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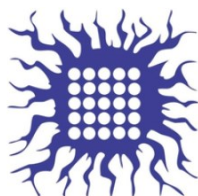
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2nd International Conference on Chemo and Bioinformatics

ICCBIKG_2023



BOOK OF PROCEEDINGS





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ICCBIKG 2023

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Kragujevac, Serbia

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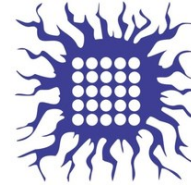
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Table of contents

PLENARY LECTURERS	1
THE IMPORTANCE OF CHEMOMETRICS IN DRUG DISCOVERY FROM MEDICINAL PLANTS	2
A REVIEW OF THE APPLICATION OF THE FINITE ELEMENT SMEARED CONCEPT TO BIOMEDICAL ENGINEERING PROBLEMS	6
IS DEUTERIUM BIOLOGICALLY SIGNIFICANT? SOME UNEXPECTED DEUTERIUM SPECTROSCOPIC DATA	7
TARGETING DEPRESSION VIA COMPUTATIONAL APPROACHES TO DESIGN NEW COUMARIN-BASED SEROTONIN RECEPTOR ANTAGONISTS/AGONISTS AND DEVELOP RELIABLE MODELS OF G PROTEIN-COUPLED RECEPTORS.....	10
ALGORITHMS AND WEB SERVERS FOR PROTEIN BINDING SITES DETECTION IN DRUG DISCOVERY	14
TOWARD QUANTITATIVE RAMAN SPECTROSCOPY.....	22
SYNTHETIC DATA GENERATION FOR BIOMEDICAL DEEP LEARNING: METHODS, CHALLENGES, AND OPPORTUNITIES	26
SECTION LECTURERS	34
BENZENE AND WATER – DIFFERENT OR SIMILAR?	35
THE HYDROGEN ECONOMY: CHALLENGES AND PROSPECTIVES	39
MULTIPARAMETER MONITORING OF CARDIOVASCULAR FUNCTION	43
DB.3D-QSAR.COM. THE FIRST 3D QSAR MODELS DATABASE.....	51
IRM@Be ²⁺ - QUANTUM CHEMISTRY BETWEEN BAVARIA AND ŠUMADIJA.....	53
APPLICATION OF CARBON-BASED NANOCOMPOSITE SYSTEMS AS PHOTOSENSITIZERS FOR PHOTODYNAMIC THERAPY.....	61
CONFUSION ABOUT THE CHOICE OF EVALUATION METRICS FOR MODEL PERFORMANCE ASSESMENT IN CHEMOINFORMATICS, BIOINFORMATICS AND IN GENERAL	67
HISTORY OF RADIOLOGICAL PROTECTION AND EVOLUTION OF DOSIMETRIC QUANTITIES	73
APPLIED SCIENCE AND TECHNOLOGY	81
ENTROPY DYNAMICS FOR A PROPELLER-SHAPED QUANTUM BROWNIAN MOLECULAR ROTATOR	82
BIOCORROSION, BIOFOULING AND HEALTH RISK: BIOLOGICAL ACTIVITY REACTION TESTS OF SELECTED BRACKISH GROUNDWATER OCCURRENCES IN SERBIA.....	86
BACTERIA IN DRINKING AND BATHING MINERAL WATERS OF SERBIA WITH POLYMER-DEGRADING POTENTIAL	91
MODELING AND SIMULATION OF A POLYMER OPTICAL FIBER HUMIDITY SENSOR FOR THE SKIN MICROENVIRONMENT	96
COMPARISON OF ORGANIC SUBSTANCE CONTENT IN PELOIDS FROM SUTOMORE AND IGALO (MONTENEGRO)	100
DRIFT SPECTROSCOPY AND PERMUTATION IMPORTANCE ALGORITHM IN QUANTITATIVE ANALYSIS OF ORGANIC MATTER IN SOIL MODEL SYSTEMS	104
THE INFLUENCE OF PYROCATECHOL ADDED IN PRE-OSCILLATORY PERIOD ON THE DYNAMICS OF THE BRAY-LIEBHAFSKY REACTION.....	108
ENVIRONMENTAL IMPLICATIONS OF FINANCIAL DEVELOPMENT IN CEE COUNTRIES.....	112
GREENHOUSE GAS EMISSIONS AND DIGITAL COMPETITIVENESS IN CEE COUNTRIES	116
ANTIFREEZE WITH COFFEE TASTE	120
THE HYDRATION AND ANTIMICROBIAL PROPERTIES OF SELECTED IMIDAZOLE-BASED IONIC LIQUIDS WITH A HOMOLOGOUS SERIES OF CHLORIDE OXYANIONS	124
INFLUENCE OF THE IONIC LIQUIDS-BASED ELECTROLYTES ON THE TOMATO (<i>SOLANUM LYCOPERSICUM</i> L.) AND CUCUMBER (<i>CUCUMIS SATIVUS</i> L.) GROWTH, DEVELOPMENT AND OXIDATIVE STRESS	128
SOLUBILITY AND STRUCTURAL ORGANIZATION OF TAURINE MOLECULES IN WATER	132
SELECTING CRITICAL FEATURES FOR BIOMEDICAL DATA CLASSIFICATION	136
THROMBOPHILIA PREDICTION USING MACHINE LEARNING ALGORITHMS	140
SIMULATION OF DNA DAMAGE USING THE “MOLECULARDNA” EXAMPLE APPLICATION OF GEANT4-DNA.....	144
DEVELOPMENT OF NANOMATERIALS FOR SUSTAINABLE FOOD PACKAGING APPLICATIONS.....	148
BIOACCUMULATION POTENTIAL OF 'MEEKER' AND 'WILLAMETTE' RASPBERRY (<i>RUBUS IDAEUS</i> L.) FRUITS TOWARDS MACRO- AND MICROELEMENTS AND THEIR NUTRITIONAL EVALUATION	152
<i>IN VITRO</i> AND <i>IN SILICO</i> ASSESSMENT OF ANTI-INFLAMMATORY ACTIVITY OF COCOA POWDERS	156

