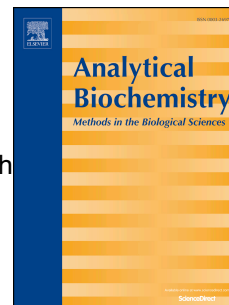


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## A Colorimetric Detection Method of Pesticide Acetamiprid by Fine-tuning Aptamer Length

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### Abstract

This work investigates the effect of shortening aptamer sequences on the colorimetric detection of acetamiprid using aptamer-wrapped gold nanoparticles (AuNPs). Truncated 37-mer and 25-mer aptamers were generated by deleting excess flanking nucleotides from parental 49-mer acetamiprid-target aptamer. In comparing the responses of the three sequences, truncated aptamers did not improve the ability to discriminate against other tested pesticides. However, comparison between 49-mer and other shorter aptamers showed that shortening aptamer sequences through removing excess flanking nucleotides outside of binding region improved colorimetric sensitivity for acetamiprid by 3.3 fold. Due to excess bases, the target-bound aptamer might still adhere to AuNPs, resulting in incomplete dissociation of aptamer from AuNPs and therefore the suppression of aggregation responses. This work provides further insight to the effects of aptamer structure on detection of the target, as well as a method by fine-tuning aptamer length for rapid detection of pesticide residues in environments or food.

**Key words:** Aptamer, Colorimetric Methods, Acetamiprid, Pesticide Residues

### 1. Introduction

Neonicotinoid insecticides as a replacement of organophosphates have been used globally for the treatment of agricultural pests. The most common neonicotinoid insecticides include imidacloprid, acetamiprid, nitenpyram and clothianidin [1-4]. In particular, acetamiprid is a broad-spectrum pesticide which has been commercialized since 1996 and been used for the protection of vegetables and fruits from Lepidoptera, Coleoptera, Homoptera and Thysanoptera [5, 6]. As a neurotoxic pesticide, acetamiprid causes agonistic effects by binding to nicotinic acetylcholine receptors (nAChRs), resulting in abnormal excitation, paralysis and death of pest organisms [6, 7]. Although acetamiprid plays an important role in the protection of agricultural products, the extensive use has led to contamination of environment including soil and water, as well as food products. Therefore the detection methods with high selectivity and sensitivity are crucial for environment and human health [8, 9]. Currently, routine methods used for such pesticide detection including HPLC, HPLC-MS, GC, and GC-MS usually require complex sample preparation, sophisticated equipment and skilled technicians, which make them unsuitable for on-site monitoring [10-12]. To overcome these limitations, new

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