Uncovering the Science Behind *Caladium bicolor's* Vibrant Colors

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Investigating a Comprehensive Study on the Factors Influencing Color Change in *Caladium bicolor* for Enhanced Cultivation and Economic Benefits in Horticulture

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ABSTRACT

In this study, the researchers aimed to compare the color-changing abilities of *Caladium bicolor* under different experimental conditions. They tested six (6) combinations of variables to the water used to water the plants, including:

1. **Water + energy drinks**
2. **Water + lemon juice**
3. **Water + energy drinks + lemon juice**
4. **MSG (monosodium glutamate) + water**
5. **MSG + water + lemon juice**
6. **Water**

The plants were watered twice a week, on Tuesdays and Saturdays, while the data was recorded once a day with a one-day interval in between. This study assessed several factors related to plant growth and development under different experiments.

Based on the result, the growth and color-changing abilities of the plants were significantly influenced by environmental parameters, such as soil moisture and temperature, relative humidity, and light intensity.

Moreover, the use of MSG had a substantially higher impact the on color change of the plants than other experimental factors, as it contains essential plant nutrients such as nitrogen, phosphorus, and potassium.

INTRODUCTION

Recently, *Caladium bicolor,* also known as the Heart of Jesus, has become increasingly popular and making it a desirable commodity in the market. It is also a plant of significance that contributes to the purification of indoor air by emitting moisture, thereby enhancing the freshness and healthiness of the environment.

There have been various approaches to enhance its color to make it more eye-catching through different experiment conditions such as by watering it with energy drinks, lemon juice, and MSG. This study seeks to answer the question:

What is the relationship between the following environmental factors and the color-changing abilities of *Caladium bicolor*?

- **soil pH**
- **soil temperature**
- **soil moisture**
- **mineral content**
- **air temperature**
- **light intensity**

Furthermore, the researchers aim to (1) provide valuable guidance to those who cultivate *Caladium bicolor* for ornamental or commercial purposes, which may help increase its marketability and demand, and (2) to identify the factors that impact the color-changing abilities of the plant, given the conflicting opinions on the efficacy of particular techniques.

METHODS

The following materials were used for the experiment:

- **18 *Caladium bicolor*, 2 months old**
- **energy drinks**
- **lemon juice**
- **MSG (monosodium glutamate)**
- **water**

Equipment for measuring factors:

- **Psychrometer for soil temperature**
- **Hygrometer for relative humidity**
- **NPK pH Test kit for mineral intensity and pH level in soil**
- **Litmus paper for pH level**
- **Lux meter for light intensity**
- **color identification for RGB**

The research methodology involved the following step:

1. **A thorough review of existing literature on *Caladium bicolor* was conducted, with a focus on color change, planting, care, and maintenance practices.**
2. **Various environmental factors that affect the color-changing process of *Caladium bicolor*, including soil pH, temperature, moisture, mineral content, air temperature, and light intensity, were studied.**
3. **The research was designed and planned, with the location selected as Paphayompittayakom School.**
4. **The study was divided into six sets of experiments that varied in terms of water and nutrient solutions used.**

    - **Experiment 1 : involved pouring a mixture of water and energy drink (M150) at a concentration of 10% into a glass with a volume of 500 ml.**
    - **Experiment 2 : water was mixed with lemon juice at a concentration of 1% (pH1) and poured into a glass with a volume of 500 ml.**

- **Experiment 3 : involved pouring of a mixture of water, energy drink (M150), and lemon juice at a concentration of 1% (pH1) into a glass with a volume of 500 ml.**
- **Experiment 4 : consisted sprinkling water-soluble MSG at a concentration of 2% into a glass with a volume of 500 ml.**
- **Experiment 5 : conducted by watering with a volume of 500 ml of water-soluble MSG and lemon.**
- **Experiment 6 : irrigated with 500 ml of water.**

5. **Data collection involved measuring soil pH, temperature, moisture, mineral content, air temperature, light intensity, and color changes using a color identification application.**
6. **The collected data were analyzed for mean, ANOVA (Analysis of Variance), and correlation coefficient to determine the relationship between environmental factors and the color-changing properties of *Caladium bicolor*.**
7. **The study results were summarized and presented in the research report.**

