SASTA OLIPHANT SCIENCE AWARDS

SOUTH AUSTRALIAN SCIENCE TEACHERS ASSOCIATION

Prize Winner

Scientific Inquiry

Year 5-6

Rahini Phull

Highgate School

OLIPHANT SCIENCE AWARDS
SCIENTIFIC INQUIRY REPORT

RAHINI PHULL, Highgate School, 2021

Learning Intention:

The purpose of this Scientific inquiry is to find out how plastic, in different amounts can affect a plant and its growth in the time period of this experiment.

Background information:

When I was little, a tree had fallen near my house. My friend and I were playing there when we saw a piece of plastic in the soil. I wondered if the tree had fallen because of that little piece of plastic.

Plastic is a contaminant that is known to affect plants and pollute soil, so I decided to investigate it.

Question: How does plastic affect plant growth?

Prediction: I think that the effect of having plastic in soil will be negative for plant growth. I predict that contamination will result in a change of colour, reduction in number of leaves and height in the plants, not sure Bout surface area.

Planning and conducting:

After a small survey of options, I chose marigolds because they are cheap, have low-maintenance and grow fast.

So, I bought a packet of marigold seeds, 20cm diameter terracotta pots and potting mix on 25/4/2021.

Osmocote Premium Plus Superior Potting Mix

Mr.Fothergill's Marigold (French Dwarf Double Mixed

Black garbage bags

20 cm diameter terracotta pots

Variables:

I will be measuring the height of the plants (end of experiment), the surface area of their leaves (end of experiment), counting leaves (every 4 days).

Independent Variable: Plastic

Dependent Variable: Plants

Controlled variables:

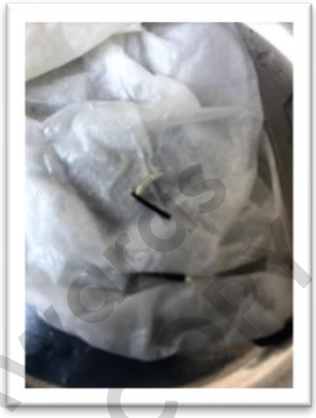
- Type of seed
- Type of soil
- Amount of water received
- Amount of soil
- Amount of sunlight
- Type of pot
- Time of watering
- Time of planting

Equipment:

- Osmocote Premium Plus Superior Potting mix
- Water
- Paper towels
- Plastic seed tray
- 20cm diameter terracotta pots
- Black garbage bags
- Measuring tools (weighing scale, measuring cups, measuring tape)
- Phone
- Cardboard
- Marigold seeds

Method:

1. First, shred about 500 grams of plastic garbage bags and keep it aside in bag for afterwards.
2. Get around 12 marigold seeds out of the packet
3. Then, place them paper towels and wrap them up, then wet the paper towel slightly and keep it moist for three days.
4. When the three days are over, go and check on the seeds, they should have germinated.
5. Next, keep the germinated seeds aside and get your plastic tray and potting mix.
   Anything beyond this point is to be done outside (e.g., backyard) and requires the person to wear gardening gloves



6. Now, put one cup of the potting mix into each of the plastic tray sections.

7. Then, carefully make a small space in the soil by pressing your finger gently into the soil somewhere around the middle.

8. Now take your seeds and carefully pick one up and place it in the small space you've made and then cover it up with soil, do the same for **9** of the seeds, water the seeds every 4 days for approximately 3 weeks.

9. After three weeks have passed, get your pots, shredded plastic and potting mix.

10. You might notice that your pots have a hole at the bottom (That's to drain out any excess water), but if you don't have any trays to put underneath the pots, then you can cut out some pieces of cardboard just big enough to cover it.

11. Carefully measure 1 kilogram of soil and put it in a pot and, cut one section of the tray out and transfer the plant (only the plant without any soil into the pots. Do this step for three plants).

12. Now, do the same step above but with only 900 gm soil and 100 gm plastic and another three with 950 gm of soil and 50 gm of plastic (the extra 50 gm plastic is there is any plastic falls out).

