CURRENT RESEARCH TOPICS IN PHARMACY:

Traditional Medicine Talks

May 26th, 2023

FIRST SESSION
11.00 AM-12.45 PM
Moderator:
Mehmet GÜMÜŞTAŞ

Welcome
Assoc.Prof. Betül OKUYAN

Bioorganic MgO nanoparticles attenuate oxidative stress and upregulate gene expressionto attenuate doxorubicin-induced cardiotoxicity
Prof. Atiar Rahman

Phytopharmaceuticals as aprotagonist approach for upsurging bioactivity of traditional medicines
Assist.Prof.Monika Dwivedi

Evaluation of *Withania somnifera* (Ashwagandha) in post-traumatic stress disorder induced neurobehavioral and biochemical markers : An experimental study
Dr. Sana Rehman

SECOND SESSION
13:00-14.45 PM
Moderator:
Ceyda EKENTOK ATICI

HPTLC: A tool for herbal drug discovery
Prof. Abhishek Gupta

Persian Traditional Medicine
Assist. Prof. Laleh Khodaie

Folk medicinal plants of Turkey : An overwiev
Assoc. Prof. Gizem Emre

Interactions of traditional and modern medicine in respiratory disorders : An Indian perspective
Prof. Arunabha Ray

THIRD SESSION
15.00-16.15 PM
Moderator:
Esra TATAR

Traditional use of medicinal plants in Albania, past and present
Prof. Vilma Papajani

Voltametric analysis of the antioxidative potential of medicinal plants traditionally used in North Macedonia
Assoc. Prof. Viktorija Maksimova

Biological activities of *Scolymus hispanicus L.*
Assist.Prof.Pervin Rayaman

CHAIR
Prof. Hatice Kübra ELÇİOĞLU
VICE CHAIRS
Prof. Levent KABASAKAL & Assoc. Prof. Esra TATAR

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ONLINE SYMPOSIUM

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VOLTAMETRIC ANALYSIS of THE ANTIOXIDATIVE POTENTIAL of MEDICINAL PLANTS TRADITIONALLY USED IN NORTH MACEDONIA

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There are over 3200 plant species identified by now according to the publication of The Flora of Republic of Macedonia, 2003 in Republic of N. Macedonia [1]. Some of the mostly used medicinal plants that can be found in our mountains and fields are: *Origanum vulgare* L., (mountain tea), *Hypericum perforatum* L., (St. John worth), *Mentha x piperita* (mint), *Thymus serpyllum* L., (wild thyme), *Mellissa officinalis* L., (lemon balm), *Verbascum thapsus* L. (mullein), *Matricaria chamomilla* L., (chamomile), *Orchis* sp. (orchid), *Capsicum annuum* (hot pepper) etc [2]. Bioactive substances from all the groups of plant metabolites terpenoids, polyphenols and even alkaloids are represented in the plants mentioned here. Altogether these medicinal plants have different traditional use and indications but what they all have in common is their ability to neutralize the free radicals. Although antioxidant ability is a very basic effect and on a cellular level there are more factors influencing their anti-oxidative effects, these experiments are wildly performed.

The investigation of the anti-oxidative effects of plant extract is still an interesting topic for exploring because of their natural origin (which is often taken as non-toxic), presence of new and unknown bioactive compounds, and the synergistic effect that few different compounds in an extract bioactive compound can promote together should be emphasized. But on the other side, these active compounds are found in small concentrations, and we should be careful about sensitivity of the method that we will use, and of course the real antioxidative effect that they exert can vary because of the absorption, distribution metabolism and elimination phases in their pharmacokinetics. Even more, pH value in the cell, many other physiological pathways that are activated by free radicals can influence the antioxidative effect of plant extracts. There is a large variety of *in vitro* methods for measuring the total antioxidant activity, and it is important to select the proper method for determination [3].

