Science Fair Proposal

Thursday Nov 2021

Student name: Julie

Project Title (be creative) – (Can be added later)

Purifying Plants

Project Question (What problem are you going to explore?):

☆ which household plant will absorb the most CO_2 in 24 hours

Hypothesis based on your project question.

Example: **If**...(I do this) ....**then**...(this will result).. ....**because** .....

If six different household plants are tested to absorb CO_2 then the Spider plant will absorb the most CO_2 because it has the most leaves and green color

Variables:

Manipulated/Independent variable (what you change): Type of plant ✓

Responding/Dependent variable (what you watch for): How much CO_2 is absorbed in 24 hours

* how will you measure? using a CO_2 meter or + 24 hour setting

Controlled/Constant variables (what stays the same): type of pot how much soil and water how much light (Lux) time, (container holding plant / volume of space). plant tent packing tape

Required materials: Soil, water, the 7 household plants, grow lamp, scale, LUX meter, skewer sticks, pots, plant tent, CO_2 meter, taper packing), measuring cup,

Feasibility Check... yes

Feasibility Check:

Can you find at least three sources of information on the subject?	(Yes)/No
Is your experiment safe to perform (for yourself and others)?	(Yes)/No
Will you be able to get all the materials/equipment you need ?	(Yes)/No
Do you have enough time to do your experiment for November END?	(Yes)/No

FOR STUDENT: I have discussed the project idea and the checklist with my parents/guardian and I am willing to commit to following through on this project.

Student Signature _____ Date November 6 2025

FOR PARENT: **I have discussed the project idea and the checklist with my child** and I believe they can follow through with this project. I will support them, as needed, in the completion of this project. I understand that while parents can support their child in completing the project, the student is expected to do the work themselves and learn from their mistakes as part of the scientific process.

Parent Signature _____ Date Nov. 6/25

Approved by Teacher: _____ Date Nov 17/25

Background research

Vocabulary and Concepts

Term	Meaning/examples
Photosynthesis	The process in which green plants use sunlight, water and carbon dioxide to create oxygen and energy in the form of sugar.
Cellular respiration	The time where plants release carbon dioxide back into the air like humans when they breath
Carbon dioxide	Carbon dioxide is the molecule which we breathe out as humans. It is one carbon and two oxygens.

Science Fair Background Research

Source(s):	Date:	Question:	Notes: (in point form and remember to put in your own words)
https://www.britannica.com/plant/plant/Photosynthesis	October 24, 2025	What is photosynthesis	Photosynthesis is the process in which plants turn carbon dioxide, sunlight and water into a sugar called glucose and the byproduct of oxygen. Photowynthesis
https://www.sciencefacts.net/cellular-respiration.html	Only says 2025	What is cellular respiration	Cellular respiration is the process in which plants break down the glucose that they made during photosynthesis. They need to do this so that their cells can do their job for the plant. Cellular respiration is a series of chemical reactions that happens when oxygen is present and the glucose is broken down into energy
https://www.dhs.wisconsin.gov/chemical/carbondioxide.htm#:~:text=Exposure%20to%20carbon%20dioxide%20can,coma%2C%20asphyxia%2C%20and%20convulsions	January 2 2025	What is carbon dioxide	Carbon dioxide is a colorless and odorless gas that makes up only one percent of the air. The normal CO2 range outside is around 400 ppm. The regular indoor levels for CO2 are around 400 to 1000 ppm. If any higher, the CO2 in the air can affect your health.
https://en.wikipedia.org/wiki/Aloe_vera	November 10 2025	How does the Aloe vera photosynthesize?	The Aloe bera has a special way of photosynthesizing called Crassulacean Acid Metabolism. This means that instead of performing photosynthesis in the daylight, it photosynthesizes at night. It is a desert plant, meaning that it is adapted to a very hot climate.

			It closes its stomata in the day to conserve water and opens its stomata at night when it's less hot.

Research Paragraphs

Carbon dioxide (CO_2) is one part carbon and two parts oxygen. It is a colorless gas that is produced by mammals when they exhale. It can also be released by plants when they decay (from decomposers in the soil) and from volcanoes. Humans also produce carbon dioxide when they burn fossil fuels. CO_2 can be absorbed from the atmosphere by natural processes like photosynthesis and weathering, or by human processes like carbon capturing and storing. This all makes up the carbon cycle, which determines how much CO_2 is present in the atmosphere at a certain point in time.

Carbon dioxide can be measured in parts per million (ppm). The normal outdoor air CO_2 levels are around 400 ppm. Indoor CO_2 levels are usually between 400-1000 ppm. If indoor CO_2 levels go higher than 1000 ppm then it becomes unhealthy. It can cause headaches, dizziness, difficulty breathing, tiredness, increased heart rate, elevated blood pressure or even tingling!

The amount of CO_2 being released into the atmosphere has been increasing at an alarming rate, which is disrupting the carbon cycle. The CO_2 concentration in the atmosphere was around 280 ppm in 1750, and it was more than 415 ppm in 2021. Increased CO_2 in the atmosphere is causing global warming, which leads to climate change.

Photosynthesis

Plants remove CO2 from the air by the process of photosynthesis. Photosynthesis is the process in which green plants use sunlight, water and carbon dioxide to create oxygen and energy in the form of sugar.

Plants naturally remove CO_2 from the air by the process of photosynthesis.

Photosynthesis is the process in which plants (and even cyanobacteria) use sunlight, water and carbon dioxide to create oxygen and energy in the form of sugar.

Photosynthesis happens in the chloroplasts. The chloroplast is a structure inside the plant's cell. It contains chlorophyll. Chlorophyll is a light absorbing pigment that helps with the production of glucose in the process of photosynthesis. With photosynthesis, chlorophyll absorbs energy from blue and red light waves and reflects green light waves. That's why the plant appears green!

Cellular respiration is the process in which the cells of all living things (including plants) break down glucose to make energy for the cells to work and do their job.

Cellular respiration is actually the chemical reaction where glucose is broken down because of the presence of oxygen. It causes the waste products of carbon dioxide and water to form in the process, and it releases energy for the cell in the form of adenosine triphosphate (ATP). It happens in three steps: glycolysis, the Krebs cycle (or citric acid cycle) and the electron transport chain. Glycolysis does not require oxygen. It splits glucose into 2 molecules of pyruvate and produces 2 molecules of ATP. The Krebs cycle requires oxygen and uses the pyruvate from glycolysis to make 2 more ATP molecules as well as other molecules that will be used by the electron transport chain. The electron transport chain requires oxygen and uses the molecules from the Krebs cycle to generate 32 molecules of ATP.

Oct 19, 2025

NASA compiles list of best plants to clean indoor air

July 8, 2025

NASA research scientists have announced that the common indoor plant may provide a natural way of helping combat sick building syndrome. Additionally, improving indoor air quality can also be effectively achieved with certain houseplants that are known for their air-purifying abilities.

We highlight the best plants below.

What plants are best for indoor air quality?

Based on the use of common indoor plants for indoor air purification, NASA studied about a dozen popular varieties of ornamental plants to determine their effectiveness in removing several key pollutants associated with indoor air pollution. NASA research found that living plants are so efficient at absorbing contaminants in the air that some will be launched into space as part of the biological life support system aboard future orbiting space stations.

1. Spider Plant (Chlorophytum comosum)

- **Benefits**: Known for its ability to remove formaldehyde, xylene, and toluene.
- **Care**: Easy to care for, thrives in indirect sunlight, and tolerates a range of temperatures.

2. Snake Plant (Sansevieria trifasciata)

- **Benefits**: Effective at removing formaldehyde, benzene, xylene, toluene, and nitrogen oxides.
- **Care**: Low-maintenance, tolerates low light, and infrequent watering.

3. Peace Lily (Spathiphyllum)

- **Benefits:** Removes formaldehyde, benzene, trichloroethylene, xylene, and ammonia.
- **Care:** Prefers indirect light and consistently moist soil.

4. Aloe Vera (Aloe barbadensis miller)

- **Benefits:** Known for removing formaldehyde and benzene.
- **Care:** Needs bright, indirect sunlight and infrequent watering.

5. Boston Fern (Nephrolepis exaltata)

- **Benefits:** Removes formaldehyde and xylene.
- **Care:** Prefers high humidity, indirect light, and regular watering.

6. English Ivy (Hedera helix)

- **Benefits:** Effective at removing formaldehyde, benzene, xylene, and toluene.
- **Care:** Thrives in moderate light and prefers moist soil.

October 19, 2025

7. Rubber Plant (Ficus elastica)

- **Benefits:** Known for removing formaldehyde.
- **Care:** Prefers bright, indirect light and moderate watering.

8. Golden Pothos (Epipremnum aureum)

- **Benefits:** Removes formaldehyde, benzene, xylene, and toluene.
- **Care:** Very easy to care for, tolerates low light, and infrequent watering.

9. Bamboo Palm (Chamaedorea seifrizii)

- **Benefits:** Effective at removing formaldehyde, benzene, trichloroethylene, and xylene.
- **Care:** Prefers indirect light and regular watering.

10. Dracaena (Dracaena spp.)

- **Benefits:** Removes formaldehyde, benzene, trichloroethylene, xylene, and toluene.
- **Care:** Prefers bright, indirect light and moist soil.

11. Areca Palm (Dypsis lutescens)

- **Benefits:** Removes formaldehyde, xylene, and toluene.
- **Care:** Prefers bright, indirect light and regular watering.

12. Gerbera Daisy (Gerbera jamesonii)

- **Benefits:** Known for removing benzene and trichloroethylene.
- **Care:** Needs bright light and well-drained soil.

13. Philodendron (Philodendron spp.)

- **Benefits:** Effective at removing formaldehyde.
- **Care:** Prefers indirect light and regular watering.

14. Weeping Fig (Ficus benjamina)

- **Benefits:** Removes formaldehyde, xylene, and toluene.
- **Care:** Prefers bright, indirect light and regular watering.

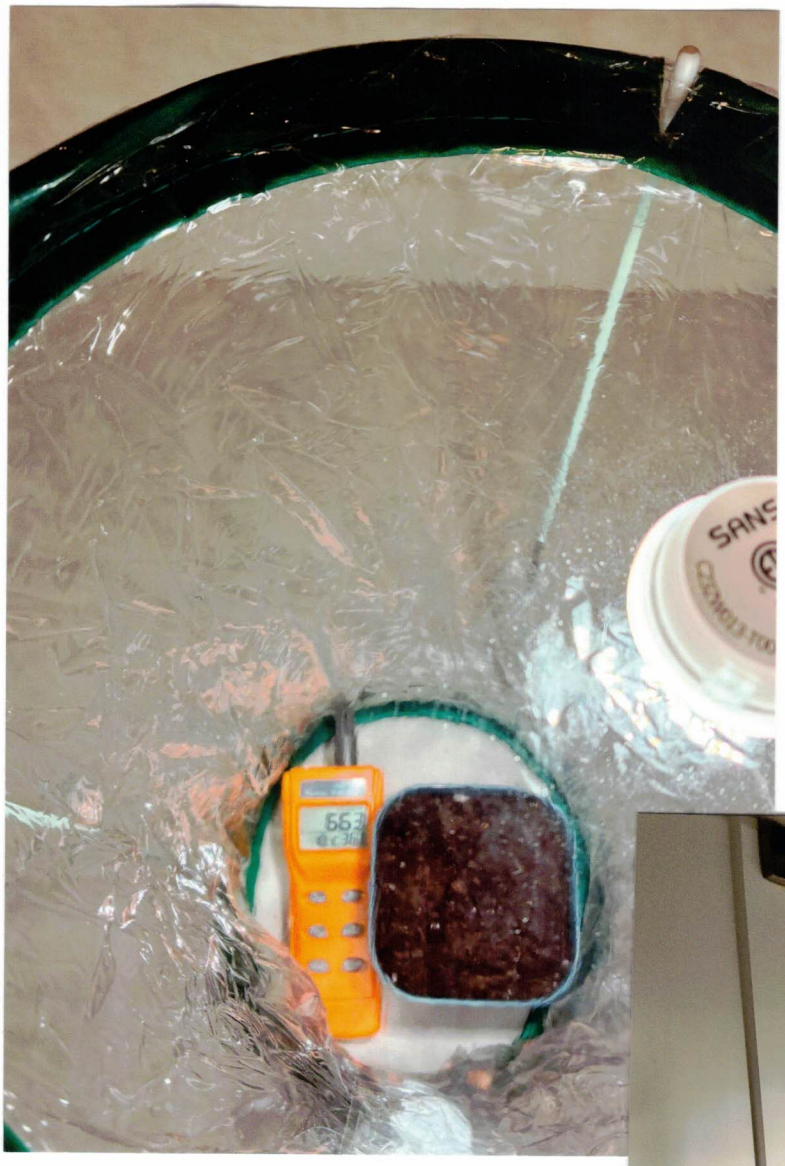
15. Chinese Evergreen (Aglaonema)

