



ELECTROCHEMICAL INVESTIGATION OF THE BASIC REDOX BEHAVIOR OF RUTIN

Mihail Aleksandrov, **Viktorija Maksimova**, Rubin Gulaboski

Faculty of Medical Sciences, University "Goce Delcev", 2000 Stip, Republic of Macedonia

Contact: aleksandrovmihail32@gmail.com



INTRODUCTION AND AIM

Rutin is one of the most common found flavonoid in many plants, containing quercetin as a flavonol aglycone. Its structure consists of a two aromatic (phenolic) rings connected through one heterocycle containing oxygen. The high number of OH groups, as well as, its aromaticity justifies the use of an electrochemical method in the aim to evaluate the basic redox processes of rutin with electrochemical method.

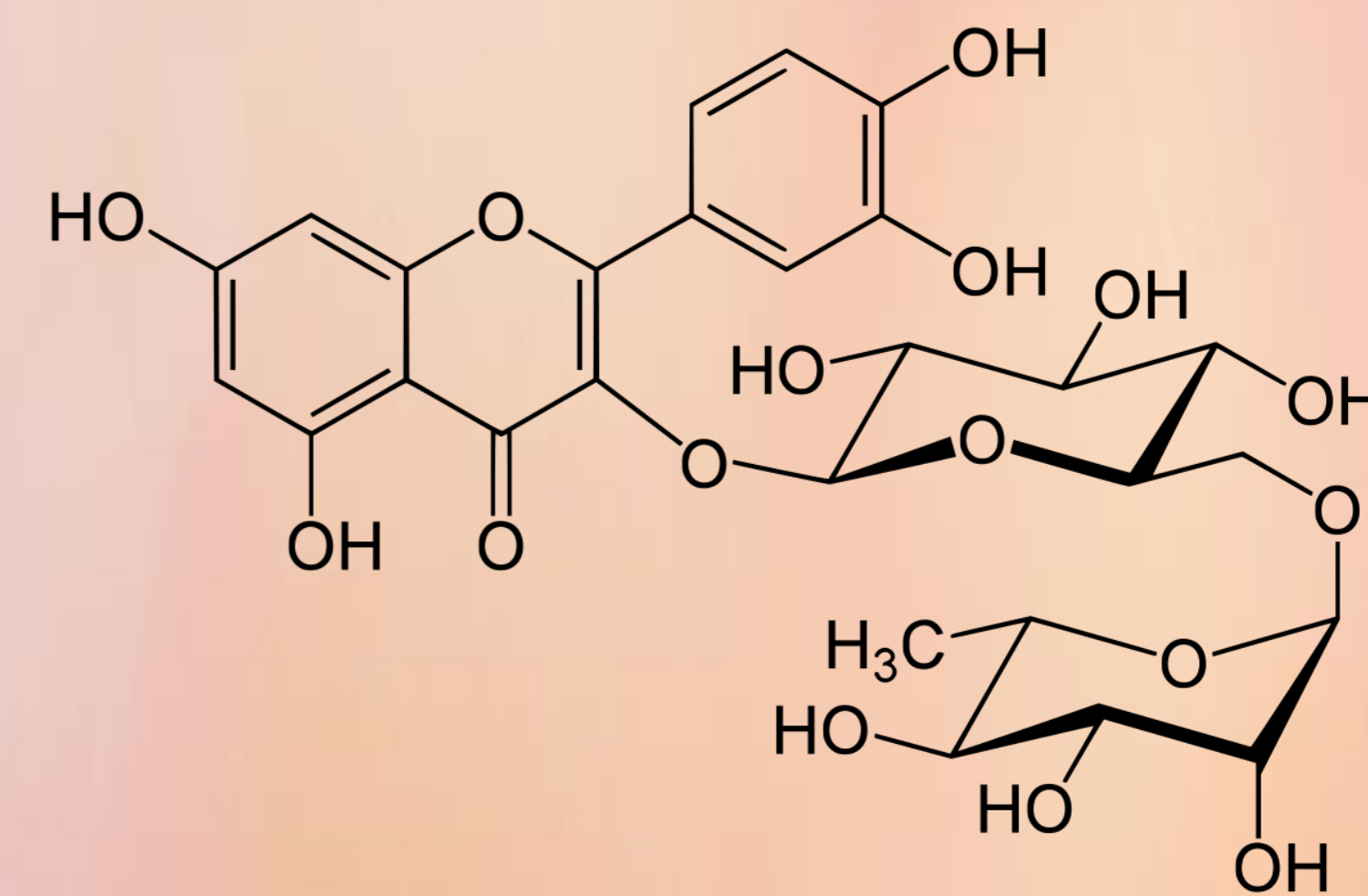


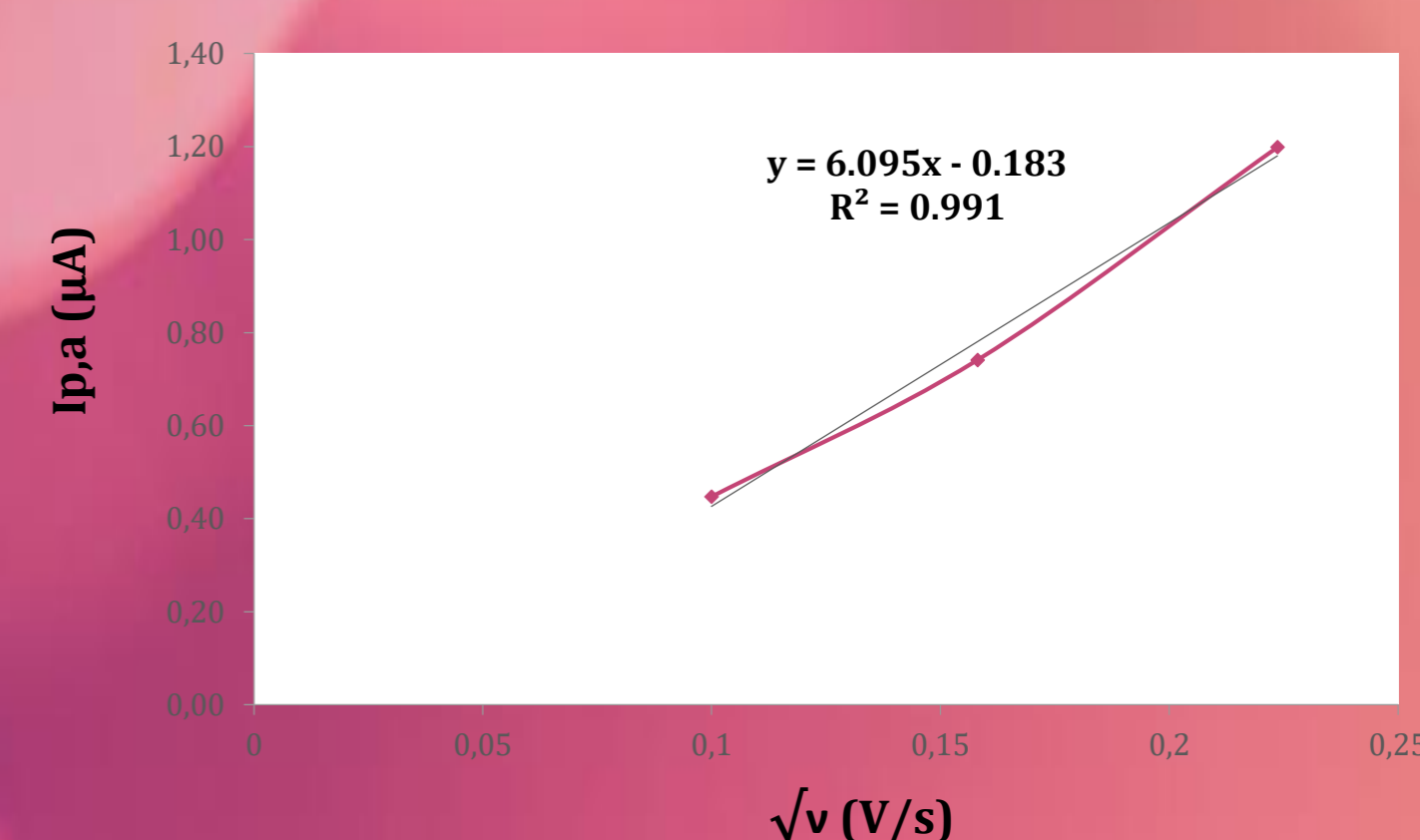
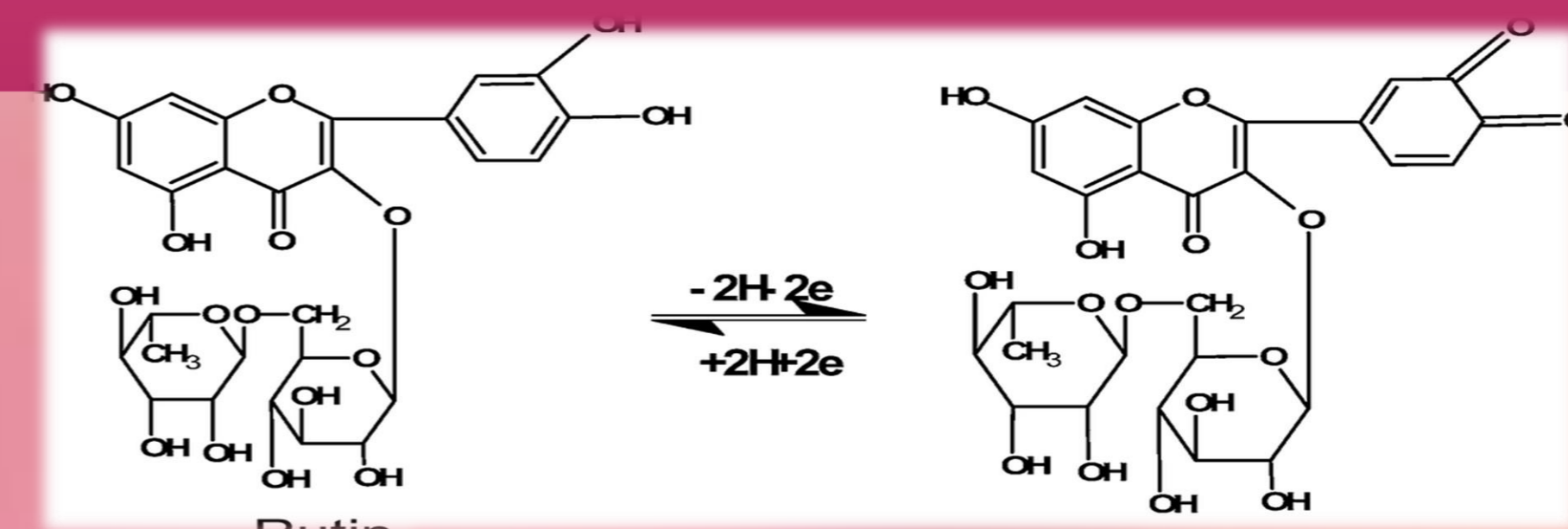
Figure 1. Chemical structure of rutin