COMPARISON OF THE LUMINESCENCE PROPERTIES OF PHOSPHATE-TUNGSTEN BRONZE AND CERIUM DOPED PHOSPHATE-TUNGSTEN BRONZE	160
THE COMPARISON OF TWO METHODS USED TO OBSERVE A NONLINEAR SYSTEM: POTENTIOMETRY AND HOLOGRAPHY	164
RADIOACTIVITY LEVELS AND HEALTH RISKS ASSOCIATED WITH HIMALAYAN SALT CONSUMPTION	168
PREVALENCE OF RADON AND METALS IN NATURAL SPRINGS IN THE SOKOBANJA AREA	172
INVESTIGATION OF THE POSSIBILITY OF INTERACTION BETWEEN LITHIUM FLUORIDE CLUSTERS AND BORON USING LDI MS.....	176
<i>IN VITRO</i> BIOLOGICAL EFFECTS OF CLONAL RED WINES	180
APPLIED MACHINE LEARNING IN EXPLORING KEY FEATURES OF CRAYFISH POPULATIONS	184
DOSE COMPENSATION ALGORITHM IN RADIOTHERAPY PLANNING	188
A PROTOCOL FOR THORACIC RADIATION THERAPY IN PATIENTS WITH CARDIAC IMPLANTABLE ELECTRONIC DEVICES.....	193
DISTRIBUTION OF DOSES TO ORGANS AT RISK IN CERVICAL CANCER HIGH DOSE RATE BRACHYTHERAPY USING TANDEM AND OVOIDS OR VAGINAL CYLINDER.....	197
ASSESSMENT OF RADIOACTIVITY LEVELS IN SOIL SAMPLES ON ZLATIBOR MOUNTAIN.....	201
INFLUENCE OF DIFFERENT PRODUCTION SYSTEMS AND TOMATO GENOTYPES ON THE	205
CHALLENGES IN RADIOTHERAPY PLANNING IN PATIENTS WITH SYNCHRONOUS RECTAL AND PROSTATE CANCER AND HIP PROSTHESIS..	209
EXPLORING THE PHARMACOKINETIC PROPERTIES OF (NH ₄) ₄ [Fe(1DADTC) ₂]: <i>IN SILICO</i> BIOLOGICAL SCREENING AND ADMET ANALYSIS	213
THE INFLUENCE OF DIFFERENT PLASTICIZERS ON THE MECHANICAL PROPERTIES OF ACTIVE EDIBLE BILAYER FILMS	217
PATCH CLAMP PIPETTE GIGA SEAL FORMING SUCCESS ON THE NANOSURGERY-OBTAINED FILAMENTOUS FUNGI PROTOPLASTS.....	221
ANALYSIS OF HEAVY METALS IN THE SOIL IN THE IBAR RIVER VALLEY IN THE DISTRICT OF KOSOVSKA MITROVICA	225
WATER QUALITY ANALYSIS IN THE DISTRICT OF KOSOVSKA MITROVICA.....	229
THE EFFECT OF CONSUMER ETHNOCENTRISM ON THE COMPETITIVENESS OF THE ECONOMY OF THE REPUBLIC OF SERBIA.....	232
THE ROLE OF SOCIALLY RESPONSIBLE BUSINESS IN IMPROVING THE COMPANY'S MARKET POSITIONING	236
CHEMOMETRIC APPROACH TO THE INVESTIGATION OF MICROELEMENTS AND POTENTIALLY TOXIC ELEMENTS IN THE SOIL.....	241
APPLICATION OF CHEMOMETRICS IN MONITORING OF SPATIAL AND TEMPORAL VARIATIONS IN RIVER WATER QUALITY AND WATER CLASSIFICATION	245
MECHANOCHEMISTRY: OPTIMIZATION OF THE SYNTHESIS OF DITHIOCARBAMATE DERIVATIVES.....	249
CAPACITIVE BEHAVIOUR OF BIOMASS-DERIVED ACTIVATED CARBON IN AL-ION-CONTAINING ELECTROLYTES	253
THE INTERDEPENDENCE OF STRUCTURAL PROPERTIES AND PSEUDOCAPACITIVE BEHAVIOR OF BIOMASS-DERIVED ACTIVATED CARBON	257
ELUCIDATING HEALTH-ENHANCING PROPERTIES OF NATURAL PRODUCTS: A JOURNEY FROM EXTRACT ISOLATION TO QUANTUM MECHANICS (QM) CALCULATIONS.....	261
A COMPUTATIONAL MODEL OF THE LEFT VENTRICLE – APPLICATION IN CARDIOMYOPATHY DISEASE	265
STATUS AND QUALITY OF LIFE OF PEOPLE WITH CELIAC AND PEOPLE ON A GLUTEN-FREE DIET	269
MODELING OF CIRCULATING TUMOR CELL (CTC) AND PLATELET INTERACTION IN CAPILLARIES.....	274
BIOINFORMATICS AND APPLIED BIOLOGY	279
ABUNDANCE, SPECIES RICHNESS AND DIVERSITY OF EARTHWORMS (LUMBRICIDAE) IN SEVERAL HABITATS OF THE NORTHERN PART OF JASTREBAC MOUNTAIN	280
A NEW RECORD OF <i>DENDROBAENA SERBICA</i> KARAMAN, 1973 (CLITELLATA; LUMBRICIDAE) FROM SERBIA.....	284
POTENTIALLY TOXIC ELEMENTS IN THE EDIBLE PART OF TROUT (<i>SALMO TRUTTA</i> L.) FROM THE UPPER REACHES OF THE RAŠKA AND STUDENICA RIVERS	288
DIET COMPOSITION AND FEEDING HABITS OF COMMON BLEAK (<i>ALBURNUS ALBURNUS</i> L.) IN THE GRUŽA AND GAZIVODE RESERVOIRS	292
IDENTIFICATION OF PROTEIN TARGET MOLECULES FOR [Pd(DACH)Cl ₂] COMPLEX IN HELA CERVICAL CARCINOMA CELLS	296
EDIBLE MUSHROOMS AS PROMISING ANTIOXIDANTS	300
ANTIMICROBIAL POTENTIAL OF MUSHROOMS <i>MACROLEPIOTA PROCERA</i> AND <i>CHLOROPHYLLUM RHACODES</i>	304
OBESITY AS A RISK FACTOR FOR COVID- 19 MORTALITY: AN OVERVIEW OF PUBLISHED META-ANALYSES	308
CLASSIFICATION AND ANALYSIS OF KEY PARAMETERS IN PREDICTING THE STATE OF FACULTATIVE OLIGOTROPHS IN TWO DIFFERENT RESERVOIRS	312