Materials

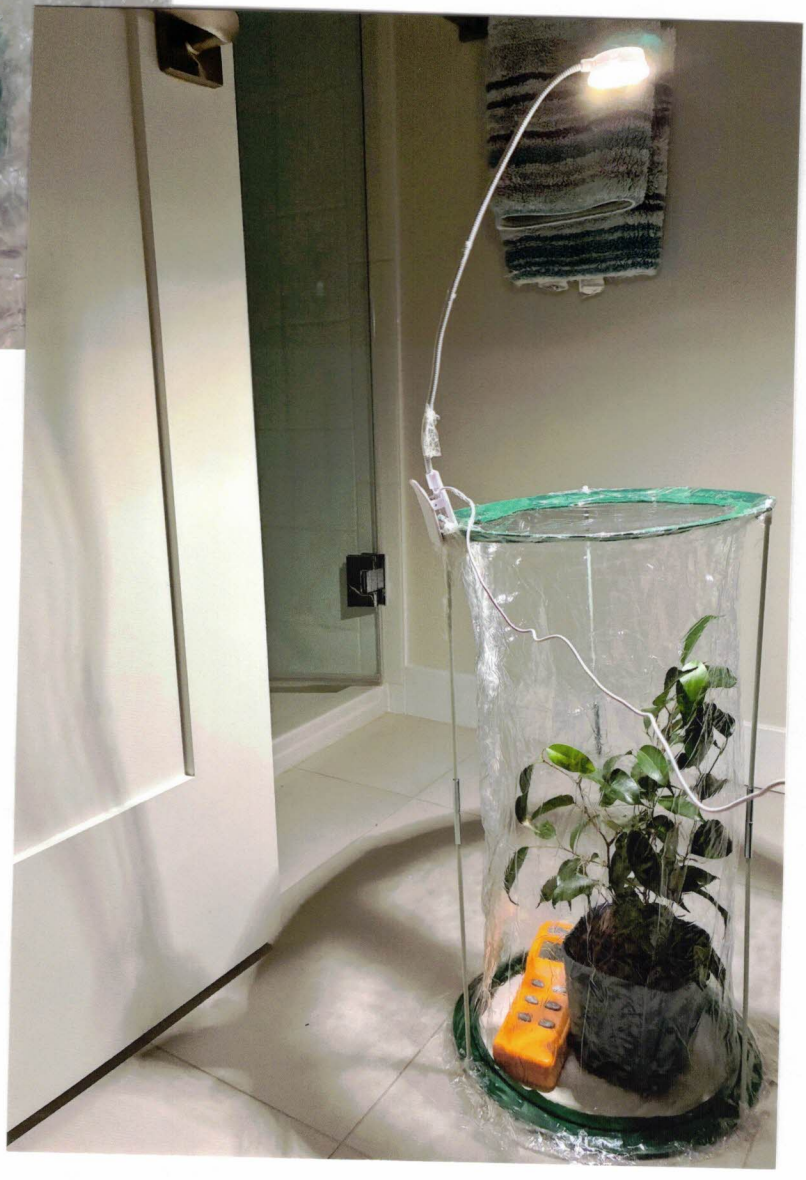
October 21, 2025

Procedure:

1. Gather materials - when buying plants, make sure all of the pot sizes are the same
2. choose a room where tempreture that can stay consistant
3. Set up plant dome, cut out the bottom and seel all the seams along the dom
4. Set up grow lamp to correct height so light intensity is 1000 lux
5. weigh the empty pot and put 4cups of soil in and weigh it again. Add 150ml of water to soil and weigh one more time. Then place the soil into plant dome and turn on CO_2 meter to correct settings and seal to the floor with tape
6. Turn on grow lamp to 12hr setting and take first value at 8:00am (right after CO_2 meter and lamp have been turned on) ending 24 hrs later
7. Prepare plants - remove as much soil as possible before being repotted
8. repeat step 5 but with a plant instead
9. Place plant in plant dome and repeat the steps above
10. Repeat steps for the rest of the three trials



Control: Soil



Plant dome set-up

Materials

- 6 household plants (spider plant, Aloe vera, Chinese evergreen, Draceana, Areca palm, weeping fig)
- plant dome
- tape (clear and other)
- Camera
- grow lamp
- ruler
- lux meter
- scale
- 7 identical flower pots
- Soil (Green Gate all purpose potting mix)
- measuring cup
- water
- CO_2 meter (also measures temp. and humidity)

Qualitative observations: October 26, 2025

Aloe vera: tall, green stems with small thorns/spikes. Slightly squishyish stems/filled with water?

Draceana: white stripes on leaves, tall, criss cross leaves at base of plant kinda like a pineapple or banana plant.

Chinese evergreen: pink stem with leaves that have a pink outli and a green inside. ~~Long~~ medium sized leaves with almost a curled look to them.

Spider plant: long slightly curled leaves. lots of green ~~L~~ves. quite close to the ground.

Areca: tall stems with long leaves reaching upward. Stems are slightly yellow with brown freckles.

Weeping fig: tall brown stems, more like bark. dark green leaves short and wide leaves. Thin branches.

Plant: Soil Date: T1 Oct 27 2025, T2 Nov 8 2025, T3 Nov 18, 2025

Time	CO_2 (ppm)			Temperature (°C)			Humidity %		
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3
8:00 am	660	581	489	16.6	16.9	18.3	33.6	35.2	84.4
10:00 am	1109	856	818	16.8	16.9	16.2	74.7	76.8	85.5
12:00 pm	1059	870	903	15.7	16.9	17.8	79.6	80.8	89.2
2:00 pm	1017	761	869	16.6	16.48	17.2	80.5	80.2	90.8
4:00 pm	1001	675	817	16.5	16.6	17.5	80.2	80.6	91.1
6:00 pm	1014	697	763	19.1	16.7	16.2	78.9	80.7	87.8
8:00 pm	977	700	768	19.3	16.5	18.8	78.7	80.9	89.6
10:00 pm	877	710	755	19.0	16.3	19.0	76.2	76.9	87.0
12:00 am	813	748	760	16.7	16.3	18.7	79.1	76.7	88.3
2:00 am	799	712	748	16.6	16.81	18.5	79.9	76.5	88.4
4:00 am	744	641	732	16.79	17.46	18.3	76.4	77.5	88.1
6:00 am	707	576	714	16.3	17.6	18.0	79.7	78.4	87.8
8:00 am	738	604	723	16.1	18.0	16.3	74.0	76.3	85.5

Weight of pot 688g

Weight of pot + soil 612g

weight of pot + soil + water

750g

3 cm above tent

T2

weight of pot 90g

weight of pot + soil = 652

weight of soil + water + pot.

778g

2cm above tent

T3

weight of pot 88g

weight of pot + soil 700g

weight of pot + soil + water 632g

2cm above tent

Plant: Aloe Vera Date: T1 = Oct 28, 2025 T2 = Nov 9, 2025
T3 = Nov 20, 2025

Time	CO_2 (ppm)			Temperature (°C)			Humidity %		
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3
8.00 am	787	560	685	19.2	18.1	18.5	43.3	38.6	44.0
10.00 am	1032	990	928	18.7	18.2	19.0	77.5	76.4	84.0
12.00 pm	977	1070	985	16.2	16.0	19	79.4	82.5	86.7
2.00 pm	918	1084	952	18.0	17.9	18.9	80.8	83.6	86.8
4.00 pm	849	1065	929	17.5	17.8	18.8	80.7	84.2	87.6
6.00 pm	850	1095	917	16.2	18.3	19.2	79.6	85.2	86.7
8.00 pm	894	1092	924	16.6	18.3	19.1	80.0	83.5	87.2
10.00 pm	862	1014	905	16.5	18.2	16.7	76.6	83.1	88.1
12.00 am	852	933	864	16.7	18.0	18.5	77.4	82.9	86.5
2.00 am	857	887	854	16.4	17.8	18.2	78.5	83.4	88.2
4.00 am	836	850	833	16.2	17.6	18.0	79.3	83.4	88.6
6.00 am	786	816	808	16.0	17.5	17.7	79.5	83.2	89.2
8.00 am	799	806	835	16.2	17.7	18.1	78.9	83.8	88.1

Trial 1
weight of pot = 90g

weight of pot & plant 968g
weight of soil + plant + water
1,032g
light = 78.6 From ground
27.6 cm above tent.

Trial 2
weight of pot = 90g
weight of pot & plant = 930g
weight of soil + plant + water
1,064
Light = 77.5 From the ground
26.5 cm above tent

Trial 3
weight of pot, 88g
weight of pot & plant, 942g
weight of pot plant 1.079kg
water,
hight 35 cm
25 cm above tent

35
-41
76
-51
25

Plant: Dracaena Date: Oct. 29, 2025 (T1) Nov 1 2025 (T2) Nov 22, 2025 (T3)

Time	CO_2 (ppm)			Temperature (°C)			Humidity %		
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3
8.00 am	662	672	621	18.7	18.3	19.2	50.5	40.0	34.0
10.00 am	1027	912	972	18.3	17.8	18.7	85.6	85.2	83.5
12.00 pm	969	905	962	18.1	18.3	18.6	86.4	87.8	88.1
2.00 pm	964	871	905	17.5	17.8	18.5	46.7	88.7	88.4
4.00 pm	846	842	879	17.8	17.7	18.4	85.5	88.8	88.7
6.00 pm	823	871	868	18.2	18.0	18.5	83.9	88.8	88.6
8.00 pm	821	912	827	18.4	18.0	18.3	84.1	89.3	88.5
10.00 pm	854	949	850	18.3	18.0	18.1	80.3	86.6	88.5
12.00 am	907	993	924	18.4	18.3	18.2	80.6	86.9	87.9
2.00 am	922	997	935	18.3	18.2	18.0	81.3	87.1	87.7
4.00 am	916	961	912	18.2	18.0	17.7	82.0	87.1	88.3
6.00 am	894	931	882	18.0	17.8	17.5	82.7	87.7	88.6
8.00 am	965	912	898	18.2	17.0	18.1	82.5	87.9	87.3

Trial 1

weight of pot = 90g

weight of pot + plant = 726g

weight of pot, plant + water, 790g

Height of plant 37.2 cm

27.2 above light

Trial 2

weight of pot = 90g

weight of pot and plant 750g

weight of pot plant + water 866.2g

hight of plant 36.5cm

36.5cm above light

41

-1 36.5

79.5

-51

29.5

Trial 3

Weight of pot 90g

Weight of pot + plant : 736g

Weight of pot, plant + water : 816g

36.5cm of plant

27.5 m above tent

Plant: Chinese evergreen Date: T1 Oct 31, 2025 T2 November 13, 2025 T3 [illegible] 2025