13. Take pictures of the plants at regular intervals and count the number of leaves every four days.

14. Once 59 days have passed, measure the surface area of the plants using the app 'EasyLeaf' (instructions in the app)

15. Measure the height, surface area and number of leaves of each plant and record it.

Processing and Analysing data:

Here is the in formation I gathered (EXPERIMENT CONCLUDED ON THE 15TH OF JULY):

Group A = Plant 1, - 100 gm plastic.

Group B =Plant 3, 4 - 50 gm plastic

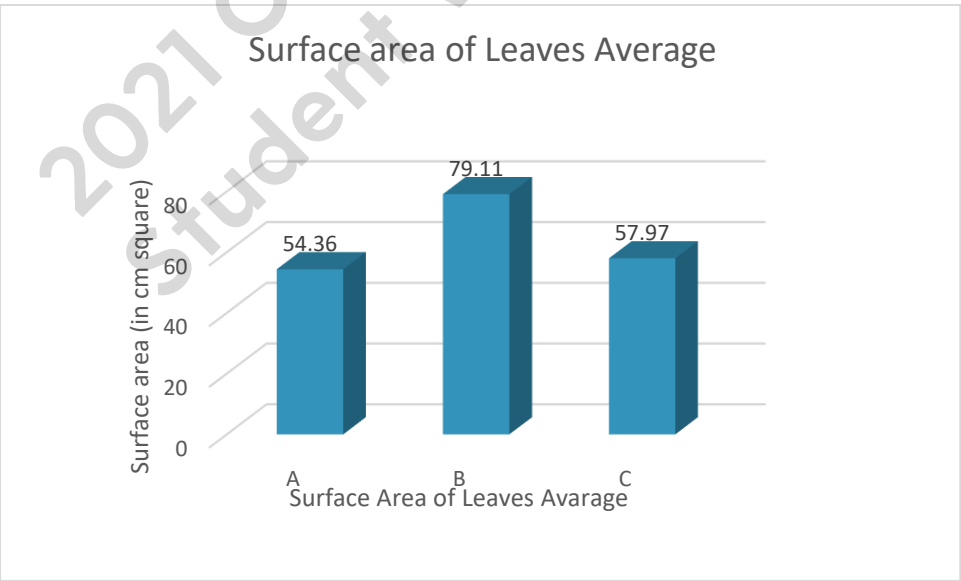
Group C = Plant 5, 6 - No plastic

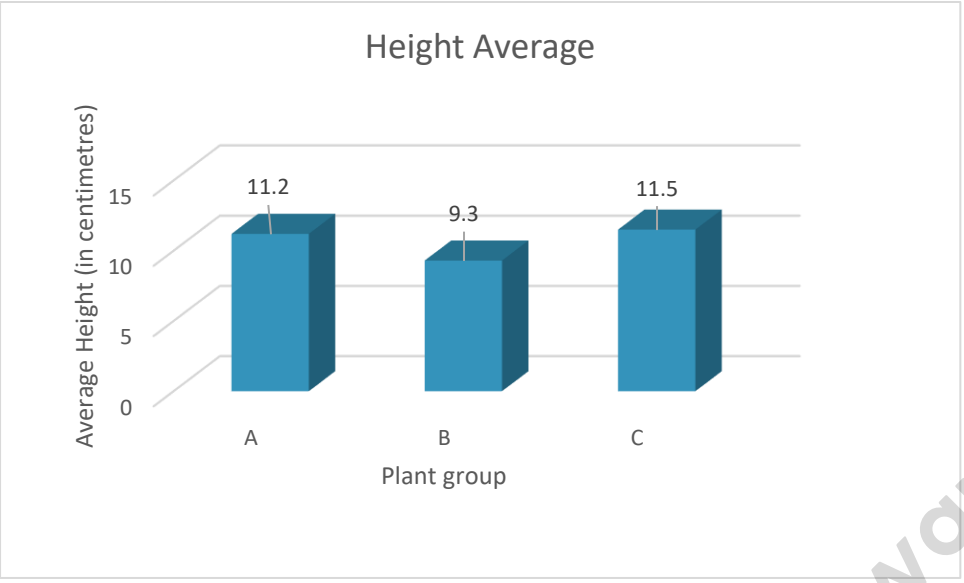
All aspects:

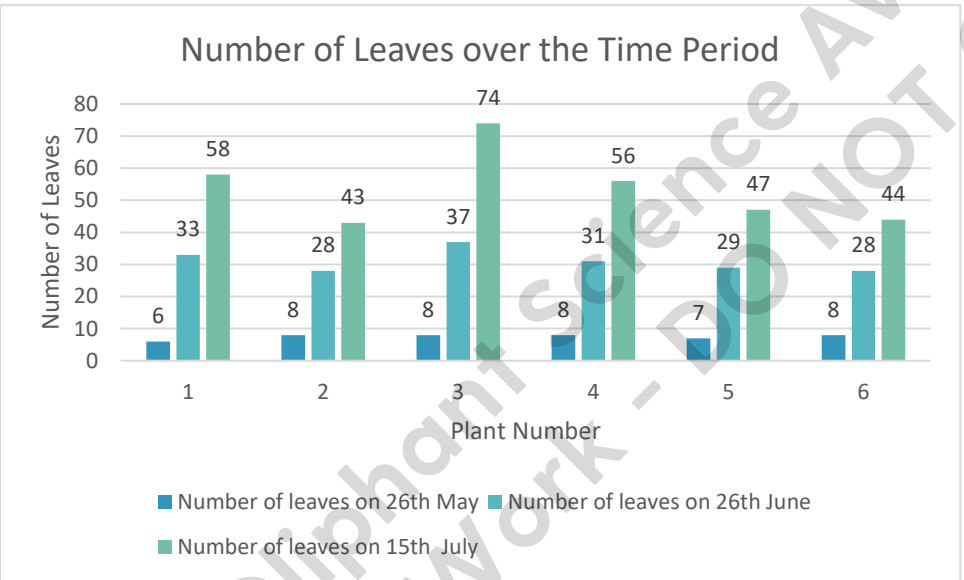
Group No.	Height Av.	Surface area of leaves average	Number of leaves on 26th May Av.	Number of leaves on 26th June Av.	Number of leaves on 15th July Av.
A	11.2 cm	54.36cm^2	7	27	50.5
B	9.3 cm	79.11 cm^2	8	34	65
C	11.5cm	57.97cm^2	7.5	28.5	45.5

Number of leaves:

Plant No.	Number of leaves on 26th May	Number of leaves on 26th June	Number of leaves on 15th July
1	6	33	58
2	8	28	43
3	8	37	74
4	8	31	56
5	7	29	47
6	8	28	44







Height: The average heights of Group A and C were extremely close, but Group C had the highest average height, Group A is second, followed by Group B.

Surface area: Group B had the highest average leaf surface area followed by Group C, then Group A.

Number of leaves: In measurements on all dates, Group B had the highest number of leaves, followed by Group A in most cases followed by Group C.

What I have noticed is that Group A and Group C are both very close in each measurement. That was unexpected. But the data collected is only accurate for now, it may change in the future. Groups A and B were starting wither.

Plastics can change soil chemistry. The plastic could increase water evaporation, which dries the soil. Plastic surfaces could allow toxic substances to gather in ways they couldn't in organic soil. That may affect plant growth in any aspect.

I believe that the plastic may have affected the soil nutrients, resulting in low height in groups A and B. Keep in mind that as the plants are still young, it is likely that the plastic contaminant will still affect the plant growth and health in the future.

Also, I think that Group B plants ,which were not as tall as the other plants, adapted to it quickly and made somewhat of a 'compensation' in terms of number of leaves and the surface area, however, Group C had so much plastic that it couldn't adapt so, although it was it the middle in height averages, a 'compensation' didn't occur to make up for the number of leaves AND the surface area of leaves.

Evaluating:

I could make improvements by taking photos regularly and have regular measurement, extending my study, observation and experiment period so that I could have more time interpret the results and maybe wait till the plants to grow to maturity. I took 3 different types of measurements so that the data will be more accurate, and I'll have three points of view to look at the results.

