Effective Electrochemical Sensor Based on Au Nanoparticles Decorated Carboxylated Multi-wall Carbon Nanotube (AuNPS@c-MWCNTs) Nanocomposites for Determination of Dicapthon Pesticide in Agricultural Food

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This study was focused on the preparation and characterization of nanocomposite Au nanoparticles and carboxylated MWCNTs (Au NPs@c-MWCNTs) as electrochemical sensors for determination of dicapthon pesticide in agricultural food samples. Au NPs@c-MWCNTs nanocomposite was electrodeposited on glassy carbon electrode (GCE). The morphology and crystal structure of the modified electrode were characterized by SEM and XRD analyses, which indicated that the spherical Au NPs in fcc crystal structure were uniformly distributed on inter-connected network-like structure of c-MWCNTs. The electrochemical characterization of bare GCE, MWCNTs/GCE and Au NPs@c-MWCNTs/GCE by cyclic voltammetry (CV) and differential pulse voltammetry (DPV) techniques showed that the Au NPs@c-MWCNTs/GCE had more stable, sharp signal toward dicapthon. Au NPs@c-MWCNTs/GCE exhibited excellent selectivity, high stability, the acceptable detection limit (0.09 µg/l) and linear range (0 to 2400 µg/l) for determination of dicapthon. The capability of Au NPs@c-MWCNTs/GCE was evaluated for dicapthon detection in cabbage as a real sample. The results showed an improvement in electrochemical sensing properties of Au NPs@c-MWCNTs/GCE which can be attributed to the electron-transfer enhancement between analyte and electrode surface due to interface efficiently of MWCNTs and Au NPs and large surface area of Au NPs and their highly conductive nature.

Keywords: Nanocomposite; Au nanoparticles; Carboxylated MWCNTs; Electrochemical sensor; Dicapthon; Agricultural food

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