Table 1 : Relative Humidity, Temperature, and Light Intensity in the Air

No.	Date	Average relative humidity in the air %	Average temperature in the air °C	Average Illuminance (lux)
1	03-Sep-22	84.67	28	1192.67
2	05-Sep-22	92	29	4761
3	07-Sep-22	77	29	840.67
4	09-Sep-22	92	29.67	2147.33
5	11-Sep-22	88.67	27	1822.33
6	12-Sep-22	88.33	29	2320.33
7	15-Sep-22	92	30	1958
8	17-Sep-22	89	29	2320.33
9	19-Sep-22	91.33	28	2794.33
10	21-Sep-22	81	30	2404.33
11	23-Sep-22	82.67	29	2404.33
12	24-Sep-22	87.33	31	1691.33
13	26-Sep-22	92	30	2472.33
14	28-Sep-22	92.67	29	2605.67
15	30-Sep-22	92	28	4269.67
16	01-Oct-22	92.33	32	2721
17	03-Oct-22	91.33	29	3173.67
18	05-Oct-22	87.33	30	2856.33
19	07-Oct-22	91.67	28	2043.67
20	09-Oct-22	89.67	30	3536.67
21	11-Oct-22	89.67	29	2918.67
22	13-Oct-22	91.33	32	3515.33
23	15-Oct-22	90.67	33	2608.67
24	17-Oct-22	93	29	4360
25	19-Oct-22	80.33	28	3520.67
26	21-Oct-22	95.67	27	4275
27	23-Oct-22	95	30	4680
28	25-Oct-22	92	30	3578.67
29	27-Oct-22	93	31	3800.33
Average		**89.51**	**29.44**	**2882.53**

The table shows that the average relative humidity, air temperature, and light intensity are significant indicators for comprehending the air conditions in the research location.

Table 2 : Effect of Different Experimental Conditions on Soil Moisture and Temperature

No.	Date	Average relative humidity in the soil %						Average temperature in the soil °C					
		Group 1 Water+M150	Group 2 water + lemon	Group 3 Water+Lemon+M150	Group 4 MSG + water	Group 5 MSG+Water+Lemon	Group 6 500 ml of water	Group 1 Water+M150	Group 2 water + lemon	Group 3 Water+Lemon+M150	Group 4 MSG + water	Group 5 MSG+Water+Lemon	Group 6 500 ml of water
1	03-Sep-22	76.33	85.67	87.67	93.67	97.67	98.67	29.67	37.00	29.33	28.00	27.00	26.33
2	05-Sep-22	75.67	78.00	80.00	83.00	83.67	84.33	23.67	22.00	23.67	24.67	24.00	25.00
3	07-Sep-22	98.67	64.33	98.67	88.33	98.33	92.33	30.33	30.00	31.67	30.33	31.00	30.00
4	09-Sep-22	83.00	79.67	82.00	70.67	96.00	99.00	30.00	30.33	31.00	30.00	30.00	30.00
5	11-Sep-22	75.33	82.00	84.33	94.00	99.00	94.33	29.67	30.33	29.00	29.67	30.00	30.33
6	12-Sep-22	86.67	83.33	96.00	86.33	95.67	94.67	30.00	30.33	29.67	30.00	29.67	31.00
7	15-Sep-22	75.67	77.00	82.00	91.00	86.00	95.67	29.00	31.00	31.33	30.00	31.00	29.67
8	17-Sep-22	78.33	83.67	93.67	83.00	81.67	88.33	28.67	31.00	30.00	31.00	30.33	30.33
9	19-Sep-22	74.00	84.67	85.00	96.00	84.00	96.00	28.33	29.00	30.00	30.00	29.67	30.00
10	21-Sep-22	77.67	85.67	86.33	89.67	84.33	88.00	29.67	29.67	29.67	31.00	29.33	30.00
11	23-Sep-22	78.33	71.33	79.33	76.67	81.00	85.67	30.00	30.33	30.00	31.00	30.00	30.33
12	24-Sep-22	81.67	80.33	78.00	76.67	83.67	98.67	28.67	30.33	31.33	30.00	30.33	30.67
13	26-Sep-22	77.67	81.33	86.00	75.00	76.67	80.67	30.33	31.33	30.00	30.00	30.67	29.67
14	28-Sep-22	77.67	81.33	81.00	89.67	84.33	85.00	29.67	31.67	29.67	30.00	30.67	29.67
15	30-Sep-22	70.33	69.33	83.00	96.00	84.00	87.33	30.33	30.33	30.00	30.33	29.67	29.33
16	01-Oct-22	75.33	74.00	81.00	88.00	85.33	87.33	29.67	30.33	30.33	29.33	30.33	30.00
17	03-Oct-22	73.33	78.33	78.67	88.67	83.67	87.33	27.33	29.00	30.33	31.00	30.00	30.33
18	05-Oct-22	73.67	71.33	78.00	87.33	82.67	85.33	30.33	29.33	30.33	30.00	30.00	30.33
19	07-Oct-22	75.33	84.33	82.67	90.67	80.67	93.00	30.33	29.67	30.00	30.33	30.33	31.00
20	09-Oct-22	88.33	84.67	87.33	87.33	88.33	87.33	30.67	30.00	29.67	30.00	30.33	30.33
21	11-Oct-22	88.67	83.33	88.00	80.00	90.00	83.00	31.00	30.33	30.00	30.33	29.33	30.33
22	13-Oct-22	79.00	90.00	87.33	92.33	95.67	88.67	29.67	29.33	29.67	30.33	29.67	31.00
23	15-Oct-22	78.67	76.67	88.67	89.00	99.00	92.33	29.67	29.33	30.33	30.33	31.00	30.33
24	17-Oct-22	77.67	86.33	89.00	89.33	87.33	86.00	31.00	30.33	31.00	30.00	30.00	30.00
25	19-Oct-22	95.67	86.67	80.33	88.00	90.00	84.33	30.33	30.33	31.00	30.33	29.33	30.33
26	21-Oct-22	90.33	89.33	79.00	88.33	88.67	89.00	31.00	29.67	30.33	30.33	31.00	117.00
27	23-Oct-22	88.00	83.00	88.00	88.33	88.33	89.00	30.33	30.00	31.00	30.67	30.67	30.67
28	25-Oct-22	88.33	89.00	90.00	95.67	86.67	88.33	29.00	29.67	29.33	30.00	29.00	30.33
29	27-Oct-22	87.00	88.33	88.33	80.00	86.00	93.00	30.33	29.67	30.33	30.33	30.00	29.67
Average		80.91	81.14	85.15	86.99	87.87	89.75	29.61	30.06	30.00	29.98	29.80	32.90

