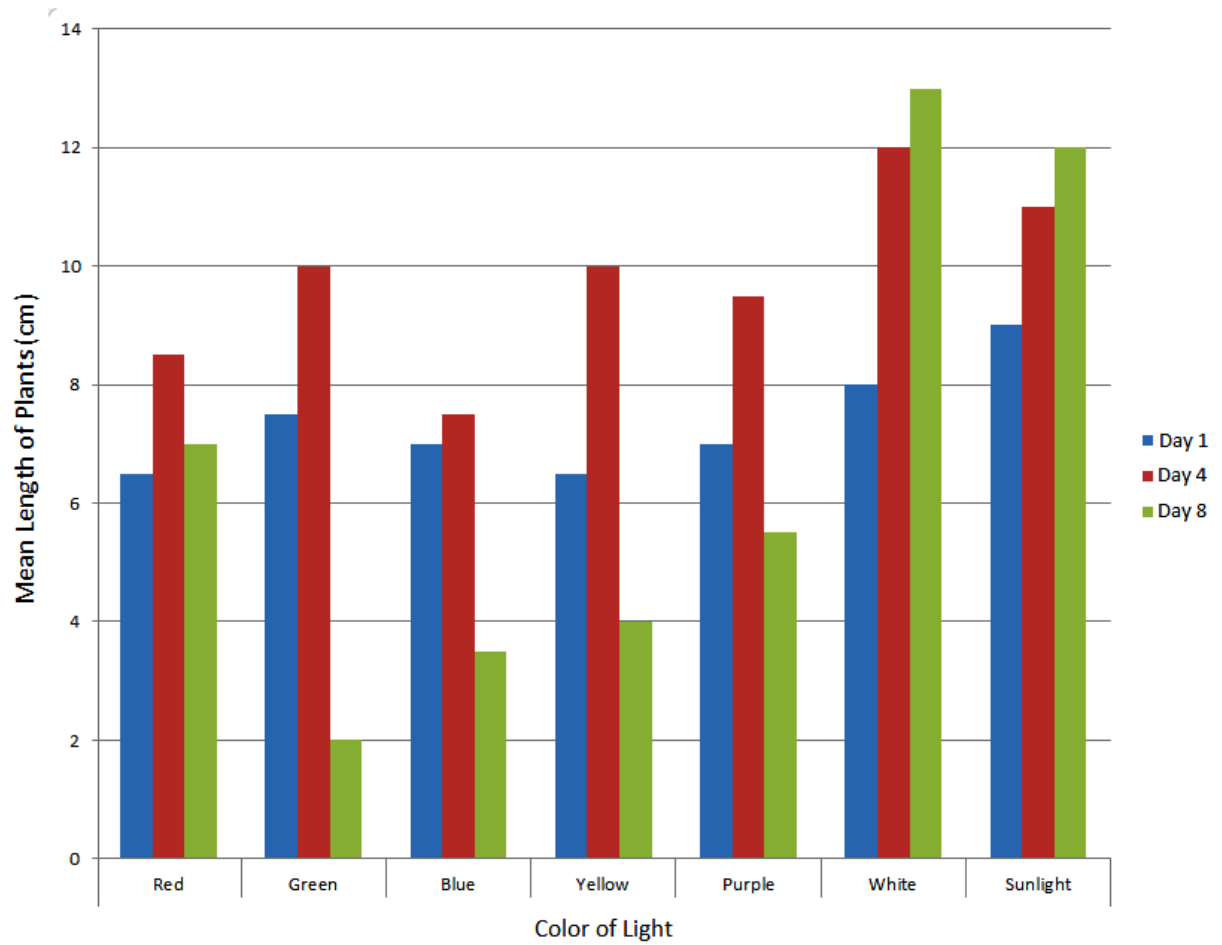
Day No.	Length of Plants (cm)											
	red		Green		Blue		Yellow		Purple		White	Sunlight
Day1	7	6	7	8	7	7	6	7	8	6	8	9
Day4	7	10	9	11	5	10	11	9	9	10	12	11
Day8	6	8	0	4	4	3	8	0	6	5	13	12

Day	Mean Length of Plants (cm)						
	Red	Green	Blue	Yellow	Purple	White	Sunlight
1	6.5	7.5	7	6.5	7	8	9
4	8.5	10	7.5	10	9.5	12	11
8	7	2	3.5	4	5.5	13	12



Interpretation of Observation:





Conclusion:

The overall highest growth of the plants was under white light and the lowest growth was under red light. There was an immediate growth of 8.5cm under red light on day 4 but it later on decreased to 7cm till day 8. Similarly, the green plant from day 4 increased to 10cm but later had a fell to 2cm. Plant that grew in yellow, blue and purple colored light also decreased by 4cm to 6cm from day 4 till day 8. Under white light, the plant's height was increased up to 12cm by day 4 and increased by 1cm till day 8. The plant which was placed under sunlight was increased by 11cm till day 4 and it increased to 12cm until day 8. Thus, through the analysis it has been observed that plant grew more rapidly in white light as compared to other colors and sunlight.

Further implications

Plantation has reduced to a severe level due to pollution, wars, increase in population and deforestation, which is increasing global warming. It is easier to sow different types of outdoor and indoor plants in countries where exposure to sunlight is in abundance; however, in countries where sunlight is restricted, growing plants seems difficult. In this study, we substituted sunlight with different colors of artificial light in order to find out another alternative for rapid and effective plant growth.

Further improvisation:

More species of plants must be tested further in order to generalize the research finding. Lights should also be tested across the countries in order to find out if lights give similar results in different weathers or not.

References:

- <https://www.annualreviews.org/doi/abs/10.1146/annurev.pp.07.060156.002105?journalCode=arplant.1>
- <https://journal.fi/afs/article/view/7897>

REFLECTION

“EFFECT OF DIFFERENT COLOURED LIGHT ON PLANT GROWTH”

How the project work progressed?

We enjoyed working on this project as we did not only imply our biology knowledge, but also of physics as we constructed the series circuit to connect the bulbs of different colours. Our team also worked hard to make the compartments in which the light was restricted to each compartment only. We were so excited and amazed to see the excitement of our juniors, who were also eager to know the results of our experiment. We are so grateful to our domestic staff, who watered plants on weekends and during the evening hours, by following the rules told to them to follow during watering. Overall, it was a wonderful experience, especially when we took length of the plant and analysed its growth.

How the team worked together?

Our team comprised of two boys and two girls. Initially, we divided the construction of compartments to the boys and kept the duty of analysis on our part, but as our work initiated, we all were fully involved at every step, as the experience was so enjoyable. Even the power point presentation and paper work was a team effort in which everyone played an equal role.

Improvements that could be made?

If we would repeat the experiment, we would like to analyze effect of light during different weather conditions on the plant growth. As in this experiment, we assumed that room temperature would be

similar in the countries where sun does not shine much, but we also predict that humidity and other factors could play a crucial role too.