Time	CO_2 (ppm)			Temperature (°C)			Humidity %		
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3
8.00am	575	608	674	16.0	16.4	16.7	35.5	35.6	86.7
10.00 am	877	1013	989	18.2	18.7	17.8	83.9	84.9	81.5
12.00pm	830	1005	949	18.0	18.7	18.1	85.1	86.4	83.4
2.00pm	738	935	891	17.6	18.6	18.0	85.2	86.7	84.8
4.00pm	670	842	647	17.6	18.11	17.5	84.7	86.8	86.2
6.00pm	738	781	817	16.0	16.8	16.5	84.0	86.4	85.2
8.00pm	739	733	799	16.3	16.4	16.6	86.4	86.7	86.2
10.00pm	742	711	784	16.3	18.5	18.5	85.1	87.0	86.3
12.00 am	679	687	780	16.2	18.3	18.3	84.7	87.1	86.3
2.00 am	655	680	766	16.1	18.1	18.0	84.5	87.3	86.8
4.00 am	658	663	737	17.9	17.8	17.6	84.1	87.3	86.6
6.00 am	649	644	708	17.8	17.6	17.2	84.2	87.3	86.3
8.00am	642	637	714	17.5	17.8	17.7	83.2	86.3	84.8

weight of pot = 88g

weight of pot + plant 674g

weight of pot plant + water

812g

hight of plant 27.5

lamp 14 cm above tent

Trial 2

weight of pot = 90g

weight of pot & plant 696g

weight of pot plant + water = 854

hight of plant 27.5

lamp 16.5 above tent

$$\begin{array}{r} 27.5 \\ -41 \\ \hline 68.5 \\ -51 \\ \hline 16.5 \end{array}$$

Trial 3

weight of pot = 90g

weight of pot + plant = 675g

weight of pot + plant + water =

Height of plant 24 cm above

14 cm above tent

$$\begin{array}{r} +24 \\ 41 \\ \hline 65 \\ -51 \\ \hline 14 \end{array}$$

Plant: Spider plant

Date: T1 Nov 2, 2025 T2 November 14 2025 T3 Dec 4, 2025

Time	CO_2 (ppm)			Temperature (°C)			Humidity %		
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3
8.00am	716	493	60	17.5	16.2	19.7	43.5	49.0	24.6
10.00 am	992	719	886	19.2	17.8	18.1	64.3	88.6	79.2
12.00pm	983	839	924	16.3	18.2	18.1	65.9	89.5	82.9
2.00pm	930	895	878	18.2	16.5	18.0	86.3	88.6	83.6
4.00pm	864	893	874	16.3	18.5	17.7	86.1	87.8	84.4
6.00pm	837	887	806	18.4	18.6	16.7	85.1	87.4	83.8
8.00pm	748	856	796	18.2	18.4	16.0	84.0	87.3	83.6
10.00pm	788	891	860	18.2	16.3	16.7	85.4	86.1	83.9
12.00am	864	946	874	18.3	18.6	18.3	85.7	86.0	84.4
2.00am	878	971	868	18.1	18.4	18.0	85.6	86.5	85.4
4.00am	846	970	860	17.9	18.2	17.7	85.4	87.7	86.0
6.00am	812	958	846	17.7	17.9	17.4	85.5	87.9	86.2
8.00am	823	903	870	18.1	17.5	17.7	86.5	84.9	86.2

Trial 1

weight of pot 96g
weight of pot + plant = 648g
weight of pot plant and water 624g
Height of plant 22.5cm

Height
12.5 cm above tent

Trial 2

weight of pot 96g
weight of pot + plant
weight of pot plant + water 722g

height of plant 21cm

41
721
62
-51
11.5

11 cm above tent

Trial 3

weight of pot = 96g
weight of pot + plant = 706g
weight of pot + plant + water = 1356g

cm height of plant 21 cm

11 cm above tent

Plant: weeping fig Date: Nov 5 2025 Nov 9, 2025
Dec 7, 2026

Time	CO_2 (ppm)			Temperature (°C)			Humidity %		
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3
8:00 am	534	598	604	19.1	18.3	18.2	35.2	50.8	20
10:00 am	742	880	935	18.3	18.2	18.7	61.3	92.9	75.6
12:00 pm	777	883	912	18.1	18.0	18.5	63.8	95.6	76.6
2:00 pm	659	829	868	17.8	18.1	18.1	64.1	92.6	80.3
4:00 pm	658	785	840	17.6	18.2	17.9	64.6	91.4	81.8
6:00 pm	641	766	829	18.2	18.5	18.5	65.5	92.5	80.5
8:00 pm	703	735	807	18.6	18.6	18.2	63.4	81.2	80.9
10:00 pm	763	772	828	18.3	18.4	18.1	64.9	90.8	81.0
12:00 am	753	830	856	18.3	18.6	18.4	63.0	88.5	81.1
2:00 am	759	848	852	18.2	18.3	18.0	64.5	87.9	81.8
4:00 am	775	838	823	18.0	18.0	17.6	64.1	87.9	82.0
6:00 am	695	817	787	17.8	17.7	17.2	64.5	87.8	82.4
8:00 am	706	834	807	19.2	18.2	18.0	65.5	89.3	80.5

weight of pot 664g

weight of pot plant 664g

weight of pot plant + water 802g

Hight of plant

43cm

33cm above tent

weight of pot: 660g

weight of pot plant 724g

weight of pot plant + water: 965g

Hight of plant 37.5cm

(27.5) cm above tent

41
-37
7 8 8
-51
27.8

Trial 3

weight of pot 666g

weight of pot plant 676g

weight of pot plant + water 802g

Height of plant 34cm

(24c) cm above tent

34
+41
75
-51
24

Plant: Areca palm

Date: T1 November 7, 2025, T2 November 16, 2025, T3 Dec 11, 2025

Time	CO_2 (ppm)			Temperature (°C)			Humidity %		
	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3	Trial 1	Trial 2	Trial 3
8.00am	661	560	611	18.3	18.8	18.7	44.1	26.5	26.2
10.00 am	935	841	872	18.4	18.3	18.4	65.1	83.6	79.3
12.00pm	902	839	853	18.5	18.2	18.1	84.4	83.3	82.0
2.00pm	853	790	779	18.3	17.8	18.5	84.2	87.5	82.2
4.00pm	814	742	706	18.0	17.6	19.5	84.4	88.2	87.5
6.00pm	767	717	677	18.5	17.9	19.3	79.2	88.2	83.5
8.00pm	721	697	656	18.7	19.1	19.3	83.7	83.1	84.8
10.00pm	699	760	780	18.2	18.4	19.0	82.2	86.1	81.2
12.00am	691	789	746	18.4	18.8	18.7	82.8	85.0	81.6
2.00am	668	793	742	18.1	18.3	18.1	81.8	85.1	83.7
4.00am	626	790	721	17.9	17.9	17.3	81.7	87.4	86.9
6.00am	598	780	719	17.7	17.5	17.4	82.0	88.4	83.9
8.00am	628	795	746	18.6	18.3	18.2	82.8	85.2	83.0

T1

weight of pot 88g

weight of pot + plant 708g

weight of pot plant + water

= 844g

Height of plant

45.5

35.5 cm above tent

T2

weight of pot: 90g

weight of pot + plant 668g

weight of pot plant + water: 832g

Hight of plant 44 cm

34 cm above tent

84
-51
33

44
+41
85
-51
34

T3

weight of pot = 90g

weight of pot + plant = 676g

weight of pot + plant + water = 812g

Height of plant 42 cm

32 cm above plant tent

Average weights December 12, 2025

Soil: (Trial 1 524g + Trial 2 562g + Trial 3 612g) ÷ 3 = 566g

Aloe vera: (Trial 1 816g + Trial 2 840g + Trial 3 854g) ÷ 3 = 837.3g − 566g = 271.3g

Dracaena: (Trial 1 636g + Trial 2 660g + Trial 3 646g) ÷ 3 = 647.3g − 566g = 81.3g

Chinese evergreen: (Trial 1 586g + Trial 2 608g + Trial 3 588g) ÷ 3 = 594g − 566g = 28g

Spider plant: (591g + 634g + 611g) ÷ 3 = 615.3g − 566g = 49.3g

weeping fig: (596g + 634g + 566g) ÷ 3 = 606g − 566g = 40g

Areca palm: (620g + 578g + 586g) ÷ 3 = 594.7g − 566g = 28.7g

lowest weight(s) = Arecapalm, Chinese evergreen

Highest weight(s) = Soil, Aloe Vera

Quantitative Observations - Table 1. Average CO_2 in the plant dome over 24 hours from trials 1-3

	Average CO2 (ppm)						
Time	Soil	Aloe Vera	Dracaena	Chinese Evergreen	Spider Plant	Weeping Fig	Areca Palm
8:00 AM	576.7	677.3	651.7	619.0	606.3	578.7	610.7
10:00 AM	927.7	983.3	968.7	959.7	865.7	862.3	882.7
12:00 PM	944.0	1010.7	944.7	928.0	915.3	857.3	864.7
2:00 PM	882.3	984.7	900.0	854.7	901.0	785.3	807.3
4:00 PM	831.0	947.7	855.7	784.7	860.3	771.0	754.7
6:00 PM	831.3	954.0	854.0	778.7	842.0	762.0	720.3
8:00 PM	815.0	970.0	853.3	757.0	798.0	748.3	691.3
10:00 PM	780.7	927.0	884.3	745.7	846.3	767.7	719.7
12:00 AM	773.7	883.0	941.3	715.3	894.7	813.0	742.0
2:00 AM	753.0	866.0	951.3	700.3	905.7	819.7	734.3
4:00 AM	705.7	839.7	931.7	686.0	892.0	795.3	712.3
6:00 AM	665.7	803.3	902.3	667.0	872.0	766.3	699.0
8:00 AM	688.3	813.3	925.0	665.7	865.3	780.7	723.0

Quantitative Observations - Table 2. Average change in CO_2 in the plant dome over 24 hours from trials 1-3

	Average change in CO2 (ppm)						
Time	Soil	Aloe Vera - soil	Dracaena - soil	Chinese Evergreen - soil	Spider Plant - soil	Weeping Fig - soil	Areca Palm - soil
8:00 AM	0	0	0	0	0	0	0
10:00 AM	351.0	-45.0	-34.0	-10.3	-91.6	-67.4	-79
12:00 PM	367.3	-33.9	-74.3	-58.3	-58.3	-88.7	-113.3
2:00 PM	305.6	1.8	-57.3	-69.9	-10.9	-99	-109.0
4:00 PM	254.3	16.1	-50.3	-88.6	-0.3	-62	-110.3
6:00 PM	254.6	22.1	-52.3	-94.9	-18.9	-71.3	-145.0
8:00 PM	238.3	54.4	-36.7	-100.3	-46.6	-68.7	-157.7
10:00 PM	204.0	45.7	28.6	-77.3	36.0	-15	-95.0
12:00 AM	197.0	8.7	92.6	-100.7	91.4	37.3	-65.7
2:00 AM	176.3	12.4	123.3	-95.0	123.1	64.7	-52.7
4:00 AM	129.0	33.4	151.0	-62.0	156.7	87.6	-27.4
6:00 AM	89.0	37.0	161.6	-41.0	176.7	98.6	-0.7
8:00 AM	111.6	24.4	161.7	-64.9	147.4	90.4	0.7

Quantitative Observations - Table 3. Average change in CO2/gram in the plant dome over 24 hours from trials 1-3

	Average change in CO2 (ppm)					
Time	Aloe Vera - soil	Dracena - soil	Chinese Evergreen - soil	Spider Plant - soil	Weeping Fig - soil	Areca Palm - soil
8:00 AM	0	0	0	0	0	0
10:00 AM	-0.166	-0.418	-0.368	-1.858	-1.685	-2.753
12:00 PM	-0.125	-0.914	-2.082	-1.183	-2.218	-3.348
2:00 PM	0.007	-0.705	-2.496	-0.221	-2.475	-3.798
4:00 PM	0.059	-0.619	-3.164	-0.006	-1.550	-3.843
6:00 PM	0.081	-0.643	-3.389	-0.383	-1.783	-5.052
8:00 PM	0.201	-0.451	-3.582	-0.945	-1.718	-5.495
10:00 PM	0.168	0.352	-2.761	0.730	-0.375	-3.310
12:00 AM	0.032	1.139	-3.596	1.854	0.933	-2.289
2:00 AM	0.046	1.517	-3.393	2.497	1.618	-1.836
4:00 AM	0.123	1.857	-2.214	3.178	2.190	-0.955
6:00 AM	0.136	1.988	-1.464	3.584	2.465	-0.024
8:00 AM	0.090	1.989	-2.318	2.990	2.260	0.024

Sample Calculations: Dec 12, 2025

Table 1. Average CO_2 (ppm) in the plant dome:

Soil at 8:00am:

(Trial 1 + Trial 2 + Trial 3) ÷ 3

= (620 ppm + 581 ppm + 489 ppm) ÷ 3 = 576.7 ppm

Table 2. Average change in CO_2 (ppm) in the plant dome:

To get plant only subtract soil from each plant CO_2 #

Example:

8:00am:

Soil: 576.7 ppm

Aloevera: 677.3 − 576.7 = 100.6 ppm

Draceana: 651.7 − 576.7 = 75.0 ppm

Chinese evergreen: 619.0 − 576.7 = 42.3 ppm

Spider Plant: 606.3 − 576.7 = 29.6 ppm

weeping fig: 578.7 − 576.7 = 2.0 ppm

Areca Palm: 610.7 − 576.7 = 34.0 ppm

To get same starting point subtract 8:00am number from everything and from 8:00am so start is zero.

