

UNIVERSITI TEKNOLOGI MARA

**DEVELOPMENT OF PILOT
BLACK SOLDIER FLY (BSF)
FACILITY FOR SUSTAINABLE
FOOD WASTE MANAGEMENT**

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Project submitted in fulfillment of the requirements for
the degree of
**Bachelor in Environmental Health and Safety
(Hons.)**

Faculty of Health Sciences

January 2023

ACKNOWLEDGEMENT

In the name of Allah, The Most Gracious, The Most Merciful.

Assalamualaikum and Alhamdulillah, all praise to Allah S.W.T The Supreme Lord of the Universe. Peace and blessing to Nabi Muhammad S.A.W., all prophets and their families. I praise Allah S.W.T. for the strength and His blessings in completing my study.

Thousands of thanks and love to my parents Mr. Muhamad Yusoff Bin Che Daud and Mrs. for their support and encouragement through thick and thin of my study. My deepest gratitude and appreciation to my dearest supervisor, Dr. Hairul Nazmin Bin Nasruddin who spent her time and efforts in guiding and advising from the beginning till the end of my research journey. Not to forget, I would like to thank to senior lecturer, Dr. Ahmad Razali Ishak and all the lecturers in Department of Environmental Health and Safety, Faculty of Health Sciences who always share their thoughts, knowledge and advice throughout my study in UiTM Puncak Alam. Only God can reward all of you with goodness.

My sincere thanks and appreciation address to all the staff from the department and laboratory who gave their full cooperation and assisted me in many ways throughout my study. A remarkable appreciation also be given to Entomal Biotech Sdn. Bhd. staffs for their willingness to assist and share their knowledge together. A special thanks to my friends from HS243 who always give me support and motivation while completing my study. May our friendship last forever. Lastly, I would like to thank everyone who involved directly and indirectly in this study.

Thank You.

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ABSTRACT

The outrageous food waste disposal has contributed to environmental pollution and land scarcity. To maintain a sustainable environment and encourage a circular economy, the alternate action of food waste bioconversion by using black soldier fly (BSF), *Hermetia illucens* larvae (BSFL) has been introduced to promote environmentally sustainable food waste management. A pilot facility was developed to harvest BSFL that can be utilized in treating the food waste from UiTM Puncak Alam Campus. This facility was established to investigate the feasibility of a small-scale cultivation system of BSFL and its potential in food waste valorization. Firstly, the optimum rearing condition (temperature, humidity and light intensity) of BSFL was determined based on the daily BSF egg production. As for food waste composting that particularly utilized organic waste, the yield of the compost and its biomass were also determined. It was found that the pilot facility can sustainably support the colonization cycle of BSF. A weekly introduction of one kg of prepupae into a 0.6 x 0.6 x 1.5 m cage resulted in 22.1 ± 1.5 g of BSF eggs per day. The pilot facility is therefore expected to be able to process up to 300 kg of food waste every day with the assumption that 2.25 kg larvae or one g of BSF eggs can be utilized to degrade 15 kg of food waste. In addition, the study also assessed that one kg of food waste could produce 0.3 ± 0.05 kg of compost and 0.15 ± 0.02 kg of larvae. Therefore, it could be concluded that the pilot facility has the potential to cultivate and utilize BSFL for food waste valorization.

Keywords: *Black soldier fly (BSF), valorization, bioconversion, organic waste, rearing system*

CHAPTER 1

INTRODUCTION

1.1 Background

Insect farming nowadays has gained more attention from the farmers and horticulture sectors. Some insects are known for the benefits of each body part. According to Gasco et al. (2019), protein, fat, and other essential nutrients are rich in insects at all of their life stages, are benefited by humans or used in agriculture, composting, and animal feedings like fish, poultry, rabbits, and swine. The insect rearing system help in improving and providing various goods and services to be exploited by its creature. They could be reared and used in medicine, such as wound therapy, or antibodies and vaccine production (Miranda et al., 2020). The studies of insects have been widely and variously studied in their exploitation as a sustainable approach.

The use of insects, including the black soldier fly (BSF), is well known for playing a significant role in tackling waste issues, particularly waste linked with the high volumes of organic wastes discharged worldwide. Black soldier flies, scientifically named *Hermetia illucens* (Linnaeus), is an insect from the Diptera of the Stratiomyidae family (Rindhe et al., 2019) and has continuously gained attention from researchers worldwide as they are renowned for their ability to provide benefits and profits to humans. Furthermore, Kim et al. (2021) mentioned that the use of BSF has exponentially treated biological waste as it is perceived to be an affordable and environmentally beneficial approach.