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sciforum-085907: Plant-Wearable Sensors Made on Eco-Friendly Mats for On-Site and Fast Pesticide Detection

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Sustainable materials for designing eco-friendly wearable sensors are needed to reach the increasing demand for new technologies for agriculture 5.0. Herein, we present the use of biocompatible mats made of poly(lactic acid) (PLA) fibers obtained using the solution-blow spinning technique as a substrate for screen-printed carbon electrode (SPCE) fabrication. The low-cost plant-wearable sensor (US$ 0.08 per unit) was used to detect carbendazim and diquat pesticides in food and crop samples using differential pulse voltammetry (DPV). The current signals increased linearly from 0.2 to 1.4 μM for carbendazim and diquat. The linear regression of I (A) = 3.42 $\times$ 10^{-8} + 2.85 $C_{Carbendazim}$ (M) and I (A) = $-$2.95 $\times$ 10^{-8} + 16.55 C_{Diquat} (M) yielded the detection limits of 43 and 57 nM for carbendazim and diquat, respectively. We also compared the analytical performance of a plant-wearable sensor made on a PLA substrate with a petroleum-derived polyethylene terephthalate (PET) substrate reaching a 5-fold and 4-fold increase in the sensitivity of carbendazim and diquat detection. The plant-wearable sensor was used to detect agrochemicals residues in apple and cabbage samples, providing good recovery values between 90 and 110%. Thus, the plant-wearable sensor could be helpful in offering real-time alerts on pesticide residues in fruit and vegetable samples. The eco-friendly sensor was successfully used on the skin of apples and cabbage surfaces for discriminating carbendazim and diquat. All those outcomes show the potential of the eco-friendly mats made of poly(lactic acid) fibers as a substrate for the development of screen-printed electrodes, providing a sustainable technology for non-enzymatic pesticide detection.