

Hong Kong Student Science Project Competition 2023

Template of Extended Abstract (Investigation)

(Word Limit: 1,600 words, Pages: 3 pages only)

Team Number: SBBC176

Project Title: Reuse Food Wastes, Renew Nature's Life

Project Type: Investigation

*To our best knowledge, there are no * similar works in the field; (if there are,) related research links are as below:*

N/A

The enhancement our project made / the difference with related research

N/A

**Please delete if not applicable. The competition values the originality of works. Students must do enough literature research to ensure that their works are unique and list relevant reference materials before starting research or invention.*

I. Background

- Provide background information of project and/or state the problem to tackle
- Provide highlights of the **literature review** with the support of pertinent and reliable references
- Provide an overview of work and mention the **research gap that the project is trying to fillg/**

Many of our classmates have been eating in the canteen ever since lunch periods were brought back after the pandemic. This led to an increase in food wastes in the school. Our biology research team was thinking about how we can use what we throw away and make use of them. So we came up with using common food wastes as natural fertilizer to speed up plant growth.

II. Objectives

We hoped to find out whether food such as apple peels could act like catalysts and speed up the growth of plants or even be as effective as chemical fertilizer.

III. Hypothesis

- Propose an explanation for a phenomenon and stating how the **hypothesis** can be tested by experiments

Since many households also use natural fertilizer, we thought the plants with natural fertilizer will grow faster than the normal plants without chemical fertilizer. Furthermore, we observed that some people preferred to use organic wastes over chemical fertilizers. Perhaps this was because it was cheaper but it could also be that it speeds up plant growth more.

IV. Methodology

- List out the materials used
- Describe the **experimental protocol** including the set-up of **control experiment** (if any), **repeated experiment** (if any), and its scientific theory
- Indicate with the support of reasons, the **analysis** used in the investigation

First experiment:

- egg shell, orange peel, apple peel, coffee beans, banana peel, peanut shell
- flower pots, blender
- Begonia cucullata* plants
- 1 control set-up without any fertilizer

Process: Blend the ingredients into small pieces and place them into the soil of the plants respectively.

Scientific theory: Organic fertilizer contains minerals and nutrients for plants to grow healthily, minerals such as potassium, nitrogen, phosphorus and magnesium are required for plants' synthesis of chlorophyll, nucleic acids, amino acids and enzymatic reactions.

Second experiment:

- egg shell, orange peel, apple peel, coffee beans, banana peel, peanut shell
- flower pots, blender
- 2 control set ups: without any fertilizer and chemical fertilizer
- Begonia cucullata* plants
- water bottles

Process: Blend the ingredients with water into solutions respectively and add one water bottle cap of the solutions onto the soil of the plants respectively daily.

Scientific theory: In addition to the above theory, this time aqueous fertilizers are used to allow better nutrients and minerals absorption of the plants, as they can seep into the soil and can be absorbed more effectively by the roots of the plants.

V. Results

- Present the **data** with figures, tables or photos
- **Data analysis** (if any, with emphasis on data reliability and the reproducibility based on statistics)
- Interpret the results and its implication
- Discuss **limitation** and compare with existing related works (if any)
- Discuss the importance or impact of the research and how it is applicable to real problems

First experiment:

Since the amount of fertilizer used was disproportionate, it was unclear which natural fertilizer was more effective in helping the plants grow relative to their fertilizer's mass. However, even with a lesser amount than some, the egg shell test and the peanut shell test both had growth surpassing the average height of both control setups.

We believed that the other set-ups such as the fruit skin and coffee grounds ones couldn't grow as tall because the minerals had been used up by the mold growing on them.

Using this new information, we decided to weigh the natural fertilizers evenly with a 1:5 food waste to water ratio and blend them with water so the mold can't get into the liquid under the soil.

Second experiment:

Unexpectedly, the peanut shells became more absorbent when they were blended with water and took in the soil nutrients. As a result, the plants didn't survive long.

Banana and apple peels performed slightly better and even grew flowers.

The eggshell setup didn't have any major changes and worked quite well while sprouting many leaves.

However all the setups besides the chemical fertilizer test had reddish leaves which we thought were caused by a deficiency in a certain nutrient.

The chemical fertilizer performed the best in every aspect, including height, amount of leaves and flowers grown.

VI. If your team will compete the Sustainable Development Award, please indicate the specific sustainable development goal the project is related to, and provide justification for competing for this award. (*Word limit: 300 words*)

VII. If your team will compete the Social Innovation Award, please list the target group or social issue the project focuses on, and provide justification for competing for this award. (*Word limit: 300 words*)

VIII. Conclusion

- Make a **data-driven** conclusion of the project and the way forward of the research
- Justify if the proposed project meets the objective(s)

The top three contenders for most effective fertilizer were the chemical fertilizer with the tallest height at 9.2cm, 54 leaves and 13 flowers, the egg shell test with the tallest plant having a 7.1cm height and 51 leaves, and the apple peel test with a 7.8cm height, 44 leaves and 2 flowers.

We discovered that natural fertilizers can be used to help plants grow taller and faster but there needs to be a mixture of food waste that contain enough nutrients to sustain the plants growth. It is highly plausible that organic fertilizers can be used as a replacement with chemical fertilizers one day.

✘ Our project is developed based on previous project and the enhancement is below: