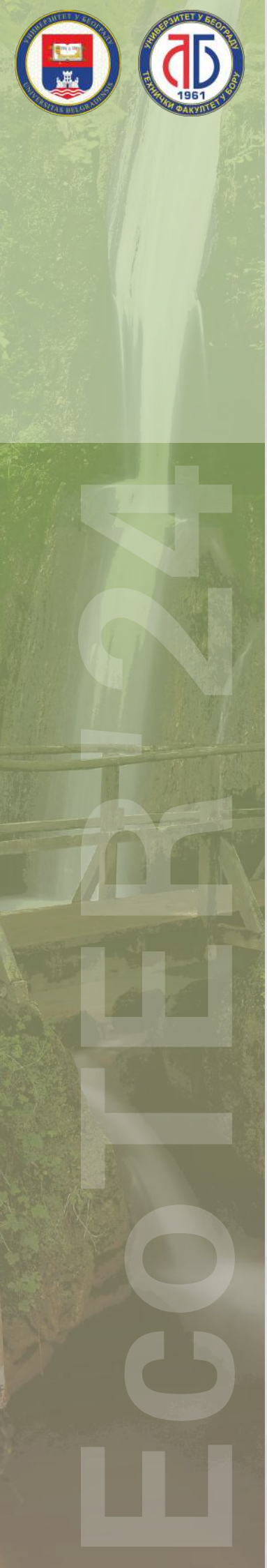
University of Belgrade
Technical Faculty in Bor



31st International conference

Ecological Truth & Environmental Research

Editor
Prof. Dr Snežana Šerbula

PROCEEDINGS

Hotel Sunce, Sokobanja, Serbia
18–21 June 2024

PROCEEDINGS

31st INTERNATIONAL CONFERENCE

ECOLOGICAL TRUTH & ENVIRONMENTAL RESEARCH – EcoTER'24

Editor:

Prof. Dr Snežana Šerbula, University of Belgrade, Technical Faculty in Bor

Technical editors of the Proceedings:

Dr Tanja Kalinović, University of Belgrade, Technical Faculty in Bor

Dr Jelena Kalinović, University of Belgrade, Technical Faculty in Bor

Prof. Dr Ana Radojević, University of Belgrade, Technical Faculty in Bor

Dr Jelena Jordanović, University of Belgrade, Technical Faculty in Bor

Sonja Stanković, MSc, University of Belgrade, Technical Faculty in Bor

Editor of the 6th Student Section:

Prof. Dr Maja Nujkić, University of Belgrade, Technical Faculty in Bor

Technical editor of the 6th Student Section:

Vladan Nedelkovski, MSc, University of Belgrade, Technical Faculty in Bor

Cover design:

Aleksandar Cvetković, BSc, University of Belgrade, Technical Faculty in Bor

Publisher: University of Belgrade, Technical Faculty in Bor

For the publisher: Prof. Dr Dejan Tanikić, Dean

Printed: University of Belgrade, Technical Faculty in Bor, 100 copies, electronic edition

Year of publication: 2024

CIP - Каталогизација у публикацији
Народна библиотека Србије, Београд

502/504(082)(0.034.2)
574(082)(0.034.2)

INTERNATIONAL Conference Ecological Truth & Environmental Research (31 ; 2024 ; Sokobanja)

Proceedings [Elektronski izvor] / 31st International conference Ecological Truth & Environmental Research - EcoTER'24, Sokobanja, Serbia, 18-21 June 2024 ; [organized by] University of Belgrade, Technical faculty in Bor (Serbia) ; [co-organizers University of Banja Luka, Faculty of Technology – Banja Luka (B&H) ... [et al.]] ; [editor Snežana Šerbula]. - Bor : University of Belgrade, Technical faculty, 2024 (Bor : University of Belgrade, Technical faculty). - 1 elektronski optički disk (CD-ROM) ; 12 cm

Sistemski zahtevi: Nisu navedeni. - Nasl. sa naslovne strane dokumenta. - Preface / Snežana Šerbula. - Tiraž 100. - Bibliografija uz svaki rad.

ISBN 978-86-6305-152-2

а) Животна средина -- Зборници б) Екологија – Зборници

COBISS.SR-ID 147002889

The 31st International Conference
Ecological Truth & Environmental Research – EcoTER'24

is organized by:

UNIVERSITY OF BELGRADE
TECHNICAL FACULTY IN BOR (SERBIA)

Co-organizers of the conference:

University of Banja Luka, Faculty of Technology,
Banja Luka (B&H)

University of Montenegro, Faculty of Metallurgy and Technology, Podgorica (Montenegro)

University of Zagreb, Faculty of Metallurgy, Sisak (Croatia)

University of Pristina, Faculty of Technical Sciences, Kosovska Mitrovica (Serbia)

Society of Young Researchers – Bor (Serbia)

The EcoTER'24 conference is financially supported
by
the Ministry of Science, Technological Development and Innovation
of the Republic of Serbia