Example:

8:00am:

Soil: 576.7 ppm − 576.7 ppm = 0 Aloe vera: 100.6 ppm − 100.6 ppm = 0

Example:

10:00 am:

Soil: 927.7 − 576.7 = 351 ppm

Aloe vera: 963.3 − 927.7 − 100.6 = −45.0 ppm
(963.3: Soil at 10:00 am; 927.7: Soil at 10:00 am; 100.6: For same starting point)

Draceana: 968.7 − 927.7 − 75.0 = −34.0 ppm
(968.7: Draceana + Soil; 927.7: Soil at 10:00 am; 75.0: For same starting point)

Table 3. Average change in CO_2/gram in plant dome:

weight of soil only:

Trial 1: weight of pot + soil = 612g

weight of pot = 88g

weight of soil = 612g − 88g = 524g

Trial 2: 652 − 90g = 562g

Trial 3: 700g − 88g = 612g

Average weight of soil = (Trial 1 + Trial 2 + Trial 3) ÷ 3

= (524g + 562g + 612g) ÷ 3 = 566g

weight of Aloe vera plant only:

Trial 1: weight of pot + plant + soil = 908g

weight of pot = 90g

Weight of Aloe vera + soil = 908g − 90g = 818g

Trial 2: Aloe vera + soil = 930g − 90g = 840g

Trial 3: Aloe vera + Soil = 942g − 88g = 854g

Average weight of Aloe vera plant only:

(Trial 1 818g + Trial 2 840g + Trial 3 854g) ÷ 3 = 837.3g (Aloe + Soil) − 566g (average soil)

= 271.3g

For Table 3 divide each number from Table 2 by the average weight of each plant

Example:

Aloe vera

8:00am: $0 \div 271.3g = 0$

10:00am: $-45.0ppm \div 271.3g =$ $-0.166ppm/gram$

Figure 1. Average CO2 (ppm) of household plants inside plant dome over 24 hours

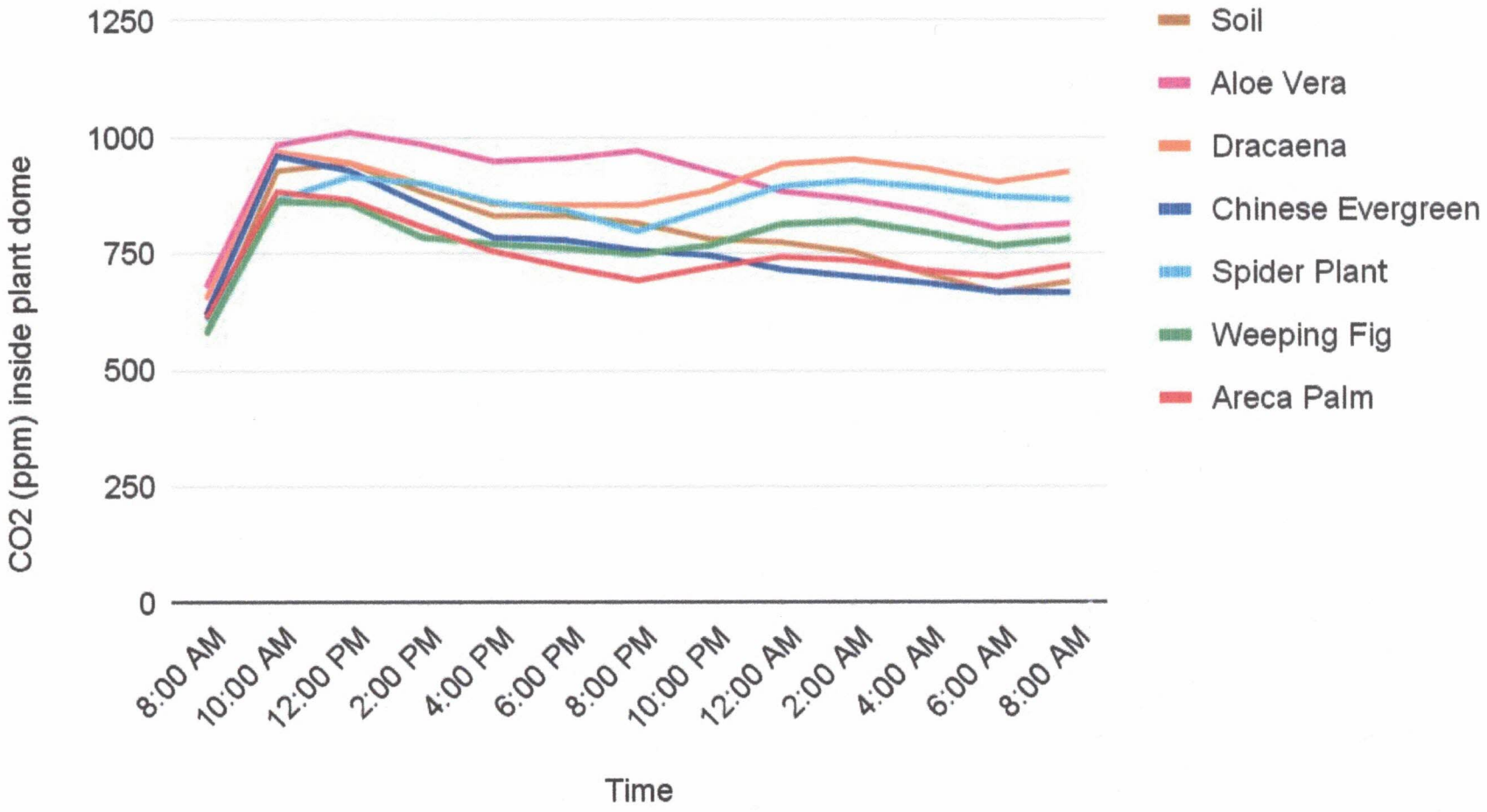


Figure 2. Average change in CO2 (ppm) of household plants inside the plant dome over 24 hours

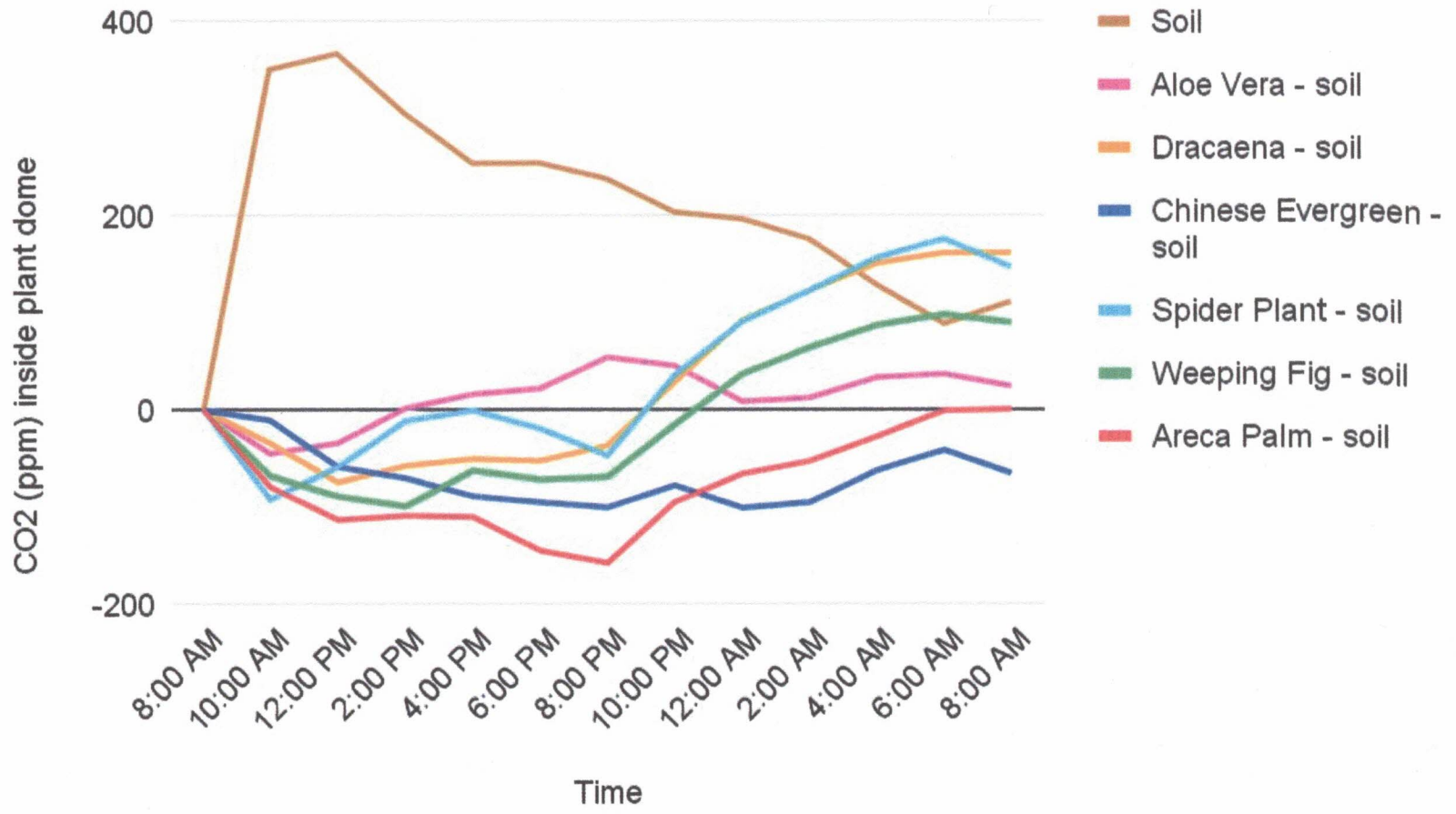


Figure 3. Average change in CO2 (ppm) of household plants inside the plant dome in the light

