CREATIONS de UiTM

INTERNATIONAL MEGA INNOVATION CARNIVAL 2023

Fostering Innovation to Global Communities

LET'S CRAFT A BETTER WORLD TOMORROW!

ePROCEEDING

20th MAY 2023

UNIVERSITI TEKNOLOGI MARA
CAWANGAN SELANGOR, KAMPUS DENGKIL
MALAYSIA

ORGANISED BY:

UNIVERSITI TEKNOLOGI MARA

Pusat Asasi

Effect of Different Primary Light Colours on Growth of Betelvine (*Piper Betle*)

***Satishkumar Palaniappan, Mohd Muzammir Firdaus Abu Bakar**

STEM Foundation, STEM Foundation Centre, University Malaysia Terengganu, 21300 Kuala Terengganu, Terengganu, Malaysia

*E-mail: a2587@ocean.umt.edu.my

ABSTRACT

This study aimed to investigate the effect of different primary light colors on the growth of betlevine (Piper betle). Betlevine plants were grown under four different primary light colors which are red, blue, green, and white light. The growth parameters will be leaf area, fresh weight, and dry weight, which were measured after three weeks of growth under different light conditions. The results showed that plants grown under red and blue light had significantly higher plant height, leaf area, fresh weight, and dry weight compared to those grown under green. The plants grown under white light had intermediate growth characteristics between those grown under red/blue and green light. The study suggests that red and blue light may positively affect the growth of betlevine, while green light may have a negative effect. The findings may have practical implications for the cultivation of betlevine and other crops that require specific light conditions for optimal growth and development. Further research is needed to elucidate the underlying mechanisms of the observed effects and to optimize the light conditions for betlevine cultivation.

Keywords: Betlevine; light colours; growth

INTRODUCTION

The name "betelvine" (Piper betle) is a binomial nomenclature, combining the terms "genus" and "species" and the botanical name for (Piper betle) is betel. This study used betel trees to study tree leaves. Light is one of the most important environmental factors for plant growth, as it starts with the absorption of light and continues through these processes and the fixation of CO_2.

Studies when betel trees are exposed to red, blue and green light as well as sunlight are carried out. The percentage of blue or red-light absorption by plant leaves is about 90%. Green light can penetrate further into the leaf than red or blue light, and continuous blue light is effective in inducing photomorphogenic responses. The combination of red and blue light is used nowadays more and more in research but also in commercial horticulture because it is the most effective wavelength band for photosynthesis at the leaf level in the short term and long terms. The betel tree was chosen in the study due to its many benefits, such as controlling blood sugar levels, reducing cholesterol levels, anti-cancer effects, and anti-microorganism effects.

However, due to the lack of agricultural land and the increase in the number of people, the productivity of photosynthesis must be increased. P. betel is also important due to the increase in global CO_2 concentration, so more plants are needed to convert CO_2 into O_2 to avoid global warming.

INNOVATION DEVELOPMENT

The most important details in this text are the preparation of four boxes to hold a betel tree, the addition of three different colours of lighting to each box, and the testing of the betel tree growth. To help the plant become used to daily living, the lights will be open in the morning, during the day, and closed at night. To test the betel tree growth, three readings should be taken such as the initial reading, the second reading, and the last reading. To draw leaves on milli grid paper, a pencil should be used to draw a line along the perimeter of the leaf and mark a pick on each box that fills half or more of the box. The surface area of a grid box can be calculated by entering the value in the length times the width formula. This method should be done in the second and third weeks.

Table 1 The chemicals, apparatus, and instruments used in the study

Chemical	**Apparatus**	**Instruments**
Normal fertilizer	Red LED Light	Betel leaf × 4
	Blue LED Light	Big box× 4
	Green LED Light	Millimeter grid paper

Results

Figure 2 shows that red and blue light growing plants have the highest leaf area compared to other plants grow lights in the second week, which may have been result from the starting feature. Further in Figure 3, on most red days has a large surface area from the blue plant grows light. But the surface area of the green light decreased.

Research studies have shown that different primary light colours have varying effects on the growth and development of betel vine. Red light is essential for the vegetative growth of betel vine, increasing leaf area, plant height, and leaf number. Blue light promotes the formation of chlorophyll and is important for the growth and development of the plant. Green light is least effective in promoting the growth of betel vine, leading to reduced leaf area, dry weight, and wilted. White light is a combination of all the primary colours and is essential for the overall growth and development of betel vine. The objectives of the study have been successful, but the experiment needs to be intensified. This study can provide knowledge on how to plant trees and ideas on how to produce a lot of results from planting trees in different light.

