

Effect of different light on the growth and development of pea plant

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ABSTRACT

This experiment was conducted during Winter season of 2022-2023 (November- December) in Botany Department of Maharishi university of information for the study of the effect of different light colour intensity on the growth and development of Pea plant. (*Pisum sativum*) was investigated. Pea plants were grown under four different Colours of light as blue, red, green, yellow and one Natural sunlight and the growth parameters such as plant height, stem height, diameter of stem, number of leaves, number of branches day to first harvest, and days to final harvest. The results that blue light promoted the growth of pea plants the most, followed by red light, while the green and yellow light had the least effect on the growth of the growth of the pea plants. But it's effect was not as strong as that blue and red light. The finding suggests that different colours of the light have different effects on the growth and development of the plants.

Key Ward: different light, growth and development, Pea Plant,

Date of Submission: 23-05-2023

Date of acceptance: 04-06-2023

I. Introduction

Light is the original source of energy for plant photosynthesis and growth. A wide range of signals and information for morphogenesis and many other physiological processes is triggered by light (Chen *et al* 2014). Different characteristics of light such as spectral composition (wavelengths), intensity, duration and direction can influence plant growth and development. Light is not only the energy for photosynthesis but also a signal for plant morphogenesis (Chen *et al* 2014). Light quality and photoperiod have an important impact on plant growth and development, as well as yield and quality. Photoperiod can regulate plant germination, growth, and flowering (Cao *et al.*, 2014; Bian *et al.*, 2015). Light quality affects plant height, chlorophyll content, antioxidant capacity, yield, and quality (de Wit *et al.*, van Gelderen *et al.*, 2018). Red and blue light is the main absorption wavelengths of plants (Ptushenko *et al.*, 2020). Plants are capable of absorbing and utilizing light energy for photosynthesis, growth, and development.

Different colours of light have different wavelengths, and plants can utilize different colours of light in different ways. Light is a major environmental factor that affects plant growth and development, and studies have shown that the quality and quantity of light affect plant growth and development in various ways. The effect of different colours of light on the growth and development of plants has been studied in many plant species. In this study, we investigated the effect of different colours of light on the growth and development of pea plants.

Study site

This study was conducted in the Botany lab of Maharishi University of Information Technology. Which is located in Lucknow. Uttar Pradesh at IIM road.

II. Material and Method

The experiment was conducted in the in Botany Department of Maharishi University of Information Technology. Lucknow, Uttar Pradesh, in the month of November, the specific materials used for growing plants under different colours of light will depend on the specific experiment being conducted, the type of plants being grown, and the growing method being used. The number of materials used for growing plants under different colours of light will depend on the specific setup and goals of the plant growth experiment. However, some common materials used in such experiments include: Plant material which is taken for this experiment is *Pisum sativum* (pea plant) this belong to the Legumes family. To grow pea plants under different light

conditions, you will need the following materials:

1. Seeds of (*Pisum sativum*) of variety AP3 were taken for the experiment.
2. Different colours of led blue, red, green, yellow and were taken.
3. Natural water was taken for growth and development of plant.
4. Electronic wire, electronic board, taken large size of boxes for provided artificial light to plant for experiment.
5. Five pots were taken four pots for different colours of light (blue, red, yellow, Green) pots were covered in boxes to provide only wanted colours of light, and one pots for control under the sun light.
6. Every pot was labeled according to the different colours of light.
7. Potting soil in the pot was taken for a suitable growing media for the pea plant.
8. All the materials for the plants were taken including fertilizer, watering cans and gardening tools and were sterilized.
9. Measuring instruments like ruler, thread, weighing scale were taken.
10. Data was recorded at each and every step.
11. Levels and marker were taken.

Seed had taken pea seed (*Pisum sativum*) from seed shop. The Variety of Pea was Ap3. I had taken five cartons prepare by four different different colours of led lights blue, red, yellow, green, with wire and boards. And taken five pots filled with garden soil. And four pots kept into the covered boxes (blue, red, yellow, green) to provide only wanted colour and one pot kept under the sun light as a control. The adequate amount of moisture and suitable growing conditions such as. The seeds of (*Pisum sativum*) pea seed var.. AP3 were used as test material. The healthy and bold seeds were selected for experiment. Total Ten seeds were sown in each pots in the month of November. After 6 days of sowing seeds I checked The viability of seeds for the first time under the following light. The photoperiod was 8 hours in every day and 16 hours dark period. The growth and development of pea plants was monitored. Data were recorded different morphological Parameters, like as height of plant, number of leaves, length of leaves, width of leaves, number of branch, number of compound leaves, number of nods, yield per plant to check the effects of different colours of light.

III. OBSERVATION AND RESULT

Effect of Blue light on pea plant

After showing 10 seeds under blue light, four seeds had germinated in six days and two seeds germinated another day. Total 6 seed germinated out of ten seeds under blue led light. The plant height of grown plant was different.(table.1). Leaves had grown on plant after two weeks. The types of leaves were compound leaves. The number of leaves and quantity of compound leaves were different. after one day slender whiplike or threadlike produced long tendrils usually from the node of a stem, of plant. In blue light, leaves arising from the upper side of the plant. Leaves were looking natural green colour. Compound leaves arising more gap on stem And the surface area of leaves were less and thick and stem was long means promotes stem growth more than leaves (fig.3) Blue light regulates plant growth and development. And they influence leaf coloration and promote vegetative growth stimulating plant growth and promoting leaf expansion affecting transpiration rates and water balance in plants .blue light inhibit elongation or extension growth in plants. This is why plants grown under predominantly blue light was appear compact and stocky.