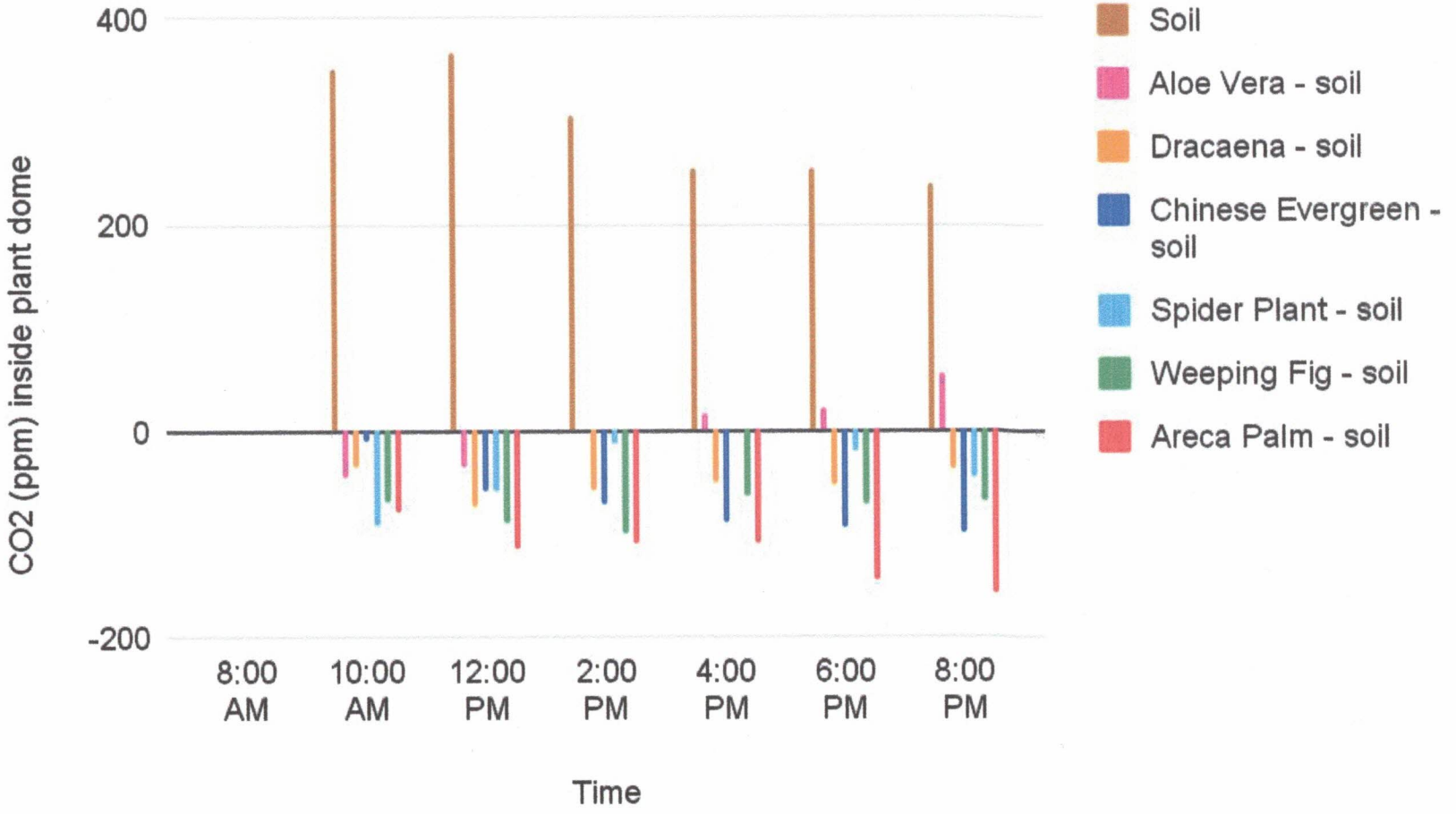


Figure 4. Average change in CO2 (ppm) of household plants inside the plant dome in the dark

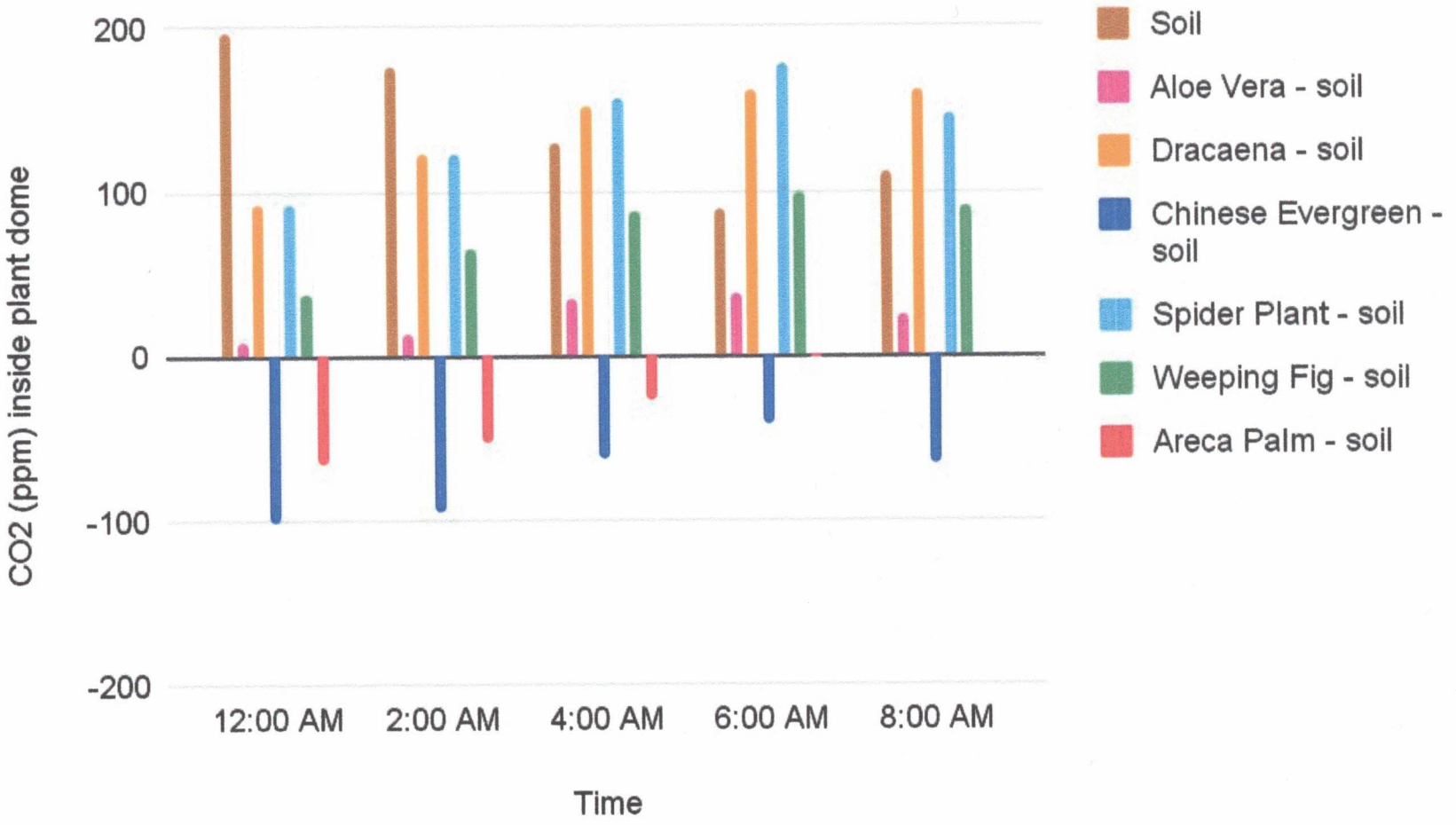
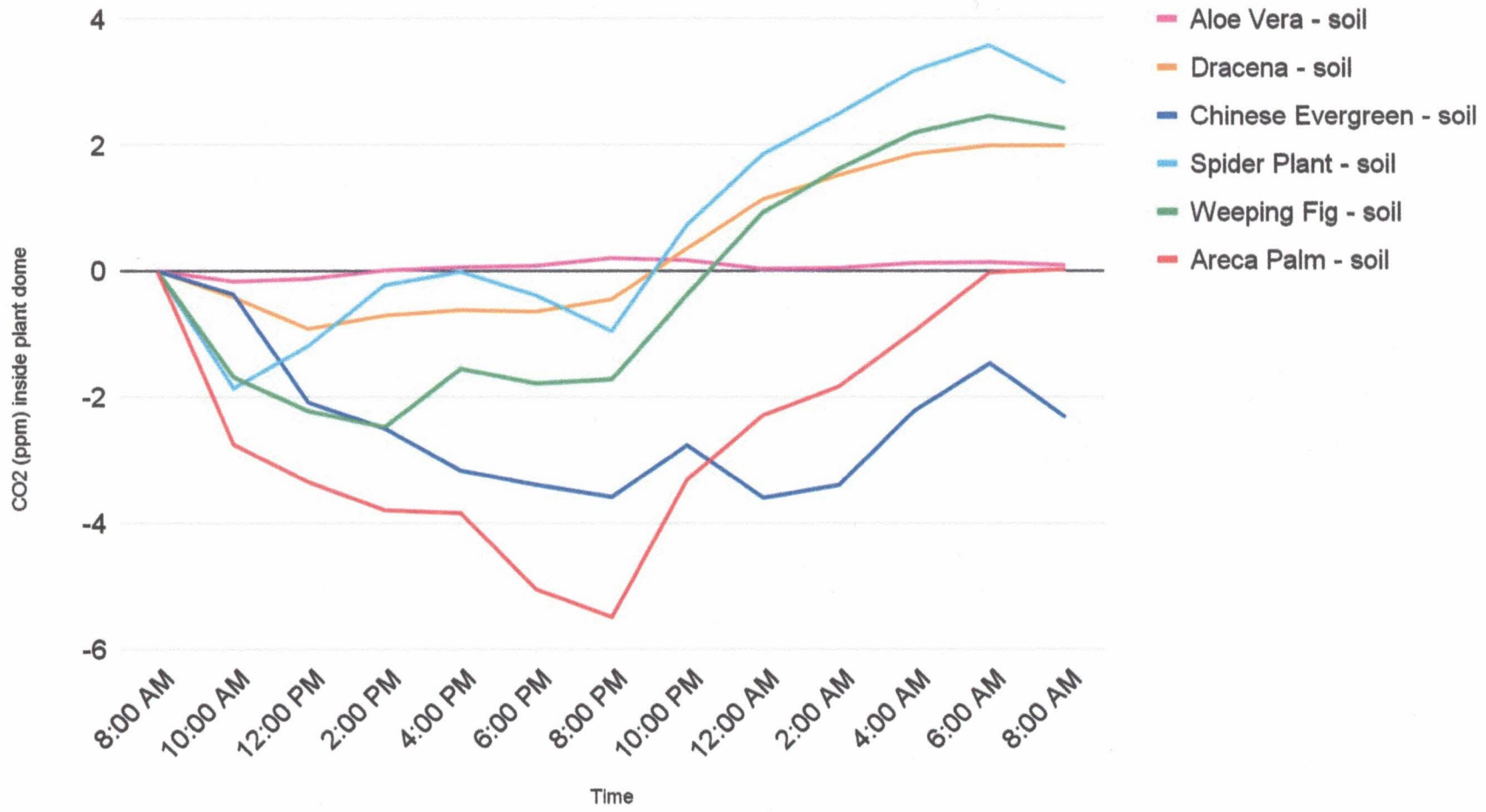
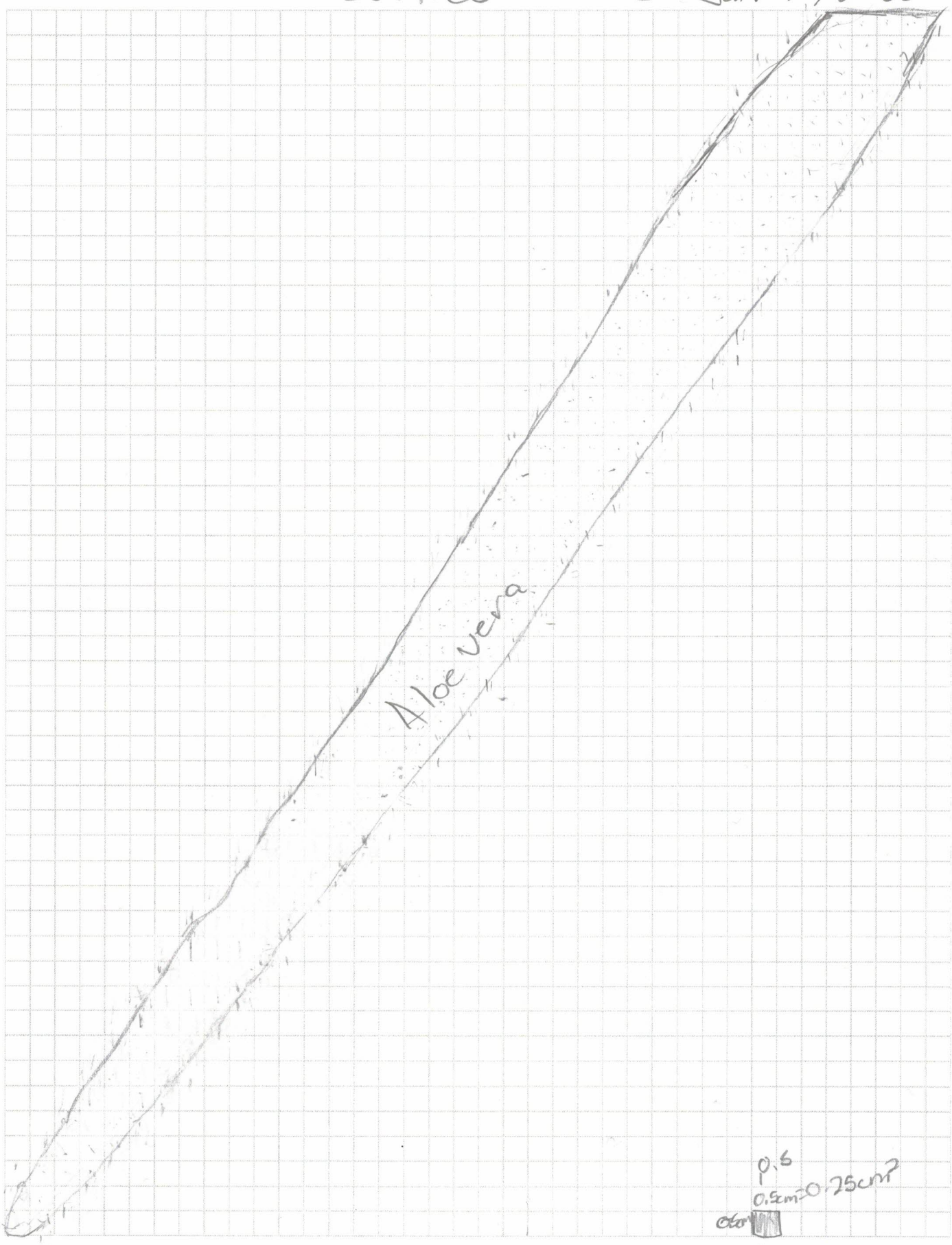
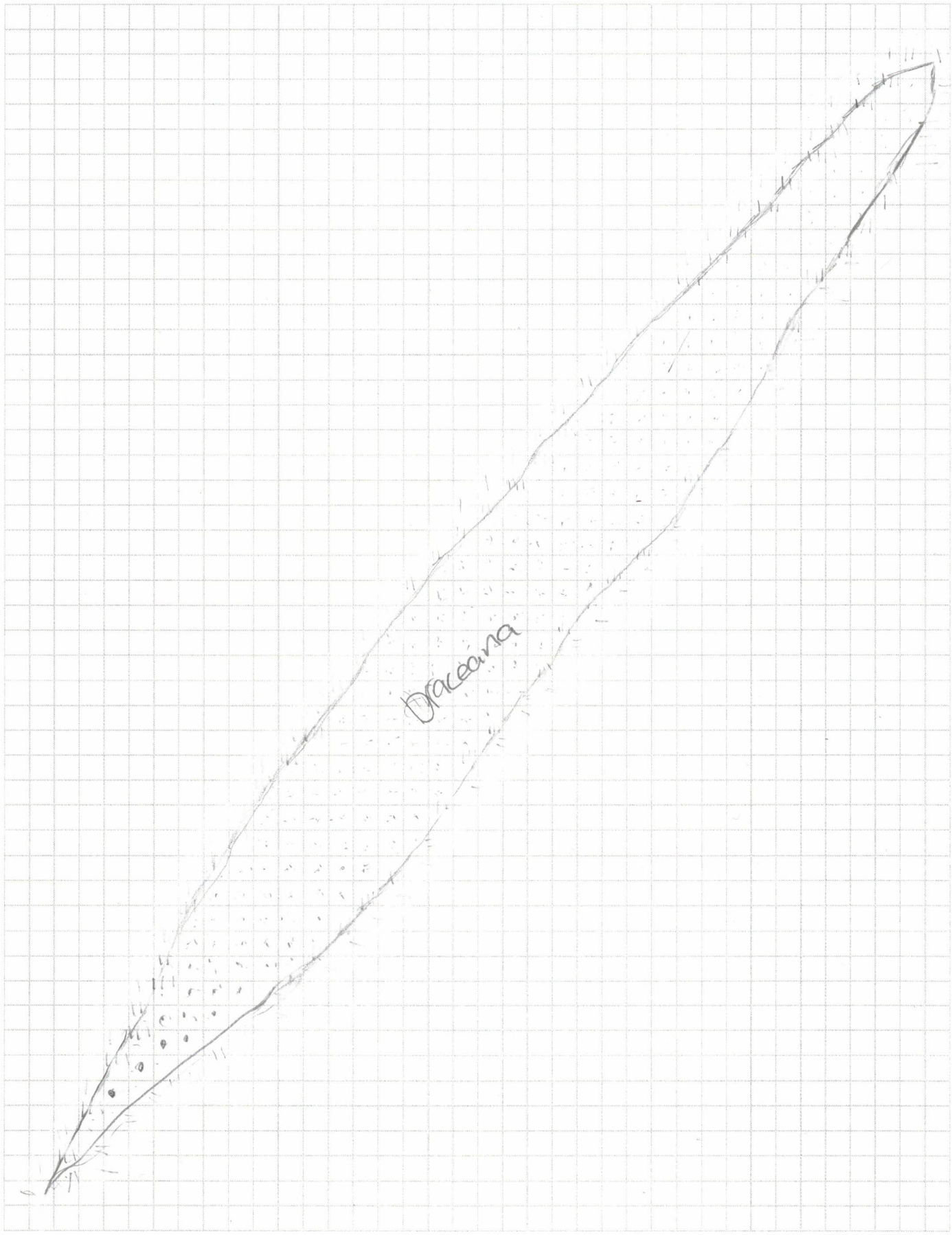


