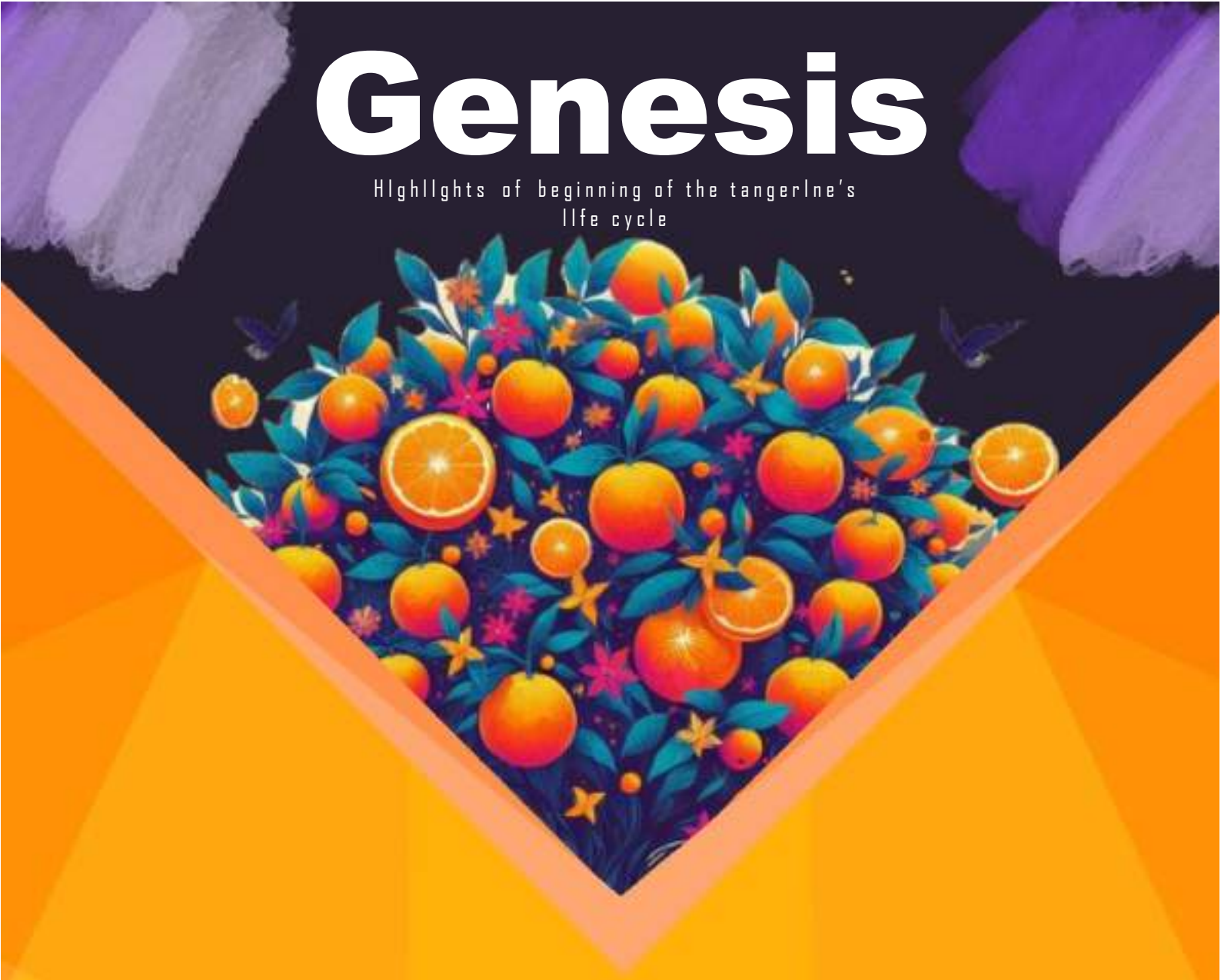
Genesis

Highlights of beginning of the tangerine's life cycle



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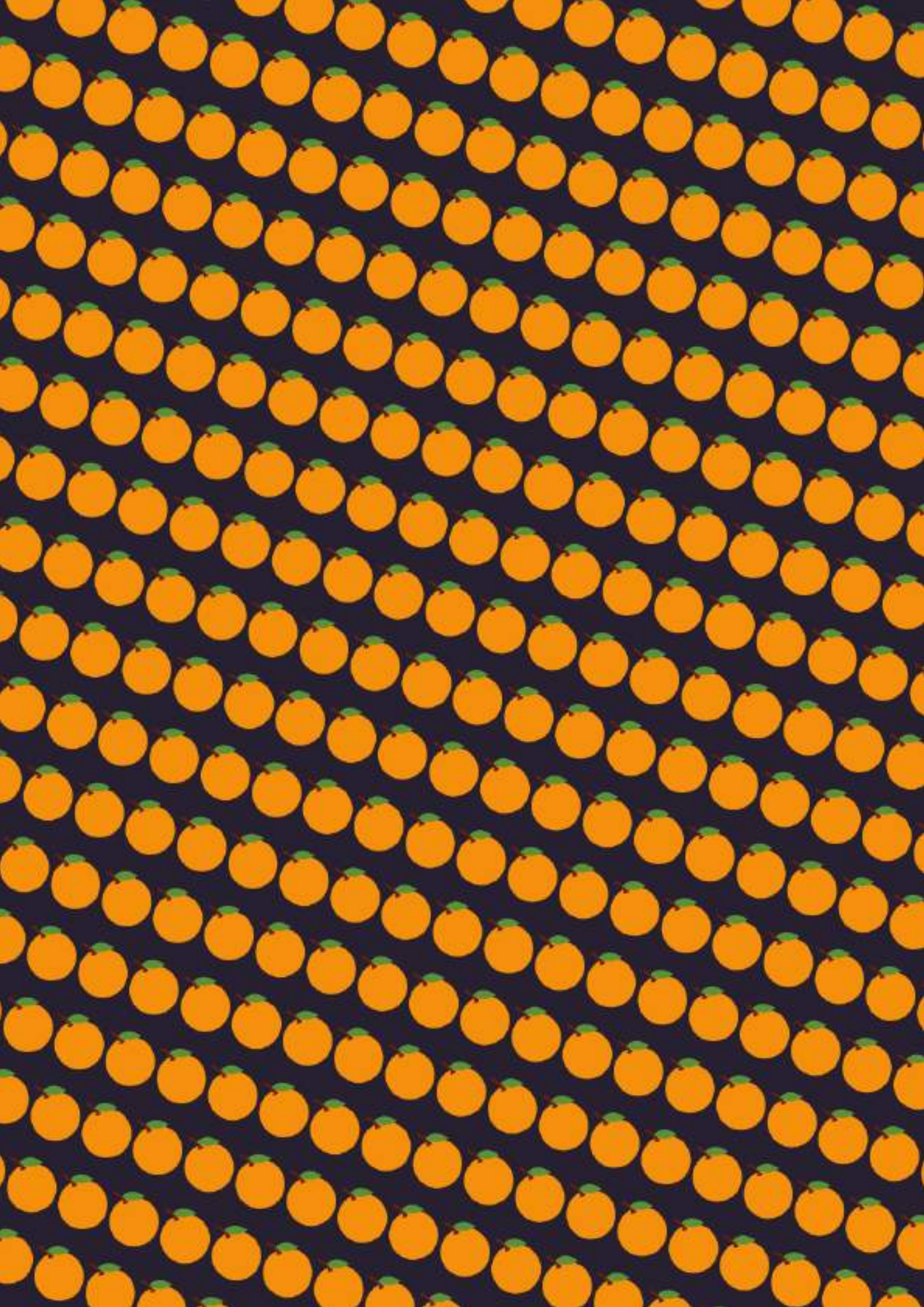
ABSTRACT

The objective was to plant a Tangerine sapling and nurture it to establishment. Tangerines are among the most paramount citrus cultures in the whole world and are appreciated for flavour and nutritional value. However, their cultivation greatly relies on various environmental factors that influence growth and fruit formation. This work tested the effects of some environmental factors on the seedlings' initial growth stages of tangerine trees.

The optimal conditions that provide healthy and strong growth are sought, with regard to temperature, light availability, and water management. Controlled atmosphere experiments will be done in which the tangerine saplings are under the influence of varying combinations of these factors. Measured growth parameters—length of shoot and stem diameter(thickness) with associated physiological responses, such as chlorophyll content and photosynthetic rate, are obtained.

The expected results would helpful in understanding the interaction between these condition variables affecting the growth pattern of young tangerine saplings. Such information can facilitate tangerine growers by presenting them with more efficient and sustainable methods to provide significant advantages to any blooming process in tangerines.

