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EFFECT OF DIFFERENT LIGHT SPECTRUM ON THE FLOWER INDUCTION OF SUN FLOWER-SOL SEEKER GOLDEN NECTAR- *HELIANTHUS ANNUUS (Helianthus)*

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ABSTRACT

Sunlight is one of the factors why flowers bloom beautifully. Yet it is one of the problems of other farms who have business regarding the cuttings of the ornamentals. The Danziger Flower Farm focuses on the production of ornamental cuttings, that made them the number one producer of ornamental in the locality of Israel and other countries like Guatemala, Kenya, USA, China and other parts of the world. Light plays a big role in the physiological process of plants. A comparison of different light spectrums helped the farm to use the best light in the production of quality and quantity of cuttings.

The project was implemented at Danziger Flower Farm (Bet Dagan). It had three (3) treatments with three (3) replications. The design Completed Randomized Design (CRD) which requires a greenhouse as the project needs to be in a control environment. The project is implemented once. This study was conducted on Sunflower- Sol Seeker Golden Nectar. Each block has 8 pots and each pot has three plants. The data gathering started during the vegetative stage of the plants.

In conclusion, the best light to use in the production of a sunflower cuttings is red light. Using natural and normal light causes low production of cuttings due to high induction of flowering. It is recommended to sunflower farmers to use red light in controlling the flowering of sunflowers for quality and quantity of cuttings. Further, nursery owners or seedling producers using asexual propagation should use red light spectrum in controlling extensive flowering of plants. Furthermore, more studies on the effect of the different light spectrums on the quantity of *Helianthus* leaves and flower production should be conducted.

Keywords:

Red Light, Light spectrum, sol seeker golden nectar

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A. INTRODUCTION

Helianthus is a genus comprising about 70 species of annual and perennial flowering plants in the daisy family Asteraceae. The common names “sunflower” and “common sunflower” typically refer to the popular annual species *Helianthus annuus* (*H. annuus*), whose round flower heads in combination with the ligules look like the sun. This and other species, notably Jerusalem artichoke (*H. tuberosus*), are cultivated in temperate regions and some tropical regions as food crops for humans, cattle, and poultry, and as ornamental plants. The species *H. annuus* typically grows during the summer and into early fall, with the peak growth season being mid-summer.

A plant needs light to grow by means of photosynthesis, a process that involves energy fixation and sugar production. But in addition to providing energy, light also plays a key role in many other plant processes, such as photomorphogenesis and photoperiodism. All these processes are influenced by the light spectrum, which is the distribution of the light across the electromagnetic spectrum.

The light spectrum in the range of 300 to 800 Nanometer (nm) causes a developmental response in the plant. Additionally, UV and infrared (IR) light are known to play a role in plant morphogenesis.

According to research Phytochromes are sensitive to red light (Phytochromes, 2020) and infrared light. Phytochromes have the biggest influence on photomorphogenesis. Stem elongation, shade avoidance, chlorophyll synthesis and the flowering response are all functions typical controlled by phytochrome.

Danzinger-Bet Dagan Branch focuses on the production of cuttings or plant materials. This project focused on one of the latest varieties of sunflower which is the Sol Seeker Golden Nectar- *Helianthus annuus*.

Danzinger produce quality plant materials. Quality Planting Material (QPM) is an essential input in agriculture and forestry for maximizing revenues, improving adaptability to adverse environmental conditions, and meeting quality raw material requirements of markets. Quality planting materials of a crop or a plant is a very important component of crop production as good cuttings interacts with the good environment around it and determines the health of the crop or plant.

The Sol Seeker Golden Nectar- *Helianthus Annuus*, is one of the latest sunflower varieties breed by Danziger Flower Farm. And the problem was the high induction of the variety to flowering that causes the cuttings or plant material low production potential.

This study aims to determine the effect of different light spectrum on the flower induction of sun flower- sol seeker golden nectar- *Helianthus Annuus* (*helianthus*) and choose the best light to use in the production of plant material. The effect on growth and color is also calculated.

B. METHODS

1. Project Design

The research was implemented at Danzinger Flower Farm (Bet Dagan). This was conducted on Sunflower- Sol Seeker Golden Nectar, each block has 8 pots and three plants, the data gathering started during the vegetative stage of the plants. (3) treatments with three (3) replications, and the design Completed Randomized (CRD) which required greenhouse as the project needs to be in a control environment. Table 1 for the Complete Randomized Design.