ECOLOGICAL APPLICATIONS BASED ON BACTERIAL COMMUNITY ABUNDANCE IN RESERVOIRS USING AN ARTIFICIAL NEURAL NETWORK APPROACH.....	317
OXIDATIVE DNA DAMAGE PREVENTIVE ACTIVITY OF ESSENTIAL OILS OF THREE <i>PINUS</i> SPECIES: <i>P. MUGO</i> , <i>P. SIBIRICA</i> , AND <i>P. SILVESTRE</i>	321
COMPARATIVE ASSESSMENT OF FISH DIVERSITY INDICES IN PROTECTED VLASINA RESERVOIR AND UNPROTECTED GRUŽA RESERVOIR	326
ASSESSMENT OF DIFFERENT MACHINE LEARNING TOOLS EMPLOYED IN LIPIDOMICS	330
SLIGHT COOLING DURING GROWTH INDUCED CHANGES IN FILAMENTOUS FUNGI HYPHA MITOCHONDRIAL MORPHOLOGY	334
STRUCTURAL SIMULATIONS PREDICTING PROTEIN FOLDING IN ALZHEIMER'S DISEASE	338
A MACHINE LEARNING APPROACH COMBINING OMICS DATA FOR ALZHEIMER'S DISEASE ANALYSIS	342
BIOMEDICAL ENGINEERING	346
NUMERICAL MODELING OF NEW 4,7-DIHYDROXYCOUMARIN DERIVATIVE DIFFUSION WITHIN FINITE ELEMENT LIVER MODEL.....	347
UV-BLOCKING SUSTAINABLE FOOD PACKAGING BASED ON POLYHYDROXYALKANOATE AND BACTERIAL PIGMENT PRODIGIOSIN	351
USING NUMERICAL MODELING TO ANALYZE THE BEHAVIOR OF CANCER CELLS AFTER DIVERSE CO-TREATMENTS.....	355
OVERVIEW OF LEFT VENTRICULAR SEGMENTATION IN ULTRASOUND IMAGES	359
FINITE ELEMENT ANALYSIS OF STRESS DISTRIBUTION IN 3D TOOTH MODEL WITH EXTENSIVE CAVITIES RESTORED WITH DIRECT AND INDIRECT COMPOSITE RESTORATION	363
MULTISCALE MODELLING OF THE EFFECTS OF TEMPERATURE ON CARDIAC TWITCHES	367
ANALYTICALLY COMPUTED FRACTIONAL FLOW RESERVE BASED ON CORONARY CT ANGIOGRAPHY.....	371
A FINITE ELEMENT MODEL FOR STRUCTURAL OPTIMIZATION OF PARAMETRIZED LATTICE SCAFFOLDS	375
APPLICATION OF MACHINE LEARNING ALGORITHMS IN MEDICAL DATA PROCESSING	379
BIOORGANIC, BIOINORGANIC AND MEDICINAL CHEMISTRY.....	382
STRUCTURAL, SPECTROSCOPIC, AND MOLECULAR DOCKING ANALYSIS OF ISOPROTERENOL.....	383
MOLECULAR DOCKING STUDY OF RUTHENIUM- <i>p</i> -CYMENE COMPLEXES WITH ISOTHIAZOLE DERIVATIVES AS SARS-COV-2 MAIN PROTEASE INHIBITORS	387
SYNTHESIS, SPECTROSCOPIC, AND QUANTUM-CHEMICAL ANALYSIS OF MONONUCLEAR Ru(II)-NAPHTHYLHYDRAZINE COMPLEX	391
SYNTHESIS, SPECTROSCOPIC, AND THEORETICAL ANALYSIS OF Ru(II)-PHENYLHYDRAZINE COMPLEX	395
DNA/BSA BINDING STUDY OF MONONUCLEAR GOLD(III) COMPLEXES WITH CLINICALLY USED AZOLES.....	399
DNA/BSA INTERACTION OF PLATINUM(II) COMPLEXES WITH PHENOTHIAZINE AND <i>N</i> -METHYLPHENOTHIAZINE	403
THE INTERACTION STUDIES OF NOVEL DIAMINOPHENAZINE GOLD(III) COMPLEX AND BOVINE SERUM ALBUMIN (BSA-IBUPROFEN AND BSA-EOZINE Y)	407
THE INFLUENCE OF STRUCTURAL MODIFICATION OF Pd(II) Pincer-TYPE COMPLEXES ON THE KINETICS OF SUBSTITUTION REACTIONS.	411
<i>IN VITRO</i> CYTOTOXIC ACTIVITY OF A MONOLACUNARY WELLS-DAWSON NANOCUSTER AGAINST CERVICAL CARCINOMA HELA CELLS	415
THE INFLUENCE OF Fe(III) INCORPORATION ON ANTI-CANCER POTENTIAL OF A WELLS-DAWSON NANOCUSTER	419
DFT APPROACH OF THE REDOX PROPERTIES OF BRIMONIDINE AND VARENICLINE.....	423
THEORETICAL AND EXPERIMENTAL STUDY OF BILASTINE IONIZATION	427
NEW VANADIUM COMPLEXES WITH POTENTIAL BIOLOGICAL ACTIVITY.....	431
SYNTHESIS OF SCHIFF BASES BETWEEN SOME FIVE-MEMBERED HETEROCYCLIC ALDEHYDES AND THIOCARBOHYDRAZIDE (TCH) AND OPTIMIZATION OF REACTION CONDITIONS	435
SYNTHESIS, STRUCTURE AND ANTICANCER ACTIVITY OF Zr(IV) COMPLEXES WITH SCHIFF BASES DERIVED FROM 8-HYDROXYQUINOLINE	439
IONIC PALLADIUM(II) COMPLEXES WITH NITRO AND HALOGEN DERIVATIVES OF 8-HYDROXYQUINOLINE	443
A NOVEL SILVER COMPLEX WITH 4-HYDROXYCOUMARIN DERIVATIVE: SYNTHESIS, STRUCTURE, AND BIOLOGICAL ACTIVITY	447
ANTICANCER GALLIUM(III) COMPLEXES WITH HALOGEN- AND NITRODERIVATIVES OF 8-HYDROXYQUINOLINE.....	451
<i>IN SILICO</i> DRUG-LIKENESS, PHARMACOKINETIC AND OTHER ADME PROPERTIES OF 2-(AMINOMETHYL)CYCLOPROPANE-1,1-DICARBOXYLIC ACID.....	455
BSA BINDING OF 2-(AMINOMETHYL)CYCLOPROPANE-1,1-DICARBOXYLIC ACID	459
INVESTIGATION OF BINDING MODE OF NOVEL 2,4-DIKETO ESTERS TO BSA	463