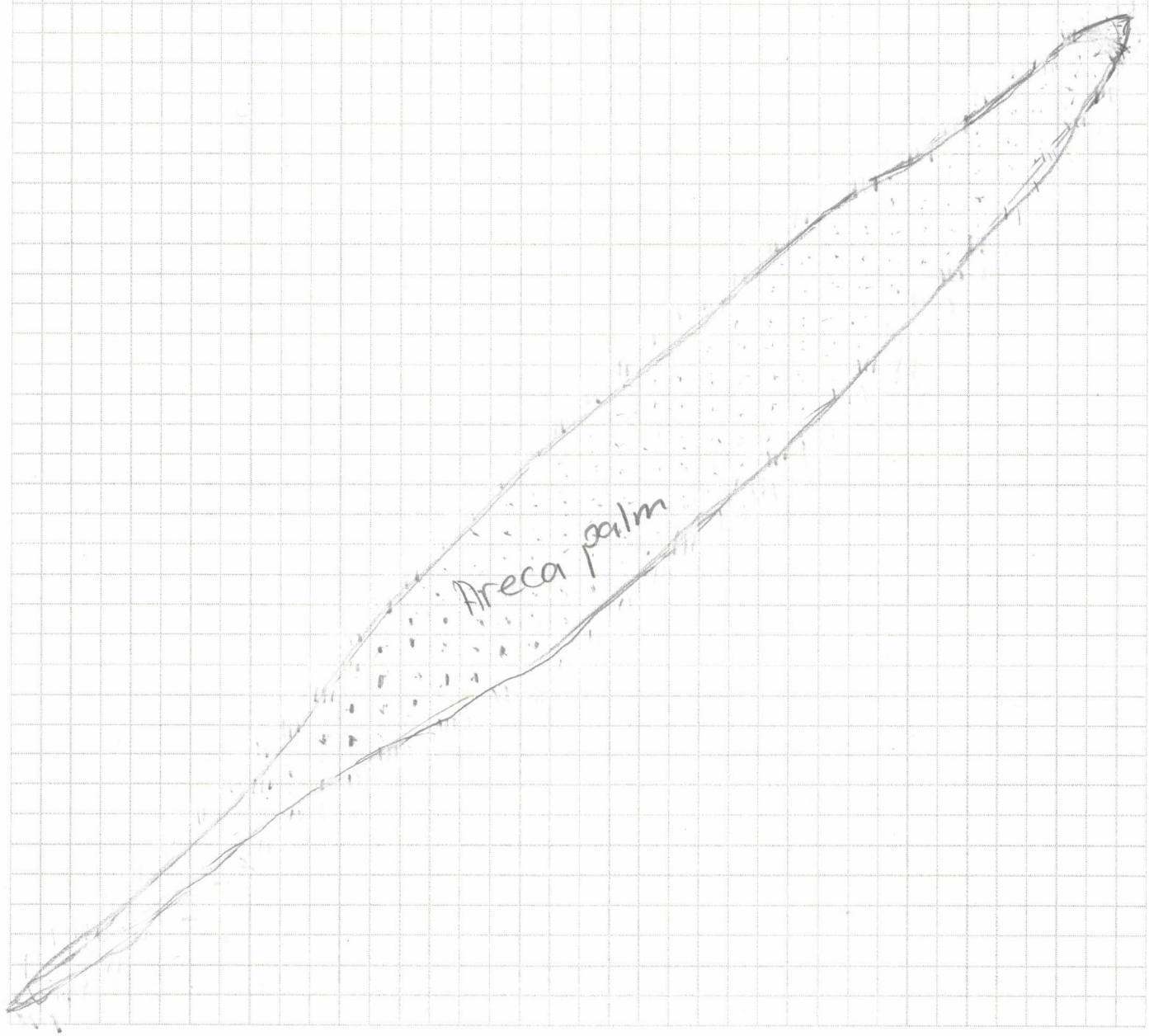
Figure 5. Average change in CO2 (ppm)/g of household plants inside the plant dome over 24 hours

