# UNIVERSITI TEKNOLOGI MARA

# MECHANICAL AND PHYSICAL ANALYSIS OF STARCH-GELATIN EDIBLE FILM INCORPORATED WITH GARLIC OIL FOR FOOD PACKAGING

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# ABSTRACT

Edible films were prepared from the mixture of partially hydrolyzed rice starch. Composite films with ratio 1:1, 1:2, and 2:1 (ratio 1 equal to 5g) were prepared by combining rice starch and gelatin as protein material. Garlic oil (1%, 2% and 3%) was used as the antimicrobial agent while glycerol (2%, 2.5% and 3%) incorporated in the films as antimicrobial agent and plasticizer respectively. The edible films produced were characterized for film thickness, tensile strength (TS), percentage elongation at break (%E), water vapor permeability (WVP), water solubility and antimicrobial activity test. Microorganism used are *Escherichia coli* which are negative gram bacteria. Bacterial strain was obtained from laboratory and inoculation and growth of the bacteria was done in the nutrient agar plate by using diffusion method. Garlic oil was used as the antimicrobial agent as it contains active compound which has potential to inhibit the growth of tested bacteria. Garlic oil was prepared using hydro-distillation method. Individual performance either starch-based only or protein-based only were reported to have many weaknesses. Research shows that starch-based film brittle while gelatin-based film too sticky. Composite based film will improve the performance in mechanical strength, water vapor permeability and other active film characteristic. Composite film ratio 1:2 gave the highest TS (10 MPa) compared to others due to higher gelatin composition. Additional of glycerol also improved the film characterization performance. Composite film of ratio 1:2 also shows that EAB increases from 10% to 40% with addition glycerol. All tests performed on the starch-gelatin based films were aimed to produce an edible film that will have or partially have the same characteristic as synthetic plastic that were used in current market. This research also drives upon the environmentally issues of non-biodegradable waste disposal.

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# CHAPTER ONE
# INTRODUCTION

## 1.1 BACKGROUND STUDY

### 1.1.1 Synthetic Food Packaging to Environment

In recent years, environmental fears have increased the awareness in searching the renewable and biodegradable agricultural resources to prepare packaging material especially for food. Quality and age of storage of foods will be decreased when food and environment interact. It also can undergo addition or releasing moisture content and odor as well as triggering the growth of microbe which lead to contamination. Packaging is compulsory in order to protect and store foods from being exposed to the environment.

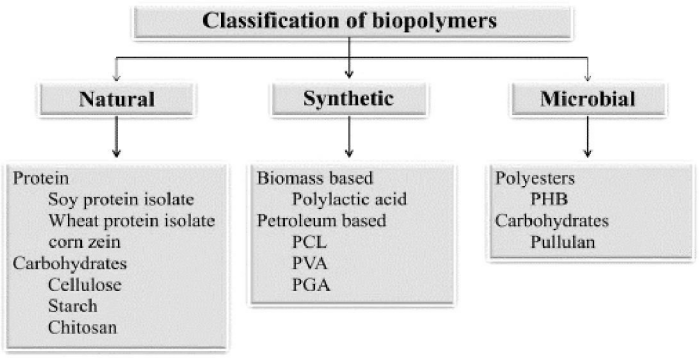


*Figure 1.1* Classification of Biopolymers (Talegaonkar *et al.*, 2017)

Figure 1.1 above shows the classification of biopolymer. Biopolymer can be classified into natural, synthetic or microbial resources. Natural resource can be from protein and carbohydrate while synthetic usually from biomass-based and petroleum-based. Microbial biopolymer classified as biopolymer where the example is polyester likes polyhydroxybutyrate (PHB) which is made by bacterial system (SN & G, 2016).

Packaging are widely used to ensure preservation with high quality and prolong the extended shelf life of the food products. Until this current era, people tend to use synthetic food packaging. Environmental issues drive the awareness of the need to reduce the usage