SR FTIR SPECTROSCOPY INVESTIGATION OF Pd@S-CD NANOCOMPOSITE SYSTEM EFFECTS ON BIOMOLECULES IN CERVICAL CARCINOMA CELLS	467
THE EFFECTS OF A SELECTED METHOXY SUBSTITUTED CHALCONE IN HUMAN MELANOMA CELLS IRRADIATED WITH γ -RAYS	471
<i>IN SILICO</i> ESTIMATION OF COX-2 AND 5-LOX INHIBITORY POTENTIAL OF SOME NOVEL THIOUREA DERIVATIVES OF NAPROXEN	475
MOLECULAR DOCKING STUDY OF DESIGNED N-MYRISTOYL TRANSFERASE INHIBITORS.....	479
PLATINUM(II) COMPLEXES WITH EPOXIDE DERIVATIVE OF 1,10-PHENANTHROLINE IN INTERACTION WITH HUMAN SERUM ALBUMIN .	483
ANALYTICAL VALUES OF BEESWAX FROM MONTENEGRO AND DETECTION OF ADULTERATION	487
PHENOLIC <i>N</i> -ACYL HYDRAZONE DERIVATIVES: <i>IN SILICO</i> ASSESSMENT OF POTENTIAL ANTIBACTERIAL ACTIVITY AGAINST SELECTED G ⁺ AND G ⁻ STRAINS	491
<i>IN SILICO</i> ANTIBIOFILM POTENCY OF PHENOLIC <i>N</i> -ACYL HYDRAZONES AGAINST SELECTED BACTERIAL STRAINS	495
TiO ₂ NANOPARTICLES AND TiO ₂ NANOPARTICLES SURFACE MODIFIED WITH SALICYLIC ACID AFFECT NEUROLOGICAL FUNCTIONS AND OXIDATIVE STRESS MARKERS IN THE EYES OF ADULT RATS	499
SYNTHESIS AND CYTOTOXIC ACTIVITY OF SELECTED DUAL COX-2 AND 5-LOX INHIBITORS IN HELA AND MIA PaCa-2 HUMAN CANCER CELL LINES	503
SYNTHESIS, CHARACTERIZATION AND HSA INTERACTIONS OF A NEW PIANO-STOOL RUTHENIUM(II) COMPLEX CONTAINING A THIOAMIDE-TYPE LIGAND	507
HPLC/UV PROFILE AND DETERMINATION OF TOTAL PHENOLIC AND FLAVONOID CONTENTS OF LICHEN <i>UMBILICARIA CRUSTULOSA</i> GROWING IN SERBIA	511
LICHENO-CHEMICAL ANALYSIS AND <i>IN VITRO</i> ANTIOXIDANT ACTIVITY OF EXTRACTS AND GYROPHORIC ACID FROM LICHEN <i>UMBILICARIA GRISEA</i>	515
BIOLOGICAL ACTIVITY OF THIENYL-TERPYRIDINE Ru(II) COMPLEX IN THE PRESENCE OF BIOCOMPATIBLE IONIC LIQUIDS	519
KINETIC STUDIES OF THE Ru(II) POLYPYRIDYL COMPLEX WITH BIOLOGICALLY RELEVANT LIGANDS	523
SYNTHESIS AND PHYSICO-CHEMICAL CHARACTERISATION OF THE Ni(II) COMPLEX WITH 3-(4-CHLOROPHENYL)-1H-PYRAZOLE LIGAND	527
