



The effect of banana starch concentration on the properties of chitosan-starch bioplastics

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ABSTRACT

The use of plastic films has been increasing due to their versatility and wide range of applications. They have been used mainly for wrapping and packaging. However, they are not easily degraded thus increasing the environmental problem. Bioplastics have been developed to substitute the petroleum based plastics. In this research, chitosan based bioplastics were made by blending chitosan with various banana starch concentrations from 10 to 30%. The bioplastics were prepared using casting method with the addition of 30% glycerol as the plasticizer. The resulting bioplastics were characterised for their mechanical properties, swelling behavior, and biodegradability. The increase of starch concentration decreased the tensile strengths while the elongation percentage, swelling, and biodegradability were enhanced. The incorporation of starch into chitosan based bioplastics reduced the film brittleness and in overall improved the desirable properties.

Keywords: bioplastics, chitosan, banana, tensile strength, biodegradability

INTRODUCTION

Plastics have become an integral part of human life due to their convenience and versatility. They have been used for a wide range of applications as home appliances, electrical equipments, medical instruments, construction, automobiles, and packaging [1-3]. However, it has been known that petroleum based plastics were hardly degraded and they have been causing environmental problems. There have been many research attempts on the development of bioplastics due to increasing demands on environmental-friendly plastics packaging materials [4-6]. Bio based plastics from renewable resources such as those derived from chitosan or starch are easily degraded thus environmentally safe.

Chitosan has been intensively studied to be used as bioplastics due to its premium film-forming ability, strong mechanical strength and flexibility, biodegradable nature and anti-bacterial characteristics [4]. It has been quite extensively used as scaffold materials in tissue engineering [7]. Starch has been chosen as one of the green packaging materials due to its availability, relatively low cost, sustainability and rapid biodegradable nature [4]. However, pure starch is sensitive to moisture [4] which greatly limit the utilization of starch-based biodegradable materials. Therefore, it was expected that the resulting composite chitosan-starch bioplastics would have improved mechanical properties (better strength and flexibility), lower water permeability and antibacterial properties [4,6] but still biodegradable. In this research, the effect of starch concentration on the overall properties of chitosan-starch bioplastics including mechanical properties, swelling behavior, and biodegradability in the present of 30% glycerol as plasticizer was thoroughly studied.