



AgroSym
2019

BOOK OF

PROCEEDINGS



*X International Scientific Agriculture Symposium
"AGROSYM 2019"
Jahorina, October 03-06, 2019*

BOOK OF PROCEEDINGS

**X International Scientific Agriculture Symposium
“AGROSYM 2019”**



Jahorina, October 03 - 06, 2019

Impressum

X International Scientific Agriculture Symposium „AGROSYM 2019“

Book of Abstracts Published by

University of East Sarajevo, Faculty of Agriculture, Republic of Srpska, Bosnia
University of Belgrade, Faculty of Agriculture, Serbia
Mediterranean Agronomic Institute of Bari (CIHEAM - IAMB) Italy
International Society of Environment and Rural Development, Japan
Balkan Environmental Association (B.E.N.A), Greece
Centre for Development Research, University of Natural Resources and Life Sciences (BOKU), Austria
Perm State Agro-Technological University, Russia
Voronezh State Agricultural University named after Peter The Great, Russia
Faculty of Bioeconomy Development, Vytautas Magnus University, Lithuania
Selçuk University, Turkey
University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania
Slovak University of Agriculture in Nitra, Slovakia
Ukrainian Institute for Plant Variety Examination, Kyiv, Ukraine
National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine
Valahia University of Targoviste, Romania
National Scientific Center „Institute of Agriculture of NAAS“, Kyiv, Ukraine
Saint Petersburg State Forest Technical University, Russia
University of Valencia, Spain
Faculty of Agriculture, Cairo University, Egypt
Tarbiat Modares University, Iran
Chapingo Autonomous University, Mexico
Department of Agricultural, Food and Environmental Sciences, University of Perugia, Italy
Higher Institute of Agronomy, Chott Mariem-Sousse, Tunisia
Watershed Management Society of Iran
Institute of Animal Science- Kostinbrod, Bulgaria
Faculty of Agriculture, University of Banja Luka, Bosnia and Herzegovina
Faculty of Economics Brcko, University of East Sarajevo, Bosnia and Herzegovina
Biotechnical Faculty, University of Montenegro, Montenegro
Institute of Field and Vegetable Crops, Serbia
Institute of Lowland Forestry and Environment, Serbia
Institute for Science Application in Agriculture, Serbia
Agricultural Institute of Republic of Srpska - Banja Luka, Bosnia and Herzegovina
Maize Research Institute “Zemun Polje”, Serbia
Faculty of Agriculture, University of Novi Sad, Serbia

Editor in Chief

Dusan Kovacevic

Technical editors

Simisa Berjan

Milan Jugovic

Noureddin Driouech

Rosanna Quagliariello

Website:

<http://agrosym.ues.rs.ba>

CIP - Каталогizacija u publikaciji
Narodna i univerzitetska biblioteka
Republike Srpske, Banja Luka

631(082)

INTERNATIONAL Scientific Agricultural Symposium "Agrosym 2019" (10)
(Jahorina)

Book of Proceedings [Elektronski izvor] / X International Scientific Agriculture Symposium "Agrosym 2019", Jahorina, October 03 - 06, 2019; [editor in chief Dušan Kovačević]. - East Sarajevo : Faculty of Agriculture, 2019

Način pristupa (URL): <http://agrosym.ues.rs.ba/index.php/en/archive>. -
Библиографија уз радове. - Перистар.

ISBN 978-99976-787-2-0

COBISS.RS-ID 8490776

X International Scientific Agricultural Symposium "Agrosym 2019"
Jahorina, October 03-06, 2019, Bosnia and Herzegovina

HONORARY COMMITTEE

BORIS PASALIC, Minister of Agriculture, Water Management and Forestry of Republic of Srpska, Bosnia, SRDJAN RAJCEVIC, Minister of Scientific-Technological Development, Higher Education and Information Society of Republic of Srpska, Bosnia, MILAN KULIC, Rector of the University of East Sarajevo, Bosnia, DUSAN ZIVKOVIC, Dean of the Faculty of Agriculture, University of Belgrade, Serbia, MAURIZIO RAELI, Director of the Mediterranean Agronomic Institute of Bari, Italy, MARIO T. TABUCANON, President of the International Society of Environment and Rural Development, Japan, FOKIAON K. VOSNIAKOS, President of the Balkan Environmental Association (B.EN.A), Greece, MUSTAFA ŞAHİN, Rector of the Selçuk University, Turkey, ALEKSEY ANDREEV, Rector of the Perm State Agro-Technological University, Russia, NIKOLAY I. BUKHTOYAROV, Rector of the Voronezh State Agricultural University named after Peter The Great, Russia, ANTANAS MAZILIAUSKAS, Rector of the Vytautas Magnus University Agriculture Academy, Lithuania, BARBARA HINTERSTOISSER, Vice-Rector of the University of Natural Resources and Life Sciences (BOKU), Austria, JOSÉ SERGIO BARRALES DOMÍNGUEZ, Rector of the Chapingo Autonomous University, Mexico, KLAUDIA HALÁSZOVÁ, Rector of the Slovak University of Agriculture in Nitra, Slovakia, CALIN D. OROS, Rector of the Valahia University of Targoviste, Romania, VIKTOR KAMINSKYI, Director of National Scientific Center „Institute of Agriculture of NAAS”, Kyiv, Ukraine, AMR AHMED MOSTAFA, Dean of the Faculty of Agriculture, Cairo University, Egypt, SORIN MIHAI CIMPEANU, Rector of the University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania, FRANCESCO TEI, Director of the Department of Agricultural, Food and Environmental Sciences, University of Perugia, Italy, DAVUT KARAYEL, Dean of Faculty of Agriculture, University of Akdeniz - Antalya, Turkey, CHOKRI THABET, the General Director of the High Agronomic Institute of Chott Mariem, Sousse, Tunisia, SEYED HAMIDREZA SADEGHI, Professor at Tarbiat Modares University and the President of the Watershed Management Society of Iran, Iran, IVAN YANCHEV, Director of the Institute of Animal Science- Kostinbrod, Bulgaria, ZLATAN KOVACEVIC, Dean of the Faculty of Agriculture, University of Banja Luka, Bosnia and Herzegovina, LAZAR RADOVANOVIC, Dean of the Faculty of Economics Brcko, University of East Sarajevo, Bosnia and Herzegovina, BOZIDARKA MARKOVIC, Dean of the Biotechnical Faculty, University of Podgorica, Montenegro, SNEZANA JANKOVIC, Director of the Institute for Science Application in Agriculture, Serbia, SASA ORLOVIC, Director of the Institute of Lowland Forestry and Environment, Serbia, BRANKO KOVACEVIC, President of the Academy of Engineering Sciences of Serbia, Serbia, VOJISLAV TRKULJA, Director of Agricultural Institute of Republic of Srpska - Banja Luka, Bosnia and Herzegovina, BRANKA KRESOVIC, Director of the Maize Research Institute "Zemun Polje", Serbia, SVETLANA BALESEVIC-TUBIC, Director of the Institute of Field and Vegetable Crops, Serbia, NEDELJKO TICA, Dean of the Faculty of Agriculture, University of Novi Sad, Serbia, RODNE NASTOVA, Director of the Institute for Animal Science, Skopje, Macedonia, RADOVAN PEJANOVIC, President of Balkan Scientific Association of Agricultural Economics, Serbia, JONEL SUBIC, Director of the Institute of Agricultural Economics, Serbia

SCIENTIFIC COMMITTEE

DUSAN KOVACEVIC, Faculty of Agriculture, University of Belgrade, Serbia, Prof. dr William Meyers, Howard Cowden Professor of Agricultural and Applied Economics, University of Missouri, USA, JOHN BRAYDEN, Norwegian Agricultural Economics Research Institute (NILF), Norway, STEVE QUARIE, Visiting Professor, School of Biology, Newcastle University, United Kingdom, ANDREAS MELCHER, CDR, University of Natural Resources and Life Sciences (BOKU), Vienna, Austria, DANI SHTIENBERG, full professor, Department of Plant pathology and Weed Research, ARO, the Volcani Center, Bet Dagan, Israel, THOMAS G. JOHNSON, University of Missouri - Columbia, USA, DIETER TRAUTZ, University of Applied Science, Germany, MACHITO MIHARA, Tokyo University of Agriculture, Japan, MARKUS SCHERMER, Department of Sociology, University of Innsbruck, Austria, JORGE BATLLE-SALES, Department of Biology, University of Valencia, Spain, SERGEI ELISEEV, Vice-Rector for Research and Innovations, Perm State Agro-Technological University, Russia, RICHARD BARICHELLO, Faculty of Land and Food Systems, University of British Columbia, Canada, NOVO PRZULJ, Faculty of Agriculture, University of Banjaluka, Bosnia and Herzegovina, TATIANA SIVKOVA, Faculty for Veterinarian Medicine and Zootechny, Perm State Agro-Technological University, Russia, ADRIANO CIANI, Department of Agricultural, Foods and Environmental Sciences, Perugia University, Italy, ALEKSEJ LUKIN, Voronezh State Agricultural University named after Peter The Great, Russia, MATTEO VITTUARI, Faculty of Agriculture, University of Bologna, Italy, SEYED MOHSEN HOSSEINI, Faculty of Natural Resources, Tarbiat Modares University, Iran, ARDIAN MACI, Faculty of Agriculture and Environment, Agricultural University of Tirana, Albania, REGUCTVILLA A. POBAR, Bohol Island State University, Philippines, SUDHEER KUNDUKULANGARA PULISSERY, Kerala Agricultural University, India, EPN UDAYAKUMARA, Faculty of Applied Sciences, Sabaragamuwa University, Sri Lanka, VLADIMIR SMUTNÝ, full professor, Mendel University, Faculty of agronomy, Czech Republic, FRANC BAVEC, full professor, Faculty of Agriculture and Life Sciences, Maribor, Slovenia, JAN MOUDRY, full professor, Faculty of Agriculture, South Bohemia University, Czech Republic, STEFAN TYR, full professor, Faculty of Agro-biology and Food Resources, Slovakia, NATALIJA BOGDANOV, Faculty of Agriculture, University of Belgrade, Serbia, SABAHUDIN BAJRAMOVIC, Faculty of Agriculture and Food Sciences, University of Sarajevo, Bosnia, FRANCESCO PORCELLI, University of Bari Aldo Moro, Italy, VASILJE ISAJEV, Faculty of Forestry, University of Belgrade, Serbia, ELAZAR FALLIK, Agricultural Research Organization (ARO), Volcani, Israel, JUNAID ALAM MEMON, Pakistan Institute of Development Economics, Pakistan, HIROMU OKAZAWA, Faculty of Regional Environment Science, Tokyo University of Agriculture, Japan, PANDI ZDRULI, Land and Water Resources Department, IAMB, Italy, MLADEN TODOROVIC, Land and Water Resources Department, IAMB, Italy, HAMID EL BILALI, CDR, University of Natural Resources and Life Sciences (BOKU), Vienna, Austria, MAKSYM MELNYCHUK, National Academy of Agricultural Science of Ukraine, Ukraine, BORYS SOROCHYNSKYI, Ukrainian Institute for Plant Variety Examination, Kyiv, Ukraine, LORENZ PROBST, CDR, University of Natural Resources and Life Sciences (BOKU), Vienna, Austria, MOHSEN BOUBAKER, High Institute of Agronomy of Chott