NORMAL AND REVERSED PHASES THIN-LAYER CHROMATOGRAPHY OF ARYLIDENE 2-THIOHYDANTOIN DERIVATIVES	531
INVESTIGATION OF THE ANTICANCER ACTIVITY OF 2-AMINO-6-METHYLBENZOTHAZOLE AND CORRESPONDING Pd(II) COMPLEX USING MOLECULAR DOCKING SIMULATIONS	535
DNA BINDING AND MOLECULAR DOCKING OF FOUR PALLADIUM(II) COMPLEXES WITH <i>O,O'</i> -DIALKYL ESTERS OF (<i>S,S</i>)-PROPYLENEDIAMINE- <i>N,N'</i> -DI-2-(2-BENZYL) ACETIC ACID	539
MACRO AND MICROELEMENTS IN THE LEAF AND EXTRACT OF NETTLE FROM DIFFERENT LOCALITIES OF MONTENEGRO	543
SYNTHESIS AND ANTIOXIDANT ACTIVITY OF NOVEL VANILLIN-BASED FERROCENYL CHALCONES	547
A CONTRIBUTION TO THE KNOWLEDGE OF THE SPECIES <i>DIPSACUS SYLVESTRIS</i> HUDS.	551
QUALITATIVE CONTENT OF SELECTED PHENOLIC COMPOUNDS IN DIFFERENT EXTRACTS OF PLANT SPECIES <i>IRIS PUMILA</i> L.	555
BUILDING A 3D QSAR MODEL WITH ISOPROPYLIDENE ANALOGS OF CYTOTOXIC STYRYL-LACTONES	559
VALIDATION OF GRAVIMETRIC METHOD FOR DETERMINATION OF CLAY IN SOIL	563
PYRAZOLE/TACRINE DERIVATIVES AS POTENTIAL CHOLINESTERASE INHIBITORS.....	567
THE INFLUENCE OF THE METHANOL EXTRACT OF <i>GALIUM VERUM</i> ON CARDIAC OXIDATIVE DAMAGE IN HYPERTENSIVE RATS IN A MODEL OF GLOBAL ISCHEMIA	571
CAN A THREE-WEEK ADMINISTRATION OF METHANOL EXTRACT OF WILD GARLIC MODULATE SYSTEMIC REDOX STATE IN HYPERTENSIVE RATS?	575
CHEMOINFORMATICS, CHEMOGENOMICS AND MOLECULAR DESIGN	579
HIGH-THROUGHPUT SCREENING OF NOVEL HYDROGEN STORAGE MATERIALS – ML APPROACH	580
3D-QUANTITATIVE STRUCTURE-ACTIVITY RELATIONSHIP AND DESIGN OF NOVEL RHO-ASSOCIATED PROTEIN KINASES-1 (ROCK1) INHIBITORS	584
VIRTUAL DOCKING, DESIGN AND <i>IN SILICO</i> ADMET PROFILING OF NOVEL RHO-ASSOCIATED PROTEIN KINASES-1 (ROCK1) INHIBITORS	589
A METRIC FOR PAIRWISE SIMILARITY ANALYSIS OF BINARY CHEMINFORMATICS DATA.....	593
COUMARINS AS PROMISING PPAR α AGONISTS. NOVEL <i>IN SILICO</i> INSIGHTS	597
COMBINED <i>IN SILICO</i> APPROACH TO IDENTIFY NEW TERPENOID PPAR α AGONISTS.....	601