Keywords: *Citrus tangerina*, growth rate, plantation journal



CONTENTS

OVERVIEW

Introduction:

Planting tree saplings is a type of ecological and social investment that assures millennial benefits to the environment, species diversity, and human well-being in the long term. It implies raising young trees that grow into giants to offer services that are invaluable from an ecological perspective. This proactive approach is all the more needed in times of ever-worsening deforestation, sprawl, and climate change.

Forests are the "lungs" of the planet, and trees should be replanted for the intake of CO2, a greenhouse gas, through photosynthesis and give back life-supporting oxygen. It is through such a natural process that the impact of the greenhouse effect will be reduced so as to cope with climate change. Trees also filter dust, pollutants, and particulates through photosynthesis, cleaning thereby the air. Improved air quality promotes the public's health.

Apart from controlling climate change and air pollution, trees have numerous other ecological advantages. The roots of trees hold the soil together to prevent erosion; fallen leaves decaying replenish soil nutrients and increase its fertility.

Trees play a significant role in the water cycle, both during groundwater recharge and in regulating runoff at the land surface. All these functions are somewhat inclined toward the maintenance of healthy ecosystems for supporting healthy agriculture.

The tree sapling plantation initiatives further support biodiversity by providing habitats for various flora and fauna. At maturity, such forests support different wildlife, hence species diversification—key to a healthy environment. Therefore, trees, in an urban setup, have more advantages than being ornamental because they enhance the beauty of the surroundings, provide shade, reduce the effect of the urban heat effect, and improve livelihoods of people.

The benefits derived from tree sapling plantation transcend the ecological sphere to affect the social as well as economic well-being of individuals, organizations, and nations. The process of public participation by planting and tending trees develops a sense of responsibility towards the environment. There is the possibility of creation of green jobs, as well as better forest management.

The overall objective of the tree sapling plantation would be to ensure that the trees and vegetation are long-lasting and can fight back in their own capacity against the threats of climate change. The attainment of this objective will be through various specific objectives, such as:

- **Enhanced green cover:** To increase the number of trees in urban and rural areas for better health, beautification, and environmental balance.

- **Carbon sequestration:** Planting trees to absorb carbon-di-oxide to help minimize global warming.

- **Soil-erosion control:** Prevent the erosion process of the soil, along with its degradation by binding or anchoring it with the roots of trees, and improvement in fertility as a result of decomposition of leaves.

- **Water Management:** Maintenance of healthy water tables and prevention of runoffs can be achieved by facilitating the absorption of water into the soil, thereby reducing flood risks.

- **Support Biodiversity:** Provide and protect different habitats of various plant and animal species to bring forth a balanced and flourished ecosystem.

- **Community Engagement:** When working with people and communities to bring about awareness of their impact on the environment and further enable them to be responsible for their surroundings.

- **Better Air Quality:** Thus, cleaning the air through filtering out pollutants and giving back the oxygen, therefore providing a much healthier living quote of all**.**

According to previous studies, the optimum temperature conditions for developing tangerine saplings range from 20-30°C. Temperatures higher or lower than this range reduce their power of growth, photosynthesis, and absorption of nutrients. If the temperature is too high, it may result in stunted growth, withering, and weak roots. If the temperature is too low, then there may be dormancy, late bud break, and increased risk of damage from diseases. Tangerine saplings do require adequate sunlight for proper growth and development. Studies recommend a minimum of 8-10 hours of direct sunlight per day. However, too high an intensity of light can cause photoinhibition that might lead to tissue damage in plants. Tangerine saplings require consistent moisture for the development of roots and shoots. However, waterlogging will hamper the availability of oxygen to roots and increase fungal diseases. Research has shown that the drip irrigation method supplies water to the tangerine saplings without loss of much water and is also suitable for the formation of roots. Balanced fertilization, researchers argue, plays a pivotal role in the development of a healthy tangerine sapling. Well-drained, highly fertile soils with good aeration play an important role in healthy root development and nutrient uptake in tangerine saplings.

The main <u>Objective</u> of this project is:

- Successfully plant and nurture a Tangerine sapling to establishment.
- Record and analyse the growth rate of the tree over a set period of time.

Referring to:

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This research project investigates how various environmental elements influence the early growth of tangerine trees. Focusing on temperature, sunlight, and water management, the study aims to identify the ideal conditions that promote healthy and robust development in these young trees. I hope this project can empower tangerine growers to implement more efficient and sustainable agricultural practices in tangerine cultivation.