Meriem, Sousse, Tunisia, NOUREDDIN DRIOUECH, Coordinator of MAIB Alumni Network (FTN), Mediterranean Agronomic Institute of Bari, Italy, ION VIOREL, University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania, CHULEEMAS BOONTHAI IWAI, Faculty of Agriculture, Khon Kaen University, Thailand, WATHUGE T.P.S.K. SENARATH, Department of Botany, University of Sri Jayawardanapura, Colombo, Sri Lanka, HAMADA ABDELRAHMAN, Soil Science Dept., Faculty of Agriculture, Cairo University, Egypt, MAYA IGNATOVA, Agricultural Academy – Sofia, Bulgaria, IOANNIS N. XYNIAS, School of Agricultural Technology & Food Technology and Nutrition, Western Macedonia University of Applied Sciences, Greece, ARTUR RUTKIEWICZ, Department of Forest Protection, Forest Research Institute - IBL, Poland, MOHAMMAD SADEGH ALLAHYARI, Islamic Azad University, Rasht Branch, Iran, LALITA SIRIWATTANANON, Faculty of Agricultural Technology, Rajamangala University of Technology Thanyaburi (RMUTT), Thailand, KONSTANTIN KORLYAKOV, Perm Agricultural Research Institute, Russia, MOHAMMAD FAROOQUE HASSAN, Shaheed Benazir Bhutto University of Veterinary & Animal Sciences Sakrand, Sindh, Pakistan, LARYSA PRYSIAZHNIUK, Ukrainian Institute for Plant Variety Examination, Kyiv, Ukraine, OKSANA KLIACHENKO, National University of Life and Environmental Science of Ukraine, Ukraine, IVAN SIMUNIC, Department of amelioration, Faculty of agriculture, University of Zagreb, Croatia, ABID HUSSAIN, International Centre for Integrated Mountain Development (ICIMOD), Nepal, AMRITA GHATAK, Gujarat Institute of Development Research (GIDR), India, NASER SABAGHNIYA, University of Maragheh, Iran, MONICA PAULA MARIN, Department for Animal Husbandry, University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania, PENKA MONEVA, Institute of Animal Science - Kostinbrod, Bulgaria, MOSTAFA K. NASSAR, Animal husbandry Dept., Faculty of Agriculture, Cairo University, Egypt, MÁRTA BIRKÁS, full professor, St. Istvan University, Godollo – Hungary, ANDRZEJ KOWALSKI, Director of the Institute for Agricultural and Food Economy, Warszawa-Poland, YALCIN KAYA, The Director of the Plant Breeding Research Center, University of Trakya, Turkey, SANJA RADONJIC, Biotechnical Faculty, University of Montenegro, Montenegro, IONELA DOBRIN, Department for Plant Protection, University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania, INOCENCIO BUOT JR., Institute of Biological Sciences, College of Arts and Sciences, University of the Philippines Los Banos, Philippines, KAROL WAJSZCZUK, Poznan University of Life Sciences, Poland, REDOUANE CHOUKR-ALLAH, International Center for Biosaline Agriculture (ICBA), United Arab Emirates, MOHAMMAD AL-MAMUN, Department of Animal Nutrition, Bangladesh Agricultural University, Bangladesh, ANUCHA WITTAYAKORN-PURIPUNPINYOO, School of Agriculture and Co-operatives, Sukhothai Thammathirat Open University, Nonthaburi, Thailand, NEDELJKA NIKOLOVA, Institute for Animal Science, Ss. Cyril and Methodius University in Skopje, Republic of Macedonia, IGNACIO J. DÍAZ-MAROTO, High School Polytechnic, University of Santiago de Compostela, Spain, NIDAL SHABAN, University of Forestry Sofia, Bulgaria, YOUSSEF SASSINE, Lebanese University Beirut, Lebanon, CAFER TOPALOGLU, Faculty of Tourism, Mugla Sitki Kocman University, Turkey, SEYED HAMDREZA SADEGHI, Faculty of Natural Resources, Tarbiat Modares University, Iran, MOHSEN MOHSENI SARAVI, University of Teheran and Member of WMSI Management Board, Iran, MAHMOOD ARABKHEDRI, Soil Conservation and Watershed Management Research Institute and Member of WMSI Management Board, Iran, ATAOLLAH KAVIAN, Sari Agricultural Science and Natural Resources University and Member of WMSI Management Board, Iran, TUGAY AYASAN, Department of Organic Farming Business Management, Osmaniye, Applied Science School of Kadiri, Osmaniye Korkut Ata University, Turkey, SAKINE ÖZPINAR, Department of Farm Machinery and Technologies Engineering, Faculty of Agriculture, Çanakkale Onsekiz Mart University, Çanakkale, Turkey, SHEREIN SAEIDE ABDELGAYED, Faculty of Veterinary Medicine, Cairo University, Cairo, Egypt, ZOHREH MASHAK, Islamic Azad University, Karaj Branch, Iran, KHALID AZIM, National Institute of Agriculture Research, Morocco, SRDJAN LALIC, Vice-dean University of East Sarajevo, Bosnia and Herzegovina, ZELJKO VASKO, Faculty of Agriculture, University of Banja Luka, Bosnia and Herzegovina, KUBILAY BAŞTAŞ, Department of Plant Protection, Faculty of Agriculture, Selçuk University, Turkey, BRANKA KRESOVIC, Director of the Maize Research Institute “Zemun Polje”, Serbia, NENAD DELIC, Maize Research Institute “Zemun Polje”, Serbia, MILAN STEVANOVIC, Maize Research Institute “Zemun Polje”, Serbia, SVETLANA BALESEVIC-TUBIC, Institute of Field and Vegetable Crops Novi Sad, Serbia, ANA MARJANOVIC JEROMELA, Institute of Field and Vegetable Crops Novi Sad, Serbia, TATJANA ZDRALIC, Faculty of Agriculture, University of East Sarajevo, Bosnia, ALEKSANDRA GOVEDARICA-LUCIC, Faculty of Agriculture, University of East Sarajevo, Bosnia, DESIMIR KNEZEVIC, University of Pristina, Faculty of Agriculture, Kosovska Mitrovica - Lesak, Kosovo i Metohija, Serbia, SNEZANA MLADENOVIC-DRINIC, Maize Research Institute “Zemun Polje”, Serbia, NEBOJSA MOMIROVIC, Faculty of Agriculture, University of Belgrade, Serbia, VELIBOR SPALEVIC, Faculty of Philosophy, Geography, University of Montenegro, ZORAN JOVOVIC, Biotechnical Faculty, University of Montenegro, Montenegro, DANIJEL JUG, associate professor, Faculty of Agriculture, University of Osijek, Croatia, MILAN MARKOVIC, Biotechnical Faculty, University of Montenegro, Montenegro, ZELJKO DOLJANOVIC, Faculty of Agriculture, University of Belgrade, Serbia, DEJAN STOJANOVIC, Institute of Lowland Forestry and Environment, Serbia, DOBRIVOJ POŠTIĆ, Institute for plant protection and environment, Belgrade, Serbia, SRDJAN STOJNIC, Institute of Lowland Forestry and Environment, Serbia

ORGANIZING COMMITTEE

VESNA MILIC, Faculty of Agriculture, University of East Sarajevo, Bosnia, DEJAN BOKONJIC, Vice rector of the University of East Sarajevo, Bosnia, DEJANA STANIC, Dean of the Faculty of Agriculture, University of East Sarajevo, Bosnia, MAROUN EL MOUJABBER, Mediterranean Agronomic Institute of Bari, Italy, ROSANNA QUAGLIARIELLO, Mediterranean Agronomic Institute of Bari, Italy, NOUREDDIN DRIOUECH, Coordinator of MAIB Alumni Network (FTN), Mediterranean Agronomic Institute of Bari, Italy, ALEKSANDRA DESPOTOVIC, Biotechnical Faculty Podgorica, University of Montenegro, Montenegro, MILIC CUROVIC, The journal “Agriculture and Forestry”, Biotechnical Faculty Podgorica, University of Montenegro, Montenegro, ANA MARJANOVIC JEROMELA, Institute of Field and Vegetable Crops, Serbia, OKSANA FOTINA, International Relations Center, Perm State Agro-Technological University, Russia, TATIANA LYSAK, International Relations Office, Voronezh State Agricultural University named after Peter The Great, Russia, ANASTASJA NOVIKOVA, Faculty of Bioeconomy Development, Vytautas Magnus University, Lithuania, ENGR. TEODORA POPOVA, Institute of Animal Science - Kostinbrod, Bulgaria, MEHMET MUSA OZCAN, Faculty of Agriculture, Selçuk University, Turkey, LAZAR

RADOVANOVIC, Faculty of Economics Brcko, University of East Sarajevo, Bosnia and Herzegovina, NIKOLA PACINOVSKI, Institute for Animal Science, Ss. Cyril and Methodius University in Skopje, Republic of Macedonia, ABDULVAHED KHALEDI DARVISHAN, Faculty of Natural Resources, Tarbiat Modares University, Iran, HAMADA ABDELRAHMAN, Soil Science Dept., Faculty of Agriculture, Cairo University, Egypt, ECATERINA STEFAN, University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania, JEERANUCH SAKKHAMDUANG, The International Society of Environmental and Rural Development, Japan, RAOUDHA KHANFIR BEN JENANA, High Institute of Agronomy of Chott Meriem, Sousse, Tunisia, ERASMO VELÁZQUEZ CIGARROA, Department of Rural Sociology, Chapingo Autonomous University, Mexico, VEDRAN TOMIC, Institute for Science Application in Agriculture, Serbia, MILAN STEVANOVIC, Maize Research Institute "Zemun Polje", Serbia, ANDREJ PILIPOVIC, Institute of Lowland Forestry and Environment, Serbia, NIKOLA PUVACA, Faculty of Economics and Engineering Management University of Business Academy, Serbia, MORTEZA BEHZADFAR, Tarbiat Modares University, Tehran, Iran, LARYSA PRYSIAZHNIUK, Ukrainian Institute for Plant Variety Examination, Kyiv, Ukraine, BRANISLAVKA BOROJA, Agricultural Institute of Republic of Srpska - Banja Luka, Bosnia, BILJANA GRUJIC, Institute of Agriculture Economics, Serbia, MARKO GUTALJ, Faculty of Agriculture, University of East Sarajevo, Bosnia, MIROSLAV LALOVIC, Faculty of Agriculture, University of East Sarajevo, Bosnia, MILAN JUGOVIC, Faculty of Agriculture, University of East Sarajevo, Bosnia, IGOR DJURDJIC, Faculty of Agriculture, University of East Sarajevo, Bosnia, MILENA STANKOVIC, Faculty of Agriculture, University of East Sarajevo, Bosnia, STEFAN STJEPANOVIC, Faculty of Agriculture, University of East Sarajevo, Bosnia, STEFAN BOJIC, Faculty of Agriculture, University of East Sarajevo, Bosnia, TANJA JAKISIC, Faculty of Agriculture, University of East Sarajevo, Bosnia, TIJANA BANJANIN, Faculty of Agriculture, University of East Sarajevo, Bosnia, SINISA BERJAN, Faculty of Agriculture, University of East Sarajevo, Bosnia, General secretary

FOREWORD

A Word from the Editor-in-Chief

Dear colleagues,

In your hands is the Book of Proceedings of the X International Scientific Agricultural Symposium "AGROSYM 2019", which I hope you will find useful in your work. As many as 900 contributions, from 82 countries, have been accepted for oral or poster presentations. Symposium themes cover all branches of agriculture and are divided into 7 sessions: 1) Plant production, 2) Plant protection and food safety, 3) Organic agriculture, 4) Environmental protection and natural resources management, 5) Animal husbandry, 6) Rural development and agro-economy, 7) Forestry and agroforestry. Papers dealing with agricultural engineering and technology were included into one of the seven sessions depending on their focus.

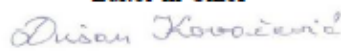
In the plenary lectures were addressed interesting topics; one keynote was on biotechnology and two others dealt with organic farming in Australia and Europe. This confirms the role of AGROSYM as a forum for open discussions and exchanges on agriculture, food, the environment and rural development in the Balkans and beyond. Many of the papers identify a number of approaches and market-based incentives to encourage producers to achieve higher levels of performance (from both economic and environmental points of view) and as a result to meet the expectations of governments and consumers.

The successful management of agricultural resources to satisfy changing human needs, while maintaining or enhancing the quality of the environment and conserving natural resources, indicate a long-term agricultural development imperative. Advances in productivity, profitability and stability of modern cropping, animal and forestry systems will have to be achieved globally on an ecologically sustainable basis. Today, it is obvious that conventional methods of agricultural production, while providing sufficient food and various products to humanity, have led to a number of negative impacts, including the transgression of many planetary boundaries. These negative impacts raise serious questions about the long-term sustainability of high-input agriculture and call for a genuine transition towards sustainable agro-food systems, which achieve food and nutrition security for present and future generations within the safe operating space for humanity.

Full texts of the submitted communications will be available on the website of AGROSYM (<http://agrosym.ues.rs.ba>). Each paper included in the present Book of Proceedings was positively reviewed.

Much appreciation is due to the authors of all papers submitted and presented at the symposium as well as to all symposium participants whose ideas and contributions allowed rich and lively discussions during the various sessions. Many thanks to all reviewers, session moderators and colleagues for their help in editing the Book of Proceedings. Special thanks go to all co-organizers, partners and sponsors for their unselfish collaboration and comprehensive support.