<i>IN SILICO</i> SCREENING OF <i>SOLANUM LYCOPERSICUM</i> CAROTENOIDS FROM CAROTENOIDS DATABASE FOR CANDIDATES PPARA AGONISTS	605
NUMERICAL SIMULATIONS OF THE OSCILLATORY DYNAMICS IN THE BRAY-LIEBHAFSKY REACTION PERTURBED BY L-TYROSINE.....	609
THE ASSESSMENT OF THE ANTIOXIDANT CAPACITY OF THE SELECTED VANILLIN-BASED PYRIDO-DIPYRIMIDINES USING DPPH ASSAY: <i>IN SILICO</i> APPROACH	613
INHIBITORY POTENTIAL OF BARBARIN AND ITS PLATINUM(II) COMPLEX TOWARDS PBP1A PROTEIN	617
MODELING ION- π INTERACTIONS OF TRANSITION METAL COMPLEXES	621
SUBSTITUENT EFFECTS ON STACKING INTERACTIONS OF AROMATIC LIGANDS IN ORGANOMETALLIC COMPOUNDS – CHEMOINFORMATICS AND QUANTUM CHEMICAL STUDY	625
COMPUTATIONAL STUDY ON THE INTERACTIONS OF QUERCETIN 3-O-RUTINOSIDE WITH HUMAN DPP III	629
NONCOVALENT INTERACTIONS OF HALOGEN ATOMS IN HALOGENATED BIPYRIDINES	633
REPULSIVE WATER-WATER CONTACTS FROM CAMBRIDGE STRUCTURAL DATABASE	637
COMPUTER-AIDED DESIGN OF NEW DRUGS AGAINST BREAST CANCER.....	641
STACKING INTERACTIONS AT LARGE HORIZONTAL DISPLACEMENTS—COMPARISON OF VARIOUS RING TYPES.....	645
INFLUENCE OF COORDINATION ON OH/ π AND NH/ π INTERACTIONS	649
RELATIVISTIC DFT CALCULATION AND THEIR EFFECT ON THE ACCURACY OF RESULTS	653
ANALYSIS OF PREDICTION OF WATER SOLUBILITY AND LIPOPHILICITY OF COUMARINS BY FREE CHEMINFORMATICS TOOLS	657
INFLUENCE OF PHTHALIMIDE SUBSTITUTION ON THE INTERACTION WITH CARBON NANOTUBE	662
INTERACTION ENERGY AND DECOMPOSITION OF INTERACTION ENERGY OF HALO-SUBSTITUTED PHTHALIMIDE WITH CARBON NANOTUBE	666
IDENTIFICATION OF SMALL MOLECULE BINDING SITES USING CMDOCK	670
A COMPREHENSIVE <i>IN SILICO</i> PROTOCOL FOR FAST AUTOMATED MUTAGENESIS AND BINDING AFFINITY SCORING OF PROTEIN-LIGAND COMPLEXES	674
WORKFLOW AUTOMATION OF HIGH-THROUGHPUT INVERSE DOCKING USING PHARMMAPPER	678
INVESTIGATING THE POTENTIAL INHIBITORY EFFECT OF THE MEGAPHONE (MOLECULE) ON NASOPHARYNGEAL CANCER GROWTH FACTOR RECEPTORS	682
GREEN SYNTHESIS OF CHROMENO-PYRIMIDINE DERIVATIVES – PART I.....	686
CHROMENO-PYRIMIDINE-TYPE COMPOUNDS (PART II): <i>IN VITRO</i> EVALUATION OF ANTIOXIDANT POTENTIAL	690