Relating Investigation Ideas:

- Long term study.
- Different type of materials.
- Study with more plants.

Conclusion:

Plants of Group C are not at the bottom in any of the parameters; therefore, it is safe to conclude that they are healthier. Group C plants are healthier because a plant with plastic as a contaminant can decrease the chances of it growing taller and bigger.

Acknowledgements:

I would like to thank my parents for supporting me through this project and urging me to do this in the first place!

REFERENCES:

https://www.sciencebuddies.org/science-fair-projects/references/measuring-plant-growth

https://www.yates.com.au/plants/flowers-and-ornamentals/marigold/how-to-grow-marigold/

https://ecogardener.com/blogs/news/4-factors-that-affect-plant-growth

https://www.botany.one/2019/03/microplastics-could-pose-a-threat-to-plants/

https://play.google.com/store/apps/details?id=com.heaslon.EasyLeafArea&hl=en_AU&gl=US
(this app can only be downloaded on a phone)

https://www.plasticseurope.org/en/about-plastics/what-are-plastics

NOTE: word count without all Headings = 1093 words

OSA RISK ASSESSMENT FORM

for all entries in (✓) ☐ Models & Inventions and ☑ Scientific Inquiry

This must be included with your report, log book or entry. One form per entry.

STUDENT(S) NAME: RAHINI PHULL ID: 0250-002

SCHOOL: HIGHGATE SCHOOL

Activity: Give a brief outline of what you are planning to do.

The effects of plastics on plants growth.

Are there possible risks? Consider the following:

- Chemical risks: Are you using chemicals? If so, check with your teacher that any chemicals to be used are on the approved list for schools. Check the safety requirements for their use, such as eye protection and eyewash facilities, availability of running water, use of gloves, a well-ventilated area or fume cupboard.
- Thermal risks: Are you heating things? Could you be burnt?
- Biological risks: Are you working with micro-organisms such as mould and bacteria?
- Sharps risks: Are you cutting things, and is there a risk of injury from sharp objects?
- Electrical risks: Are you using mains (240 volt) electricity? How will you make sure that this is safe? Could you use a battery instead?
- Radiation risks: Does your entry use potentially harmful radiation such as UV or lasers?
- Other hazards.

Also, if you are using other people as subjects in an investigation you must get them to sign a note consenting to be part of your experiment.

Risks	How I will control/manage the risk
Working with soil	Wearing gloves
Cutting plastic	Being careful

(Attach another sheet if needed.)

Risk Assessment indicates that this activity can be safely carried out

RISK ASSESSMENT COMPLETED BY (student name(s)): Rahini Phull

SIGNATURE(S): Rahini

☑ By ticking this box, I/we state that my/our project adheres to the listed criteria for this Category.

TEACHER'S NAME: Lucyna Jachacy

SIGNATURE: Jachacy DATE: 30.06.2021

OLIPHANT SCIENTIFIC INQUIRY LOGBOOK

Date	Day (Day1, Day 2, etc.)	Photo and remark
20/4/21	N/A	Seeds were purchased
26/4/21	N/A	Seeds were put in paper towels to germinate (Marigolds need to be soaked in wet papertowels to germinate before they're put in a tray) 
27/4/21	N/A	
28/4/21	N/A	Seeds start to germinate 
29/4/21	N/A	
30/4/21	N/A	

1/5/21	N/A	 Seeds were put in planting tray, only nine, I soaked twelve of them, just in case that some don't germinate as fast as others.
2/5/21	N/A	
5/5/21	N/A	
7/5/21	N/A	

14/5/21	N/A	
15/5/21	N/A	
19/5/21	N/A	

20/5/21	N/A	
21/5/21	N/A	

23/5/21	N/A	
26/5/21	Day 2	

2/6/21	Day 5		

26/6/21	Day 27	  Plants started to go crooked and wither, but not the ones with no plastic.

7/7/21	38	 Same as above row.
10/7/21	41	
15/7/21	46	

*END OF EXPERIMENT (sorry there are some missing pictues couldn't take them daily because of some circumstances)+