Editor-in-Chief



Dusan Kovacevic, PhD

East Sarajevo, 12 October 2019

CONTENT

1. PLANT PRODUCTION	34
NUTRIENTS STATUS IN MAIZE GRAIN FROM SUSTAINABLE AGRICULTURE Vesna DRAGIČEVIĆ, Milena SIMIĆ, Milan BRANKOV, Milovan STOILJKOVIĆ, Branka KRESOVIĆ, Miodrag TOLIMIR.....	35
INCREASE IN GROWTH AND YIELD OF SOYBEAN IN FIELD TRIAL BY IAA-PRODUCING MUTANT <i>BACILLUS</i> SP. CO-INOCULATED WITH <i>B. JAPONICUM</i> Renata ILIČIĆ, Dragana LATKOVIĆ, Dragana JOŠIĆ.....	41
EVALUATION OF RAPE SEED GENETIC DIVERSITY AND CREATION OF DROUGHT-RESISTANT GENOTYPES USING <i>IN VITRO</i> CELL CULTURE Oksana KLYACHENKO, Larysa PRYSIAZHNIUK, Tetiana DUDKA.....	47
CULTIVATION PRACTICES EFFECT <i>CANNABIS SATIVA</i> YIELD Eleni WOGIATZI-KAMWOUKOU, Kyriakos D. GIANNOULIS, Eleftheria Anna PORICHI, Nikolaos GOUGOULIAS, Dimitrios KALFOUNTZOS, Dimitrios BILALIS.....	56
TEMPERATURE EFFECT ON SEED GERMINATION RATES OF DIFFERENT WINTER LEGUMES AND SPRING CEREALS Elpiniki SKOUFOGIANNI, Kyriakos D. GIANNOULIS, Dimitrios BARTZIALIS, Foteini LAVDI, Nicholas G. DANALATOS.....	64
RESPONSE OF SUNFLOWER HYBRIDS TO STAND DENSITY Igor BALALIĆ, Jovan CRNOBARAC, Vladimir MIKLIĆ, Velimir RADIĆ, Nenad DUŠANIĆ.....	70
INFLUENCE OF AGROTECHNICAL MEASURES ON YIELD AND QUALITY OF GREEN ONION Aleksandra GOVEDARICA-LUČIĆ, Goran PERKOVIĆ, Alma RAHIMIĆ, Jelena PLAKALOVIĆ.....	75
RESPONSE OF SOME WHEAT GENOTYPES TO DROUGHT AT GERMINATION AND EARLY SEEDLING GROWTH Mirjana JOVOVIĆ, Vesna TUNGUZ, Milan MIROSAVLJEVIĆ, Novo PRŽULJ, Zoranka MALEŠEVIĆ.....	79
SOWING QUALITIES AND YIELDING PROPERTIES OF SUDAN GRASS (<i>Sorghum sudanense</i>) DEPENDING ON FRACTIONATION OF SEEDS AND SEEDING RATE Tatiana KRIUKOVA, Georgiy SHENTSEV.....	86
IDENTIFICATION OF MOLECULAR MARKERS FOR FOREGROUND AND BACKGROUND SELECTION IN <i>Ga1-S</i> INCORPORATION INTO MAIZE LINES Marija KOSTADINOVIĆ, Dragana IGNJATOVIĆ-MIČIĆ, Jelena VANČETOVIĆ, Danijela RISTIĆ, Ana OBRADOVIĆ, Olivera ĐORĐEVIĆ MELNIK, Anika KOVINČIĆ.....	91
EFFECT OF CULTIVAR ON THE YIELD AND ANTIOXIDANT ACTIVITY OF OKRA (<i>Abelmoschus esculentus</i> L. Moench) GROWN IN SLOVAK REPUBLIC Miroslav ŠLOSÁR, Ondrej HEGEDŮS, Ivana MEZEYOVÁ, Alžbeta HEGEDŮSOVÁ, Ján FARKAŠ.....	96

RESULTS OF TESTING THE SOWING AGGREGATES FOR PLANTING THE NARROW-ROW CROPS WITH CONVENTIONAL AND REDUCED TILLAGE Saša BARAĆ, Milan BIBERDŽIĆ, Dragan PETROVIĆ, Aleksandar ĐIKIĆ, Rade RADOJEVIĆ, Aleksandar VUKOVIĆ, Dragoslav ĐOKIĆ	102
THE SIGNIFICANCE OF CLIMATE VARIABILITY ON THE PRODUCTION OF WHEAT AND RAPESEED IN SERBIA Jasmina KNEŽEVIĆ, Miroljub AKSIĆ, Dalibor TOMIĆ, Vera DJEKIĆ, Nebojša GUDŽIĆ, Dragan TERZIĆ, Dobrivoj POŠTIĆ, Rade STANISAVLJEVIĆ	108
EFFECT OF CULTIVAR AND YEAR ON YIELD AND GRAIN QUALITY OF TWO-ROW SPRING BARLEY Milomirka MADIĆ, Dragan ĐUROVIĆ, Aleksandar PAUNOVIĆ, Vladeta STEVOVIĆ, Dalibor TOMIĆ, Desimir KNEŽEVIĆ, Vera ĐEKIĆ	113
CROP ROTATION PRODUCTIVITY WITH CEREALS AND LEGUMES: A SHORT REVIEW Elpiniki SKOUFOGIANNI, Kyriakos D. GIANNOULIS, Dimitrios BARTZIALIS, Georgios CHARVALAS, Nicholas G. DANALATOS	119
INTERCROPPING – MAY BE AN OLD PRACTICE BUT TIMELESS: A SHORT REVIEW Elpiniki SKOUFOGIANNI, Kyriakos D. GIANNOULIS, Dimitrios BARTZIALIS, Georgios CHARVALAS, Nicholas G. DANALATOS	126
A MISUNDERSTANDING BUT VERY PROMISING CROP: LUPINS Elpiniki SKOUFOGIANNI, Kyriakos D. GIANNOULIS, Dimitrios BARTZIALIS, Georgios CHARVALAS, Foteini LAVDI, Nicholas G. DANALATOS	133
ASSESSMENT OF CEREAL SPECIES BASED ON YIELD AND AGRO-PHYSIOLOGICAL PARAMETERS UNDER RAINFED CONDITION İrfan ÖZTÜRK	139
EFFECT OF YEAR AND FERTILIZATION ON WINTER BARLEY QUALITY Vera RAJIČIĆ, Jelena MILIVOJEVIĆ, Dragan TERZIĆ, Milan BIBERDŽIĆ, Ranko KOPRIVICA, Dragan GRČAK, Milosav GRČAK	146
GRAIN YIELD AND QUALITY OF WINTER WHEAT CULTIVARS Vera RAJIČIĆ, Vesna PERIŠIĆ, Milomirka MADIĆ, Vera POPOVIĆ, Vladimir PERIŠIĆ, Kristina LUKOVIĆ, Dragan TERZIĆ	152
PRODUCTIVITY AND BIOCHEMICAL COMPOSITION OF SOYBEAN GRAIN, DEPENDING ON THE MEANS OF PROTECTION Tatyana ASEEVA, Anna TISHKOVA, Natalia SAVCHENKO	158
FORMATION OF SPRING TRITICALE GRAIN YIELD IN CONDITIONS OF MONSOON CLIMATE Tatyana ASEEVA, Kristina ZENKINA, Egor TOLOCHKO	162
FEATURES OF THE INFLUENCE OF CLIMATIC FACTORS ON THE CROP AND QUALITY OF GRAIN OF SPRING OATS Tatyana ASEEVA, Irina TRIFUNTOVA, Egor TOLOCHKO	167
GENOTYPE BY ENVIRONMENT INTERACTIONS ON NINE COTTON FIBER TRAITS Vasileios GREVENIOTIS, Evangelia SIOKI, Constantinos G. IPSILANDIS	172
ASSESSING YIELD OF WINTER CEREALS UNDER EXTREME CONDITIONS IN GREECE	

Vasileios GREVENIOTIS, Stylianos ZOTIS, Evangelia SIOKI, Constantinos G. IPSILANDIS	176
THE INFLUENCE OF AGRO-ECOLOGICAL CONDITIONS ON THE QUALITY OF FIELD PEA	
Igor ĐURĐIĆ Vesna MILIĆ, Branka GOVEDARICA, Saša LALIĆ, Željko LAKIĆ	180
EFFECT OF THE 1BL.1RS WHEAT-RYE CHROMOSOMAL TRANSLOCATION IN BREAD WHEAT CULTIVARS ON PHYSIOLOGICAL TRAITS	
Fokion PAPATHANASIOU, Ioannis TASIOS, Dimitrios TRAKOSIARHS, Fani KOYTZOYRA, Athanasios G. MAVROMATIS, Chryssanthi I. PANKOU, Ioannis N. XYNIAS	186
COMPARISON OF SPECIES COMPOSITION OF VASCULAR PLANTS IN AGROFORESTRY SYSTEM	
Helena HANUSOVA, Jan WINKLER, Lucie CHMELIKOVA, Nicole MAIER, Kurt-Jürgen HÜLSBERGEN	191
THE EFFECT OF DROUGHT STRESS ON FRUIT AND SEED COLOR IN PUMPKIN (<i>Cucurbita pepo</i> L.) GENOTYPES	
Musa SEYEMEN, Önder TÜRKMEN, Duran YAVUZ, Atilla DURSUN, Ertan Sait KURTAR	197
THE COMPOSITION OF POLLENIZERS FOR SWEET CHERRY (<i>Prunus avium</i> L.) CULTIVARS RELEASED IN THE REPUBLIC OF SERBIA	
Sanja RADIČEVIĆ, Slađana MARIĆ, Milica FOTIRIĆ-AKŠIĆ, Radosav CEROVIĆ, Milena ĐORĐEVIĆ, Nebojša MILOŠEVIĆ, Ivana GLIŠIĆ	205
MOLECULAR CHARACTERISATION OF MAIZE HYBRIDS	
Danijela RISTIĆ, Marija KOSTADINOVIĆ, Natalija KRAVIĆ, Anika KOVINČIĆ, Ana OBRADOVIĆ, Milan STEVANOVIĆ, Jovan PAVLOV	211
THE UTILITY OF AGRO-MORPHOLOGICAL DESCRIPTORS IN UNIFORMITY AND STABILITY DETERMINATION OF MAIZE INBREDS	
Anika KOVINČIĆ, Ksenija MARKOVIĆ, Danijela RISTIĆ, Vojka BABIĆ, Marija KOSTADINOVIĆ, Natalija KRAVIĆ	216
THE INFLUENCE OF CONTINUOUS ANTHROPOGENIC PRESSURE ON FERTILITY AND BIOLOGICAL ACTIVITY OF SOILS	
Tatyana ASEEVA, Natalia SAVCHENKO, Natalia SELEZNEVA, Sergey SHMIGIRILOV	223
QUANTITATIVE PHENOTYPIC CHARACTERISTICS OF PARENT PLANTS OF SOYBEAN CULTIVAR BATYA	
Tatyana ASEEVA, Tamara FEDOROVA, Sergey SHUKYUROV, Natalia SAVCHENKO	230
THE FIRST RECORD OF <i>RATTUS NORVEGICUS</i> ON THE ISLAND OF CYPRUS AND THE EXPECTED EFFECT ON AGRICULTURE AND LOCAL BIOTA	
Eleftherios HADJISTERKOTIS, George KONSTANTINOU, Daria SANNA, Monica PIRASTRU, Paolo MEREU	236
INFLUENCE OF INTERCROPPING MAIZE WITH COWPEA AND FERTILIZATION WITH CLINOPTILOLITE ON FORAGE YIELD AND QUALITY	
Ivan HORVATIĆ, Martina KOVAČEVIĆ, Dubravko MAČEŠIĆ, Darko UHER	242

