

Team Number: SDBC201

Project Title: Effects of acidity, temperature, oxygen level, and other diets on the consumption of plastic polyethylene by the great wax moth (*Galleria mellonella* L.)

Project Type: Investigation Design Proposal

To our best knowledge and after thorough literature research, as at 28/06/2022 , there are / are no similar works. If there are, the reference links are as below:

https://www.e-nnovate.eu/image_upload_2021/1362988923.pdf
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The enhancement our project has made for the existing related products or research is summarized as below:

It has been proven that Greater Wax Moth larvae can degrade plastic into smaller molecules, even the toughest plastic polymer polyethylene(PE).

***Please delete if not applicable. HKSSPC values the originality of works. Students must conduct literature research thoroughly to ensure that their works are unique, and to list relevant reference materials to complement the research or invention.**

I. Background

In the modern world, we noticed the seriousness of plastic pollution, and we discovered a moth that is able to digest plastic. Therefore, in the research, we are investigating the optimal conditions for the moth to carry out its highest rate of plastic consumption and setting up a few experiments to investigate our test. As a result, we hope to find out a method to increase the rate of degradation of plastic which gives a possible solution to tackle the severe plastic pollution around the globe

In our project, some tests will be conducted, with previous literature as references, a certain range of pH levels, co-diet food type, temperature and oxygen levels are designed. Eventually, we hope to find out the particular condition where the moth could carry its highest rate of plastic consumption.

Our ultimate goal is to maximise the rate of consumption of plastics in Greater Wax Moth so that this method of biological degradation can be applied in large scale and solve the problem of plastic pollution.

II. Objective(s)

To discover the optimal conditions for the moth to carry out their highest rate of plastic consumption.

III. Hypothesis

Range of Temperature, pH, oxygen level and food diet may affect the consumption rate of plastics in Greater Wax Moth. (*Galleria mellonella* L.)

IV. Methodology

Indicate with the support of reasons, the **analysis** used in the investigation

1. Separate container (25cm x 25cm x 10 cm) made with transparent materials
2. Polyethylene sheets
3. Moth larvae
4. Electronic balance

By changing the oxygen level, pH level, co-diet and temperature, the change of size of the activity of these moth larvae and the change of the weight of the plastic sheet will be measured.

V. Expected Results and Impact of research

The moth larvae would be relatively inactive or die in strongly acidic and alkaline medium. They could consume plastic at the highest rate at pH 7.

The moth larvae would be inactive or die in high temperature or low temperature and they could consume plastic at the highest rate at 29-33°C

The size of moth larvae would change in different oxygen levels, higher concentration would grow in larger size and consume more plastic while lower concentration would grow in smaller size.

In this project, our ultimate goal of this research is to discover possible solutions to deal with plastic pollution. If plastic waste is reduced, there will be lower carbon dioxide emissions from producing or disposing of waste materials. Lastly, it will be a significant direction for other scientists' work, since we investigated different conditions for the optimal rate of plastic consumption of the moth. Other scientists can therefore take this research as references to maintain or even improve the moth's rate of plastic consumption, so as to relieve global plastic pollution.

VI. Conclusion

To sum up, in order to understand the conditions which favour moths to consume plastics at a higher rate with their underlying mechanism, we believe that this research may potentially help other researchers and scientists in investigating how Great Wax Moths (*Galleria mellonella L.*) may benefit human society and the environment in their future studies. Further research will be conducted on improving the rate of plastic consumption of the moth.

Our project is developed based on our school's previous project and the enhancement is as below:

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