METHODOLOGY

I plan to conduct a short comparative study to deduce under what environmental condition my plant of choice thrives the most before nurturing the focal plant for the maximum results.

To complete our objective, I shall trail the following procedure:

1. **Selection of Saplings**: Healthy, uniform tangerine saplings will be selected for the experiments. The saplings will be of the same age and variety to ensure consistency.

2. Hold a **comparative study** for a short period (about 6 weeks) to infer the growth rate of the sapling under different controlled environmental conditions to optimise our plant for maximum growth

   Environmental condition variables

   a. **Light Intensity**:
      i. Abundant sunlight
      ii. Shaded place
   b. **Temperature**:
      i. Cool
      ii. Warm
   c. **Soil Composition**:
      i. Loamy soil
      ii. Clayey soil
   d. Water Regimes and soil pH

3. **Collect Data**
   a. Growth measurements
      i. Plant height (measured by measuring tape & ruler)
      ii. Base stem diameter (measured by slide calliper)
   b. Temperature (measured by thermometer)
   c. Soil pH (checked by litmus paper)

   Apart from 4 tools mentioned above to collect data, basic gardening tools such as shovel, watering can, hoes etc and weighing were used over the duration of this project

4. **Analyse the Data**
   a. Determine the growth rates

   formula used: $$Growth\ rate = \frac{(final\ height - initial\ height)}{no.\ of\ weeks} + \frac{final\ diameter}{initial\ diameter}$$

   b. Statistical Presentation if any
      (Graphs and charts were made on Microsoft Excel)

c. Identify the combination of factors that result in the best growth

5. Plant the principal sapling in the topmost favourable inferred from previous steps and nurture it for 5 months

6. Monitor and analyse the growth rate of the principal plant with the same method used previously

I hope to minimise/terminate the random errors occurring during plantation or while taking measurements and calculation.

A Comparative Study

Brief about the plant of choice:

The tangerine is a type of fruit that is orange in colour that is considered either a variety of *Citrus reticulata*, the mandarin orange or a closely related species, under the name *Citrus tangerina*, or yet as a hybrid

(***Citrus* × *tangerina*)** of mandarin orange varieties, with some pomelo contribution.

Tangerines are smaller and less round in form than the oranges. The flavour is rated as less acid, and also sweeter and stronger, than that of an orange. Mature tangerines are firm to barely soft, pebbly-skinned with no deep grooves, and orange in colour. The rind is thin, easily peeling, and with little white mesocarp that tastes of bitter sweetness. All these features are typical of mandarins in general.

Peak tangerine season lasts from autumn to spring. The fruit is most commonly peeled and eaten by hand. Fresh fruit is also used in salads, desserts and main courses. The peel is fresh or dried as spice or zest for baking and drinks. Fresh tangerine juice, besides frozen juice concentrate, is also commonly available in the United States.

Tangerines command a very important place in the world's citrus production due to their flavour, peelability, and value as a source of nutrition. However, the successful growing of tangerines depends mostly on climatic conditions, which are critical for average yields, fruit quality, and health conditions of trees.

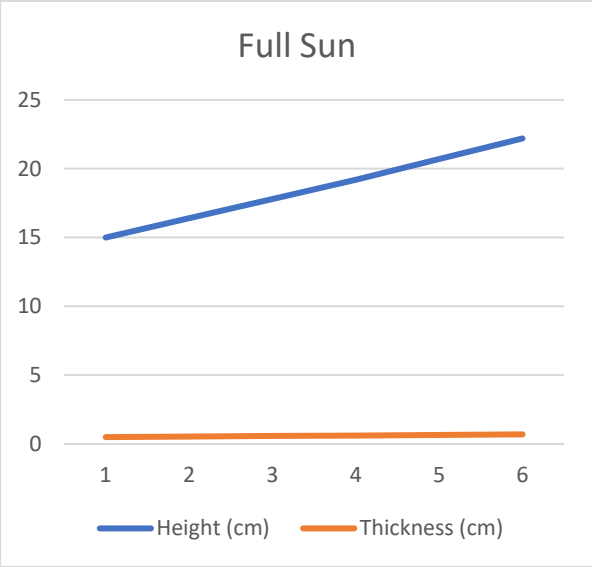
A full understanding of the optimum growing conditions for tangerine saplings is required to enable the optimization of production efficiency and fruit quality. Therefore, this research aims to contribute to filling the knowledge gap by investigating the effects of key environmental factors, under controlled environmental conditions, on the early growth phases of tangerine saplings. By pointing out which factor will induce the healthiest and most robust growth, this study may provide an important lesson to tangerine growers and facilitate more sustainable agricultural practices