UPTAKE OF PHOSPHORUS AND POTASSIUM IN SORGHUM PLANTS IN DEPENDENCE ON NUTRITIONAL LEVEL Ivan VELINOV.....	248
STUDIES ON STABILITY OF GRAINS WEIGHT FROM PANICLE TO A COLLECTION OF OATS AUTUMN (<i>Avena Sativa</i> L.) GENOTYPES Emilian MADOSA, Giancarla VELICEVICI, Sorin CIULCA, Adriana CIULCA, Constantin AVADANEI, Lavinia SASU, Marcel DANCI.....	254
GENETIC ANALYSIS OF CHLOROPHYLL CONTENT IN BARLEY (<i>HORDEUM VULGARE</i> L.) Emilian MADOSA, Giancarla VELICEVICI, Adriana CIULCA, Sorin CIULCA.....	261
BREEDING VEGETABLE ROOTSTOCKS TOWARD COPING WITH BIOTIC AND ABIOTIC STRESSES Rezq BASHEER-SALIMIA, Doaa NAJAJREH.....	267
EFFECT OF DIFFERENT DOSES OF NITROGEN FERTILIZER AND VARIETY ON THE YIELD AND GRAIN QUALITY OF WINTER TRITICALE Dragana LALEVIĆ, Milan BIBERDŽIĆ, Lidija MILENKOVIĆ.....	270
CHANGE IN ACIDITY AND MOBILE ALUMINIUM LEVELS IN FOREST, MEADOW AND ARABLE LAND PSEUDOGLEY SOILS Marijana DUGALIĆ, Ljiljana BOŠKOVIĆ-RAKOČEVIĆ, Goran DUGALIĆ.....	276
THE USE OF WASTEWATER FROM THE RECIRCULATING AQUACULTURE SYSTEM FOR BASIL CULTIVATION AND ITS EFFECTS ON THE ESSENTIAL OIL COMPOSITION Marian BURDUCEA, Ivayla DINCHEVA, Ilian BADJAKOV, Lenuta DIRVARIU, Alin-Cristian BARBACARIU, Valtcho D. ZHELJAZKOV.....	282
COMPARISON OF COMMON FERTILIZERS AND FERTILIZERS WITH NITRIFICATION INHIBITOR TO YIELD AND PROTEIN CONTENT ON TRITICUM DURUM Kyriakos D. GIANNOULIS, Eleni WOGIATZI-KAMWOUKOU, Evangelos KARAKASIS, Anastasios KARAKASIS, Ilias PLATIS.....	288
VARIABILITY OF LENGTH OF SPIKE AND NUMBER OF SPIKELETS PER SPIKE IN WHEAT (<i>Triticum aestivum</i> L.) Desimir KNEZEVIC, Danica MICANOVIC, Veselinka ZECEVIC, Gordana BRANKOVIC, Danijela KONDIC, Adriana RADOSAVAC, Mirela MATKOVIC STOJSIN, Sretenka SRDIC, Srdjan ATANASJEVIC, Dusan UROSEVIC.....	295
PISTACHIO KERNEL CONTENT OF MINERAL ELEMENTS, PROTEIN AND TOTAL OIL UNDER RAIN-FED CULTIVATION IN SYRIA Najwa M. ALHAJJAR, Talat AMER, Bayan M. MUZHER.....	300
GENOTYPE ENVIRONMENT (GXE) INTERACTION AND ASSESSMENT OF BREAD WHEAT (<i>Triticum aestivum</i> L.) GENOTYPES UNDER RAINFED CONDITION İrfan ÖZTÜRK.....	306
INVESTIGATION OF THE EFFECT OF CALCIUM APPLICATIONS ON PLANT DEVELOPMENT OF PEPPER PLANT IN SALT STRESS Fikret YASAR, Ozlem UZAL.....	312

INFLUENCE OF TWO APPLE ROOTSTOCKS ON LEAVES AND FRUITS MINERAL CONTENT OF STARKRIMSON CULTIVAR UNDER RAINFED CONDITIONS Bayan M. MUZHER, Ola T. ALHALABI, Talaat AMER, Sami HENNAWI.....	318
EFFECT OF DIFFERENT SEED TREATMENTS ON DORMANCY BREAKING AND GERMINATION OF ACER CAPILLIPES MAXIM. Marija MARKOVIĆ, Mihailo GRBIĆ, Dragana SKOČAJIĆ, Matilda ĐUKIĆ, Danijela ĐUNISJEVIĆ-BOJOVIĆ	324
MORPHOLOGICAL PROPERTIES OF DIRECTLY SOWED AND TRANSPLANTED SWEET CORN PLANTS CULTIVATED WITH COVERING TECHNOLOGIES Ferenc OROSZ.....	328
THE INFLUENCE OF ABSORBENT AND SOIL TYPE ON GERMINATION, GROWTH AND DEVELOPMENT OF PEA GRAINS Vesna MILIĆ, Aleksej LUKIN, Branka GOVEDARICA, Igor ĐURĐIĆ, Tanja JAKIŠIĆ	334
YIELD OF SELECTED GENOTYPES OF SPRING PEAS (<i>Pisum sativum</i> L.) DEPENDING ON TOP DRESSING AND AGROECOLOGICAL CONDITIONS Igor DJURDJIC, Vesna MILIC, Vladeta STEVOVIC, Branka GOVEDARICA, Goran PERKOVIC	341
DETECTING THE BERRY SIZE RESPONSES IN TWO STRAWBERRY CULTIVARS USING DIFFERENT IRRIGATION LEVELS AND BIO-ACTIVATOR Eser ÇELIKTOPUZ, Burçak KAPUR, Mehmet Ali SARIDAŞ, Sevgi PAYDAŞ KARGI, Bülent ÖZEKİCİ, Müge ERKAN CAN, Uğur KEKEÇ	348
VARIABILITY OF CAROTENOIDS AND TOCOPHEROLS CONTENT IN MAIZE INBRED LINES Snežana MLADENOVIĆ DRINIĆ, Jelena MESAROVIĆ, Natalija KRAVIĆ, Jelena SRDIĆ, Milan STEVANOVIĆ, Ana NIKOLIĆ, Violeta ANĐELKOVIĆ	354
MINERAL COMPOSITION OF TWO PEPPER CULTIVARS (<i>CAPSICUM ANNUUM</i> L.) FROM SERBIA AT THREE RIPENING STAGES Milica LUČIĆ, Ivana SREDOVIĆ IGNJATOVIĆ, Slađana ĐURĐIĆ, Antonije ONJIA	360
EFFECT OF DIFFERENT STORAGE TEMPERATURES ON PHYSICAL STATE AND SOME INNER CONTENTS OF SWEET POTATO (<i>IPOMOEA BATATAS</i> L.) BULBS Nour AlHADIDI, Tamas ZSOM, Katalin FEKETE, Mariann KIS KRISZTIANNE, Zoltan PAP	366
EFFECT OF DRYING ON THE CHANGE OF SUGAR CONTENT IN PLUM FRUITS Olga MITROVIĆ, Branko POPOVIĆ, Nemanja MILETIĆ, Aleksandar LEPOSAVIĆ, Aleksandra KORIĆANAC.....	372
VARIABILITY OF QUALITY AND RHEOLOGICAL PROPERTIES IN WINTER WHEAT UNDER THE INFLUENCE OF ECOLOGICAL FACTORS Kristina LUKOVIĆ, Veselinka ZEČEVIĆ, Vladimir PERIŠIĆ, Vesna PERIŠIĆ, Vera RAJIĆIĆ, Kamenko BRATKOVIĆ, Mirela MATKOVIĆ STOJŠIN	379

VARIATION IN MORPHOLOGICAL AND CHEMICAL TRAITS IN RED AND YELLOW MINI WATERMELON Milica STOJANOVIĆ, Đorđe MORAVČEVIĆ, Slađana SAVIĆ, Jelena DRAGIŠIĆ MAKSIMOVIĆ, Vuk MAKSIMOVIĆ.....	385
INFLUENCE OF CULTIVAR, MICROBIOLOGICAL FERTILIZERS AND GROWING SEASONS ON NITRATE CONTENT IN LETTUCE Milica STOJANOVIĆ, Milena ŽUŽA, Ivana PETROVIĆ, Đorđe MORAVČEVIĆ, Gorica CVIJANOVIĆ, Dragosav MUTAVDŽIĆ, Slađana SAVIĆ.....	390
IMPACT OF PASTERIZATION ON THE QUALITY OF POMEGRANATE JUICE FROM "HICAZ" VARIETY FROM THE REGION OF NORTH MACEDONIA Violeta DIMOVSKA, Fidanka ILIEVA, Sanja KOSTADINOVIĆ VELIČKOVSKA, Ljupco MIHAJLOV, Biljana KOVAČEVIĆ, Elizabeta DAVITKOVSKA BARBAREEVA.....	396
NUTRITIVE CHARACTERISTICS AND ANTIOXIDANT ACTIVITY OF PSEUDOGRAINS Bojana VIDOVIĆ, Mirjana MARČETIĆ, Snežana JANKOVIĆ, Svetlo RAKIĆ, Maja PAVLOVIĆ, Katarina PERIŠIĆ, Radojica RAKIĆ.....	401
BIODIVERSITY OF CHICKPEA: BLACK CHICKPEA Ali KAHRAMAN.....	408
SUSTAINABLE SOIL USAGE: LEGUMES AND HEAVY METALS Ali KAHRAMAN.....	412
NITROGEN FIXATION IN LEGUMES AND CHANGES IN CLIMATE Mustafa ONDER, Ali KAHRAMAN.....	416
SUSTAINABLE PESTICIDE USAGE IN FARMING LEGUMES Mustafa ONDER, Ali KAHRAMAN.....	420
BIODIVERSITY ON PASTURES: HUNTING AND SOCIO-ECONOMIC DIMENSIONS Serpil ONDER, Ali KAHRAMAN.....	423
EFFECTS OF A SUBSTRATE IMPROVEMENT AGENT ON THE VEGETATIVE GROWTH AND QUALITY OF VEGETABLE SEEDLINGS Zoltan PAP, Katalin FEKETE, Dzszenifer NEMETH, Levente KARDOS, Lyza Maquilan QUILONG QUILONG, Mohammed Omer MUSTAFA, Anna SZABO, Gabor BALAZS	427
EFFICACY OF MULTILAYER CROPPING ON FIG PRODUCTION IN ARID CONDITIONS OF KUWAIT Hani A. AL-ZALZALEH, Gladson DCRUZ.....	433
ASSESSMENT OF SAP FLOW TECHNIQUES AS AN AUTOMATED INDICATOR OF <i>VITIS VINIFERA</i> WATER STATUS IN THE PORTUGAL'S DOURO VALLEY Aureliano C. MALHEIRO, Nuno CONCEIÇÃO, José SILVESTRE, Maria Isabel FERREIRA.....	440
THE EFFECT OF DIFFERENT FOLIAR FERTILIZERS AND DOSAGES ON THE YIELD AND SEED QUALITY CHARACTERISTICS OF DURUM WHEAT Kyriakos D. GIANNOULIS, Eleni WOGIATZI-KAMWOUKOU, Niki C. ASIMAKI, Ilias PLATIS, Dimitrios KOUTLIS.....	444

THE EFFECT OF LIMING ON THE ALUMINIUM CONTENT IN A WHEAT ROOT	
Nebojša GUDZIĆ, Gordana ŠEKULARAC, Vera RAJIČIĆ, Slaviša GUDZIĆ, Mirosljub AKSIĆ, Dragan GRČAK, Aleksandar ĐIKIĆ, Jasmina KNEŽEVIĆ	451
DETERMINATION OF VITAMIN C CONTENT IN DIFFERENT EXTRACTS OF THE <i>ALCHEMILLA VULGARIS</i> L.	
Jelena MLADENOVIĆ, Duško BRKOVIĆ, Milena ĐURIĆ, Ljiljana BOŠKOVIĆ-RAKOČEVIĆ, Jasmina ZDRAVKOVIĆ, Nenad PAVLOVIĆ	456
GERMINATION OF CAPPARIS SPINOSA L. SEEDS UNDER DIFFERENT DORMANCY BREAKING TREATMENTS	
Marija MARKOVIĆ, Mihailo GRBIĆ, Dragana SKOČAJIĆ, Matilda ĐUKIĆ, Danijela ĐUNISLJEVIĆ-BOJOVIĆ	460
NITROGEN FERTILIZATION AND SOWING DENSITY INFLUENCE ON WINTER WHEAT YIELD AND YIELD COMPONENTS	
Vladimir AČIN, Milan MIROSAVLJEVIĆ, Goran JACIMOVIĆ, Bojan JOCKOVIĆ, Ljiljana BRBAKLIĆ, Dragan ŽIVANČEV, Sonja ILIN	465
INFLUENCE OF SUPERABSORBENT „TVERDAYA VODA” ON MORPHOLOGICAL CHARACTERISTICS OF POTATO	
Saša LALIĆ, Vesna MILIĆ, Aleksej LUKIN, Branka GOVEDARICA, Igor DJURDJIC, Andrija TOMIĆ	471
NUTRITION VALUES OF HULLED AND NAKED OATS AND BAKING QUALITY OF WHEAT-OAT COMPOSITE FLOURS	
Sonja GAVURNIKOVÁ, Michaela HAVRLENTOVÁ	479
DETERMINATION OF PHYSICAL AND CHEMICAL PARAMETERS OF SELECTED VARIETIES OF BUTTERNUT SQUASH (<i>CUCURBITA MOSCHATA</i> DUCH. EX POIR.)	
Alena ANDREJIOVÁ, Alžbeta HEGEDŮSOVÁ, Adriána MAŤOVÁ, Ondrej HEGEDŮS, Andrea VARGOVÁ	486
IDENTIFICATION OF S-ALLELES IN SOME INDIGENOUS SWEET CHERRY GENOTYPES GROWN IN OHRID REGION	
Slađana MARIĆ, Sanja RADIČEVIĆ, Melpomena POPOVSKA, Viktor GJAMOVSKI, Nebojša MILOŠEVIĆ	493
RESEARCH ON IMPROVING TOMATO GROWTH ON PERLITE SUBSTRATE BY HORSE URINE AND BENEFITS FOR PLANT RESISTANCE TO PATHOGENS	
Carmen COARFĂ, Sorin MATEI, Gabi-Mirela MATEI, Ovidiu Ionuț JERCA, Elena Maria DRĂGHICI	500
PRELIMINARY RESULTS ON USING CAPILLARY DYNAMOLYSIS IN ASSESSING THE EFFECT OF STRUCTURED WATER ON CUCUMBER PLANTS	
Florin ENACHE, Sorin MATEI, Gabi-Mirela MATEI, Ionuț Ovidiu JERCA, Elena Maria DRĂGHICI	506
HARVEST TIME IMPACT ON SHATTERING HABIT AND MILLING QUALITY OF RICE CULTIVARS	
Alireza ALLAMEH	512