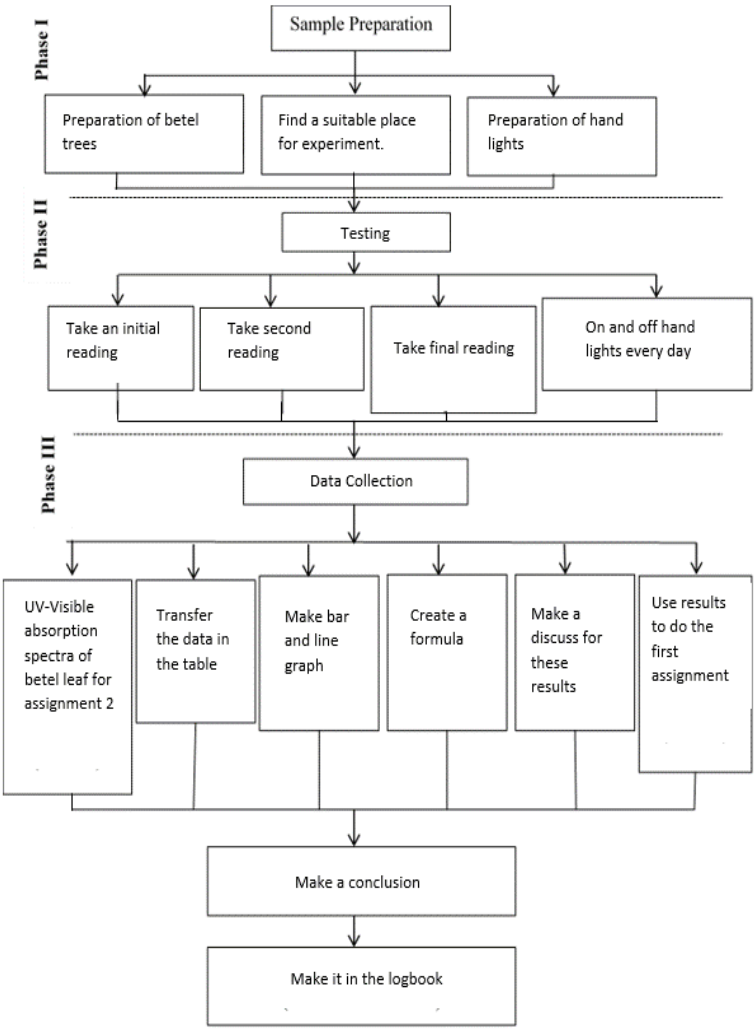

Figure 1: Flow chart of research methodology

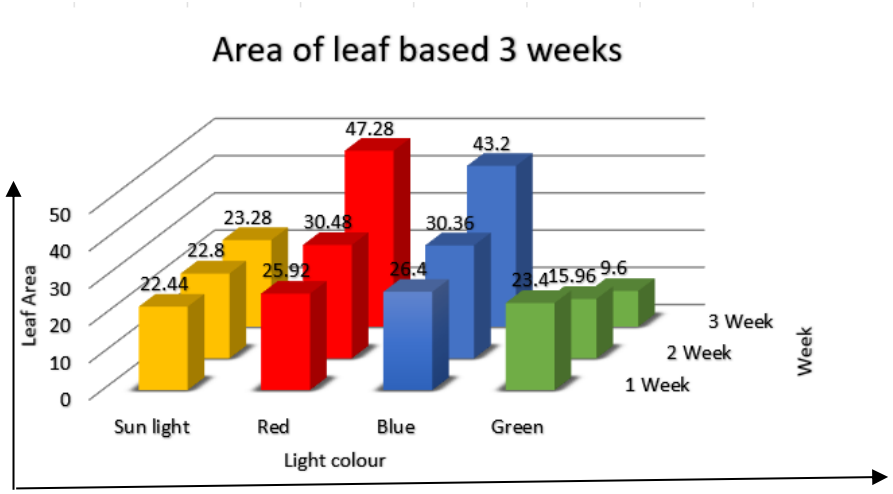

Figure 2: Area of leaf based 3 weeks in bar graph

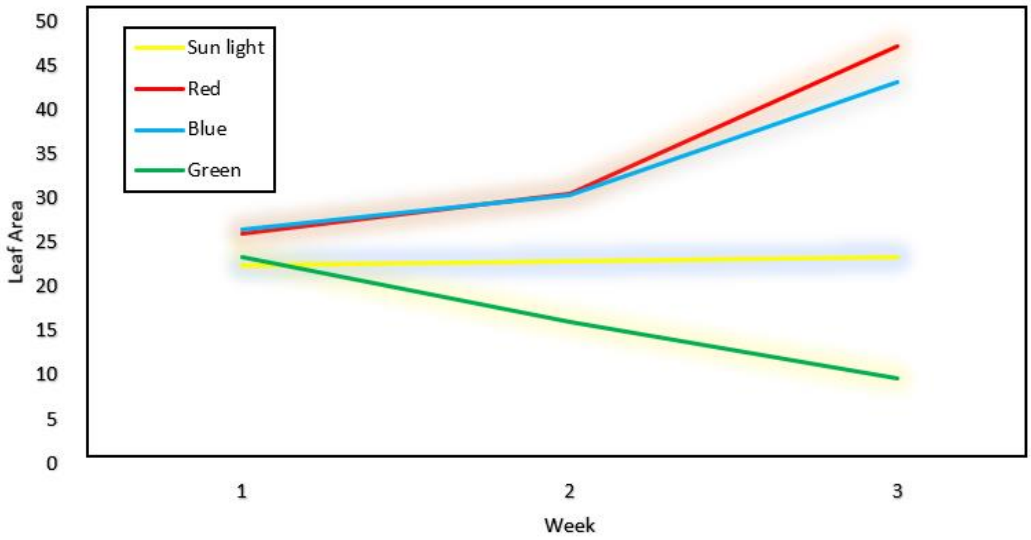

Figure 3: Area of leaf based 3 weeks in line graph

COMMERCIAL POTENTIAL

Piper betle, commonly known as betlevine, is a plant of commercial potential due to its many uses in traditional medicine, culinary arts and economic uses. It has medicinal uses, such as treating respiratory problems, digestive disorders, and skin diseases, and contains bioactive compounds such as alkaloids, phenolics, and essential oils, which have antimicrobial, anti-inflammatory, and antioxidant properties. It also has culinary uses, such as chewing it as a stimulant and breath freshener, adding flavour to dishes, and adding flavour to salads, smoothies, and other health drinks. Its cultivation has the potential to be a profitable enterprise, as it is in high demand for its various uses.

CONCLUSION

Research has found that the growth and development of betlevine (Piper betle) can be influenced by different primary light colours. Red light is essential for vegetative growth and can increase leaf area, blue light is important for the formation of chlorophyll and photosynthesis, and green light has a negative effect on growth. White light, which contains all primary colours, is essential for the overall growth and development of betlevine. Further research is needed to determine the most effective light conditions for betlevine cultivation. All research objectives have been achieved.

ACKNOWLEDGEMENT

The most important details in this text are the appreciation for the supervisor's advice, motivation, and assistance during the research project. The financial assistance from the University Malaysia Terengganu (UMT) and the library staff's assistance with accessing relevant literature and resources were also appreciated. The supervisor's knowledge and insight had a crucial role in influencing the technique and approach.

REFERENCES