MATERIALS AND METHODS

Standard solution of rutin in concentration of 0.001 mol L^{-1} has been used as material. All experiments were performed in different buffer solutions in pH range from 2.8 to 8.8 and 0.1 mol L^{-1} KCl added as electrolyte. Cyclic voltammetry has been applied in order to investigate the redox oxidation and reduction processes of rutin on a glassy carbon electrode, as working electrode. Additionally, the platinum electrode has been used as a reference electrode and a graphite stick has been employed as counter electrode. The redox behaviour of rutin have been investigated in potential range of -0.4 to 0.6 V .

RESULTS

Rutin has shown high electrochemical activity, that is reflected in the forms of a pair of reversible peaks on the cyclic voltammogram. Reversible oxidation in physiological pH has occurred on potential, $E_{pa} = 0.198 \text{ mV}$ and $E_{pc} = 0.221 \text{ mV}$, but the results have shown that its oxidation is a pH dependent electron transfer process. The distance between anodic and cathodic current peaks in acidic pH is about 60 mV . The increasing of pH, moves the half-wave potential ($E_{p/2}$) of the rutin to more negative values. Two electrons and two protons have been included in the redox process of rutin. The increase in the scan rate of rutin in $\text{pH} = 7.00$, have shown a linear increase in the two peaks currents. Special mathematical models were used to calculate the rate of diffusion of rutin in the electrochemical cell, the diffusion coefficient of rutin is $2 \times 10^{-6} \text{ cm}^2 \text{ s}^{-1}$.



Graph 2. Linear dependence of the scan rate and anodic current peak of rutin in phosphate buffer ($\text{pH}=7.00$)

CONCLUSIONS

Transport of rutin to the working electrode mainly depends on the process of diffusion. The application of these data considering the redox behavior of rutin could be used in prospecting of its mechanism of oxidation and structure - activity relationship, as well as developing a method for fast estimation of its antioxidant activity.

