ELECTROCHEMICAL BEHAVIOR OF CAPSAICIN AND ITS ANTI-OXIDATIVE PROPERTIES STUDIED BY MEANS OF CYCLIC VOLTAMMETRY

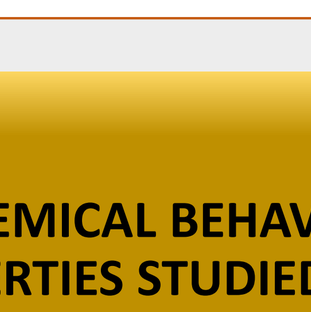
Viktorija Maksimova[1], Rubin Gulaboski[1], Liljana K. Gudeva[1], Galaba Naumova[2], Maja Jancovska[2], Valentin Mirceski[2]

[1] "Goce Delcev" University , Faculty of medical sciences, Krste Misirkov bb, 2000, Stip, Macedonia, viktorija.maksimova@ugd.edu.mk

[2] "Ss. Cyril and Methodius" University, Faculty of Natural Sciences and Mathematics, Institute of chemistry, Arhimedova 5, 1000, Skopje, Macedonia

Introduction

The research for plant derived anti-oxidants is one of the main topics currently and therefore it is the aim of many studies. Especially, because of the connection between free radicals and various pathologies as cancer, heart diseases and aging. The aim of this study was to assess the electrochemical behavior of capsaicin, as a potential antioxidant agent that can be extracted from genus Capsicum.

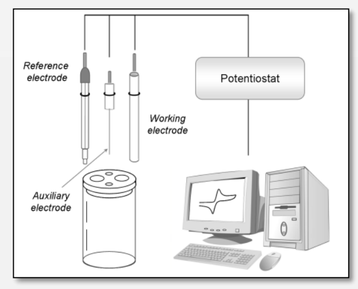


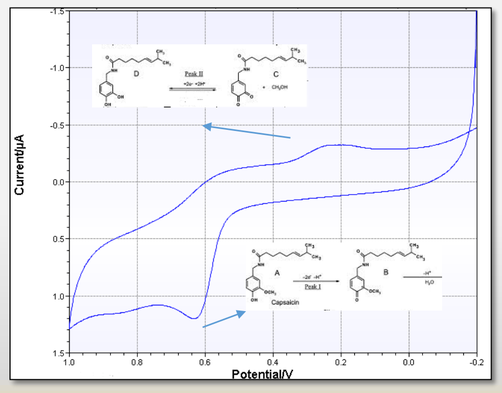
Structure of capsaicin

Materials & Methods

The antioxidant activity of this molecule was investigated by means of **cyclic voltammetry at a glassy carbon electrode.**

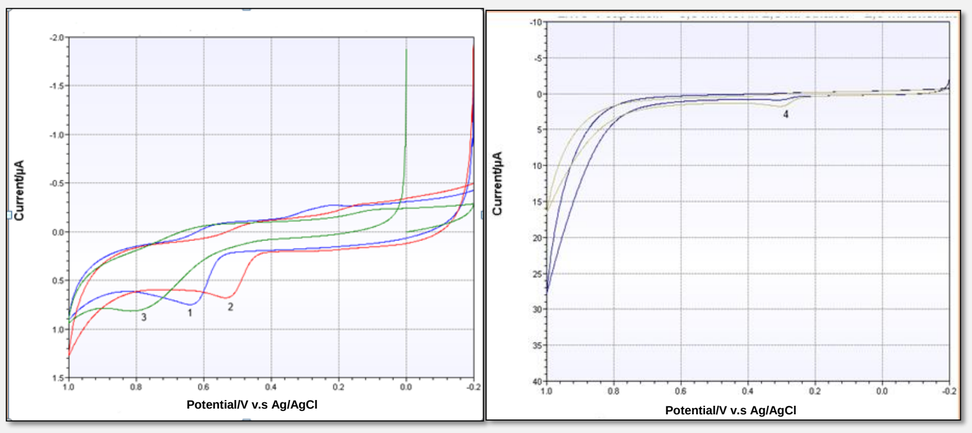
- Stock solutions of capsaicin were prepared in 96% ethanol, and diluted to different concentrations (10, 100, 150, 200, 250, 300 μmol/L). Voltammetric experiments were carried out using a PalmSens potentiostat running with PSTrace 3.0 software.
- Measurements were carried out using a three-electrode system in a 5 mL one-compartment electrochemical cell. Glassy carbon electrode (GCE,d=1.5 mm) was the working electrode, Pt wire the counter electrode and the Ag/AgCl (3 M KCl) reference electrode.