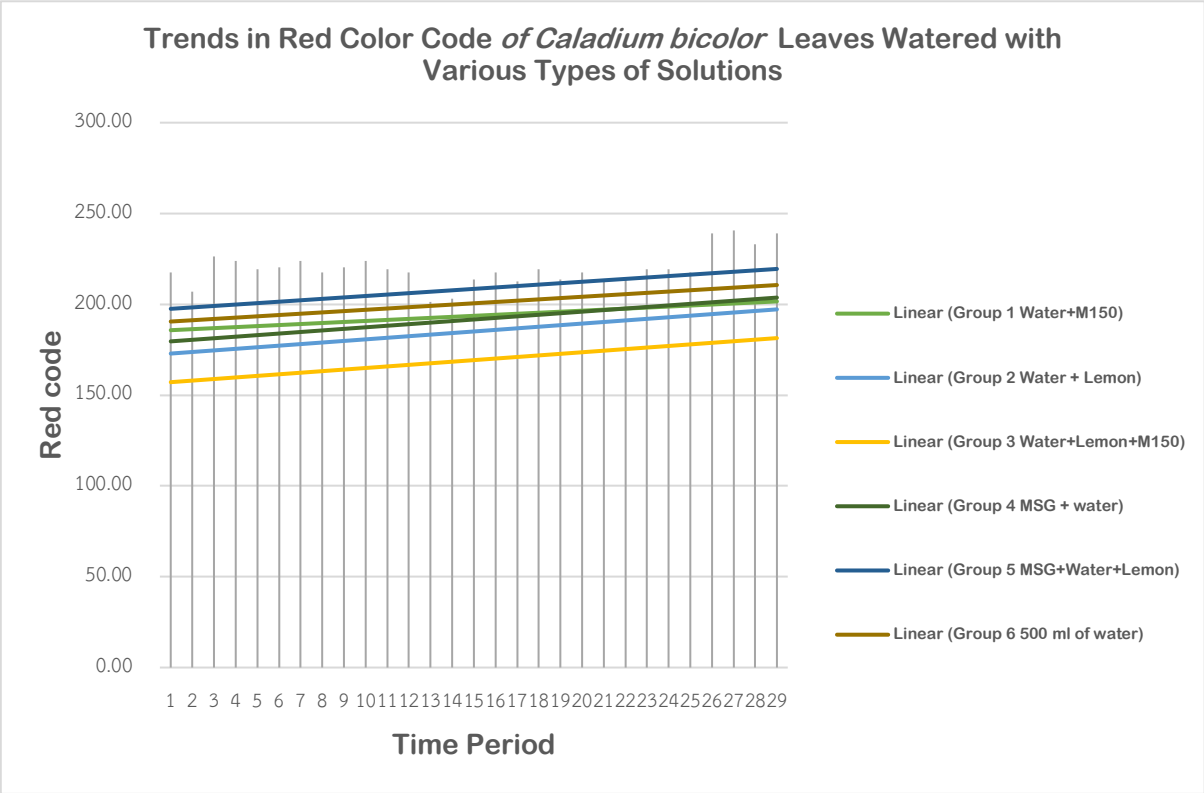
The table displays the effect of different experimental conditions in the soil moisture and temperature. This reveals that:

- **Watering the soil with 500 ml of water had the most significant impact.**
- **Watering with a mixture of water, lemon juice, and MSG had the least impact.**