Effect of Red light on pea plant

After showing 10 seeds under red light, two seeds had grown in six days and four seeds had grown after two days. Total 6 seeds germinated out of ten seeds under red led light. The plant height of grown plant was different. leaves had grown on plant after two weeks like blue plant. The types of leaves were compound leaves. The number of leaves and quantity of compound leaves were different in number. On the next day tendrils arising on plant stem. Leaves was looking light yellowish colour means plant show chlorosis.(figure.2) After one month all plant had withered.(figure)Red light had promoted stem elongation and internode spacing, leading to taller plants. It is particularly important in situations where plants was reaching for light, such as in dense vegetation or when grown indoors under artificial lighting.

Effect of Yellow light on pea plant

After showing 10 seeds under yellow light, one seed had germinated after one week and six seeds had germinate after two days. Total 7 seeds germinated out of ten seeds under yellow light. The plant height of grown plant was different. leaves had grown on plant after two weeks like blue and red plant. The types of leaves were compound leaves. The number of leaves and quantity of compound leaves were different in number. On other day short tendrils had arises on plant stem. Leaves was looking dark green colour. After one month all plants bending towards light and found more dry soil.(figure.3) on next day plant was showing temporary wilting. and on next day plant was looking natural.

Effect of Green light on pea plant

After showing 10 seeds under green light, two seeds had grown in six days and two seeds grown next day and three seeds grown after 4 days. Total 7 seeds germinated out of ten seeds under green light. The plant height of grown plant was different. leaves had grown on plant after two weeks on plant. The types of leaves were compound leaves. The number of leaves and quantity of compound leaves were different in number after 10 days more leaves are present on green light plant and plants had more number of tendrils and leaves were looking natural green colour. (Figure.4) After one month no difference seen in green light plant. The energy utilization of green light for photosynthesis is relatively low compared to other light plant.

Effect of Sun light on pea plant

After showing 10 seeds under sun light, one seed had grown in six days and one seed grown next day and three seeds grown after 4 days. Total five seeds germinated out of ten seeds under sun light. The plant height of grown plant was different. leaves had grown on plant after two weeks on plant. The types of leaves were compound leaves. The number of leaves and quantity of compound leaves were different in number after 16 days' plant were looking more green and more healthier in sun light. leaves were arising from base of the stem and natural tendrils raised.(figure. 5) after one month not any symptoms show. Plant was looking natural.

IV. DISCUSSION

Blue light was primarily responsible for controlling phototropism, which was the bending or growth of plants in response to light. It promotes upward growth and helps plants orient their leaves and stems towards the light source also influence seed germination. Blue light is influence stomatal opening, affecting transpiration rates and water balance in plants. It provides energy for the light-dependent reactions of photosynthesis, stimulating plant growth and promoting leaf and stem elongation. Blue light is inhibiting elongation or extension growth in plants. This is why plants grown under predominantly blue light appear compact and stocky. Red light also facilitating plant growth and development. Red light also promotes stem elongation and internode spacing, leading to taller plants. It is particularly important in situations where plants are reaching for light, such as in dense vegetation. According to (Hyeonhye kim) et al 2004 red and blue light was an effective light source for several crops. Which is similar to my experiment. Yellow light is less effective in driving photosynthesis compared to other as blue and red light. Green light can affect plant morphology by influencing various processes, such as leaf expansion and lead to reduced plant growth. But in Yellow light also still contribute to plant growth and development. and in yellow light plant have more Phototropism. Under yellow light grow more number of plant. According to Qianru yang *et al.* 2019 yellow light treatment had beneficial effects on shoot number. Which is similar to my experiment.

V. CONCLUSION

Each type of light supports plant growth and development in a unique way. Blue light More effective for seed germination, the first and foremost seed germinate was in seen in blue Light. and Blue light regulates plant growth and development better than other plant. height of the plant was mostly seen in blue light. Leaves arising from the upper side comprising other light plant. Leaves was looking natural green colour in blue light. And found long stem in blue light plant. Blue light is primarily responsible for controlling phototropism, which is the bending or growth of plants in response to light. It promotes upward growth and helps plants orient their leaves and stems towards the light source. affecting transpiration rates and water balance in plants. Red light primarily supports the growth of stems and expansion of leaves and regulates flowering, germination, and dormancy. But after some time leaves was looking light yellowish colour. Red light was showing chlorosis in plant leaves. In Yellow Light Seeds were germinated after a long time but were germinated in large numbers of seed. A lot of photoperiodism was seen in yellow light and in the comparison of other light plant. Yellow light was less effective in photosynthesis compared to other, such as blue and red light. In green may promote whole plant photosynthesis by increasing overall photosynthesis in individual leaves, and by transmitting light to lower leaf layers and the height of the plant under the green light was small in size. But in green light plant more leaves was present than other and more tendrils was present in green light. In sun light, seeds were germinated after long time but plant was looking healthy, plant height was medium plant leaves was looking natural leaves were arising based of stem. More tendrils arising of the plant. Overall blue light is best light for plant growth and development. But the growth seen in red light was also good.

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Table 1. Effect of different light on the Pea plant.

Sr. No.	Light	Plant height (In Cm)						
		10 Day	20 Day	30 Day	40 Day	50 Day	60 Day	At final harvest
1.	Blue	8.8	15.5	19.2	24.1	28.3	30.1	35.1
2.	Red	3.6	6.7	9.3	13.2	18.1	21.3	25.2
3.	Yellow	2.5	4.7	6.8	11.2	15.3	19.2	24.6
4.	Green	4.1	8.8	11.1	16.8	20.2	22.5	26.4
5.	Sun	1.6	3.5	5.2	9.3	14.1	17.2	23.2



Fig.1



Fig.2



Fig.3



Fig.4



Fig.5