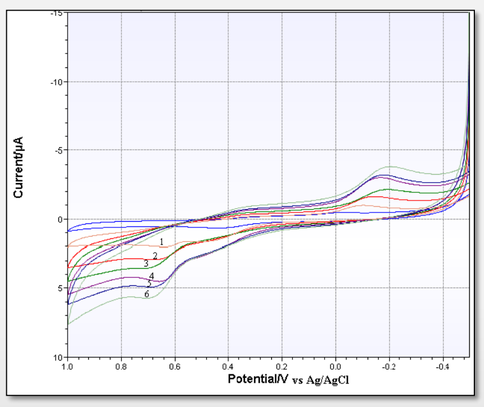


Results

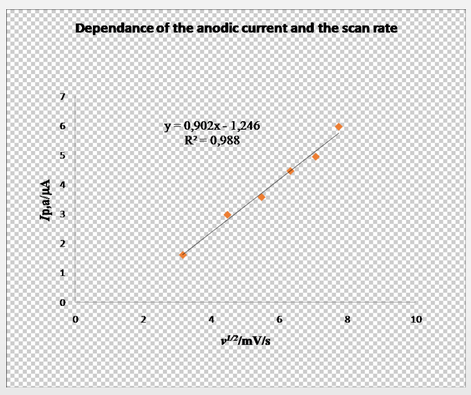
The anodic oxidation behavior of capsaicin and its catalytic effect on the reduction of Ferric to Ferrous ion were investigated in different pH values (3,5; 5,5; 7 and 10) and different scan rates (10 to 50 mV/s). Appropriate buffer solutions were used in order to achieve this pH range. For a comparison of the anti-oxidative properties of capsaicin, voltammetric experiments for vitamin C (100, 200, 300, 400, 500 μmol/L) were also conducted in the same experimental conditions using cyclic voltammetry (CV), in supporting electrolyte. Results showed that in the presence of acetic buffer pH=3,6 capsaicin (250 μmol/L) is generating the highest anodic currents I_a, and shows well defined voltamograms on E_{pa}=0,62 V.



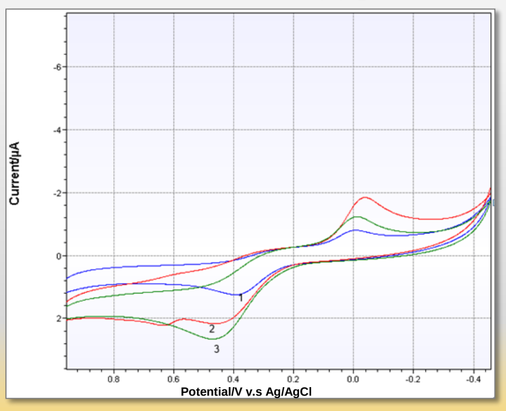
Cyclic voltammograms of 100μM capsaicin in etanolic/water solution (50:50v/v), in different pH values:
(1) pH=3,6 (2) pH=5.5 (3) pH=7 (4) pH=10



Cyclic voltammograms of capsaicin (200μM) in etanolic/water solution (50:50v/v)in presence of (1)$FeSO_4$ (10^{-3}M).



Dependance on the anodic current of capsaicin and the scan rate (10,20,30,40,50,60 mV/s)



Cyclic voltammograms of (2) capsaicin and (3) Vitamin C (200μM) in etanolic/water solution (50:50v/v)in presence of (1)$FeSO_4$ (10^{-3}M).

Conclusion

The electrochemical characterization under different conditions is a promising tool to understand the redox behavior of these alkaloids found in *Capsicum sp*. and only several studies are reported on the electrochemical properties of capsaicin. Therefore, these results can contribute to development of a new method for a rapid estimation of capsaicin and its anti-oxidative properties by fast and simple technique as cyclic voltammetry.

References

[1] M.A.N. Manaiaa, V.C. Diculescua, E.S. Gil, A.M.O. Brett, *J ANAL CHEM+*, **682** (2012) 83–89
[2] V.Supalkova, H.Stavelikova, S.Krizkova, V.Adam, A.Horna, L.Havel, P.Ryant, P.Babula, R.Kizek, *Acta Chim. Slov*, **54**, (2007) 55-59
[3] D.E. Henderson, A. M. Slickman, *J. Agric. Food Chem.* **, 47,** (1999), 2563-2570
[4] RT Kachoosangi, GG Wildgoose, RG Compton, *Analyst*. **133**(7),2008,888-895

Workshop "From Molecules to Functionalised Materials" – Ohrid, September 2014

Stabilitätspakt für Südosteuropa
Gefördert durch Deutschland
Stability Pact for South Eastern Europe
Sponsored by Germany