



الْمَدِينَةُ الْمَعْلَمَةُ
UNIVERSITI
TEKNOLOGI
MARA

Cawangan Terengganu
Kampus Bukit Besi

**MUHAMAD AFIQ HAZIQ BIN SUHARZELI
(2020488506)**

**PREPARATION OF HYDROGEL WITH
PROCESSED HONEY**

**SUPERVISOR:
MISS ISWAIBAH BINTI MUSTAFA**

**SCHOOL OF CHEMICAL ENGINEERING
COLLEGE OF ENGINEERING**

2023

ABSTRACT

Preparation of hydrogel wound dressing from processed honey are one of the purposes to further improve the use of honey in wound care and for convenience. A hydrogel that contains honey that has been processed by stingless bees and could be utilised as a material for treating wounds is created using layers of chitosan/PVA. The aim of this research is to do the research of the prepared hydrogel's tensile strength, porosity, and gel fraction and to prepare the hydrogel wound dressing with containing process honey at selected temperature. First things first, the preparation of process honey has been done to remove the crystallization and reduce the ability to fermentation that can cause deterioration. After the samples of treated honey being tested to make the best choice which temperature is better for hydrogel wound dressing. pH, Refractive Index, moisture content and hygroscopicity has been tested to determine which temperature is the best. From that, sample 60°C treated honey has been choose to be the best temperature for treated honey. Last but not least, the preparation of hydrogel from the best sample. The optimal temperature is determined by dividing the honey into three batches and heating them at varying temperatures during the manufacturing process.

TABLE OF CONTENTS

	Page
AUTHOR'S DECLARATION	2
ABSTRACT	3
TABLE OF CONTENTS	4
CHAPTER ONE BACKGROUND	5
1.1 Introduction	5
1.2 Literature Review	6
1.3 Problem Statement	10
1.4 Objectives	10
1.5 Scope of Study	11
CHAPTER TWO METHODOLOGY	12
2.1 Introduction	12
2.2 Materials	12
2.3 Method/synthesis	12
CHAPTER THREE RESULT AND DISCUSSION	17
3.1 Introduction	17
3.2 Processed Honey Data Analysis	17
3.3 Processed Honey Hydrogel Data Analysis	19
CHAPTER FOUR CONCLUSION AND RECOMMENDATION	21
4.1 Conclusion	21
4.2 Recommendation	22
REFERENCES	23

CHAPTER ONE

BACKGROUND

1.1 Introduction

Honey is a delicious liquid that honey bees make from flower nectar. It is the plant nectar and sugary exudate that honeybees collect, process, and store in comb. Honey is a pure product that cannot have any additional ingredients added to it (N. Singh & Kaur Bath, 1997). In locations where no particular flower is dominant, bees also produce natural blends of honey from a variety of flowers. Since the earliest human beings, it has been used as a sweetener and flavouring in foods and beverages as well as in medicine (Basualdo et al., 2007).

Stingless bees can produce honey which contain glorious taste and aroma. Most of the ingredients of stingless bee honey contain carbohydrates, water, amino acids, vitamins, and minerals (Babarinde et al., 2011). The phenolic acid and flavonoid are profile of stingless bee's honey, in addition to its peculiar flavour, adds to its potent antioxidant, antibacterial and anti-inflammatory activities (Ramlan et al., 2021). So, it is proven to be effective for a variety type of illnesses including anxiety, diabetes, bacterial infection, inflammation, and fertility treatment.

Processed honey is one of the treatments that apply heat to the honey. Heating treatment has been introduced in processes honey due to tendency of honey to crystallise (Subramanian et al., 2007). Heating can prevent the crystallization for occurs, destroys the microorganisms, and reducing the moisture content that can spoil the honey. It can enhance the shelf life of honey. Heating treatment also help in retaining honey's nutritional value and antioxidant level without destroy it (Ramlan et al., 2021).

For a wound to heal, wound dressings are necessary because they create a physical barrier between the wound and the outside world, preventing further damage or infection (Zhang & Zhao, 2020). They also maintain a moist environment for cell migration, which can effectively encourage cell proliferation. With the addition of honey as an antioxidant to improve the healing process, the qualities described make hydrogels an ideal candidate product for wound dressings. It thus improves the wound microenvironment, encourages collagen synthesis and re-epithelialization, which speeds up healing and prevents infection (Cao et al., 2021).

1.2 Literature Review

1.2.1 Stingless Bees Honey

A natural species of bee found on practically every continent is the stingless bee. This bee makes honey, which has been used extensively across history and space (Abd Jalil et al., 2017). Incredibly important to humans as a food and medicine, stingless bees honey is a naturally occurring biological substance that evolved from nectar (Subramanian et al., 2007). This honey stands out because it is naturally preserved in the cerumen, which also contributes to its medicinal effects, particularly in the healing of wounds (Abd Jalil et al., 2017). Stingless bees honey contains trace amounts of proteins, minerals, organic acids, and vitamins in addition to water, glucose, and fructose. Its unique flavour, sweetness, and texture make it popular (Subramanian et al., 2007). In Malaysia, where honey is in high demand, the total amount of imported honey (3,668 tonnes) in 2016 was substantially higher than the total amount of exported honey (470 tonnes) from Malaysia (Ghee-Thean, 2020).

1.2.2 Heating Process of Honey

In the honey industry, heat treatments are usually applied to maintain honey's quality and shelf life. Heat treatment is used to avoid crystallisation and allow the easy use of honey (Ramlan et al., 2021). Due to honey's propensity to crystallise, heat treatment has been added to the processing of honey; heating stops the crystallisation from occurring and kills microorganisms that could taint the honey. Using a water bath, the heat treatment was carried out (Subramanian et al., 2007).

1.2.2.1 Acidity

In comparison to bee honey, stingless bee honey has a lower pH and a higher free acidity [(Nordin et al., 2018), (de Almeida-Muradian et al., 2013)]. The extraction and storage procedures, among other things, have an impact on the pH value of honey produced by stingless bees. Additionally, the texture, stability, and shelf life of honey can be affected by its pH. Most bacteria prefer a neutral or slightly alkaline environment to grow in. This characteristic is a very reliable indicator of microbiological stability. Additionally, the flavour of stingless bee honey is improved by the acidity content [(Shamsudin et al.,