No.	Date	RGB codes	Group 1 Water+M150	Group 2 water + lemon	Group 3 Water+Lemon+ M150	Group 4 MSG + water	Group 5 MSG+Water+L emon	Group 6 500 ml of water
1	03-Sep-22	R	212.67	164.00	183.67	217.67	177.00	153.33
		G	122.00	58.33	98.67	70.33	77.00	57.33
		B	236.00	89.33	117.67	114.33	99.00	85.33
2	05-Sep-22	R	175.67	205.00	147.33	205.67	207.00	205.67
		G	101.67	96.33	62.00	71.67	57.00	52.67
		B	103.00	144.33	93.00	151.33	110.00	91.67
3	07-Sep-22	R	200.33	211.00	225.00	171.67	186.67	226.33
		G	119.67	89.67	120.67	75.33	32.67	155.67
		B	127.00	148.00	151.67	108.33	72.67	335.67
4	09-Sep-22	R	176.33	196.33	171.33	158.33	218.00	224.00
		G	128.00	112.67	66.00	80.00	50.33	116.33
		B	138.67	121.33	108.67	122.67	104.33	144.33
5	11-Sep-22	R	192.00	146.67	112.67	175.33	213.67	219.33
		G	128.67	74.00	52.67	144.67	125.33	101.67
		B	127.00	75.67	50.67	92.33	145.67	141.00
6	12-Sep-22	R	220.33	201.67	198.67	211.33	209.33	159.33
		G	126.00	78.33	101.33	92.00	128.00	87.00
		B	156.00	137.00	137.67	148.33	127.33	124.67
7	15-Sep-22	R	176.33	196.33	171.33	158.33	218.00	224.00
		G	128.00	112.67	66.00	80.00	50.33	116.33
		B	138.67	121.33	108.67	122.67	104.33	144.33
8	17-Sep-22	R	212.67	164.00	183.67	217.67	177.00	153.33
		G	122.00	58.33	98.67	70.33	77.00	57.33
		B	236.00	89.33	117.67	114.33	99.00	85.33
9	19-Sep-22	R	220.33	201.67	198.67	211.33	209.33	159.33
		G	126.00	78.33	101.33	92.00	128.00	87.00
		B	156.00	137.00	137.67	148.33	127.33	124.67
10	21-Sep-22	R	176.33	196.33	171.33	158.33	218.00	224.00
		G	128.00	112.67	66.00	80.00	50.33	116.33
		B	138.67	121.33	108.67	122.67	104.33	144.33
11	23-Sep-22	R	192.00	146.67	112.67	175.33	213.67	219.33
		G	128.67	74.00	52.67	144.67	125.33	101.67
		B	127.00	75.67	50.67	92.33	145.67	141.00
12	24-Sep-22	R	190.67	147.00	123.00	200.67	217.00	217.67
		G	124.33	64.00	49.00	167.33	76.00	102.33
		B	145.67	62.33	53.33	123.00	140.67	143.33
13	26-Sep-22	R	139.00	174.33	157.67	122.00	201.33	158.00
		G	72.33	68.00	107.33	105.67	115.00	90.67
		B	110.33	80.67	125.00	154.33	132.67	106.00
14	28-Sep-22	R	203.00	124.00	164.33	179.00	170.00	193.67
		G	120.33	134.33	121.00	41.00	65.33	85.33
		B	126.00	114.33	125.33	72.00	118.00	121.33
15	30-Sep-22	R	173.33	212.67	180.33	201.67	213.67	193.33
		G	87.00	140.33	101.67	132.00	70.67	88.67
		B	103.67	117.67	121.67	150.00	127.00	118.33
16	01-Oct-22	R	190.67	147.00	123.00	200.67	217.00	217.67
		G	124.33	64.00	49.00	167.33	76.00	102.33
		B	145.67	62.33	53.33	123.00	140.67	143.33
17	03-Oct-22	R	173.33	212.67	180.33	176.00	185.33	158.67
		G	87.00	140.33	101.67	110.67	106.33	73.00
		B	103.67	117.67	121.67	154.67	108.67	123.00
18	05-Oct-22	R	190.67	147.00	109.33	175.33	213.67	219.33
		G	124.33	64.00	49.33	144.67	125.33	101.67
		B	145.67	62.33	52.00	92.33	145.67	141.00
19	07-Oct-22	R	173.33	212.67	180.33	201.67	213.67	193.33
		G	87.00	140.33	101.67	132.00	70.67	88.67
		B	103.67	117.67	121.67	150.00	127.00	118.33
20	09-Oct-22	R	190.67	147.00	123.00	200.67	217.00	217.67
		G	124.33	64.00	49.00	167.33	76.00	102.33
		B	145.67	62.33	53.33	123.00	140.67	143.33
21	11-Oct-22	R	173.33	212.67	180.33	201.67	213.67	193.33
		G	87.00	140.33	101.67	132.00	70.67	88.67
		B	103.67	117.67	121.67	150.00	127.00	118.33
22	13-Oct-22	R	173.33	212.67	180.33	201.67	213.67	193.33
		G	87.00	140.33	101.67	132.00	70.67	88.67
		B	103.67	117.67	121.67	150.00	127.00	118.33
23	15-Oct-22	R	192.00	146.67	112.67	175.33	213.67	219.33
		G	128.67	74.00	52.67	144.67	125.33	101.67
		B	127.00	75.67	50.67	92.33	145.67	141.00
24	17-Oct-22	R	192.00	146.67	112.67	175.33	213.67	219.33
		G	128.67	74.00	52.67	144.67	125.33	101.67
		B	127.00	75.67	50.67	92.33	145.67	141.00
25	19-Oct-22	R	212.67	164.00	183.67	217.67	177.00	153.33
		G	122.00	58.33	98.67	70.33	77.00	57.33
		B	236.00	89.33	117.67	114.33	99.00	85.33
26	21-Oct-22	R	214.00	234.00	237.67	218.00	239.00	236.67
		G	0.00	24.67	24.00	62.33	57.67	29.00
		B	54.33	44.00	34.33	85.33	125.67	93.00
27	23-Oct-22	R	230.67	240.67	221.33	219.00	214.00	214.67
		G	24.00	18.33	38.67	18.33	34.67	21.00
		B	86.33	84.33	88.33	54.67	71.00	79.33
28	25-Oct-22	R	218.67	215.67	233.00	212.00	228.00	224.67
		G	25.33	22.67	35.67	24.67	46.00	26.00
		B	107.67	66.00	72.00	77.33	85.67	91.00
29	27-Oct-22	R	229.67	239.00	229.00	218.00	237.00	224.00
		G	81.33	34.67	35.33	50.00	26.00	52.67
		B	79.00	92.33	86.00	88.33	88.67	84.33

Table 3 : RGB Color Codes of *Caladium bicolor* with Different Watering Solutions

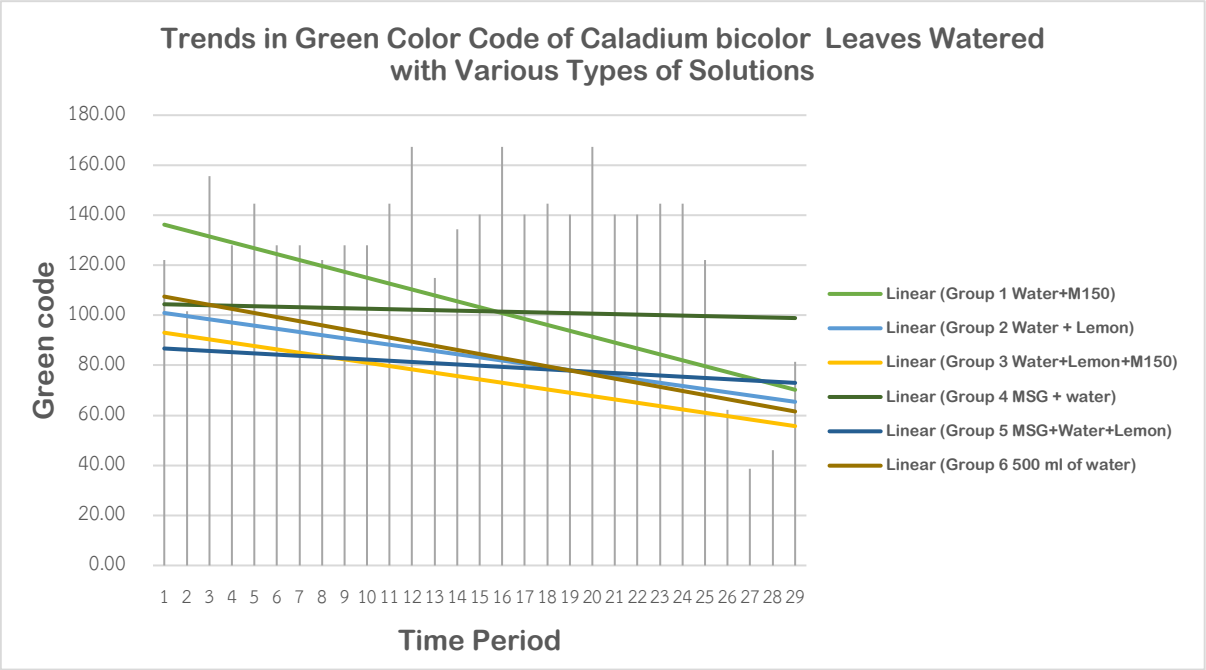
This result reveals that the color-changing abilities of *Caladium bicolor* tended to increase in the red and decrease in the green and blue when exposed to water and various experimental solutions.



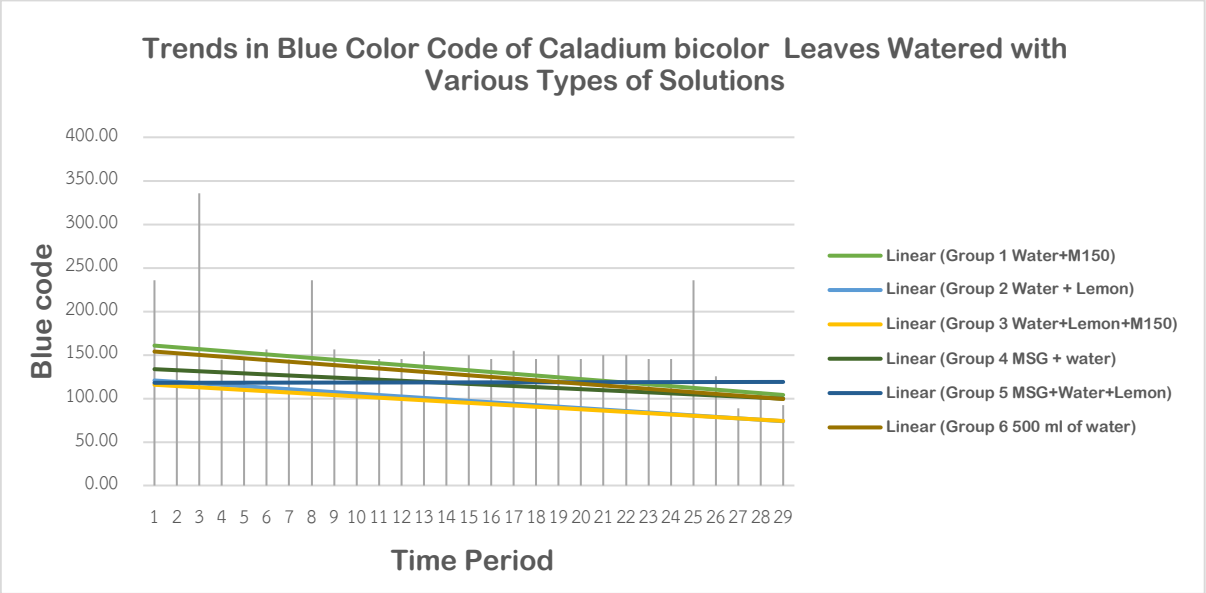
This graph demonstrates that Experiment 1 and Experiment 3 had the most significant impact on the plant's color-changing abilities.

It also suggests a clear trend of increased darkness in the red code of the plant when watered with different types of solutions, compared to when watered with water alone.

This RGB code indicates a decrease in the red color code of the *Caladium bicolor* that were watered with different types of solutions, except for those watered with a mixture of water and lemon and MSG, which showed a stronger tendency towards darker red color.



Based on the graph, the results of the RGB code suggest that the green color of the *Caladium bicolor* tends to decrease when subjected to different watering and experiment methods.



The RGB value of *Caladium bicolor* exhibited a decline in the blue color channel when subjected to various watering solutions, except for watered with a mixture of water, lemon, and MSG, which maintained a consistent level of blue color.

Table 4: Leaves Count of the *Caladium bicolor* Watered with Various Types of Solutions