Republic of Serbia
MINISTRY OF SCIENCE,
TECHNOLOGICAL DEVELOPMENT AND INNOVATION

EFFICIENT DETERMINATION OF UNDECYLENIC ACID CONTENT IN PHARMACEUTICAL PRODUCTS: A NOVEL SIMPLE APPROACH

EFIKASNO ODREĐIVANJE SADRŽAJA UNDECILENSKE KISELINE U FARMACEUTSKIM PREPARATIMA: NOVI, JEDNOSTAVAN PRISTUP

Students: Aleksa Vizi[1*], Nebojša Radović[2], Željka Nikolić[3]

Mentor: Ivan Kojić[1], Ksenija Stojanović[2]

[1]University of Belgrade, Innovative Centre of the Faculty of Chemistry, Ltd., Studentski trg 12–16, Belgrade, SERBIA

[2]University of Belgrade - Faculty of Chemistry, Studentski trg 12–16, Belgrade, SERBIA
[3]Institute of General and Physical Chemistry, Studentski trg 12–16, Belgrade, SERBIA

[*]*vizialeksa@gmail.com*

Abstract

Undecylenic acid (UDA), a medium-chain fatty acid industrially derived from castor oil, naturally occurs in black elderberry. UDA has attracted significant attention due to diverse applications in pharmaceutical formulations, particularly as a topical antifungal agent. Recent research has even hinted potential role of UDA in inducing apoptosis in tumor cells, further elevating its importance in therapeutic contexts.

The primary objective of this study was to design a rapid and straightforward analytical method for determining UDA content in commercially available preparations. The presence of a terminal double bond in UDA enables it to undergo addition reactions, rendering it an invaluable tool for quantifying UDA concentration in commercial products.

In pursuit of this objective, a commercially available liquid preparation, sourced from a U.S.A. manufacturer (AS), was employed as the UDA test sample. This preparation represented a binary mixture of UDA and isopropyl palmitate. Its precise qualitative composition was confirmed by GC-MS analysis subsequent to sample derivatization, in accordance with the ISO 12966-2:2017 procedure. A novel approach for determining UDA content in pharmaceutical preparations was established, drawing upon the ISO 3961:2018 standard method for determining the iodine value of fats and oils. Initially, the density of the AS sample was determined using the pycnometer method. Then, the prescribed AS mass was dissolved in *n*-hexane, and a reaction mixture was prepared by introducing 25.00 mL of iodine monochloride (ICl) solution in glacial acetic acid. Ultrasonic sonication facilitated the reaction at room temperature for 10 minutes. Subsequently, a 10% potassium iodide solution was introduced, and the liberated iodine was titrated using a standard solution of sodium thiosulfate. A blank test (without AS) was concurrently conducted applying the same procedure.

The results of this innovative method showcased a calculated mass/volume concentration of UDA in the tested sample at 25.1% (n=5). This finding closely aligned with results obtained utilizing the European Pharmacopoeia method for UDA assay determination, which yielded a UDA concentration in AS of 25.2% (n=5). This robust correlation underscores the efficacy of the new method for rapid and uncomplicated determination of UDA content in commercial pharmaceutical products devoid of auxiliary substances, which chemically react with the halogenating reagent, ICl [7]. The novel advantage of this method (over conventional chromatographic techniques) lies in its economic accessibility. Eschewing the necessity for analytical instruments, complex sample derivatization, or the procurement of expensive certified reference materials, this method offers a cost-effective solution without compromising accuracy.

In conclusion, the rapidity and simplicity of this innovative method render it as viable option for routine UDA content determination in pharmaceutical preparations. However further research, involving a broader spectrum of pharmaceutical products containing UDA, is mandatory to fully explore the applicability of this technique in routine analytical practice.

Keywords: undecylenic acid, antifungal agent, pharmaceutical analysis, volumetric technique, rapid determination

ACKNOWLEDGEMENT

The support from the Ministry of Science, Technological Development and Innovation of Republic of Serbia (Contracts numbers: 451-03-66/2024-03/200168, 451-03-66/2024-03/200288, and 451-03-66/2024- 03/200051) is greatly appreciated.

REFERENCES

[1] Vanderlei C., Marcele C., Vanderleia B. *et al*., Chem. Ind. Chem. Eng. Q. 29 (4) (2023) 263–271.

[2] Shi D., Zhao Y., Yan H., *et al*., Int. J. Clin. Pharmacol. Ther. 54 (5) (2016) 343–353.

[3] Day Z.I., Mayfosh A.J., Giel M.C., *et al*., Int. J. Mol. Sci. 23 (22) (2022) 14170.

[4] ISO 3961:2018, Animal and vegetable fats and oils - Determination of iodine value, *Available on the following link:* https://www.iso.org/standard/71868.html

[5] ISO 12966-2:2017, Animal and vegetable fats and oils - Gas chromatography of fatty acid methyl esters, Part 2: Preparation of methyl esters of fatty acids, *Available on the following link:* https://www.iso.org/standard/72142.html

[6] European Pharmacopoeia Tenth Edition Volume I, European Directorate for the Quality of Medicines & Health Care of the Council of Europe, Strasbourg Cedex (2019), p. 4148, ISBN: 978-92-871-8912-7.

[7] Day D., Alsenani N., Alsimaree A., Eur. J. Org. Chem. 2021 (30) (2021) 4299–4307.

[8] Olivares I.R.B., Souza G.B., Nogueira A.R.A., *et al*., TrAC, Trends Anal. Chem. 100 (2018) 53–64.