



The specific immunochemical detection of 2,4-dichlorophenoxyacetic acid and 2,4,5-trichlorophenoxyacetic acid pesticides by amperometric cholinesterase biosensors

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Abstract

Two specific immunoassays for the detection of 2,4-dichlorophenoxyacetic acid (2,4-D) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) herbicides were developed. These methods are based on a specific immunoreaction of pesticides with antibodies followed by electrochemical detection of unbounded pesticides by its inhibition effect on the amperometric cholinesterase biosensor. The total time of assay is less than 20 min. The antibodies are used in solution or immobilised on the nitrocellulose membrane. The immobilised antibodies could be regenerated several times and are stable for at least 30 days. The dynamic ranges of detection of 2,4-D and 2,4,5-T are 1×10^{-11} – 5×10^{-7} M and 5×10^{-11} – 5×10^{-7} M, respectively. The developed method was applied for 2,4-D determination in milk without sample pre-treatment.

Keywords: Amperometric cholinesterase biosensor; 2,4-dichlorophenoxyacetic acid; 2,4,5-trichlorophenoxyacetic acid; Pesticide; Immunoassay

1. Introduction

2,4-dichlorophenoxyacetic acid (2,4-D) is a herbicide used worldwide which could potentially contaminate ground water and food samples. 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) is a habitat herbicide around the world now, but some environmental samples are contaminated with this pesticide. Monitoring of 2,4,5-T level would be of great value in

detecting dioxin, which is a trace contaminant of 2,4,5-T.

The development of specific and sensitive assays for detection of biologically active compounds like pesticides are one of the aims of modern analytical chemistry. Present-day methods of pesticide detection use gas or liquid chromatography, which have several limitations. The initial screening method for the determination of pesticide residue should be technically simple, inexpensive and useful for routine analysis of a large number of samples. These requirements can be met by applying immunochemical methods, based on a specific antigen–antibody interaction.

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