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# **NEW WAYS OF IMPROVING OUTDATED METHODS AND TECHNOLOGIES**

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## TABLE OF CONTENTS

AGRICULTURAL SCIENCES		
1.	Літвак О.А., Іванюк Д.В. АНАЛІЗ ЕФЕКТИВНОСТІ ВИКОРИСТАННЯ ЗОЛИ ВІД СПАЛЮВАННЯ БІОМАСИ ЯК ДОБРИВА	12
ARCHITECTURE, CONSTRUCTION		
2.	Franchuk Y., Konovaliuk V. PROBLEMATIC ISSUES IN THE OPERATION OF GAS DISTRIBUTION NETWORKS IN UKRAINE	15
ART HISTORY		
3.	Никифоров А.М., Бойченко М.А., Гулей О.В., Нечипоренко А.В., Никифоров А.М. СКУЛЬПТУРНІ ТВОРИ ВОЛОКИТИНСЬКОЇ ПОРЦЕЛЯНИ У ЗБІРЦІ СУМСЬКОГО ХУДОЖНЬОГО МУЗЕЮ ІМЕНІ НИКАНОРА ОНАЦЬКОГО	18
BIOLOGY		
4.	Demyanyuk O., Mudrak O., Andrusiak D., Lyubinska L. LAS SINGULARIDADES DEL PARQUE NATURAL NACIONAL MÁS GRANDE DE UCRANIA PODILSKI TOVTRY	21
CHEMISTRY		
5.	Tishakova T., Butko Y. MEDICAL PLANTS AS A POTENTIAL SOURCE OF ACTIVE SUBSTANCES FOR MEDICINES	28
COMPUTER SCIENCE		
6.	Jinze Zhang, Shiming Ou RENEW FUSION-TFT: LEVERAGING TEMPORAL FUSION TRANSFORMERS FOR ACCURATE RENEWABLE ENERGY FORECASTING	31
7.	Kopp A., Kudii D., Halatova O., Volosnikov M. RESEARCH ON SOFTWARE COMPONENT FOR ANALYZING IMPACT OF PARALLEL GATEWAYS ON ERRORS IN BPMN PROCESS MODELS	36

18. Царик, П.Л. & Царик, Л.П. До оцінки сприятливості ландшафтних комплексів НПП «Подільські Товтри» для цілей рекреації. Геополітика і екодинаміка регіонів. 2014. 10. 817-822. URL: <http://geopolitika.cfuv.ru/wpcontent/uploads/2016/11/0150tcarik.pdf>
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## MEDICAL PLANTS AS A POTENTIAL SOURCE OF ACTIVE SUBSTANCES FOR MEDICINES

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Currently, there has been a noticeable increase in interest in herbal medicine. The use of herbal medicinal products and supplements has increased tremendously over the past three decades with not less than 80% of people worldwide relying on them for some part of primary healthcare. Nowadays, the use of medicinal plants represents 40% of the world's pharmacological products [1-3].

What are the reasons for the great attention herbal products gain? The interest is mainly based on the assumption of a better tolerability compared to synthetic drugs and sufficient efficacy.

Medicinal plants are the unique sources of biologically active compounds, used as for prevention and treatment of various diseases. In our research we focussed on two plants species from three different genera, i.e., *Agrimonia eupatoria*, *Sambucus nigra*, that are important candidates for the study of their antioxidant, anti-inflammatory activities [4, 5].

The therapeutic properties of herbal remedies are typically linked to the extraction of plant compounds using either boiling water or ethanol as solvents. These methods facilitate the isolation of secondary metabolites, which are key contributors to the health-promoting effects of the plants. In this regard, the extraction procedure used to obtain the bioactive extract is crucial to determine which kind of compounds will be extracted. For the extraction, four different extraction techniques were evaluated: boiling extraction, magnetic-assisted extraction, and ultrasound-assisted extraction (UAE), and microwave-assisted extraction (MAE).

Boiling extraction was used as a comparison of the traditional preparation of the medicinal herbs, that usually are consumed as infusion of water at 100°C. On the other hand, MAE was tested as an emergent extraction technique. It allows the reduction of both, the consumption of solvents and the extraction time, providing significant advantages compared to other conventional extraction techniques. To show these benefits, MAE was compared with two conventional techniques like magnetic-assisted extraction and UAE. Depending on the extraction technique we chose optimal extraction techniques: time, solvent-to-plant ratio, temperature, microwave power etc.

Conventional and emergent extraction techniques (infusion, magnetic-, ultrasound- and microwave-assisted extraction) were optimized on different plant parts of *Sambucus nigra* via a design of experiment by MODDE. The parameters solvent-to-plant ratio, ethanol content in the extraction solvent, extraction time and temperature,

and microwave power are varied and the total phenolic content, antioxidant and radical scavenging activity are determined. 3-level 2-factor full factorial design we used for infusion, ultrasound- and microwave-assisted extraction and Box Behnken design at the case of magnetic-assisted extraction.

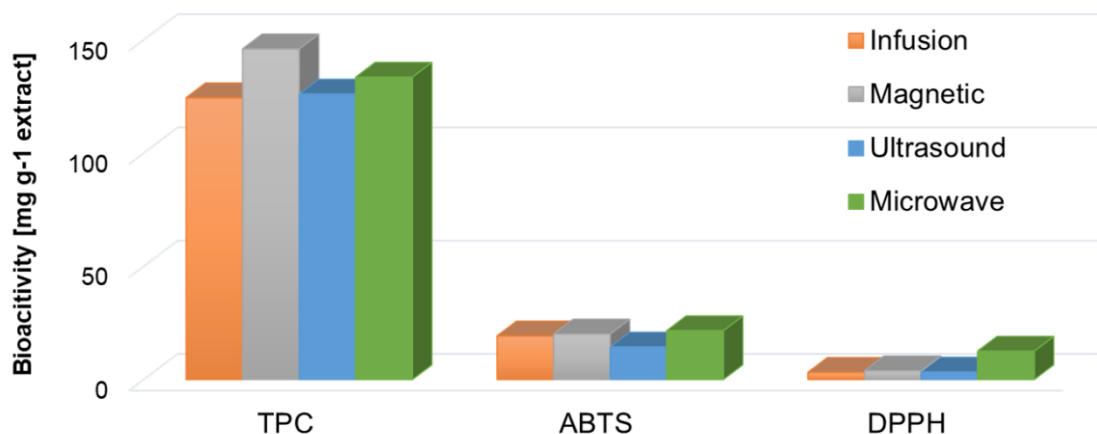


Figure 1. Comparison of bioactivity and extraction techniques for *S. nigra* flower extract.

According to Fig.1 it could be concluded that:

- comparison of different extraction methods according to the total phenolic content, antioxidant activities showed that TPC of microwave and ultrasound extracts was not significantly different than TPC of extracts obtained conventionally.
- But when microwave-assisted extraction was used, antioxidant activity of the investigated extracts was significantly higher than that obtained by conventional method and by ultrasound- assisted extraction.

So, microwave-assisted extraction was chosen as the most suitable technique to get highly bioactive plant extracts.

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