

Hong Kong Student Science Project Competition 2023

Template of Extended Abstract (Invention)

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

Team Number: JABC254

Project Title: 意「油」未盡 A Study on Essential Oils

Project Type: Invention

*To our best knowledge, there are / ~~are no~~ * similar works in the market; (if there are,) related product links are as below:*

https://www.youngliving.com/en_HK/products/tea-tree-melaleuca-alternifolia-essential-oil

The enhancement our project made / the difference with related products are:

Tea tree is not a common plant in Hong Kong and their oils are quite expensive, our main focus is on other foods such as thyme and orange in this experiment. We have further investigated more effective methods of extraction and application.

**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 as to learn about the audience for whom the project is addressing
- Provide highlights of **literature review** and/or related technologies or devices, with the support of pertinent and reliable references
- Provide an overview of work, create a point of view as to define the needs and insights of the audience and mention the **research or technology gap the project is trying to fill**

Many home cooks enjoy using fruit (e.g.: Oranges/lemon) or heavy spices (e.g.: Thyme/rosemary) to add flavor to their dishes. However, during this process, unwanted parts in a fruit (eg. Peels) or leftover herbs are often thrown into waste eventually. For that reason, our aim is to find a sustainable and home-applicable method to utilize these waste effectively in an environmentally-friendly way.

Furthermore, as COVID measures in Hong Kong are gradually alleviated, there has been a decline in our need for surgical face masks. Therefore, many people are struggling to handle the excess face masks left in their home as the masks are no longer needed. Consequently, we wish to find a way to recycle these leftover face masks by transforming them into a beneficial cleansing product to users at home. With the combination of unused face masks and leftover fruit or spices, we hope to invent an economical and sustainable product which is home-applicable, so more people will be able to make better use of their unwanted material, and to gain benefits from this invention.

II. Objectives

- State the **aim(s)** of project

We hope to find a powerful natural replacement for sanitizing products such as alcohol, which can be made at home and successfully utilize the masks remaining after lifting the mask mandate arrangement.

III. Methodology

- Briefly describe the **approaches** used e.g. use of equipment, materials, tests and experiments
- Explain the selected implementation strategies with the **scientific theory**

Subjects used: Orange, thyme, alcohol, tea tree oil

Step 1: Extraction of essential oils

For extracting orange oil, mostly containing limonene, steam distillation is used.

For extracting thyme oil, mostly containing thymol, simple distillation using alcohol is used.

Step 2: Identification of product

A boiling point test is done with the products obtained from Step 1. The boiling point of the product is compared with the literature value to determine whether we have successfully extracted the desired compounds.

Step 3: Test for antibacterial activity on agar plate

Bacteria obtained from rubbish bin lids is used. By comparing the size of the clear zones (zone of inhibition of bacterial growth) obtained, we can find out which food is the most effective.

Result:

Tea tree oil > thyme > orange > alcohol

IV. Design of Invention

- Describe the **design** and the **principle** of invention (e.g. The ideation of the projects, the prototypes or creative solution as far as applicable)
- Provide sketches / drawings / photos of the invention

Method 1

The inner sides of masks are extremely absorbent. In addition, they are antibacterial and are sanitised thoroughly in production. Hence, thyme oil can be rubbed into the inner layers of masks and carried anywhere to act as disinfectant wipes.

Method 2

By spraying thyme oil on the surface of the mask, doctors and nurses in hospitals can use their masks for longer while enhancing its antibacterial ability. It can reduce the amount of medical wastes and protect medical staff in an environmentally friendly way.

Method 3

Last but not least, masks can be used as substitutes for single-use dishcloths. By scrubbing thymol oil onto the masks and letting them absorb the oil, one can use the mask to cleanse dishes thoroughly and also create a more environmentally friendly way to eliminate the germs on dishes. They are natural and can also emit a fragrant scent!

Photos of Innovation:

Under development

V.

VI. Application / Market Need

- Explain the area of **application** and function of invention
- Indicate the market need and impact of invention
- Discuss **limitation** and compare with existing related works (if any)

The invention is a sanitizing product made from disposable masks and essential oils. As the products on the market currently are mainly made from alcohol, it is quite irritating and might not be the best option for pregnant women and young children. Therefore, we created a product with natural substances that have antibacterial properties so that a wider range of people can be suitable for the sanitizing product. Moreover, as we noticed that a large amount of disposable masks are left as the influence of COVID-19 has reduced, our product can utilize the masks before disposing them when they expire. We combined the masks with essential oils that can be extracted from leftover food at home so that more waste can be

reused for a better impact to the environment.

However, there are a few limitations of our product. As the essential oils can already be quite effective in killing germs, the combination with disposable masks might not be too significant if the essential oils can already have similar effects alone by itself. Moreover, the extraction of essential oils carried out at home might not be the best way to do so as allowing alcohol to evaporate for simple distillation can be harmful to the human body if suitable safety precautions are not taken.

VII. 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)

As the influence of COVID-19 has started to reduce, most families are left with an ample amount of disposable masks without being put in use. The masks will eventually expire and more waste will be created. Therefore, we aim to utilize the disposable masks and discovered that a sanitizing product can be made with several essential oils, namely orange essential oil, thyme essential oil and melaleuca oil. Comparing with other sanitizing products in the market, the components of our product are natural materials instead of alcohol. While alcohol can be irritating and not the best sanitizing products for young children, natural substances, such as essential oils, can be suitable for a wider variety of people. To take a step further, we carried out several experiments, including steam distillation and simple distillation using alcohol, to extract essential oils from leftover orange peels and thyme. It shows that the essential oils can be also extracted at home to create the sanitizing product while making use of some leftover food. All in all, our product can fully make use of leftover disposable masks as well as the orange peels and thyme left after a meal. It greatly reduces the amount of household waste created. Even more, the product's effectiveness of killing germs is almost equivalent to the sanitizing products on the market and less harm can be caused to a human body with the natural components in our products. With the environmentally friendly and user friendly factors, our product is sustainable.

VIII. 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)

N/A

IX. Conclusion

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

The experiment results show that these naturally extracted oils and their antibacterial compounds may be even more effective than alcohol. We hope to test more types of food waste in the future and even investigate special characteristics or components of essential oils which make them a good antibacterial agent. Better utilization of properties of different layers of the mask is under investigation and we hope to be able to simplify the extraction process so that it is easier and safer to do at home.

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