[1] Fukuda, N., Fujita, M., Ohta, Y., Sase, S., Nishimura, S., & Ezura, H. (2008). Directional blue light irradiation triggers epidermal cell elongation of abaxial side resulting in inhibition of leaf epinasty in geranium under red light condition. *Scientia Horticulturae*, *115*(2), 176-182.

[2] Terashima, I., Fujita, T., Inoue, T., Chow, W. S., & Oguchi, R. (2009). Green light drives leaf photosynthesis more efficiently than red light in strong white light: revisiting the enigmatic question of why leaves are green. *Plant and cell physiology*, *50*(4), 684-697.

[3] McNellis, T. W., & Deng, X. W. (1995). Light control of seedling morphogenetic pattern. *The plant cell*, *7*(11), 1749.

[4] McCree, K. J. (1971). The action spectrum, absorptance and quantum yield of photosynthesis in crop plants. *Agricultural Meteorology*, *9*, 191-216.

[5] Hogewoning, S. W., Trouwborst, G., Maljaars, H., Poorter, H., van Ieperen, W., & Harbinson, J. (2010). Blue light dose–responses of leaf photosynthesis, morphology, and chemical composition of Cucumis sativus grown under different combinations of red and blue light. *Journal of experimental botany*, *61*(11), 3107-3117. [6] American Psychological Association. (n.d.). Divisions. Retrieved October 28, 2018, from http://www.apa.org/about/division.

[6] Muhammad Ilhamdi Rusydi ,Arrya Anandika ,Budi Rahmadya ,Khandra Fahmy, Andrivo Rusydi (2019) Implementation of Grading Method for Gambier Leaves Based on Combination of Area, Perimeter, and Image Intensity Using Backpropagation Artificial Neural Network https://www.mdpi.com/2079-9292/8/11/1308

[7] Xiao Xue Fan, Zhi Gang Xu, Xiao Ying Liu, Can Ming Tang, Li Wen Wang, Xue lin Han (2021) Effects of light intensity on the growth and leaf development of young tomato plants grown under a combination of red and blue light https://www.sciencedirect.com/science/article/pii/S0304423813000332?via%3Dihub

[8] Xin Zhang, Tianmeng Fang, Yuqing Huang, Shengguan Cai.(2022)Transcriptional regulation of photomorphogenesis in seedlings of Brassica napus under different light qualitiesPlanta,256: 77 https://link.springer.com/article/10.1007/s00425-022-03991-3