ANALYSIS AND CHARACTERISTICS OF THE NEW VIRGINIA HYBRID LINES IN CMS FORM Ilija RISTESKI, Karolina KOCOSKA.....	519
EVALUATION OF ANDROGENIC COMPETENCE OF DIFFERENT PEPPER, TOMATO AND EGGPLANT GENOTYPES Marija POCKOVSKA, Fidanka TRAJKOVA, Liljana KOLEVA GUDEVA	524
SOIL PROPERTIES AND QUALITY GRASSLANDS OF THE MUNICIPALITY OF IVANJICA Snežana ANĐELKOVIĆ, Tanja VASIĆ, Snežana BABIĆ, Mirjana PETROVIĆ, Zoran LUGIĆ, Vladimir ZORNIĆ, Goran JEVTIĆ.....	530
YIELD AND CONTENT OF STARCH AND PROTEIN IN THE SEED OF THE QUINOA GENOTYPES PUNO AND TITICACA Slađana SAVIĆ, Borisz CZEKUS, Ivana PETROVIĆ, Milena MARJANOVIĆ, Zorica JOVANOVIĆ, Radmila STIKIĆ.....	537
BOTANICAL COMPOSITION AND FORAGE QUALITY OF NATURAL GRASSLANDS OF PEŠTER HIGHLANDS Snežana BABIĆ, Zoran LUGIĆ, Dejan SOKOLOVIĆ, Mirjana PETROVIĆ, Vladimir ZORNIĆ, Snežana ANĐELKOVIĆ, Djordje LAZAREVIĆ.....	542
EFFECT OF GROWTH STAGE ON MINERAL CONCENTRATION IN THE TOP ALFALFA AND DRY MATTER YIELD Jordan MARKOVIĆ, Dragan TERZIĆ, Tanja VASIĆ, Snežana ANĐELKOVIĆ, Mirjana PETROVIĆ, Dragoslav ĐOKIĆ, Snežana BABIĆ	548
EFFICIENCY OF EQUIPMENT FOR CLEANING OF THE NATURAL RED CLOVER (<i>Trifolium pratense</i> L.) SEEDS Dragoslav ĐOKIĆ, Rade STANISAVLJEVIĆ, Dragan TERZIĆ, Jasmina MILENKOVIĆ, Tanja VASIĆ, Jordan MARKOVIĆ, Ranko KOPRIVICA.....	554
GRAIN YIELD, YIELD COMPONENTS, MACRO AND MICROELEMENTS VARIATION ANALYSIS IN WHEAT GROWN ON SOLONETZ SOIL Miodrag DIMITRIJEVIĆ, Sofija PETROVIĆ, Borislav BANJAC, Petar SEKULIĆ ..	560
MINERAL ELEMENTS TRANSLOCATION AND RELATIVE YIELD AND YIELD COMPONENTS TOLERANCE IN WHEAT GROWN ON SOLONETZ SOIL Sofija PETROVIĆ, Miodrag DIMITRIJEVIĆ, Borislav BANJAC, Petar SEKULIĆ ..	567
THE EFFECTIVENESS OF SOIL TILLAGE SYSTEMS IN MAIZE CULTIVATION UNDER VARIABLE METEOROLOGICAL CONDITIONS OF CENTRAL SERBIA Milena SIMIĆ, Vesna DRAGIČEVIĆ, Branka KRESOVIĆ, Dušan KOVAČEVIĆ, Željko DOLJANOVIĆ, Milan BRANKOV	574
THE INFLUENCE OF PLANT CUTTING ON GRAIN YIELD TRAITS IN MAIZE Jelena VANČETOVIĆ, Dragana IGNJATOVIĆ-MIČIĆ, Sofija BOŽINOVIĆ, Ana NIKOLIĆ, Dejan DODIG, Vesna KANDIĆ, Olivera ĐORĐEVIĆ MELNIK	580
TROPHIC STRUCTURE OF THE NEMATODE COMMUNITY IN MONOCULTURES OF CARROTS (<i>DAUCUS CAROTA</i> SUBSP. <i>SATIVUS</i>) Lilyana KOLEVA, Deria ADEM.....	586
MICROMORPHOLOGICAL AND BIOCHEMICAL ASPECTS IN <i>MENTHA</i> x <i>PIPERITA</i> L. FOR INDUSTRIAL APPLICATIONS	

Jailawi Asmaa ALI, Monica Luminița BADEA, Vlad POPA, Sorin MATEI, Gabi-Mirela MATEI, Oana Crina BUJOR, Elena Maria DRĂGHICI,	593
STUDYING THE ACCLIMATIZATION AND AGRICULTURAL PECULIARITIES OF EARLY SPECIES OF TANGERINE INTRODUCED FROM JAPAN IN CONDITIONS OF ADJARA	
Rezo JABNIDZE, Mirza KURSHUBADZE, Mamuka TURMANIDZE, Nana JABNIDZE	599
GENERAL COMBINING ABILITIES OF ELITE MAIZE INBRED LINES FOR YIELD AND IMPORTANT TRAITS	
Nikola GRČIĆ, Ana STEPANIĆ, Marko MLADENOVIĆ, Milan STEVANOVIĆ, Jovan PAVLOV, Zoran ČAMDŽIJA	604
ESTIMATION OF YIELD STABILITY OF ZP MAIZE HYBRIDS USING DIFFERENT STATISTICAL MODELS	
Jovan PAVLOV, Nenad DELIĆ, Milan STEVANOVIĆ, Zoran ČAMDŽIJA, Gordana BRANKOVIĆ, Ana STEPANIĆ, Marija KOSTADINOVIĆ	609
EFFECT OF DIFFERENT SIZES OF (PRE BASIC SEEDS) MINITUBER ON PLANT GROWTH AND SEED YIELD OF POTATO	
Shyama Nadeeka HETTIARACHCHI, Nilusha AMARASINGHA, George Chandra BABU, Kanagarathnam DAYANI AND RATHNAKUMARA	613
INFLUENCE OF SOIL MOISTURE REGIME ON ALLUVIAL FOREST HABITAT	
Tanja JAKISIC, Vesna NIKOLIC JOKANOVIC , Radovan SAVIC , Ljubomir LETIC , Marko GUTALJ	618
EFFECT OF NITRIC OXIDE (NO) APPLICATION ON THE DEVELOPMENT OF PEPPER PLANT UNDER DROUGHT STRESS	
Fikret YASAR, Ozlem UZAL	625
OLIVE PRODUCTION AND TRAITS OF MAIN CULTIVARS GROWN SOUTHEAST ANATOLIAN PART OF TURKEY	
Bekir Erol AK, Ebru SAKAR, Sehnaz KORKMAZ	630
THE TRAITS OF PISTACHIO ROOTSTOCKS AND THEIR IMPORTANCE	
Bekir Erol AK	638
EFFECTS OF DIFFERENT SOIL TYPES ON SOME FRUIT PHYSICAL TRAITS OF 'KETEN GOMLEGI' PISTACHIO CULTIVAR	
Ahmet CELIK, Bekir Erol AK	645
ECO-FRIENDLY WATER-RETAINING AGENTS AS THE BASIS FOR POTATO AGROTECHNOLOGY (Black-Earth Region, Russia)	
Alexey LUKIN, Olga MARAEVA, Tatyana NEKRASOVA, Nadezhda PODLESNYKH, Aleksander KASHIRIN, Vyacheslav KUZNETSOV, Vladimir SELEMENEV	651
CHEMICAL COMPOSITION AND YIELD OF DILL AS AFFECTED BY METALLURGICAL SLAG AND ORGANIC FERTILIZER APPLIANCE TO MARGINAL SOIL	
Aleksandra STANOJKOVIĆ-SEBIĆ, Radmila PIVIĆ, Zoran DINIĆ, Dobrivoj POŠTIĆ, Jelena MAKSIMOVIĆ	657
ASSESSMENT OF THE POSSIBILITIES FOR ALTERNATIVE WEED CONTROL IN SOYBEAN	

Bogdan NIKOLOV, Slaveya PETROVA, Ekaterina VALCHEVA, Irena GOLUBINOVA, Plamen MARINOV-SERAFIMOV.....	663
ALLELOPATIC EFFECT OF FIVE WEED SPECIES ON SEED GERMINATION OF SORGHUM CROPS	
Bogdan NIKOLOV, Slaveya PETROVA, Ekaterina VALCHEVA, Irena GOLUBINOVA, Plamen MARINOV-SERAFIMOV.....	670
IN-DEPTH BRAIN PHOSPHOPROTEOME STUDY REVEALS NEUROBIOLOGICAL UNDERPINNINGS FOR FORAGER HONEYBEE WORKERS (<i>APIS MELLIFERA LIGUSTICA</i>)	
Haitham RAMADAN, Jianke LI	676
BEHAVIOR OF YOUNG CONSUMERS REGARDING FLAVORED WINES - CASE STUDY: RETSINA AND VERMOUTH	
Vasiliki - Foteini MPAKABELLOU, Efthymia OIKONOMOU, Vasileios GREVENIOTIS, Evangelia SIOKI, Elisavet BOULOUMPASI, Athanasios MANOURAS	687
ASSESSING STABILITY IN MAIZE	
Vasileios GREVENIOTIS, Stylianos ZOTIS, Evangelia SIOKI, Constantinos G. IPSILANDIS	692
DEVELOPMENT OF CHANGES OF LACTIC ACID AND COLOR CONTENT IN HARVEST SEASON FROM ELDERBERRY (<i>SAMBUCUS NIGRA L.</i>)	
Zsuzsanna PALÁGYI, Diána FURULYÁS, Mónika STÉGER-MÁTÉ.....	696
REVALUATION OF NATIVE CORN TO FACE ENVIRONMENTAL CHANGE	
José Sergio BARRALES-DOMÍNGUEZ; Edgar BARRALES-BRITO	701
PRODUCTIVITY OF RED CLOVER-ITALIAN RYEGRASS MIXTURES ON ACIDIC SOIL DEPENDING OF THE LIMING	
Dalibor TOMIĆ, Đorđe LAZAREVIĆ, Vladeta STEVOVIĆ, Dragan ĐUROVIĆ, Milomirka MADIĆ, Vladimir ZORNIĆ, Jasmina KNEŽEVIĆ	706
LENGTH OF THE ONE-YEAR-OLD BRANCHES AND CATKIN POSITION ON THEM AFFECT QUANTITY AND MORPHOLOGICAL CHARACTERISTICS OF STAMINATE FLOWERS IN WALNUT	
Slađana JANKOVIĆ, Jelena STANKOVIĆ, Dragan JANKOVIĆ, Zoran NIKOLIĆ, Gorica PAUNOVIĆ, Bratislav ĆIRKOVIĆ	712
THE EFFECT OF TEMPERATURE ON POLLEN GERMINATION OF TWO WALNUT CULTIVARS	
Slađana JANKOVIĆ, Jelena STANKOVIĆ, Dragan JANKOVIĆ, Zoran NIKOLIĆ, Gorica PAUNOVIĆ, Bratislav ĆIRKOVIĆ.....	718
THE EFFECT OF CYTOPLASMATIC MALE STERILITY ON YIELD AND YIELD COMPONENTS OF MAIZE INBRED LINES	
Milan STEVANOVIĆ, Snežana MLADENOVIĆ DRINIĆ, Jovan PAVLOV, Nikola GRČIĆ, Danijela RISTIĆ, Milica NIKOLIĆ, Iva SAVIĆ	724
QUALITATIVE ANALYSIS OF SUNFLOWER SEEDING IN REDUCED SOIL TILLAGE USING PRECISION AGRICULTURE SYSTEM	
Stanko OPARNICA, Vladimir VIŠACKI, Jan TURAN, Ondrej PONJIČAN, Aleksandar SEDLAR, Rajko BUGARIN.....	729
THE EFFECT OF DIFFERENT FERTILIZER APPLICATIONS ON PLANT DEVELOPMENT AND FLOWERING OF DEMRE PEPPER	