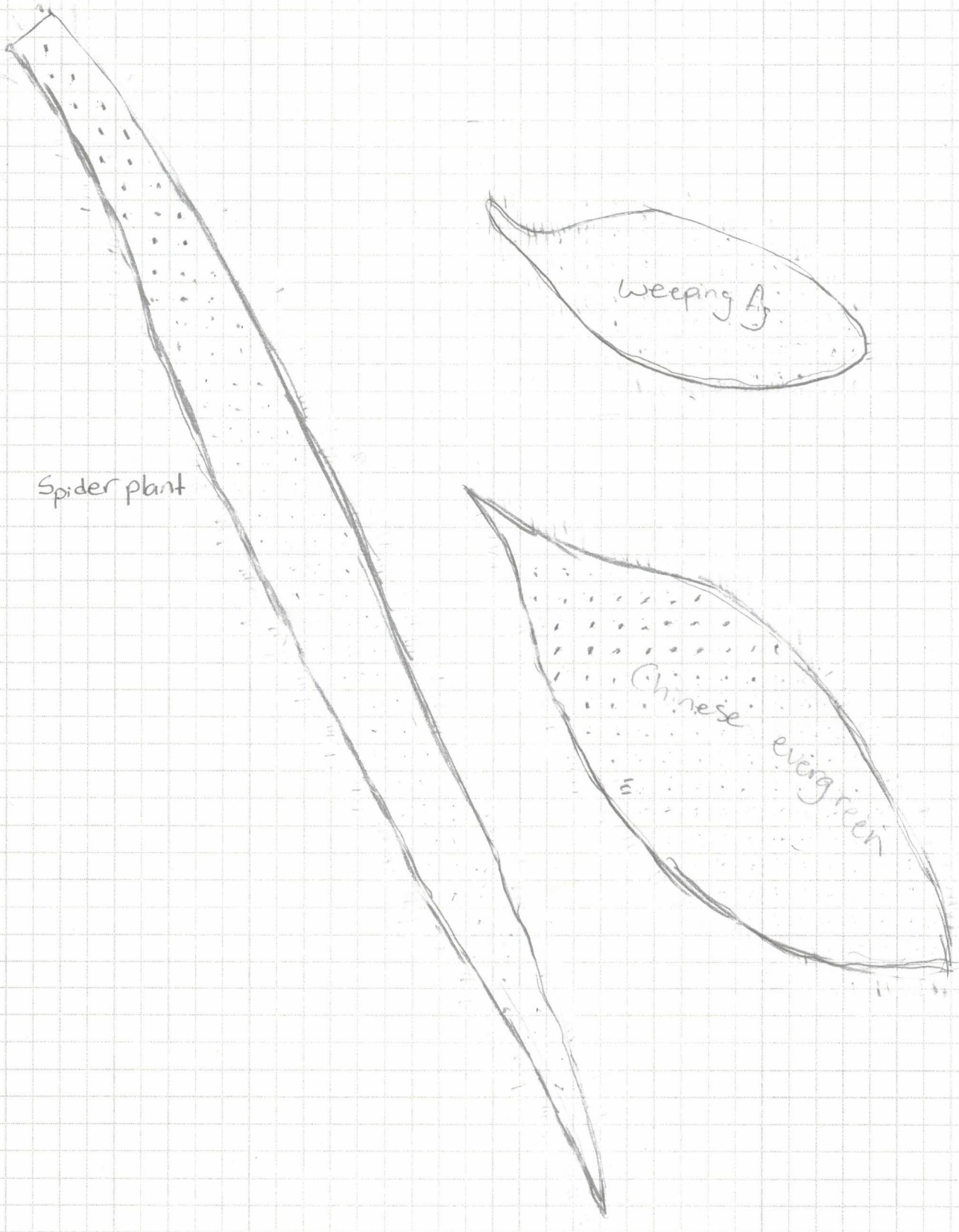


leaf surface areas Jan 10, 2026









Surface area calculations:

Aloe vera: 167 + 20 + 34 + 2.25

= 187 + 34 + 2.25

= 221 + 2.25

= 223.25

(Round answer)

= 223.25 × 0.25 = 55.8125

Aloe vera = 55.8 cm2

Draceana: 199 + 20.5 + 44 + 0.75

= 263 + 1.25

= 264.25 + 20

(Round answer)

= 264.25 ÷ 4 = 66.05125

Draceana = 66.1 cm2

Areca palm: 103 + 29 + 16.75

= 132 + 16.75

= 148.75

(Round answer)

= 148.75 ÷ 4 = 37.1875

Areca palm = 37.2 cm2

Spider plant: $96+31+11+1+3$

$= 127+11+1+3$

$= 138+1+3$

$= 139+3$

$= 142$

$4 \overline{)142}$ $= 35.2$

12

22

20

2

Spider plant = 35.2cm2

Chinese evergreen: $118+8+14+2.5$

$= 140+.25$

$= 140.25$

$4 \overline{)140.25}$ $= 35.0625$

12

20

20

025

24

10

Weeping fig: $44+6+7$

$= 50+7$

$= 57$

$4 \overline{)57}$ $= 14.1$

4

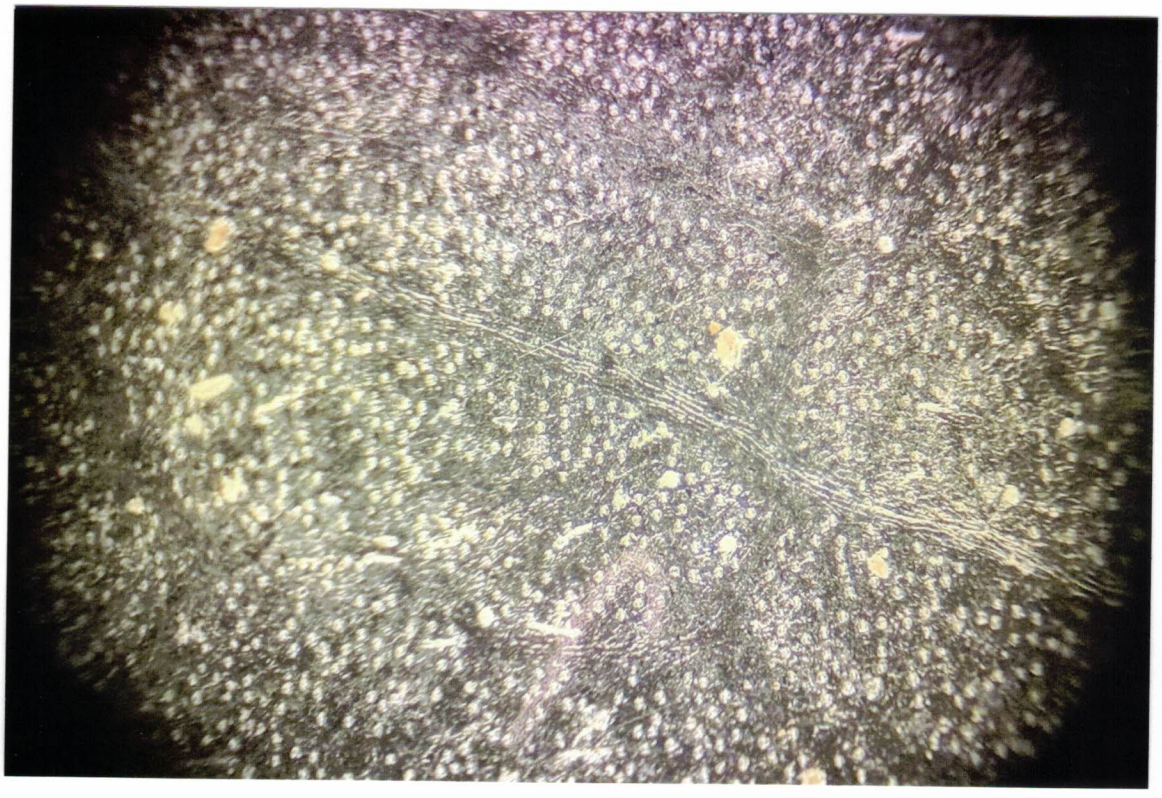
17

16

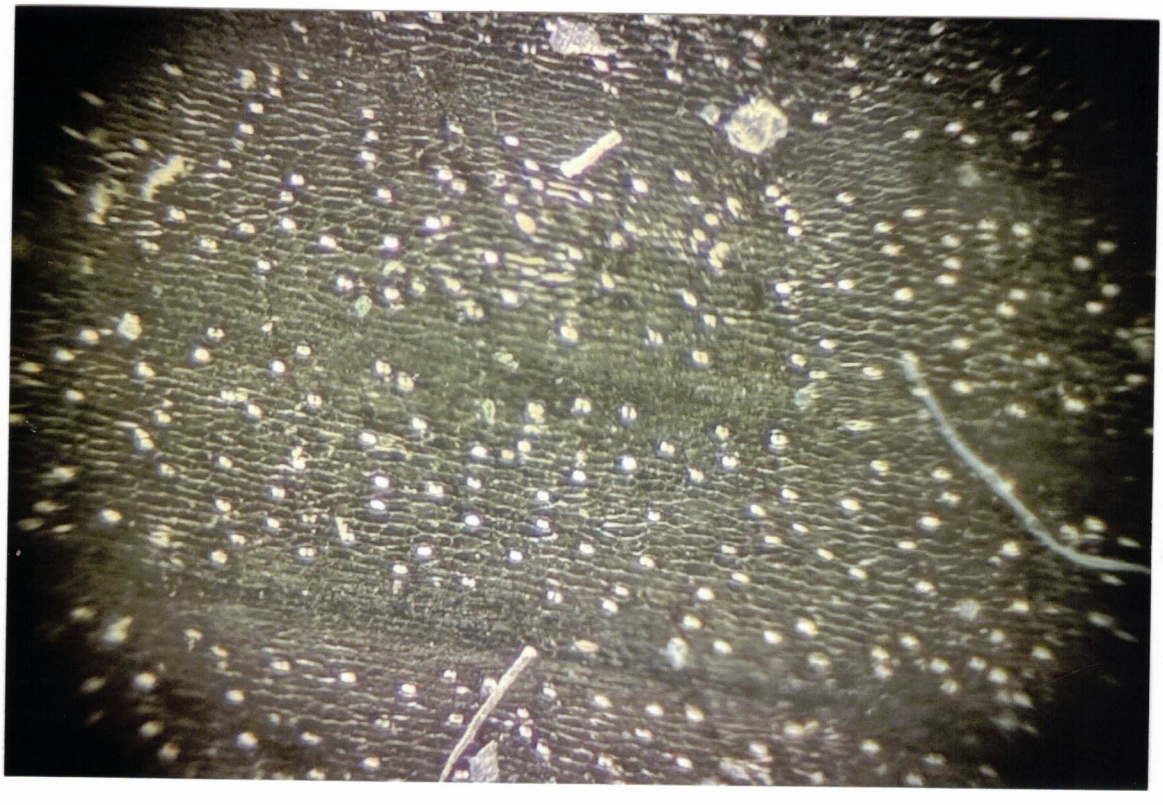
1

Weeping fig = 14.1cm2

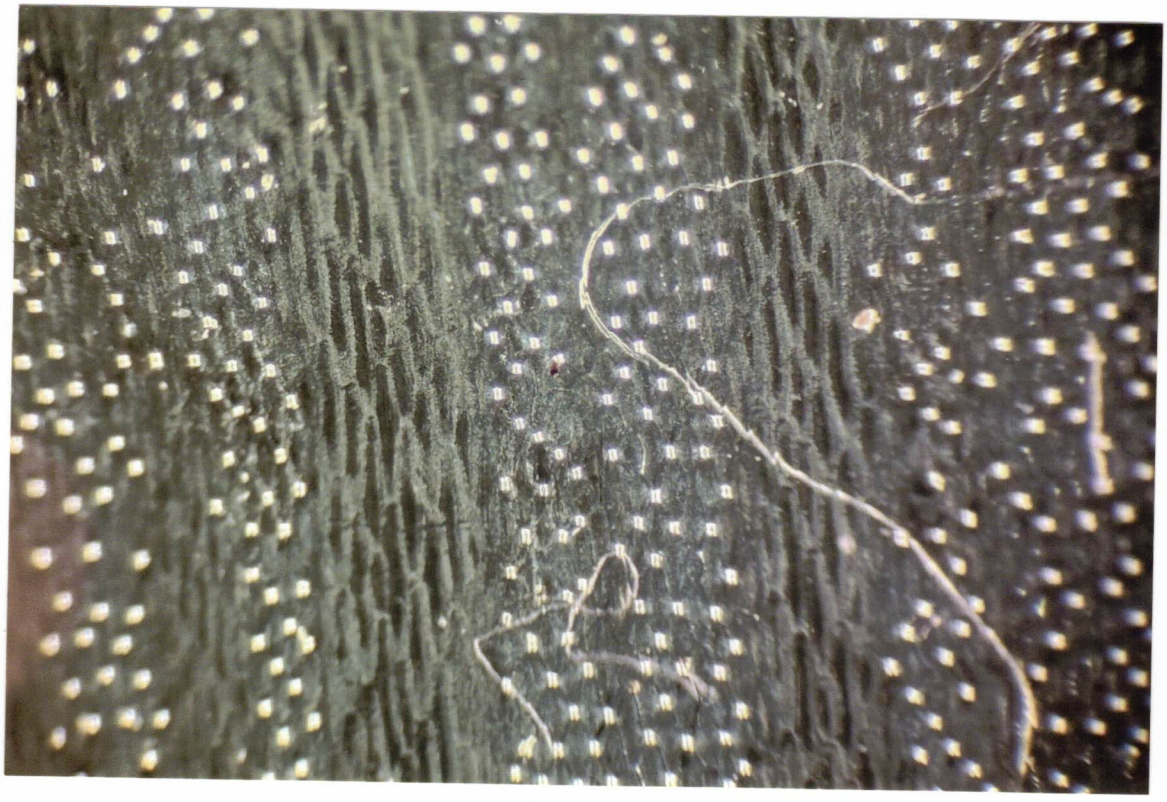
Jan 17, 2006 Stomata under microscope:



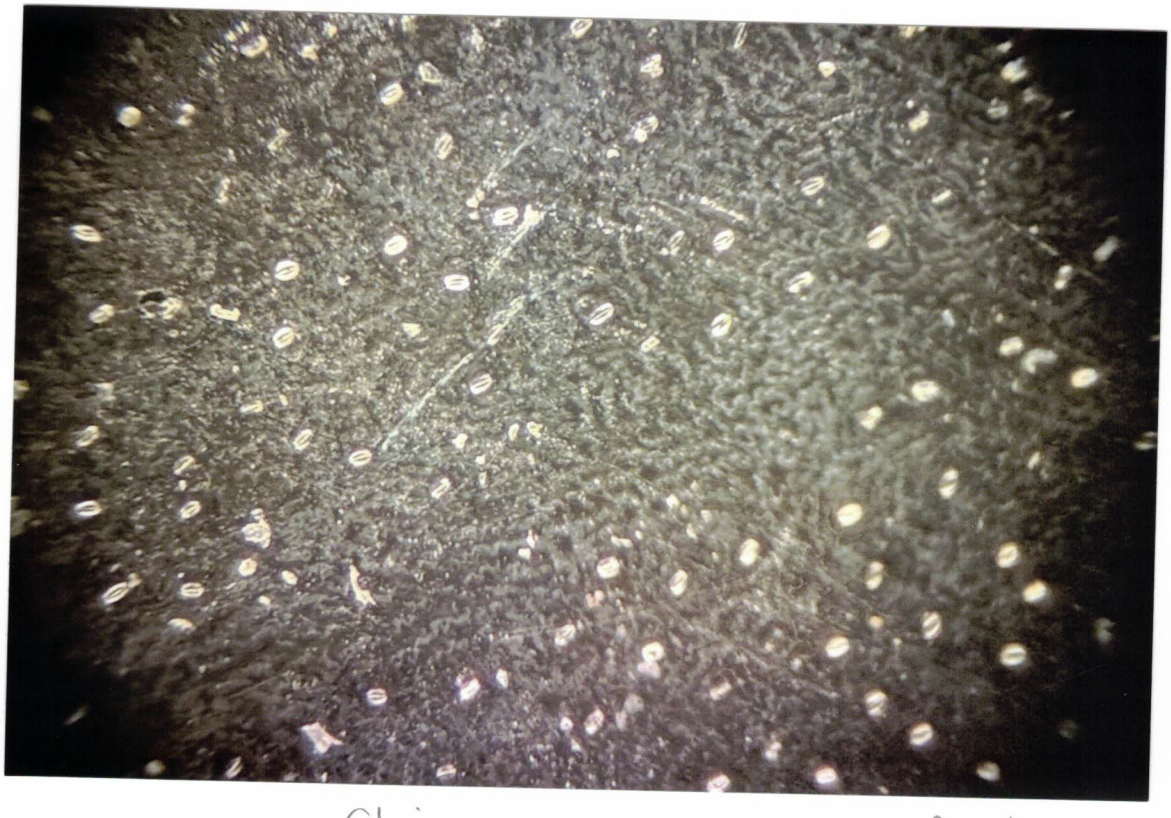
weeping fig - most densely packed



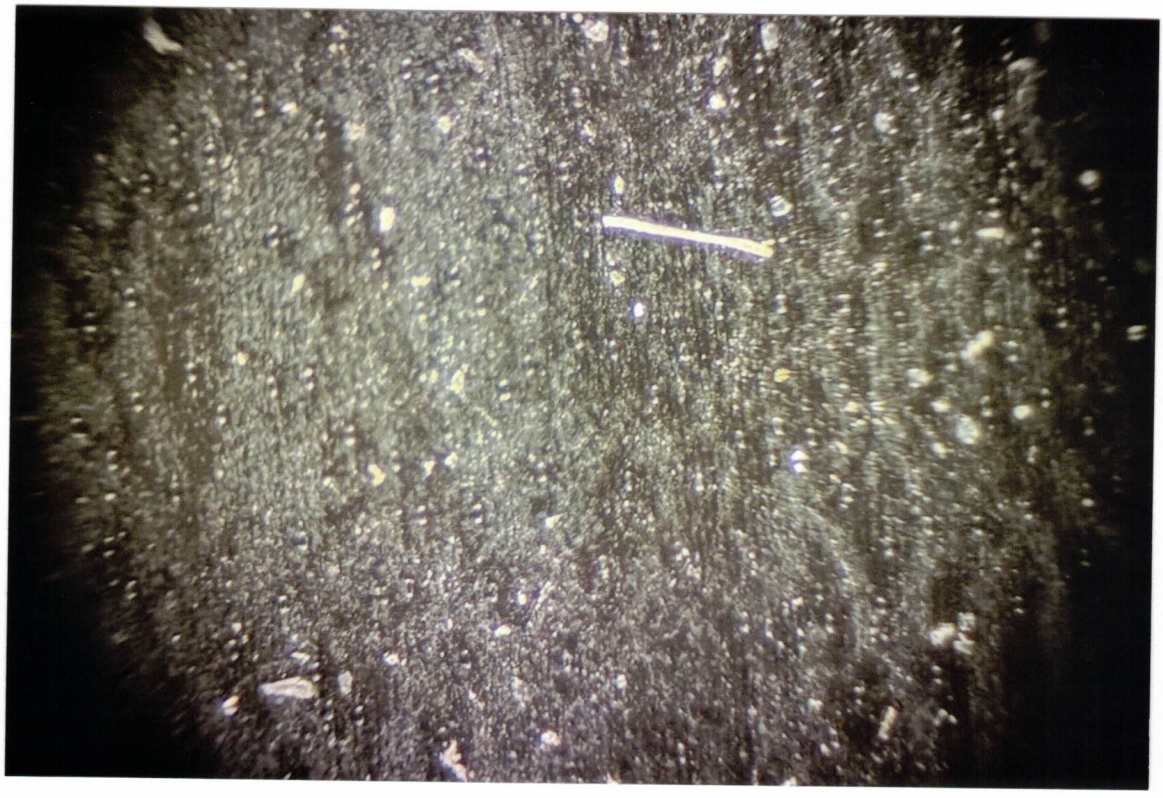
Areca palm - second most densely Packed



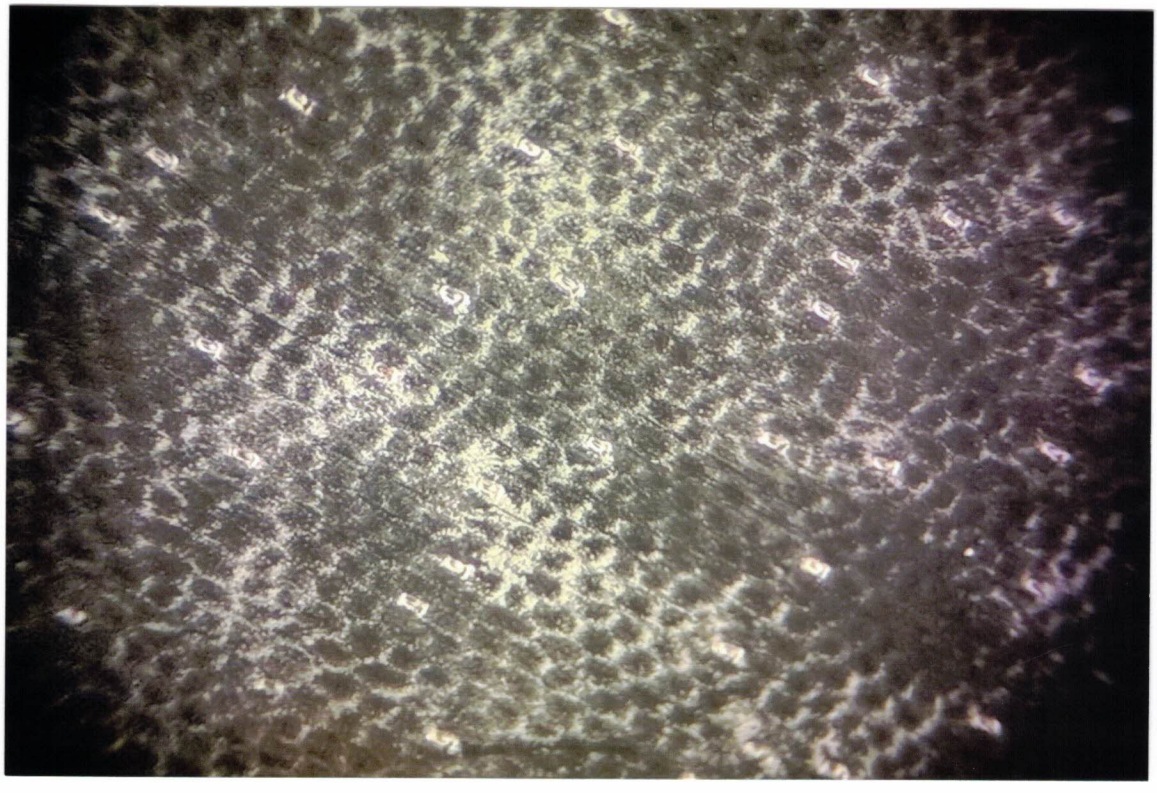
Spider plant - Third most densely Packed



Chinese evergreen - fourth most densley Packed



Draceana - fifth most densley packe



Aloe vera - least densely packed

Analysis

Jan 20, 2026

Based on the data that was collected, the Areca Palm had the best results in the light while the Chinese evergreen had the best results in the dark

The Areca palm showed the best results in the light which might have been due to its wide leaf span and densely packed stomata. It had the third largest surface area out of all the plants and second most densly packed Stomata. The Aloe vera had the largest surface area but the least dense stomata. It was also CAM so its stomata were closed during the day. The Areca Palm only had the third largest surface area but the second most dense stomata, which is why the Areca palm did better then the other plants.

The Chinese evergreen showed the best results during the night. The chinese evergreen is not a CAM plant meaning it releases CO_2 at night made the results Confusing. In theory, the Aloe vera should have done the best at night, but the leaves were starting to droop at the end of trial three. The Chinese evergreen was probably under stress which caused it to act differently then it normally would.

Conclusion

My hypothesis was proven incorrect.

The Areca showed the best results in the light not the Spider plant. The Areca palm had a higher leaf surface area and more densley packed stomata which likely why it did better than the Spider plant

The chinese evergreen showed the best results in the dark not the Aloe vera. The Aloe was looking pretty stressed by the end with droopy leaves which might have affected the results.

I learned something very interesting. The overall CO_2 levels in the dome were never lower then the starting point which means that a small desk plant can't absorb more then the soil releases.

Applications: Ideas Jan 21, 202

- Stuffy office spaces
- Ventalation in the winter
- Study Stomata (geneticly engeneered plant?)
- Plant covers (crochet cover? root rot?)
- farming soil cover (a bunch of plants?)
- Carbon footprint - reduce it
- Green house affect / Gas exchange?
- Plant houses and sustainable infastructure
- Forest fire (best CO_2 absorbing trees - greenhouse?)
- Cover / block open soil
- Study and modify Clorophyl?

Next Steps: Idea

- Forest fire trees - greenhouse?
- Different tempretures
- Hydroponics in houses
- Different wave lenghs for phdosynthesis
- Covers for soil (beads, stones?)
- Try to make a 'green house'

(sustainable infastructure?)