UNIVERSITI TEKNOLOGY MARA

EDIBLE ALGINATE AND CHITOSAN FILM AS PLASTIC AND PLATE SUBSTITUTE

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ABSTRACT

This project designs alginate and chitosan films as plastic or plate substitute with the aim of reducing water usage in cleaning activity. Three types of films were prepared by solvent-evaporation technique: i) alginate film, ii) alginate-chitosan film, iii) alginate–chitosan–glycerol film. The physicochemical characteristics of films were evaluated via thickness test, scratch test, folding endurance test and food containment functional test. Polyelectrolyte complexation between alginate and chitosan strengthened the film. The glycerol increased the flexibility and durability of film. The results of functional test showed that the single layer of these films was not suitable as plastic or plate substitute due to them being highly soluble in water and easily eroded due to moisture content of the foods. The use of three layers of alginate-chitosan-glycerol film in food containment however can negate the unfavorable erosion outcome. Selected film was subjected to oil absorption/adsorption characterization with the aim that plastic or plate substitute of such film can be consumed to reduce fat absorption and related medical complications. Overall, alginate-chitosan film and alginate-chitosan-glycerol film appeared to have a higher oil absorption/adsorption capacity than alginate film or commercial plastic packaging material. The alginate-chitosan-glycerol film had the most desired physicochemical features for use as plastic or plate substitute: thick, durable, flexible, scratchable, oil absorptive/adsorptive.

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CHAPTER ONE
INTRODUCTION

1.1 Background of Study

The dietary fiber from brown algae is essentially composed of four families of polysaccharides which are alginate, laminarans, fucans and cellulose (Jiménez-Escrig & Sánchez-Muniz, 2000). Alginates are the major plant fiber found in brown seaweed (Georg et al., 2012). Alginates are binary, linear copolymer that consists of the (1→4) linked β-D-mannuronic acids (M) and α-L-guluronic acid (G) with different compositions and sequences (Draget & Taylor, 2011). The main property of alginate is its ability to gel forming either when the pH is less than 3.5 (acid gelation) or presence of multivalent cations (ionic gelation) (Jensen et al., 2012). Alginates have a great potential to decrease the postprandial glycemic level in diabetes patients (Paxman et al., 2008a). Many researchers have suggested to formulate the alginate as pharmaceutical product or food for the management of overweight and obesity (Dettmar et al., 2011). Lately, Kadir et al (2013) indicate that the alginate is able to bind to glucose in gastrointestinal tract thereby lowering the blood glucose levels of rats.

Chitosan is commercially manufactured mainly from exoskeleton of crustacean (Arancibia et al., 2015). Chitosan has unique cationic character which leads to interact with anionic polymers such as alginate to form polyelectrolyte complexes (Mateescu et al., 2015). Chitosan exhibits hypocholesterolemic and hypolipidemic activities which can lower the plasma and liver triacylglycerol as well as total cholesterol level ((Ngo et al., 2015). Moreover, chitosan is known to possess antibacterial and antifungal properties and has been widely used as a natural antimicrobial agent in food, agriculture, cosmetic and pharmaceutical industries (Zivanovic et al., 2015).