Optimization assay of Enzymatic Biosensors for determination of Carbaryl Pesticides

Abstract

Pesticides are chemicals used worldwide to destroy or control insects, fungi, and other pests. In agriculture, farmers use numerous pesticides to protect seeds and crops. Application of pesticides compounds has indeed significantly increased the yield of agricultural products such as vegetables and fruits. The excessive use of pesticides somehow negatively affects both human and environment. The bioaccumulation characteristic has allowed them to accumulate and remain persistent in the environment for a long period. The presence of pesticides in the environment is particularly hazardous, and prolonged exposure may leads to several health problems like asthma attacks, skin rashes and neurological diseases. Carbaryl is one of the most widely used pesticides due to its powerful effect and low cost. At present, pesticides are detected through conventional analytical techniques. However, such techniques requires high skills personnel, expensive instruments and time-consuming. A demand for simple, fast and effective method is necessary for pesticide detection. This lead to the development of enzymatic biosensor which the objective is to immobilize butyrycholinesterase enzyme based on chitosan onto the glassy carbon electrode via cross-linking with glutaraldehyde. Optimization of the experimental parameters for the biosensor performance was conducted using cyclic voltammetry which includes pH, time, scan rate and the effect of methylene blue. Upon the optimizations, it found that pH7 of electrolyte solution, 40s of response time and 50mVs-1 was identified to provide the optimum conditions for the proposed biosensor that potentially can be used as a tool for pesticide detection. The optimized parameters will be employed for further experiments for designation of sensitive enzymatic biosensor for detection of pesticides from the vegetables.