Fikret YASAR, Ozlem UZAL	737
BIOCHEMICAL STRESS MARKERS OF PLANTS IN CONDITIONS OF FOREST AND PARK ECOSYSTEMS	
Oksana KLYACHENKO, Artur LIKHANOV, Nataliya MIROSHNYK, Igor TESLENKO	741
2. PLANT PROTECTION AND FOOD SAFETY	751
PHENOLIC COMPONENTS AND ANTIOXIDANT ACTIVITIES IN VARIOUS TYPES OF CARROT EXTRACTS	
Jelena MLADENović, Ljiljana BOŠKOVIĆ-RAKOČEVIĆ, Milena ĐURIĆ, Jasmina ZDRAVKOVIĆ, Nenad PAVLOVIĆ, Marijana DUGALIĆ	752
CHANGES IN GERMINATION AND PRIMARILY GROWTH OF THREE CULTIVARS OF FENNEL UNDER APPLICATION OF DIFFERENT DIATOMITE TREATMENTS	
Mohamad Hesam SHAHRAJABIAN ^a , Wenli SUN ^a , Qi CHENG ^a	756
ANISE SEED GERMINATION AND PRIMARILY GROWTH UNDER VARIOUS TREATMENTS OF GIBBERELLIC ACID, BENZYLADENINE AND KINETIN	
Mohamad Hesam SHAHRAJABIAN ^a , Wenli SUN ^a , Qi CHENG ^a	762
INTERCROPPING AND ORGANIC FERTILIZERS WITH COMPARATIVE ADVANTAGES IN SUSTAINABLE AGRICULTURE FOR MORE STABLE AGRICULTURAL SYSTEM	
Mohamad Hesam SHAHRAJABIAN, Wenli SUN, Mehdi KHOSHKHARAM, Peiman ZANDI, Qi CHENG	769
PROSPECTIONS FOR FOOD BASED LURES IN MASS TRAPPING OF <i>BACTROCEA DORSALIS</i> ON <i>CHRYSOPHYLLUM ALBIDUM</i> IN OSUN STATE, NIGERIA	
Juliana Amaka UGWU	776
PHYTOCHEMICAL CHARACTERISTICS OF DIFFERENT MALTS AND POSSIBILITIES FOR THEIR APPLICATION IN FUNCTIONAL BEVERAGES	
Vesela SHOPSKA, Mina DZIVODEROVA-ZARCHEVA, Kristina IVANOVA, Petar NEDYALKOV, Rositsa DENKOVA-KOSTOVA, Maria KANEVA, Georgi KOSTOV	784
CONTROL TRIALS OF ANABOLIC HORMONE RESIDUES IN TISSUES OF WILD AND FARMED NILE TILAPIA IN EGYPT	
Mohamed HAMADA, Reda KHADER, Abdel Rahman EL-BAGORY	790
LEGAL REQUIREMENTS FOR PREPARATION AND PRODUCTION OF FOOD IN BOSNIA AND HERZEGOVINA WITH SPECIAL REFERENCES ON THE ENTITY OF THE REPUBLIC OF SRPSKA	
Saša LALIĆ, Dragan VUJADINOVIĆ	796
EFFECT OF DIFFERENT THICKENING AGENTS ON FREEZE-THAW STABILITY OF FOOD SYSTEMS WITH MODIFIED MAIZE STARCH	
Mina DZIVODEROVA-ZARCHEVA, Kremena NIKOVSKA, Raina HADJIKINOVA, Vesela SHOPSKA	806
TOXIGENIC POTENTIAL OF <i>ASPERGILLUS PARASITICUS</i> ISOLATES ORIGINATING FROM MAIZE GRAIN IN SERBIA	
Milica NIKOLIĆ, Iva SAVIĆ, Ana OBRADOVIĆ, Milan STEVANOVIĆ, Jovan PAVLOV, Marko JAUKOVIĆ, Slavica STANKOVIĆ	812

COMPARATIVE EVALUATION OF MOLECULAR METHODS USED FOR FUSARIUM STRAINS IDENTIFICATION IN THE WEST PART OF ROMANIA Sorina POPESCU, Dorica BOTAU, Aurica BOROZAN, Ioan SARAC, Oana-Maria BOLDURA.....	817
EVALUATION OF SPRAY QUALITY USING WATER SENSITIVE PAPERS AND SIMULATED TREE CANOPY Reza TABATABAEKOLoor, Behrooz MOKHTARPOUR, Yahya ABTALI.....	823
TESTING ANTIBACTERIAL ACTIVITIES OF <i>SEMPERVIVUM TECTORUM</i> Vesna KALABA, Željko SLADOJEVIĆ, Željka MARJANOVIĆ BALABAN, Dragana KALABA.....	829
EFFECTS OF ZINC OXIDE NANOPARTICLES ON <i>SOLANUM LYCOPERSICUM</i> L. AND VIABILITY OF <i>TENEBRIO MOLITOR</i> (TENEBRIONIDAE) Ivan RANKIĆ, Marek DVOŘÁK, Bořivoj KLEJDUS, Helena ŠTUŘÍKOVÁ, Dalibor HŮSKA.....	835
VEGETABLE OILS: DO THEY HAVE ANTIOXIDANT ACTIVITY? Raisa IVANOVA, Dina ELISOVETCAIA, Pavel TATAROV.....	842
HAZARDS RELATED TO FOOD SAFETY Yasin AKKEMİK.....	849
THE EFFECTS OF PROBIOTICS ON PUBLIC HEALTH Yasin AKKEMİK.....	855
THE INFLUENCE OF ABIOTIC FACTORS IN DEVELOPMENT OF CODLING MOTH AND ITS NATURAL ENEMIES IN SOUTHERN SERBIA Katerina NIKOLIĆ, Ana SELAMOVSKA, Slaviša GUDŽIĆ, Zoran NIKOLIĆ, Dragan GRČAK, Milosav GRČAK.....	859
EFFECT OF MODE PACKAGING AND STORAGE ON SENSORY PROPERTIES AND COLORS IN LETTUCE Danijela VASKOVIĆ, Midhat JAŠIĆ.....	865
LABORATORY GERMINATION AND EPIPHYTIC MYCOPHLOA OF VARIOUS GENOTYPES OF SORGHUM (<i>SORGHUM BICOLOR</i> (L.) MOENCH) Mariya KASCHIEVA, Krasimira TANOVA.....	873
EFFICIENCY AND THE POSSIBILITY OF USING ZEOLITE AND APATITE IN PURIFYING WATER FOR IRRIGATION AND REMEDIATION OF CONTAMINATED SOIL Mirko GRUBIŠIĆ, Ljiljana BOŠKOVIĆ-RAKOČEVIĆ, Goran DUGALIĆ, Jelena PETROVIĆ, Marija PETROVIĆ, Jelena MILOJKOVIĆ, Marija KOJIĆ.....	879
USAGE OF PARSLEY POWDER AS AN ALTERNATIVE CURING AGENT IN FERMENTED SUCUK PRODUCTION Ali Samet BABAOĞLU, Mustafa KARAKAYA.....	885
BIOCONTROL OF STRAWBERRY GREY MOLD USING PEPPER EXTRACTS Lina ŠERNAITĖ, Alma VALIUŠKAITĖ, Neringa RASIUKEVIČIŪTĖ, Edita DAMBRAUSKIENĖ, Pranas VIŠKELIS.....	892
MONITORING OF THE SAFETY OF WILD -GROWING FRUITS FROM DIFFERENT REGIONS OF KAZAKHSTAN Gulnar AIDARKHANOVA, Raya AIDARKULOVA, Talgat ABZHANOV, Zhumagul BORANBAI.....	898

COMPARING OF PREEMERGENT WEED CONTROL TECHNOLOGIES IN SOYBEAN (GLYCINE MAX) György PÁSZTOR, Bálint VÁRADI, Veronika DOBSZAI-TÓTH, Erzsébet NÁDASY	904
CONTENT OF Cu, Zn, Co, Ni, Cr IN SOIL AND FRUITS OF APPLE AND PLUM Mira MILINKOVIĆ, Svetlana M. PAUNOVIĆ, Milena ĐORĐEVIĆ, Jelena TOMIĆ, Žaklina KARAKLAJIĆ STAJIĆ, Dragana VRANIĆ	909
EFFECTS OF TEA WOOD ESSENTIAL OIL ON <i>TRIBOLIUM CONFUSUM</i> DU VAL. AND <i>ORYZAEPHILUS SURINAMENSIS</i> L. Dragana BOŠKOVIĆ	916
THE EFFECT OF SOME CHEMICAL ADDITIVES ON THE FOAMING PERFORMANCE OF THE PASTEURIZED LIQUID EGG WHITE Mehmet Musa ÖZCAN, Hatice Kübra YAVUZ	922
CHEMICAL PROTECTION OF WINTER WHEAT AND ITS ENVIRONMENTAL IMPACT IN DIFFERENT SOIL TILLAGE SYSTEMS Małgorzata HOLKA, Jerzy BIENKOWSKI	928
ANTIBACTERIAL ACTIVITY OF PROPOLIS EXTRACTS FROM GREECE AND REPUBLIC OF SRPSKA (BOSNIA AND HERZEGOVINA) Vesna KALABA, Tanja ILIĆ, Dragana KALABA, Željko SLADOJEVIĆ, Bojan GOLIĆ	934
INFLUENCE OF INOCULATION OF <i>Q. CERRIS</i> SEEDLINGS WITH A ROOT PATHOGEN <i>P. PLURIVORA</i> ON THE PERFORMANCE OF <i>L. DISPAR</i> LARVAE UNDER EXTREMELY ELEVATED CO₂ LEVEL CONDITIONS Slobodan MILANOVIĆ, Jovan DOBROSAVLJEVIĆ, Nemanja KAŠIĆ, Marija POPOVIĆ, Ivan MILENKOVIĆ, Stefan BOJIĆ, Čedomir MARKOVIĆ	942
DIFFERENT ASPECTS OF NON-STANDARD FOLIAR FERTILIZERS BASED ON AMINO ACIDS, PHYTOHORMONES AND PLANT EXTRACTS Bogdan NIKOLIĆ, Hadi WAISI, Vesna DRAGIČEVIĆ, Sanja ĐUROVIĆ, Bojan JANKOVIĆ, Maja PAGNAZZO, Vladan JOVANOVIĆ	948
COMPARISON OF THE BIOACTIVITY OF PROPOLIS EXTRACTED BY OLIVE OIL PRODUCED BY DIFFERENT PRODUCTION PROCESSES Sibel SİLİCİ	954
NUTRITIONAL CONTENT OF BEE BREAD (PERGA) FROM NEW DISCOVERED HONEYBEE PRODUCTS Sibel SİLİCİ	960
PRESENCE OF DEOXYNIVALENOL IN BREAD IN SERBIA DURING 2018-2019 Marko M. JAUKOVIĆ, Veselinka M. ZEČEVIĆ, Milica J. NIKOLIĆ	965
FUNGAL BIOMASS AND MYCOTOXIN IN KERNELS OF <i>AVENA</i> L. Svetlana ŠLIKOVÁ, Martina HUDCOVICOVÁ, Edita GREGOVÁ, Peter HOZLÁR	969
CONTROL OF APHIDIDAE IN CHRYSANTHEMUM UNDER GREENHOUSE PRODUCTION Slavica VUKOVIĆ, Sanja LAZIĆ, Dragana ŠUNJKA, Antonije ŽUNIĆ, Dragana BOŠKOVIĆ	976
APPLICATION OF CHITOSAN-BASED COATING IN LEMON FRUIT CONSERVATION S. Jafar HASHEMI, Ebrahim TAGHINEZHAD, Reza TABATABAEE	980