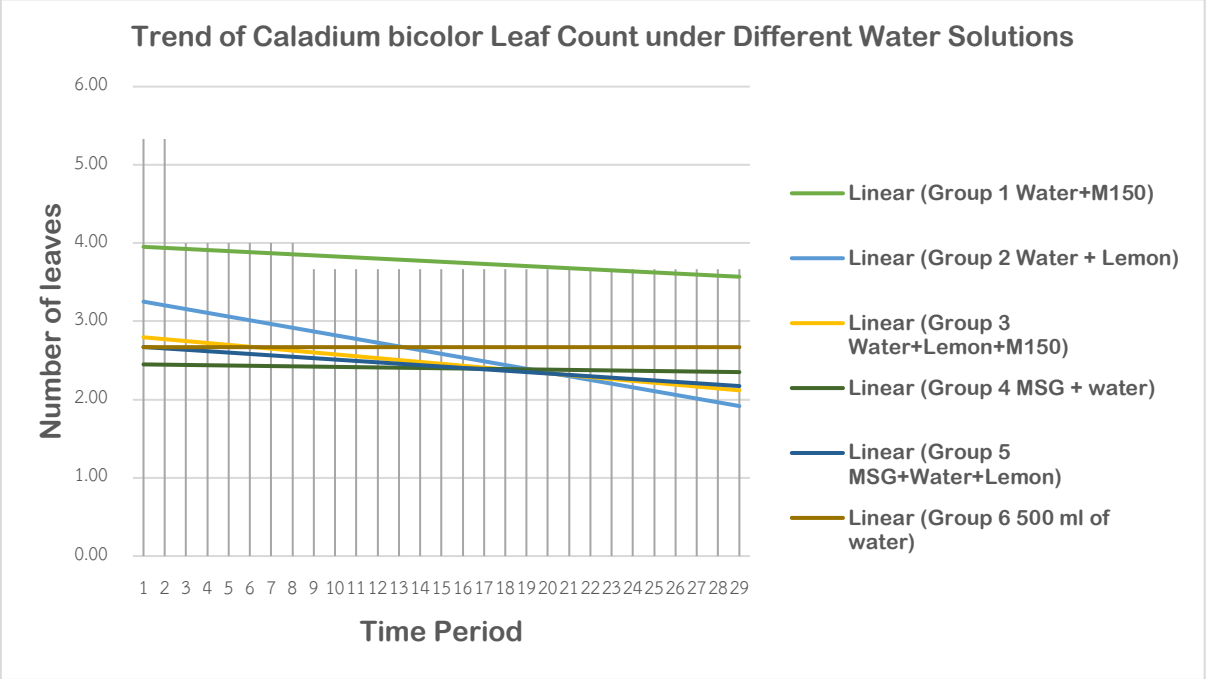
No.	Date	Average leaves					
		Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
		Water+M150	water + lemon	Water+Lemon+M150	MSG + water	MSG+Water+ Lemon	500 ml of water
1	03-Sep-22	4.00	5.33	4.00	2.33	3.67	2.67
2	05-Sep-22	4.00	5.33	4.00	2.33	3.67	2.67
3	07-Sep-22	4.00	2.67	2.67	2.33	2.33	2.67
4	09-Sep-22	4.00	2.67	2.33	2.33	2.33	2.67
5	11-Sep-22	4.00	2.67	2.33	2.33	2.33	2.67
6	12-Sep-22	4.00	2.67	2.33	2.33	2.33	2.67
7	15-Sep-22	4.00	2.67	2.33	2.33	2.33	2.67
8	17-Sep-22	4.00	2.67	2.33	2.33	2.33	2.67
9	19-Sep-22	3.67	2.00	2.33	2.67	2.33	2.67
10	21-Sep-22	3.67	2.00	2.33	2.67	2.33	2.67
11	23-Sep-22	3.67	2.33	2.33	2.67	2.33	2.67
12	24-Sep-22	3.67	2.33	2.33	2.67	2.33	2.67
13	26-Sep-22	3.67	2.33	2.33	2.67	2.33	2.67
14	28-Sep-22	3.67	2.33	2.33	2.67	2.33	2.67
15	30-Sep-22	3.67	2.33	2.33	2.33	2.33	2.67
16	01-Oct-22	3.67	2.33	2.33	2.33	2.33	2.67
17	03-Oct-22	3.67	2.33	2.33	2.33	2.33	2.67
18	05-Oct-22	3.67	2.33	2.33	2.33	2.33	2.67
19	07-Oct-22	3.67	2.33	2.33	2.33	2.33	2.67
20	09-Oct-22	3.67	2.33	2.33	2.33	2.33	2.67
21	11-Oct-22	3.67	2.33	2.33	2.33	2.33	2.67
22	13-Oct-22	3.67	2.33	2.33	2.33	2.33	2.67
23	15-Oct-22	3.67	2.33	2.33	2.33	2.33	2.67
24	17-Oct-22	3.67	2.33	2.33	2.33	2.33	2.67
25	19-Oct-22	3.67	2.33	2.33	2.33	2.33	2.67
26	21-Oct-22	3.67	2.33	2.33	2.33	2.33	2.67
27	23-Oct-22	3.67	2.33	2.33	2.33	2.33	2.67
28	25-Oct-22	3.67	2.33	2.33	2.33	2.33	2.67
29	27-Oct-22	3.67	2.33	2.33	2.33	2.33	2.67

This result illustrates that using 500 ml of water in watering the plant did not affect the number of leaves significantly. However, using the experimental solutions led to a reduction in the plant's number of leaves.

Table 5 : Effect of Various Water and Solutions on Mineral Content and Soil pH

Mineral Elements	Group 1 Water+M150	Group 2 water + lemon	Group 3 Water+Lemon +M150	Group 4 MSG + water	Group 5 MSG+Water+Lemon	Group 6 500 ml of water
Ammonium	very low	very low	very low	very low	very low	very low
Nitrates	non	non	non	non	non	non
Phosphorus (P)	very low	very low	very low	very low	very low	very low
Potassium (K)	moderate	high	high	low	low	high
pH	5	2	2	7	5	7

This table illustrates that the mineral content and soil pH of plants that were grown in various solutions. The results suggest that low levels of nitrogen and phosphorus in the experimental solutions did not have a substantial impact on plant coloration. However, the plants that were watered with a solution having high potassium content and low soil pH produced acidic conditions. These conditions had a significant effect on the plant coloration.



Watering plants with 500 ml of water did not affect the average number of leaves, while other solutions tested resulted in a decrease in the number of leaves. Specifically, the group treated with lemon had a significantly lower number of leaves.