Environmental Implications of Financial Development in CEE countries

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Abstract: The examination considers the causality between financial development and carbon dioxide (CO₂) emissions in the sample of six Central and Eastern European (CEE) countries in the period range between 2000 to 2020. Utilizing the Dumitrescu and Hurlin panel causality test, the results confirmed a one-way causality, where financial development precedes changes in CO₂ emissions. The observed one-way causality suggests that improvements or advancements in financial development might have implications for environmental sustainability. Additionally, the Westerlund error-correction-based panel cointegration tests reveal cointegration between the variables, indicating a stable equilibrium association among them in the complete sample of countries. As countries strive for economic growth and development, it becomes crucial to consider the environmental consequences and adopt measures that promote sustainable practices. Policymakers and stakeholders must proactively recognize the potentially important role of financial development in shaping environmental outcomes and identify opportunities to effectively integrate sustainable practices into financial and economic strategies.

Keywords: financial development, CO₂ emissions, CEE countries

1. Introduction

The European Union (EU) has set an ambitious goal to achieve climate neutrality by 2050. This means creating an economy where the total greenhouse gas emissions produced are balanced by the amount removed from the atmosphere, effectively resulting in zero net emissions. This commitment forms the core of the European Green Deal, which outlines the EU's comprehensive plan to address climate change and promote sustainability [1]. Achieving carbon neutrality by 2050 poses a significant and complex challenge for the Central and Eastern European (CEE) countries. Unlike their more developed counterparts in Western Europe, CEE countries cannot simply replicate the strategies employed by them. Instead, they must chart a unique path toward carbon neutrality that aligns with their specific circumstances and capabilities.

While numerous studies have shed light on the impact of economic development on carbon dioxide emissions, the relationship between financial development and emissions has been relatively understudied, leading to inconsistent findings. Interestingly, the period between 2007 and 2009 witnessed a significant reduction in global per capita CO₂ emissions [2], indicating a subtle correlation with the global

financial crisis of 2007-2008. This observation underscores the potential influence of financial factors on carbon emissions.

The prevailing mainstream viewpoint regarding the relations between financial development and CO₂ emissions can be categorized into three main perspectives. First, a majority of studies have concluded that financial development has a detrimental effect on CO₂, as demonstrated by research conducted by [3]. Second, there are some studies that have highlighted the possibility of financial development leading to an increase in CO₂, as observed in [4]. Finally, thirdly, certain studies have found no significant correlation between financial development and CO₂, suggesting a lack of substantial connection between these two factors [5].