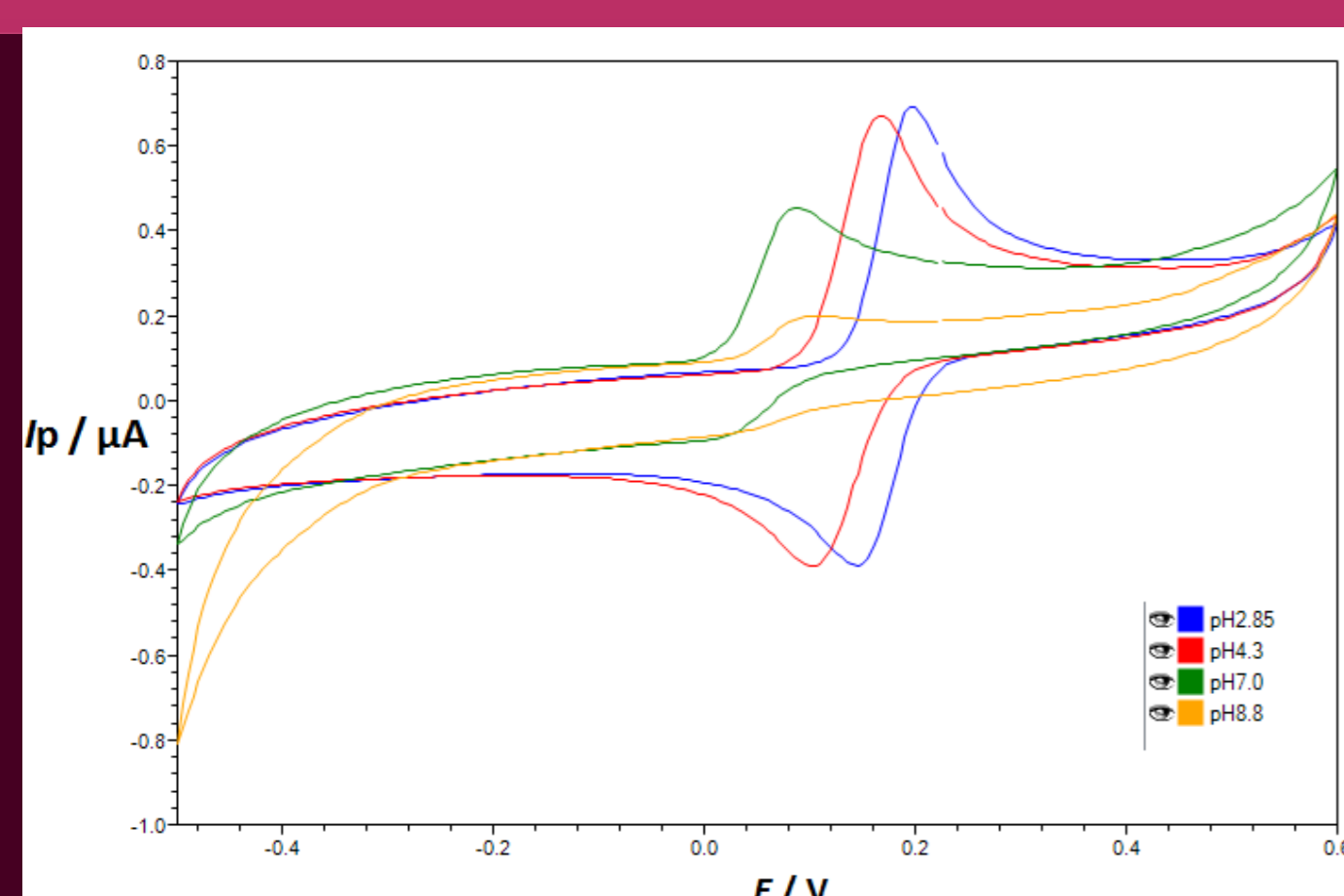
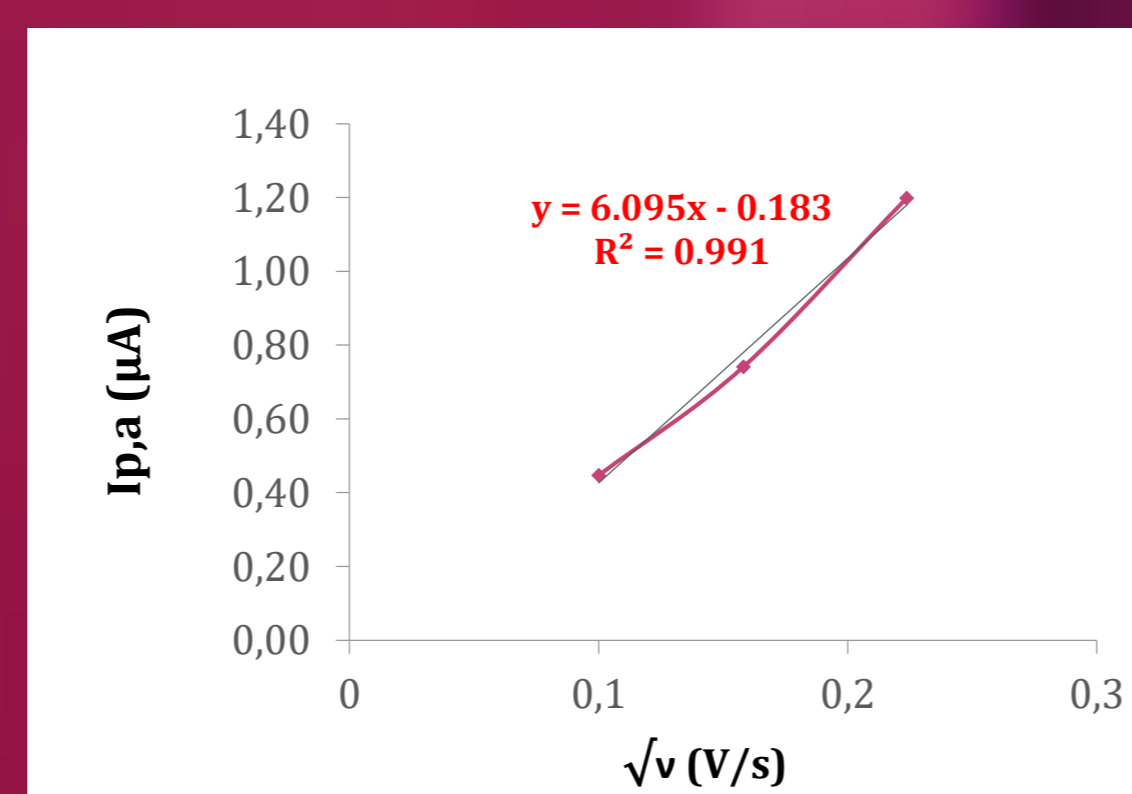


Figure 4. Cyclic voltammograms of rutin with concentration of 0.2 mmol/L in different pH with scan rate of 10 mV/s , on glassy carbon electrode



Graph 3. Linear dependence of the half-wave potential and pH