

Abstract

Novel Platforms for the Electrochemical Sensing of Antioxidant Compounds [†]

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Abstract: Quercetin (QR-3,3',4',5,7-pentahydroxyflavone) is very well known as a strong antioxidant with anti-inflammatory, antiviral, antineoplastic, and antithrombotic properties that can act as a free radical scavenger in human beings. It can be found in vegetables such as capers, lovage, broccoli, lettuce, spinach, onions, tea, seeds, and fruit skins. QR is recognized as one of the most important nutrients in a person's daily diet. Lipoic acid (LA), also known as 1,2-dithiolane-3-pentanoic acid, is synthesized by animal, plant, and human cells from fatty acids and cysteine. LA is often used in the treatment of oxidative stress, diabetes, cardiovascular and hepatitis diseases, and heavy metal poisoning. In the literature, several chromatographic and optical methods have been developed in order to determine the presence of lipoic acid and quercetin with a low detection limit, but these methods have drawbacks such as sample pretreatments, the use of hazardous and expansive chemicals, and sophisticated extraction procedures. In view of this, an alternate electrochemical method for the sensitive determination of LA and QR is required. In the present work, we have developed novel electrochemical platforms for LA and QR sensing based on PEDOT-PB (poly(3,4-ethylenedioxythiophene-Prussian Blue) and PEDOT-AgNPs. Both nanocomposite materials were synthesized using a sinusoidal currents (SCs) method. The amplitude and frequency of the SCs method have been optimized. The developed electrochemical sensing platforms that use PEDOT-PB and PEDOT-AgNPs were assessed and validated for their LA and QR determination in synthetic and real samples in terms of their limit of detection, limit of quantification, and linear response range. The proposed sensing platforms ensured a comparable, fast, simple, and reliable detection of the target analytes QR and LA without sample pretreatment, as is usually required by other analytical methodologies such as chromatographic and optical methods.

Keywords: lipoic acid; quercetin; electrochemical sensing platform; sinusoidal current method



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