ANTIMICROBIAL ACTIVITY OF PGPR ACTINOBACTERIA Lamia AOUAR, Ines BOUKELOUL, Abderrahmane BENADJILA.....	985
INVESTIGATION OF THE OXIDATION PRODUCTS OF THE OILS OF THE LATEST NON-OILY SUNFLOWER HYBRID SEEDS Tanja LUŽAIĆ, Ranko ROMANIĆ, Nada GRAHOVAC, Nada HLADNI, Snežana KRAVIĆ, Zorica STOJANOVIĆ	991
THE EFFECTS OF WATER EXTRACTS OF XERANTHEMUM CYLINDRACEUM SIBTH. ET SM. ON SEED GERMINATION OF THREE WEED SPECIES Vladan JOVANOVIĆ, Miloš GALOVIĆ, Bogdan NIKOLIĆ, Ivana DRAGIĆEVIĆ, Hadi WAISI, Zlatko GIBA	997
BIOCONTROL POTENTIAL OF <i>TRICHODERMA HARZIANUM</i> AGAINST ROT CAUSING FUNGI OF WHITE YAM (<i>DIOSCOREA ROTUNDATA</i> POIR) TUBERS Victor Iorungwa GWA., Alphonsos Okechukwu NWANKITI.....	1004
INFLUENCE OF MACERATION TIME OF GRAPE POMACE CABERNET SAUVIGNON ON EXTRACTION KINETICS OF SOME POLYPHENOLS AND ANTI-DPPH RADICAL ACTIVITY OF WINES Nikolina LISOV, Uroš ČAKAR, Aleksandar PETROVIĆ, Ljiljana GOJKOVIĆ-BUKARICA	1013
INTERSPECIFIC IDENTIFICATION OF SOME APHID SPECIES BASED ON THE MITOCHONDRIAL CYTOCHROME OXIDASE I (mtCOI) PARTIAL GENE Samir ALI AROUS, Yamina GUENAOUI	1017
FUNGAL PATHOGENS OF BIRDSFOOT TREFOIL (<i>Lotus corniculatus</i> L.) IN SERBIA Tanja VASIĆ, Vesna KRNJAJA, Jordan MARKOVIĆ, Snežana ANDJELKOVIĆ, Mirjana PETROVIĆ, Aleksandra LEPOSAVIĆ, Dragan TERZIĆ.....	1023
PRESENCE OF VIRUSES IN THE POPULATION OF GRAPEVINE CULTIVAR "PROKUPAC" (<i>Vitis vinifera</i> L.) IN RASINA DISTRICT, SERBIA Sandra MILETAKOVIC, Sladjan STANKOVIC, Dragan RAHOVIC, Slobodan KRNJAJIC, Ivana BAKIC, Radomir JOVANOVIC	1028
PHYTOCHEMICAL AND BIOLOGICAL SCREENING OF APIACEAE THAPSIA GARGANICA L. Fatma ACHEUK, Khemais ABDELLAOUI, Wassima LAKHDARI, Abderrahmène DEHLIZ, Nora CHAHBAR, Messaouda BELAID, Lamia YALAOUI, Hadjer BOUKAHAL	1031
AMARANTH GRAIN AS ENRICHING INGREDIENT FOR BAKERY TECHNOLOGY Anastasiia STAKHURLOVA, Natalia DERKANOSOVA, Irina PONOMARYOVA.....	1040
EXAMINATION OF VITAMIN C IN FEED AND MILK Julijana TOMOVSKA, Dijana BLAZEKOVIC-DIMOVSKA, Ilmije VLASAKU	1046
STUDY OF BIOLOGICAL EFFECTIVENESS AND RESIDUE DYNAMICS OF USED NEONICOTINOIDS AND PYRETHROIDS ON CEREALS Ilya KASATOV, Anton POLIKARPOV, Yuriy SAVUSHKIN, Elena TESTOVA, Anastasia FILATOVA	1054

BIOCHEMICAL CHARACTERISTICS OF MEDICINAL RAW MATERIALS OF MYRTUS COMMUNIS L. IN CONDITIONS OF THE SOUTHERN COAST OF THE CRIMEA	
Yuri PLUGATAR, Ekaterina BAKOVA, Oksana SHEVCHUK, Anfica PALIY, Nadezhda BAKOVA.....	1059
ANALYSIS OF FUNGICIDES BOSCALID AND PYRACLOSTROBIN RESIDUES IN LETTUCE	
Sanja LAZIĆ, Dragana ŠUNJKA, Dragana BOŠKOVIĆ, Monika TOMŠIĆ, Denis GRNČA, Slavica VUKOVIĆ, Antonije ŽUNIĆ	1065
INFLUENCE OF BIOTIC STRESS ON TURKEY OAK SEEDLINGS IN ELEVATED CO₂ CONDITIONS	
Slobodan MILANOVIĆ, Jovan DOBROSAVLJEVIĆ, Nemanja KAŠIĆ, Marija POPOVIĆ, Ivan MILENKOVIĆ, Stefan BOJIĆ, Čedomir MARKOVIĆ.....	1070
MACRO AND MICRO ELEMENT CONTENTS OF SOME HERB AND CONDIMENTS	
Nurhan USLU, Mehmet Musa ÖZCAN, Mustafa HARMANKAYA, Nesim DURSUN, Mustafa Mete ÖZCAN, Durmuş Ali CEYLAN, Fatma GÖKMEN.....	1076
EFFECT OF SALICYLIC ACID APPLICATION ON PHENYLALANINE AMMONIA-LYASE ACTIVITY AND TOTAL PHENOLIC CONTENT IN WHEAT (<i>Triticum aestivum</i> L.) AND BUCKWHEAT (<i>Fagopyrum esculentum</i> MOENCH) PLANTS UNDER CADMIUM STRESS	
Yana KAVULYCH, Myroslava KOBYLETSKA, Olga TEREK.....	1084
CORNERSTONE OF STRATEGY AIMED AT CREATION OF RESISTANT VARIANTS OF CARROT (<i>DAUCUS CAROTA</i> L.) TO WHITE AND GRAY ROT PATHOGENS AT THE FEDERAL SCIENTIFIC VEGETABLE CENTER (FGBNU FNCO, RUSSIA)	
Irina ENGALYCHEVA, Elena KOZAR, Alexandr USHAKOV	1090
3. ORGANIC AGRICULTURE.....	1097
DEPENDENCE OF GRAIN YIELD OF SPELT ON LOCALITIES AND DIFFERENT TYPES OF FERTILIZER	
Željko DOLJANOVIĆ, Snežana OLJAČA, Dušan KOVAČEVIĆ, Zoran JOVOVIĆ, Srđan ŠEREMEŠIĆ, Nemanja GRŠIĆ	1098
INFLUENCE OF SEEDING RATE ON COMMON VETCH-WHEAT FODDER CROP MIXTURE PERFORMANCE UNDER ORGANIC MANAGEMENT	
Dubravko MAČEŠIĆ, Matija VRBANČIĆ, Sanja SIKORA, Zlatko SVEČNJAK, Luboš VOZAR, Darko UHER.....	1104
ORGANIC AGRICULTURE IN CENTER REGION OF PORTUGAL: THE BEIRA LITORAL AND LIS VALLEY DISTRICT CASE STUDY	
Maria de Fátima OLIVEIRA, Jorge BULHA, José MENDES, Susana FERREIRA, Rosa GUILHERME, António DINIS FERREIRA, Rodolfo BERNABÉU, José Manuel GONÇALVES, Francisco GOMES DA SILVA.....	1109
CORRELLATION BETWEEN MULCHING, MYCORRHIZA FUNGI, AND OTHER PARAMETERS IN LETTUCE IN TWO FARMING SYSTEMS	
Katalin FEKETE, Rozália BALASSA, Nour ALHADIDI, Barbara FERSCHL, Zita SZALAI, Zoltán PAP.....	1115

KNOWLEDGE OF THE ECONOMIC EFFECT OF BIOLOGICAL METHODS APPLICATION IN AGRICULTURE Angel SAROV.....	1121
SOME ASPECTS OF THE ORGANIC FOOD MARKET IN SERBIA Tatjana BRANKOV, Stanislav ZEKIC, Marija JEREMIC, Bojan MATKOVSKI.....	1127
AGRICULTURAL UTILISATION OF BIOWASTES AND BIODEGRADABLE WASTES Monika JAKUBUS	1133
THE USE OF FUNGI OF THE GENUS TRICHODERMA TO REDUCE THE INFECTIOUS BACKGROUND OF THE SOIL Anna MARKAROVA, Maria MARKAROVA, Sergey NADEZHKIN, Oleg RAZIN	1139
ISOLATION, IDENTIFICATION AND PERFORMANCE OF PHOSPHATE-SOLUBILIZING BACTERIA FROM WARM-WATER FISH POND IN IRAN Nemat MAHMOUDI, Mostafa ARMANDEH, Alireza FALLH NOSRATABAD, Blažo LALEVIC.....	1145
ORGANIC BEEKEEPING DEVELOPMENT IN LATVIA Ligita MELECE, Ilze SHENA.....	1151
4. ENVIRONMENT PROTECTION AND NATURAL RESOURCES MANAGEMENT.....	1158
ESTIMATION OF CLIMATE CHANGE IMPACTS ON EVAPOTRANSPIRATION BY USING DIFFERENT METHODS Muhammet AZLAK, Levent ŞAYLAN.....	1159
PHOSPHORUS, POTASSIUM AND NITROGEN ABUNDANCE IN SOIL OF DOLJEVAC MUNICIPALITY Milosav GRČAK, Dragan GRČAK, Dragana GRČAK, Miroљjub AKSIĆ, Slaviša GUDŽIĆ, Katerina NIKOLIĆ, Vera RAJIĆIĆ.....	1167
ABUNDANCE OF POTASSIUM AND PHOSPHORUS IN AGRICULTURAL SOIL OF THE MUNICIPALITIES AND THE CITY OF NIŠ Milosav GRČAK, Dragan GRČAK, Dragana GRČAK, Miroљjub AKSIĆ, Slaviša GUDŽIĆ, Katerina NIKOLIĆ, Vera RAJIĆIĆ.....	1172
FOOD WASTE IN PORTUGAL- A PUBLIC POLICY WITH THE COMMITMENT OF ALL SOCIETY Nuno Vieira E BRITO, Paula BICO, Carlos BRANDAO	1178
HARMONIZATION OF RELATIONS BETWEEN URBAN AREAS, AGROCOMPLEX AND FOREST BIOCENOSIS IN THE MANAGEMENT FUNCTION Saša OBRADOVIĆ, Branislav ŠARČEVIĆ, Dragana GRUJIĆ ŠARČEVIĆ, Raško STEFANOVIĆ, Milanka RADULOVIĆ, Branko PETRUJKIĆ, Nebojša POTKONJAK	1187
THE CONCENTRATIONS OF HEAVY METALS IN THE LIVER AND MUSCLE TISSUE OF THREE KINDS OF FISH DURING FIVE YEAR PERIOD Saša OBRADOVIĆ, Branko PETRUJKIĆ, Milanka RADULOVIĆ, Raško STEFANOVIĆ, Nebojša POTKONJAK, Milica ŽIVKOV-BALOŠ, Vladimir ŽIVKOVIĆ.....	1192

DIVERSITY AND DISTRIBUTION OF THE SPECIES OF GENUS <i>AMARANTHUS</i> L. 1753 IN VOJVODINA (SERBIA) Natasa MARIC, Sladjana PETRONIC, Zoranka MALESEVIC	1197
ROOT DISTRIBUTION OF DRIP IRRIGATED CITRUS TREES PLANTED ON RIDGE Uğur KEKEÇ, Bulent OZEKICI.....	1203
SUSTAINABILITY OF RICE PRODUCTION SYSTEMS: AGRO-ECONOMIC ANALYSIS OF <i>BALIXO MONDEGO</i> AND <i>LIS</i> IRRIGATION DISTRICTS, PORTUGAL Fátima OLIVEIRA, Pedro REIS, Sérgio OLIVEIRA, António JORDÃO, António RUSSO, Henrique DAMÁSIO, Rui EUGÉNIO, José PAIXÃO, Filipe MELO, Manuel NUNES, Margarida TEIXEIRA, Kiril BAHCEVANDZIEV, José M. GONÇALVES	1210
POSSIBILITY AND EFFECTIVENESS OF MICRO-ORGANISMS IN PURIFICATION OF WASTE WATER, LAGUNA AND WATERWAY Mirko GRUBIŠIĆ, Radislav RADOVIĆ, Ljiljana BOŠKOVIĆ-RAKOČEVIĆ, Marija PETROVIĆ, Jelena PETROVIĆ, Jelena MILOJKOVIĆ, Marija KOJIĆ	1216
THE HOUSEHOLDS BIO-WASTE MANAGEMENT ON THE EXAMPLE OF THE MALOPOLSKA REGION Małgorzata PINK, Dawid BEDLA, Marta CZEKAJ.....	1222
CONTENT OF NITROGEN IN AGRO-CULTURAL SOIL ON THE TERRITORY OF THE MUNICIPALITIES AND THE TOWN OF NIŠ (SERBIA) Dragan GRČAK, Milosav GRČAK, Dragana GRČAK, Snežana GOŠIĆ-DONDO, Mirosljub AKSIĆ, Vera ĐEKIĆ, Katerina NIKOLIĆ	1227
YIELD OF GRASSLAND BIOMASS IN SECOND SWATH AND IMPACT OF APPLIED MEASURES ON CHEMICAL REACTION OF REKULTISOL Nenad MALIĆ, Una MATKO, Željko LAKIĆ.....	1233
AGRICULTURE AND LAND USE: CONTEXT ANALYSIS AND FUTURE PERSPECTIVES FROM THE MEDITERRANEAN TO THE APULIA REGION Simona GIORDANO	1242
CHRONOSEQUENCE OF NATURAL REGENERATION IN ABANDONED MINING SITES IN THE AMAZON RAINFOREST OF MADRE DE DIOS, PERU Edson MORALES, Nobuyuki TANAKA, Martin PILLACA, Francisco ROMÁN-DAÑOBEYTIA, Luis E. FERNANDEZ, Miles SILMAN	1250
DISPERSION AND BIOACCUMULATION OF HEAVY METALS IN PLANTS AT THE BASIN OF WEST MACEDONIA LIGNITE CENTER, GREECE Lazaros TSIKRITZIS, Georgios SAMIOTIS, Konstantinos TSIOPTSIAS, Stavros THEOFANIDIS	1259
BROWNFIELDS AS ENVIRONMENTAL QUALITY INDICATOR: CASE OF LATVIA Velta PARSOVA, Vivita PUKITE	1265
HABITAT TYPES OF EUROPEAN IMPORTANCE ON THE JAHORINA MOUNTAIN (BOSNIA AND HERZEGOVINA) Natasa MARIC, Sladjana PETRONIC, Vesna TUNGUZ	1272
ANALYSIS OF DROUGHT IN NEGOTIN LOWLAND FROM THE ASPECT OF PLANT PRODUCTION	

