VOLTAMMETRIC BEHAVIOR OF INDOLE-3-ACETIC ACID AND KINETIN AT PENCIL-LEAD GRAPHITE ELECTRODE AND THEIR SIMULTANEOUS DETERMINATION IN THE PRESENCE OF ANIONIC SURFACTANT

Yavuz Yardım, Zühre Şentürk

Yüzüncü Yıl University, Faculty of Science, Department of Analytical Chemistry, 65080 Van, Turkey
E-mail: yavuz@yyu.edu.tr; zuhresenturk@hotmail.com

Plant hormones (phytohormones), or plant growth regulators (PGRs), are organic substances that in very small amounts regulate numerous aspects of plant growth, development, and response to stress. To date several types of phytohormones have been characterized mainly including auxins, cytokinins, gibberellins, abscisic acid and ethylene. Auxins are a class of phytohormones which are involved in many aspects of growth and development of plants. In this group, indole-3-acetic acid (IAA), the first plant hormone, is regarded as the principal native hormone, and is known to regulate processes such as division, elongation and differentiation of cells. Kinetin (N\(^6\)-furfuryladenine) is a synthetic substance belonging to the cytokinins family, which is used in studies related to germination and control of plant growth [1]. New analytical methods are needed to verify both the absence of added synthetic hormones and the presence of effective biostimulant activity in plant samples.

In this study, a method was developed for the simultaneous determination of IAA and kinetin, based on the oxidation of both phytohormones at a pencil-lead graphite (PG) electrode. The electrochemical behaviors were examined by cyclic, linear sweep and square-wave voltammetry in the pH range 2-12. In Britton-Robinson (BR) buffer solution (pH 6), the oxidation peaks of IAA and kinetin were well-separated. By adding an anionic surfactant (sodium dodecylsulfate, SDS) in concentration of 50 μM, especially the sensitivity of kinetin increased significantly without reducing the resolution (Figure 1). Using square-wave voltammetry, the detection limits were found to be 0.14 and 0.11 μM (24.53 and 23.67 ng mL\(^{-1}\)) for IAA and kinetin, respectively. In order to testify its practical application, this voltammetric method was applied to the determination of endogenous IAA alone in the seed samples of maize plant (Zea mays L.).

Figure 1. Multisweep CV curves of IAA (a) and kinetin (b) mixtures in BR buffer (pH 6) containing 50 μM SDS. Each phytohormone, 50 μM; scan rate, 100 mV s\(^{-1}\). Dashed lines represent background current.

Reference