Table 6 : ANOVA Analysis of Environmental Parameters, RGB Codes, and Leaves Count

ANOVA (Analysis of Variance)						
Source of Variation		Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F	Sig.
Humidity Air	Between Groups	.000	5	.000	.000	1.000
	Within Groups	10059.305	516	19.495		
	Total	10059.305	521			
Temperature Air	Between Groups	.000	5	.000	.000	1.000
	Within Groups	1024.442	516	1.985		
	Total	1024.442	521			
Humidity	Between Groups	5459.494	5	1091.899	24.897	.000
	Within Groups	22630.092	516	43.857		
	Total	28089.586	521			
Temperature	Between Groups	11.648	5	2.330	.857	.510
	Within Groups	1401.908	516	2.717		
	Total	1413.556	521			
Red	Between Groups	79319.826	5	15863.965	14.079	.000
	Within Groups	581436.46	516	1126.815		
	Total	660756.285	521			
Green	Between Groups	61393.51	5	12278.702	5.042	.000
	Within Groups	1256607.77	516	2435.286		
	Total	1318001.28	521			
Blue	Between Groups	101552.429	5	20310.486	8.881	.000
	Within Groups	1180050.276	516	2286.919		
	Total	1281602.705	521			
Leaves	Between Groups	117.877	5	23.575	19.490	.000
	Within Groups	624.161	516	1.210		
	Total	742.038	521			

The result shows that the color-changing capabilities and leaves count of *Caladium bicolor* are significantly influenced by relative humidity, with sig values below 0.005.

Table 7 : Correlation Analysis Showing the Relationship Between Environmental Parameters, Color Codes, and Leaves Count

Correlations									
Source of Variation		Air		Soil		Red	Green	Blue	Leaves
		Humidity	Temperature	Humidity	Temperature				
Humidity Air	Pearson Correlation	1	.125**	-.066	-.080	.114**	-.148**	-.190**	-.029
	Sig. (2-tailed)		.004	.132	.069	.009	.001	.000	.502
	N	522	522	522	522	522	522	522	522
Temperature Air	Pearson Correlation	.125**	1	-.036	.053	-.043	.022	-.045	-.047
	Sig. (2-tailed)	.004		.416	.225	.331	.624	.302	.287
	N	522	522	522	522	522	522	522	522
Humidity	Pearson Correlation	-.066	-.036	1	.093*	.196**	-.032	.075	-.076
	Sig. (2-tailed)	.132	.416		.033	.000	.461	.089	.083
	N	522	522	522	522	522	522	522	522
Temperature	Pearson Correlation	-.080	.053	.093*	1	-.036	-.004	-.041	-.099*
	Sig. (2-tailed)	.069	.225	.033		.418	.925	.347	.024
	N	522	522	522	522	522	522	522	522
Red	Pearson Correlation	.114**	-.043	.196**	-.036	1	.189**	.309**	-.089*
	Sig. (2-tailed)	.009	.331	.000	.418		.000	.000	.042
	N	522	522	522	522	522	522	522	522
Green	Pearson Correlation	-.148**	.022	-.032	-.004	.189**	1	.517**	.040
	Sig. (2-tailed)	.001	.624	.461	.925	.000		.000	.367
	N	522	522	522	522	522	522	522	522
Blue	Pearson Correlation	-.190**	-.045	.075	-.041	.309**	.517**	1	.024
	Sig. (2-tailed)	.000	.302	.089	.347	.000	.000		.588
	N	522	522	522	522	522	522	522	522
Leave	Pearson Correlation	-.029	-.047	-.076	-.099*	-.089*	.040	.024	1
	Sig. (2-tailed)	.502	.287	.083	.024	.042	.367	.588	
	N	522	522	522	522	522	522	522	522
**. Correlation is significant at the 0.01 level (2-tailed).									
*. Correlation is significant at the 0.05 level (2-tailed).									

The analysis indicates a significant positive correlation between red color-changing and relative humidity in the soil and air. This occurrence of red color-changing tends to increase with higher relative humidity. Evidently, humidity plays a significant role in the color-changing abilities of *Caladium bicolor.*

Conclusion

The study revealed that various environmental variables listed below have a significant impact on the color-changing abilities of *Caladium bicolor*.

- **soil pH**
- **soil temperature**
- **soil moisture**
- **mineral content**
- **air temperature**
- **light intensity**

The results also demonstrate that increasing soil moisture leads to a darker red coloration, as evidenced by using 500 ml of water. Additionally, the experiment utilizing mixed water, lemon juice, and energy drink with a high potassium and low pH level demonstrated a darker red coloration, which indicates that this solution may be suitable for cultivating the plant. Consequently, watering with mixed water, lemon juice, and energy drink is the optimal approach for adapting to planting *Caladium bicolor*, as this cultivates an environment suitable for the plant's moisture requirements, high potassium level, and low soil pH levels.

SIGNIFICANCE OF THE STUDY

This research has several potential benefits to people and the economy as it provides valuable guidance on the factors that impact the growth and color-changing abilities of *Caladium bicolor*. This plant can purify indoor air by releasing moisture, which leads a healthier and fresher environment. As this plant becomes in-demand and popularity, it may contribute to the local economy by creating job opportunities and boosting economic growth.

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APPENDICES


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