

CHAPTER I

INTRODUCTION

Chitosan and other chitin derivatives with various chemical modifications have been reported. Chitin, poly- β -(1-4)-N-acetyl-D-glucosamine, is the second most abundant natural occurring polymer next to cellulose. Chitin is found as the major constituent of the exoskeleton of crustaceans and insects as well as of cell wall of bacteria and mushrooms. Chitosan is the deacetylated form of chitin, contains 2-amino-2-deoxy- β -D-glucopyranose (Figure 1.1).

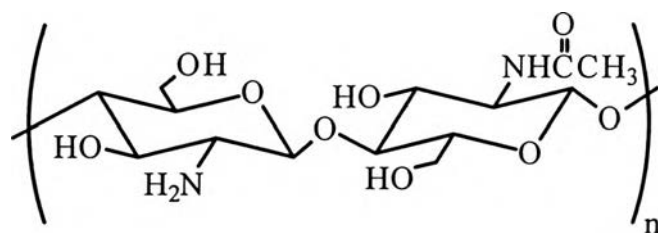


Figure 1.1 Chemical structure of chitin-chitosan copolymer.

Chitin-chitosan copolymers have received much attention owing to its specific properties of biodegradability and biocompatibility including the possibility for physical and chemical modifications. Due to the inherent intractability of chitin in most common solvents, chitin is deacetylated to obtain chitosan. The chemical structure of chitosan has the potential for chemical modifications for wide range of applications. There is a reactive amino group at the C-2 position, as well as primary hydroxyl at C-6 position as same as chitin.

In the past decade, chitin-chitosan derivatives have become of interest for drug delivery systems (DDS) in medical and pharmaceutical fields. However, less attention has been paid on DDS of chitosan conjugated with toxic reagents as a controlled release system for agricultural applications. The present work investigates the potential utilization of chitosan in agriculture by introducing insecticide onto chitosan matrix via chemical conjugation. 1-Naphthyl methylcarbamate or carbaryl (Figure 1.2), a widely used insecticide with a functional group for chemical reaction and having a short application interval, was used as a model drug to prepare a chitosan-containing controlled release system. In the present work, two types of insecticide conjugated chitosan are designed, i.e., to enhance the stability of carbaryl by polymeric system (Type 1) and to achieve the controlled release by the spacer group (Type 2) (Figure 1.3). *In vitro* release studies of the prepared chitosan are also investigated.

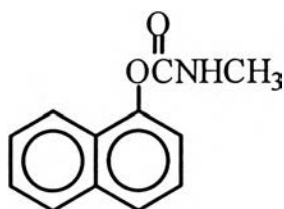


Figure 1.2 Chemical structure of 1-naphthyl methylcarbamate (carbaryl).

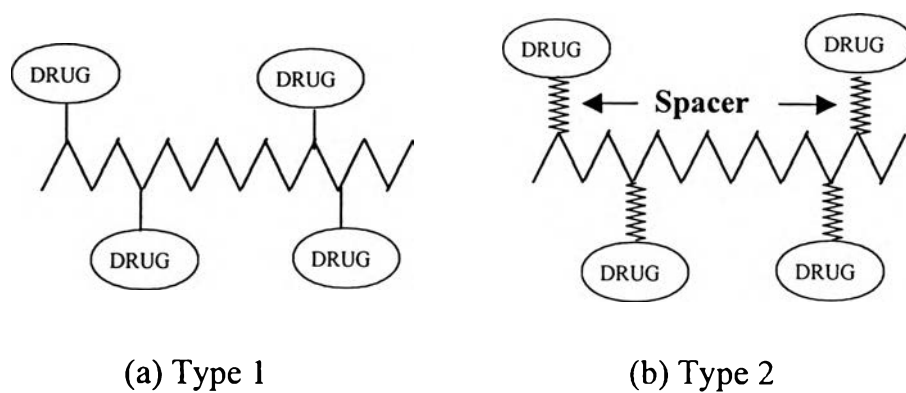


Figure 1.3 Molecular design for insecticide conjugated chitosan, (a) Type 1, polymeric drug molecule without spacer, and (b) Type 2, polymeric drug molecule with spacer.