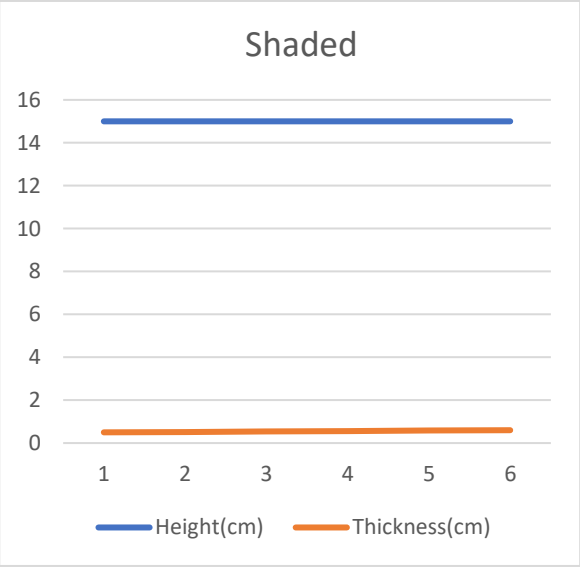
1st Parameter: Light Intensity

I planted two saplings and put one in a place where sunlight was available for most of the day, the other where the shadow is casted during the entire day.

OBSERBATION TABLE:

Week	Full Sun		Shaded	
	Plant Height	Stem Diameter	Plant Height	Stem Diameter
1	15	0.5	15	0.5
2	16.4	0.54	15	0.52
3	17.8	0.58	15	0.54
4	19.2	0.62	15	0.56
5	20.7	0.66	15	0.58
6	22.2	0.7	15	0.6





Calculated growth rate: 2.6 Calculated growth rate: 1.2

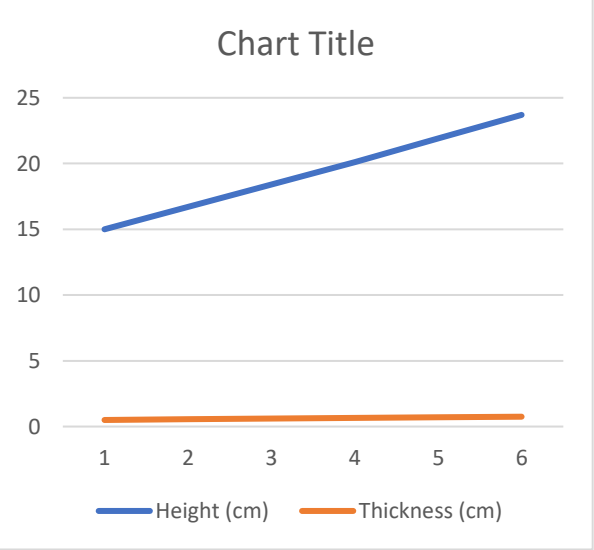
Inference: it's safe to say under the absence of sunlight, the shoot of the plant didn't exhibit any elongation at all

2nd Parameter: Temperature

One sapling was placed normally and the other was put in a makeshift greenhouse that helped raising the temperature by a small amount and lock moisture. (The natural temperature was around 13° Celsius)

OBSERBATION TABLE:

Week	Natural (Around 13°C)		w/ Greenhouse	
	Plant Height	Stem Diameter	Plant Height	Stem Diameter
1	15	0.5	15	0.5
2	16.5	0.54	16.7	0.55
3	18	0.58	18.4	0.6
4	19.5	0.62	20.1	0.65
5	21.1	0.66	21.9	0.7
6	22.7	0.7	23.7	0.75



Calculated growth rate: 2.683

Calculated growth rate: 2.95

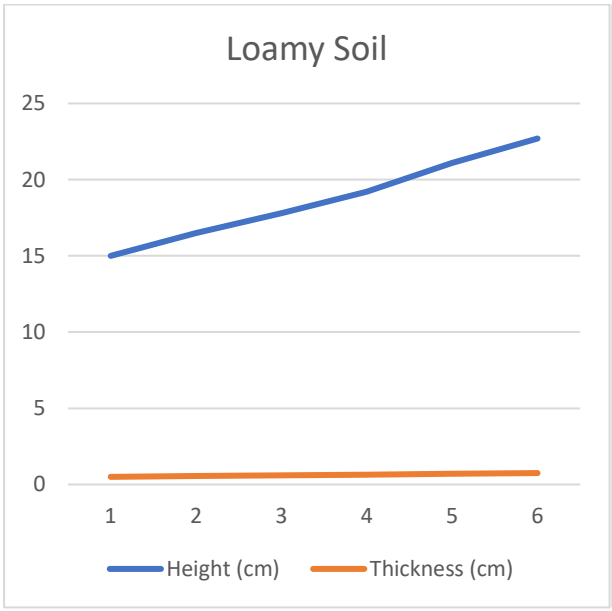
Inference: The plant grew comparatively faster in a more humid and warmer condition (around 17°C – 19°C)

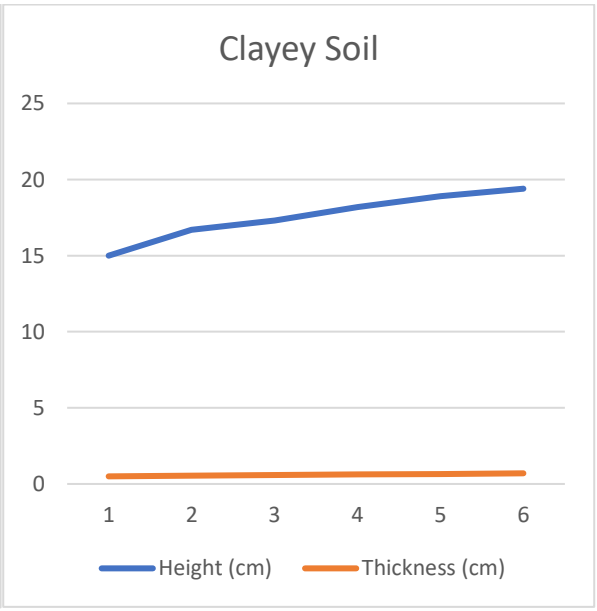
3rd Parameter: Soil Type

One sapling was planted in the local clayey soil and other was plated in a loamy soil mixture

OBSERBATION TABLE:

Week	Loamy Soil		Clayey Soil	
	Plant Height	Stem Diameter	Plant Height	Stem Diameter
1	15	0.5	15	0.5
2	16.5	0.55	16.7	0.54
3	17.8	0.6	17.3	0.58
4	19.2	0.65	18.2	0.62
5	21.1	0.7	18.9	0.66
6	22.7	0.74	19.4	0.7





Calculated growth rate: 2.763

Calculated growth rate: 2.13

Inference: the sapling exhibited better growth in the loamy type of soil composition

Water regimes is actually heavily dependent upon the temperature of the day so instead of making an observation I watered the saplings accordingly.

Principal Plant

PLANTATION OF PRINCIPAL SAPLING

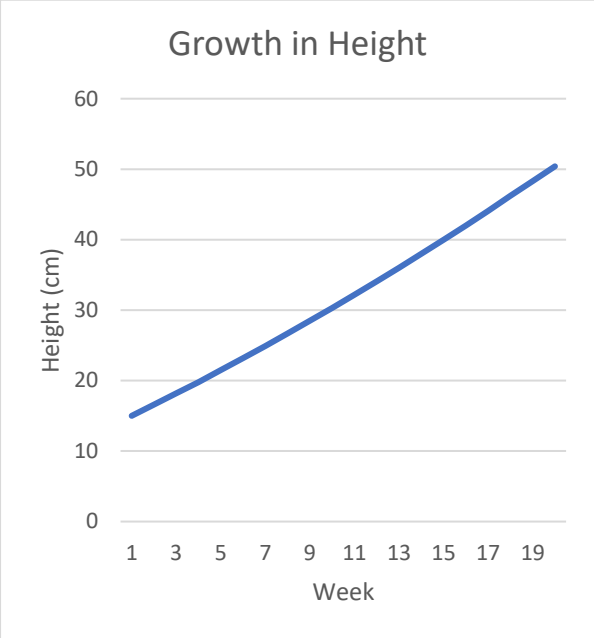
After identifying how different condition affects the growth of the sapling, I planted a sapling under all favourable conditions and recorded its growth for about 5 months. This time I took extra precautions like:

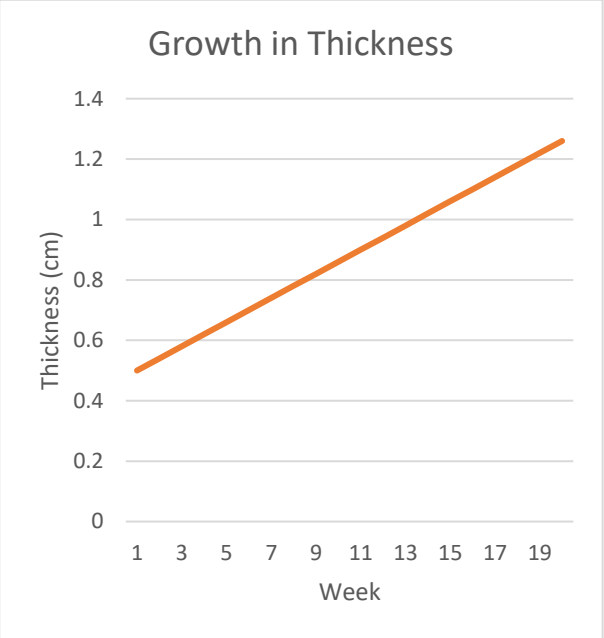
a. As the soil available in my local area were just a tad bit acidic than desired, I made sure to neutralize it accordingly with slaked lime (CaOH)
b. The vital nutrients that the plant required were added externally as a supplement

OBSTERBATION TABLE:

Week	Plant Height (cm)	Stem Diameter (cm)
1	15	0.5
2	16.6	0.54
3	18.2	0.58
4	19.8	0.62
5	21.5	0.66
6	23.2	0.7
7	24.9	0.74
8	26.7	0.78
9	28.5	0.82
10	30.3	0.86
11	32.2	0.9
12	34.1	0.94
13	36	0.98
14	38	1.02
15	40	1.06
16	42	1.1
17	44.1	1.14
18	46.2	1.18
19	48.3	1.22
20	50.4	1.26

ANALYSIS





By $$growth\ rate = \frac{final\ measurement - inital\ measurement}{no.of\ weeks}$$

Calculated height growth rate: 1.77 Calculated thickness growth rate: 0.038

And the overall growth rate was calculated to be:

$$Growthrate = \frac{final\ height - initial\ height}{no.of\ weeks} + \frac{final\ diameter}{initial\ diameter}$$

$$\textbf{Growth rate} = \frac{50.4-15}{20} + \frac{1.26}{0.5}$$

Growth rate = 4.29

Inference: The comparative study surely helped as we were able to achieve almost double the growth rate on an individual scale which is a great marginal feat.

