UNIVERSITI TEKNOLOGI MARA

GREEN SYNTHESIS OF SILVER NANOPARTICLES IMPREGNATED IN NATURAL BIOPOLYMER FILM AS ANTIMICROBIAL FOOD PACKAGING

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ABSTRACT

This study was done as an initiative to help reducing forborne disease such as food poisoning that cause by food contamination. Food industry has done many approaches to produce long shelf life of food including encapsulation of food and high pressure food technology that can help to prevent damage of food quality in short period. The main objective of this study is to produce nanoparticles by using green method and characterize the properties of nanoparticles produced. Furthermore, the aim of this study is to demonstrate the antimicrobial effect of AgNP produced. To achieve the objective, Silver nanoparticles(AgNPs) was synthesized using fruit waste and impregnated with sodium alginate to produce Alginate-silver Nanoparticles(Alg-AgNP) film. Elimination of using harmful chemical in producing AgNP has categorized this method as a green method. The total of phenol content of fruit waste is also determined to see its capability to reduce Ag ions. The process is then proceeds with several characterization techniques such as UV Vis Analysis, Thermal Gravimetric Analysis (TGA), Differential Scanning Calorimetric (DSC) and lastly, antimicrobial test to determine the properties of AgNP. From the characterization result, AgNPs produces was claimed to have diameter of 10nm with thermal stability up to 200^{o}C after being impregnated in Alginate (Alg) film. The antimicrobial property of Alg-AgNPs was then proven to be efficient when tested on E.Coli. The inhibitory zone occurs arround the Al-AgNPs film is larger than the inhibitory zone that surrounded Alg film. In the nutshell, producing AgNP using green method is very beneficial to environment to and easy to operate the process.

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INTRODUCTION

1.1 Research Background

Nanotechnology can be defined as a technology that involves a multidisciplinary of physics, chemistry and biology at an extremely small scale of 1 divide by 100 million of meter. It is the most advanced technology that has been used in our industry and it offers numerous benefits to us. Meanwhile, nanoparticle is an extremely small particle that has a size ranging from 1-100 nanometer and cannot be seen by human naked eyes. A new property can be obtained in nano-sized where they have larger total surface area compared to its bulk form that helps to increase the reactivity and possible biochemical activity. Nanoparticle also has received much attention due to their unique optoelectronic and physicochemical properties (Castro et al., 2014).

Recently, medical field has been applied nanoparticles in many ways such as in drug delivery and imaging (M. S. Khan, Vishakante, & Siddaramaiah, 2013). Due to their property of smaller in size, nanoparticle can easily penetrate through membrane that has become a limitation in some drug delivery application. It also has been applied as diagnosis and imaging tools of medical field due to their unique optical property. Furthermore, nanoparticle also have been widely used in agriculture to produce nanopesticide (M. R. Khan & Fatima, 2014). The antibacterial effect of nanoparticles especially the one that produced from silver and gold metal has been widely established (Bindhu, Sathe, & Umadevi, 2015; Gatea et al., 2015) and therefore being used in nanopesticide to protect crop from disease. Textile industry also has been using nanoparticles as wound dressing, bed lining and medicinal bandages. Other applications such as electronics devices and food packaging also can benefits or utilize the unique properties of nanoparticles.