

**Sensitive detection of mitragynine from *Mitragyna speciosa* Korth using an electrochemical immunosensor based on multiwalled carbon nanotubes/chitosan-modified carbon electrode**

**ABSTRACT**

The indole alkaloid, mitragynine, is the prominent substance in *Mitragyna speciosa* Korth. (kratom), the use of which has led to addiction potential and adverse health effects. In this study, an electrochemical immunosensor was developed for the first time for the sensitive and rapid detection of mitragynine. Multiwalled carbon nanotubes (MWCNTs)/ chitosan (CS) nanocomposite was utilised as modifier for the sensor fabrication. The detection of mitragynine was based on an indirect competitive assay where, the electrochemical signal was produced from the enzymatic reaction of HRP-modified secondary antibody using 3,3',5,5'-tetramethylbenzidine (TMB) as substrate. The electrochemical immunosensor exhibited higher sensitivity (10-fold) over conventional ELISA with a limit of detection (LOD) of 0.018  $\mu\text{g/mL}$  and limit of quantification (LOQ) of 0.06  $\mu\text{g/mL}$ . Detection of mitragynine in spiked urine samples resulted in good recoveries between 70–110 %. Hence, the developed immunosensor is a useful tool to detect mitragynine in urine to control the misuse of kratom.

**Keyword:** Mitragynine; Opioid; Multi walled carbon nanotubes; Chitosan; Carbon electrode