For a brisk comparison

INITIAL STAGE

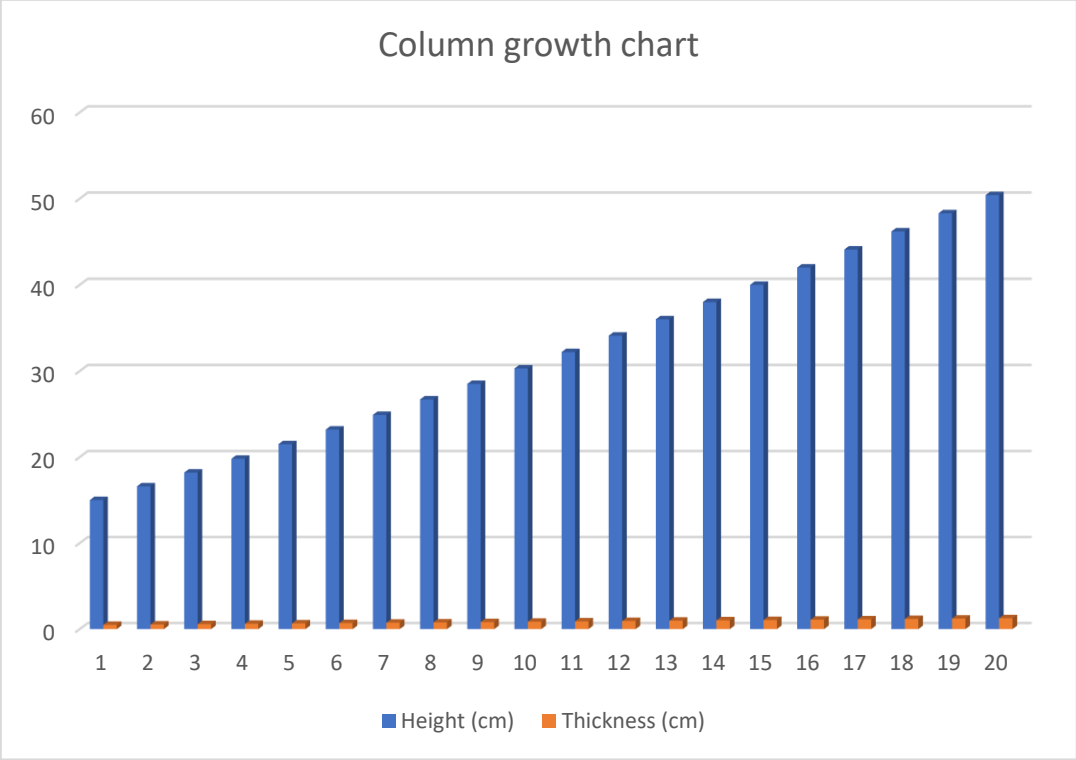
Height: 15cm

Stem Diameter: 0.5 cm

FINAL STAGE

Height: 50.4 cm

Stem Diameter: 1.26 cm



Future benefits of the plant

Planting tangerine plants has several advantages connected with the environment and economics in the future. Some of these key advantages are here:

Environmental Benefits:

- Carbon Sequestration: Like all trees, the tangerine plants help reduce greenhouse gases in the atmosphere with the absorption of carbon dioxide and the emission of oxygen.
- Soil Fertility: Tangerine trees enhance the structure and fertility of the soil through leaf litter and root systems that add organic matter and cause beneficial microbial activity.
- Biodiversity: They provide habitat and food for many wildlife species, such as birds and beneficial insects, and thus help support local biodiversity.
- Water Management: Their roots can bind the soil, preventing soil erosion and increasing the water infiltration rate to minimize runoff during rainfall events and that allow a good recharge into the groundwater.

Economic Benefits:

- Fruit Production: Tangerines are of high-value crops by the market demand. They can be sold fresh, their juice extracted, or used for several culinary purposes to bring a steady income for the growers.
- Employment: Growing, harvesting, and processing will create useful work in agricultural, transport, marketing, and retail outlets.
- Value-Added Products: Other than fresh fruit, tangerine products processed into marmalade, essential oil, and dried peel will increase farmers' incomes.
- Export Potential: Tangerines have a ready market worldwide; hence, their export could earn foreign exchange for growing regions.

Health and Social Benefits:

- Nutritional Value: Tangerines are rich in vitamins, particularly vitamin C, and other nutrients; therefore, their production will contribute to higher standards of public health and nutrition.
- Local Food Supply: Producing tangerines reduces the quantity that has to be imported to meet national demand.
- Community Development: It can foster community development since tangerine farming would invigorate the local economy and cooperative behaviours among farmers.
- Educational Opportunities: Growing tangerines should provide educational opportunities in the communities around them for sustainable agriculture and horticulture.

Long-term Sustainability:

- Sustainable Agriculture: Cultivation of tangerines will result, when done on sustainable principles, in long-term agricultural productivity and food security.
- Climate Resilience: Well-managed tangerine orchards can enhance resilience to climate change by improving soil health and water retention, hence improving the responsiveness of agriculture to climate change.

CONCLUSION

For truly, this project has shown me the amazing might of planting a tiny tree. Indeed, it can look negligible to human eyes, but little saplings turn into giants and change the world in the most positive way. They further become teeming havens for all manner of creatures, furry and feathered. They act the same as natural air purifiers, sucking up all the stuff that is disgusting and pumping out fresh oxygen for us to breathe. Their roots form a strong underground network, giving the soil cohesion and keeping it healthy. As these little guys grow into towering trees, they effectively become guardians of our water supply, regulating the flow and keeping things in balance.

We get a chance to make a change. Planting a tree is more than just sticking something to the ground; it is promising to take care of our planet. That's giving to the future— a gift, warning to our later selves, and for future generations to have a healthy, lively world.

So, this kind of serves as a call to action! Now, imagine what an amazing impact we could all have if everyone just planted one tree. This really isn't a hard thing to do. Everything we do achieves its best results when carried out together. So, let's not stop planting these green soldiers, the little ones at least, and see them grow into emblems of hope. Seeds sown today offer tomorrows for a world where nature and human coexist with harmony.

BIBLIOGRAPHY

For successfully completing my project, I have taken help from sources:

Websites:

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- https://scholar.google.com/
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- https://www.mdpi.com/
- https://www.nature.com/

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