Electroanalytical techniques have a wide spectrum of use. They can be based on measuring charge transport properties of ions or measuring charge-transfer processes at interfaces. These second group is divided in static and dynamic methods. In example, potentiometry used for measuring the pH values can is presenting the static method, and dynamic methods are characterized with controling, or we can change the potential or the current at the working electrode by time [4]. A very important technique in controlled potential methods is volammetry. The term voltammetry is derived from volt-ampero-metry, and it expresses that the current is measured as a function of voltage, i.e., electrode potential. Voltammetry can measure the rate of

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oxidation/reduction reaction. This reaction must be reversible, or reactants which are measured have to be able to go in both ways (oxidation and reduction). And so, by measuring the height of these peaks we could measure the rate of oxidation or reduction of a substance [5,6].

The system is composed of an electrochemical cell in which 3 electrodes are immersed in electrolyte solution. Glassy carbon electrode GCE (d=1,5mm) as working electrode, Ag/AgCl (KCl 3mol/L) reference electrode, Pt wire as counter electrode were immersed in 5 ml electrochemical cell. Measurements were carried out using a PalmSense Potentiostat connected to a PS Trace system 3.0. KCl solution (0,01mol/L) was used as an electrolyte in the electrochemical cell. Capsaicin (<99, 8%) Sigma- Aldrich, 96% *(V/V)* ethanol and 5 different plant extracts were used in examination.

First, we performed an electrochemical characterization of capsaicin and examined its oxidation at a potential of 0.60V. Then we followed up its shifting of oxidation potential to the left, which means that in more alkaline condition it can be easily oxidized. Cyclic voltammogram of capsaicin 100 µmol/L, on GCE, scan rate ν = 10 mV/s, KCl as electrolyte solution c = 0,010 mol/L was analyzed. This voltammogram have shown that capasiain can be more easily reduced than oxidized and is exhibiting very low antioxidant potential by itself. From a chemical point of view this oxidation is reversible, but because the reaction of reduction is very slow, we could classify this reaction as quasi-reversible [7]. As an alternative method we have developed cyclic voltammetry by using ABTS (2,2'-azino-bis(3- ethylbenzothiazoline-6-sulphonic acid)). Antioxidant capacity of medicinal plant extracts has been evaluated using cyclic voltammetry (CV) measuring the rate of homogeneous redox reaction radical ABTS•+. The stable radical cation ABTS•+ was electrochemically in situ generated on the surface of the glassy carbon electrode by electrochemical oxidation of ABTS. ABTS•+ radical cation is a mediator in the catalytic oxidation of the antioxidants present in different plant extracts. The calibration was made with theoretical simulation of the electrochemical analysis of potential standard substance depending on the kinetics of the electrode reaction and the anti-oxidative capacity of these samples were determined by measuring the intensity of anodic current and was expressed in terms of the kinetics of the electrode reaction. The method is based on the well-known regenerative catalytic EC′ mechanism, where the ABTS•+ radical serves as a redox mediator for catalytic oxidation of antioxidants present in the plant infusion. Mountain tea, Lemon balm, St. John's wort, Wild thyme, Mint tea extracts in the form of water infusions (1:10) were examined by cyclic voltammetry (scan rate ν = 10 mV/s) and results have indicated that Mountain tea possess the highest antioxidative potential. In the present study we developed a rapid and effective electrochemical method for estimation of the total anti-oxidative capacity (TOC) in medicinal plants infusions. Infusions prepared from medicinal plants originated from our country exhibit strong antioxidant potential and this fact justifies their use as potent natural antioxidant agents. There were strong correlations between the results obtained with FRAP method and cyclic voltammetry and both methods can be used for evaluation of total antioxidant capacity in medicinal plants infusions. Cyclic voltammetry provides high potential for investigation of antioxidant compounds, assessment of antioxidant capacity and measurement of electrochemical kinetics. This method is suitable for the characterization of antioxidant capacity in plant extracts and food control samples, also.

Keywords: Anti-oxidative; cyclic voltammetry; medicinal plants.

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