The primary objective of the paper is to investigate the causal relationship between financial development and CO₂ emissions in the CEE countries. The study aims to delve deeply into this subject to determine whether financial development plays a causal role in influencing CO₂ emissions in these countries. The primary contribution of the research is to empirically uncover the causal connection between financial development and CO₂ emissions in selected CEE countries, complementing the existing literature with valuable insights. To achieve this research objective, the paper employs the Dumitrescu and Hurlin panel Granger causality test (DH test) [6], which is particularly suitable for examining causality when cross-sectional dependence is present.

2. Data and methodology

The analysis in the study utilizes annual data spanning the period from 2000 to 2020. The research focuses on six CEE countries, namely Bulgaria, Croatia, the Czech Republic, Hungary, Poland, and Romania, as the sample for examination.

Financial development is presented by the financial development index provided by the International Monetary Fund – variable FD. This index comprises nine individual indicators that collectively measure the depth, accessibility, and efficiency of financial institutions and financial markets. The CO₂ emissions are presented as the yearly percentage increase in total production-based carbon dioxide (CO₂) emissions, excluding emissions resulting from land-use changes – variable CO₂ emissions. Data on CO₂ emissions were taken from the Global Change Data Lab (Our World in Data).

Given the high level of interactivity and interconnectedness in the economies of the analyzed countries, the occurrence of spatial spillover consequences becomes more probable. These spillover effects can be a fundamental cause of cross-sectional dependence in the data. Two tests, the Breusch-Pagan LM test and Pesaran-scaled LM test, are used to examine cross-sectional dependence among the units in the data. The Breusch-Pagan test detects heteroskedasticity, while the Pesaran-scaled LM test specifically identifies cross-sectional correlation in panel data, indicating potential spatial spillover effects [7]. These tests ensure the reliability of the research findings on the relationship between FD and CO₂ emissions in the CEE countries. The article also utilizes the error-correction-based panel cointegration tests proposed by Westerlund [8]. Two group statistics (Gt, Ga) test whether at least one unit is cointegrated, while two panel statistics (Pt, Pa) test whether the entire panel is cointegrated. Lastly, to assess the

causality between financial development and CO₂ emissions, the study employs the DH test. This test is well-suited for yielding reliable results in both large and small heterogeneous panels, while also considering cross-sectional dependence. The DH test utilizes bootstrapping to enhance the statistical validity of the panel-causality test by reducing the impact of cross-sectional dependence [6].

3. Results and Discussion

Table 1 displays the results of the cross-sectional dependence tests, indicating that there is indeed cross-sectional dependence among the examined countries. The presence of cross-sectional dependence supports the appropriateness of using the DH test to examine the causality between financial development and CO₂ emissions.

Table 1. Cross-sectional dependence tests results

Variable	FD	CO ₂ emissions
Breusch–Pagan LM	145.3339 (0.0000)	92.65646 (0.0000)
Pesaran-scaled LM	23.79561 (0.0000)	14.17806 (0.0000)

Source: Authors' calculations

Table 2 presents the results of the robust Westerlund error-correction-based panel cointegration tests. The robust p-values for Gt, Ga, Pt, and Pa statistics lead to the rejection of the null hypothesis of no cointegration at a 1% significance level, indicating the presence of a cointegration relationship between financial development and CO₂ emissions in the complete sample of countries.

Table 2. The Westerlund cointegration test results

Westerlund's Test	Value	Z-value	P-value	Robust P-value
Gt	-3.405	-5.719	0.0000	0.0000
Ga	-13.185	-5.053	0.0000	0.0000
Pt	-9.658	-7.203	0.0000	0.0000
Pa	-14.785	-11.640	0.0000	0.0000

Source: Authors' calculations

The results of the short-run dynamic bidimensional causality between the variables presented in Table 3. reveal a one-way causality, where financial development influences CO₂ emissions. This finding indicates that changes in financial development precede changes in air pollution, implying that improvements or alterations in financial development may have an impact on CO₂ emissions in CEE countries.

Table 3. The Dumitrescu-Hurlin panel causality test results

Variable	FD	CO ₂ emissions
FD	-	-1.1256
CO ₂ emissions	5.4701**	-

Notes: The values are the Z-bar statistics. ** Indicate significance at 5% P-values are computed using bootstrap replication

Source: Authors' calculations

4. Conclusions

The analysis demonstrates a one-way causality from financial development to CO₂ emissions, indicating that changes in financial development precede changes in air pollution levels in CEE countries. The finding emphasizes the potential role of financial development as a driver of environmental outcomes, underscoring the need for integrating sustainability considerations into economic and financial strategies.

One possible limitation of the examination is that while the DH test showed causality between FD and CO₂ emissions, it did not provide insights into the specific positive or negative impacts of this relationship. To address this limitation, future research can use appropriate panel models to better understand the magnitude and direction of the effects between FD and CO₂ emissions, thus improving the examination's comprehensiveness.

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