The light was open for 16 hours to have same light exposure in treatment one (1).

Table 1 Complete Randomized Design

TREATMENT 1	TREATMENT 2	TREATMENT 3
T1R1	T2R2	T3R3
T1R1	T2R2	T3R3
T1R1	T2R2	T3R3

a. Treatments

1. T1- Using Sun light Control
2. T2- Normal Light Spectrum
3. T3- Red Light Spectrum

The following data were gathered during the experimental stage:

1. The flower induction on the different light spectrums is determined.
2. The project determined the best light spectrum to use in sunflower-sol golden nectar for the production potential of cuttings.
3. The influence of light on the color of leaves is figured out.

b. Parameters

1. *Number of buds/flowers on Helianthus Annuus* - The number of flowers is gathered once a week. The data gathering started upon emergence of buds on the vegetative stage of plants. See Figure 1.



Figure 1 Different Number of Buds

2. *Number of cuttings on Helianthus Annuus* - The number of cuttings or plant material are gathered upon emergence of cuttings on the vegetative stage of the plants, and it was collected once every two weeks. See Figure 2.



Figure 2 Number of Cuttings

3. *Color of leaves on Helianthus Annuus* - The color of leaves is determined at the end of the project. There is color chart used as basis in checking the color of leaves. Dark green color was rated number three (3), green color is number two (2), while light green indicates the lowest number which is one (1).

Project Development

The project was developed to solve the problem of the farm with regards to the high induction of sunflower to flowering and to fulfill the needs of the clients. The researcher used different tools, materials and facilities in conducting the study. See Table 2 for the list of tools materials and facility used in the conduct of study.

Table 2 Tools, Materials, and Facilities

NUMBER OF CUTTINGS	NUMBER OF CUTTINGS	NUMBER OF CUTTINGS
Hand towel	Clear plastic bags	Greenhouse
Knife	Dripper for irrigation	
Scissors	Plot for the plants	
	Red bulb	
	Soil for flower plants	
	White bulb	

RESULTS AND DISCUSSION

Project Description

The study focuses on the aim of the project which is to determine the effect of different light spectrum on the flower induction of sun flower- sol seeker golden nectar (*helianthus*); and choose the best light to for the production of plant material. The effect on growth and color is calculated.

The parameters measured were the number of buds which indicated the potential number of number of cuttings, which indicated the potential number of plants; and the color of leaves, which indicated the strength of the leaves; and the efficiency of the photosynthesis procedure.

Table 3 shows the Summary of the effect of different light spectrum on *Helianthus* (Sunflower) induction.

Table 3 Effect of Different Light Spectrum on *Helianthus* (golden nectar sunflower) Production

LIGHT SPECTRUM	NUMBER OF BUDS	NUMBER OF CUTTINGS	COLOR OF LEAVES
Natural Light Sun	21.018	2.167	3
Normal Light	14.004	10.75	2
Red Light	10.125	20.542	1

Danzinger Flower Farm was already using the result of the study after the first repeat has been gathered and analyzed. Also, this study has been presented to other country like Guatemala and Kenya.

In addition, the farm is now using the red light to rooting rooms to control the rooted cuttings in the induction of flowers. It was also observed that the cuttings sent to other countries that has been under red light has low induction of flower when reaching the costumer.

3. Project Capabilities and Limitations

This research only covers the induction of flowers, number of cuttings and color of leaves subject to various treatments.

4. Project Evaluation

The project was installed or implemented in DANZINGER FLOWER FARM, Israel and other countries like Guatemala and Kenya; places where there was problem on the high induction of sunflower into flowering testimonies and responses of clients served have proven that the project is very good and economical.

D. CONCLUSIONS AND RECOMMENDATIONS

1. Conclusions

In conclusion, the best light to use in the production of sunflower cuttings is red light with 620 to 750 nm. Using natural and normal light causes low production of cuttings due to high induction to flowering.

2. Recommendations

To ensure high-quality and plentiful cutting production, the researcher suggests using red light to regulate sunflower flowering. Additionally, seedling growers who employ asexual reproduction must use the red light spectrum to restrain plants' profuse blossoming.

Studies on how different light spectrums affect the quantity of *Helianthus* leaves and flower production are also strongly encouraged.

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