Enika GREGORIĆ, Gordana MATOVIĆ, Vesna POČUČA	1281
INTENSITY OF OOGENESIS AND SPERMATOGENESIS IN RAINBOW TROUT (<i>Oncorhynchus mykiss</i> Wabbaum, 1792) IN VARIOUS MICROENVIRONMENTAL CONDITIONS	
Selma PILIĆ, Nadžida MLAČO, Amela KATICA, Velija KATICA, Rizah AVDIĆ, Faruk TANDIR, Jasmin KATICA, Kenan PODŽO	1287
Fe, Cu AND Zn PRESENCE IN THE SOIL AT DIFFERENT LOCATIONS IN HERZEGOVINA REGION (BOSNIA AND HERZEGOVINA)	
Alma MIČLJEVIĆ, Aida ŠUKALIĆ, Alma LETO	1296
AGRICULTURE AND CLIMATE CHANGE IN THE REPUBLIC OF SERBIA	
Dragana DROBNJAK, Nenad KATANIC	1302
EFFECTS OF DRAINAGE AND RUNOFF ON THE PRODUCTIVITY OF THE LAGOON OF GHAR EI MELH (TUNISIA)	
Mohamed Salah ROMDHANE, Chiheb FASSATOUI, Amel BEN REJEB JENHANI	1307
MERCURY CONTENT IN AGRICULTURAL SOILS AND FIELD CROPS OF CENTRAL SERBIA	
Jordana NINKOV, Stanko MILIĆ, Jelena MARINKOVIĆ, Jovica VASIN, Branka MIJIĆ, Milorad ŽIVANOV, Dragana BJELIĆ	1312
VARIATION OF SOIL STRUCTURE IN THE FOOT AND TOE SLOPES OF MT. VUKAN, EAST-CENTRAL SERBIA	
Ljubomir B. ŽIVOTIĆ, Boško A. GAJIĆ, Branka ŽARKOVIĆ, Vesna RADOVANOVIĆ, Ljiljana NEŠIĆ, Aleksandar R. ĐORĐEVIĆ	1318
COST AND ENVIRONMENTAL EFFICIENCY IN MEASURING THE ECO-EFFICIENCY PERFORMANCE OF WINTER TRITICALE PRODUCTION	
Jerzy BIENKOWSKI, Małgorzata HOLKA	1325
IMPACT OF GRAZING ON SOIL ORGANIC MATTER AND PHYSICAL PROPERTIES OF A FLUVISOL IN NORTHWEST SERBIA	
Branka KRESOVIĆ, Boško GAJIĆ, Angelina TAPANAROVA, Snežana DRAGOVIĆ, Ranko DRAGOVIĆ, Borivoj PEJIĆ, Ljubomir ŽIVOTIĆ	1331
FOOD SECURITY IN QATAR: THE BLOCKADE OF 2017 AS AN OPPORTUNITY TOWARDS A PRODUCTIVE AND SUSTAINABLE LOCAL FOOD PRODUCTION	
Tarek BEN HASSEN, Hamid EL BILALI	1337
GEOGRAPHICAL ORIGIN OF INVASIVE PLANT SPECIES IN THE WORLD AND SERBIA	
Milan GLIŠIĆ, Vera RAŠKOVIĆ, Vera MILOŠEVIĆ, Vojislav TOMIĆ	1344
DIVERSITY AND SPECIFICITY OF BIOTA IN TUNISIAN ARTIFICIAL RESERVOIRS IN A MANAGEMENT CONTEXT	
Amel BEN REJEB JENHANI, Afef FATHALLI, Khaled GHARBI, Mohamed Salah ROMDHANE	1350
RESOURCE ASSESSMENT OF ADONIS VERNALIS IN REPRESENTATIVE NATURAL LOCALITIES IN WESTERN BULGARIA	
Ina ANEVA, Petar ZHELEV, Milena NIKOLOVA, Slavcho SAVEV	1356
CLIMATE CHANGE ADAPTATION OPTIONS IN LATVIA'S AGRICULTURE	
Ligita MELECE, Ilze SHENA	1363

CHEMICAL COMPOSITION OF FLOODPLAIN SOILS OF THE LOWER DNIESTER RIVER Tamara LEAH, Nicolai LEAH.....	1369
IMPACT OF OLEA EUROPAEASUBSPEUROPAEAVARSILVESTRISON ABUNDANCE AND DISTRIBUTION OF SOIL INVERTEBRATES IN NORTH ALGERIA Malika BOUDIAF NAIT KACI, Najet MESTAR, Massiva IOUALITENE, Maya CHERIEF	1375
CALIBRATION OF SALTMED MODEL FOR INDUSTRIAL TOMATO CULTIVATION IN CENTRAL GREECE USING A DRIP IRRIGATION SYSTEM Maria KOKKORA, Antonios SIOURAS, Panagiotis VYRLAS, Dimitrios KALFOUNTZOS.....	1381
RECYCLING OF PACKAGING MATERIALS TO OBTAIN AN OENOLOGICAL ADJUVANT Vito Michele PARADISO, Concetta Eliana GATTULLO, Ignazio ALLEGRETTA, Giuseppe NATRELLA, Mirella NOVIELLO, Giuseppe GAMBACORTA, Roberto TERZANO	1390
THE ECOLOGICAL FORMULATION OF A PESTICIDE MANUFACTURED BY JSC SCHELKOVO AGROHIM (RUSSIA) ON THE EXAMPLE OF THE HERBICIDE ZONTRAN CSC Salis KARAKOTOV, Elena ZHELTOVA, Sergey KLISHIN	1395
THE PLACE OF GREEN PRODUCTION IN ENVIRONMENTAL PROTECTION AND NATURAL RESOURCE MANAGEMENT Sertaç ARI, Durmuş Ali CEYLAN	1400
POTENTIALS OF PRODUCED WATER BACILLUS SP. FOR PHA PRODUCTION AND PLANT GROWTH PROMOTION Nazia JAMIL, Dur-e-SHAHWAR, Rafeya SOHAIL.....	1407
LITHUANIAN COMPOST QUALITY: PHYSICAL CHARACTERISTICS, NUTRIENT CONTENT, HEAVY METALS AND ORGANIC POLLUTANTS Karolina BARČAUSKAITĖ, Romas MAŽEIKA	1414
5. ANIMAL HUSBANDRY	1421
EFFECTS OF GENOTYPE AND SEX ON PRODUCTIVE PERFORMANCE AND CARCASS CHARACTERISTICS OF BROILER CHICKENS Jozef BUJKO, Cyril HRNČÁR, Emília HANUSOVÁ, Jiřina ZEMANOVÁ.....	1422
THE EFFECT OF APPLIED CROSSBREEDING ON INCREASING OF MILK PRODUCTION IN GOATS Pascal CONSTANTIN, Ionică NECHIFOR, Costică CRISTIAN.....	1429
MICROELEMENT PROFILE ANALYSIS OF GRAPE BY-PRODUCTS FROM SLOVAKIA AND AUSTRIA Renata KOLLÁTHOVÁ, Ondrej HANUŠOVSKÝ, Branislav GÁLIK, Daniel BÍRO, Milan ŠIMKO, Miroslav JURÁČEK, Michal ROLINEC, R. PUNTIGAM, J.A. SLAMA, Martin GIERUS.....	1434
HAPLOTYPE BLOCK STRUCTURE IN THE GENOME OF SLOVAK PINZGAU CATTLE Radovan KASARDA, Nina MORAVČÍKOVÁ, Kristína LEHOCKÁ, Barbora OLŠANSKÁ, Ján PRIŠŤÁK, Anna TRAKOVICKÁ, Ondrej KADLEČÍK.....	1440

EFFECT OF SPRAYING SULPHUR, MAGNESIUM, ZINC AND, ON FRUITING OF SUPERIOR SEEDLESS GRAPEVINES Mustafa H. HASHEM, Faisal. F. AHMED, Ali. A. GOBARA, Ahmed. K. ABDELAAL	1446
THE DIFFERENCES IN MACROMINERAL PROFILES IN WINE BY-PRODUCTS FROM SLOVAKIA AND AUSTRIA Ondrej HANUŠOVSKÝ, Branislav GÁLIK, Daniel BÍRO, Milan ŠIMKO, Miroslav JURÁČEK, Michal ROLINEC, Renata KOLLÁTHOVÁ, Aljoša JANJIĆ, Christian PHILIPP, Reinhard PUNTIGAM, Julia Andrea SLAMA, Martin GIERUS	1453
THE CHEMICAL COMPOSITION AND QUALITY OF MEAT FROM POLISH NATIVE PIG BREEDS Władysław MIGDAŁ, Regina KULIG, Aleksandra LEKSTON, Maria WALCZYCKA, Lukasz MIGDAŁ, Anna MIGDAŁ	1460
EFFECT OF LACTATION STAGE ON THE CONCENTRATION OF SELECTED ESSENTIAL AND TOXIC ELEMENTS IN MILK OF SHEEPS FROM AREA OF SLOVAKIA WITH SLIGHTLY DISTURBED ENVIRONMENT Martina PŠENKOVÁ, Róbert TOMAN, Vladimír TANČIN	1466
THE CHEMICAL CONTENT OF BEEF MEAT AT THE DIFFERENT FEEDING Lilija DEGOLA, Elita APLOČINA	1472
IMPROVING REPRODUCTIVE PERFORMANCES IN PRIMIPAROUS AND MULTIPAROUS COWS Tarik MUTEVELIĆ, Edin RAMIĆ, Benjamin ČENGIĆ, Nazif VARATANOVIĆ, Lejla VELIĆ, Amel ČUTUK	1477
EFFECT OF DIFFERENT NITROGEN FERTILIZER APPLICATION LEVELS ON YIELD AND QUALITY OF THE GREEN FODDER <i>TRICHANTHERA GIGANTEA</i> Tu Quang HIEN, Tu Trung KIEN, Mai Anh KHOA, Tran Thi HOAN, Tu Quang TRUNG	1482
IMPACT OF TEMPERATURE-HUMIDITY INDEX (THI) ON THE EGG WEIGHT OF HYBRID „HISEX BROWN“ LAYING HENS Bratislav PEŠIĆ, Nebojša ZLATKOVIĆ, Nikola STOLIĆ, Ivana ZLATKOVIĆ	1488
EVALUATION OF LACTOSE, MILK PRODUCTION, SOMATIC CELLS COUNT AND CALVING INTERVAL IN SELECTED FARMING CONDITIONS OF THE SLOVAK SPOTTED DAIRY COWS Jozef BUJKO, Juraj CANDRÁK, Peter STRAPÁK, Július ŽITNÝ, Cyril HRNČÁR	1495
EFFECT OF SEX ON GROWTH OF ABERDEEN ANGUS CALVES Radek FILIPCIK, Jan KUČTIK, Vojtech PESAN, Zuzana RECKOVA, Martin HOSEK, Katarina SOUSKOVA	1500
EFFECT OF DIFFERENT DIETARY PROTEIN CONTENT ON PRODUCTION PARAMETERS OF CROSS-BRED FATTENING LAMBS Aida KAVAZOVIĆ, Almira SOFTIĆ, Teufik GOLETIĆ, Amina HRKOVIĆ-POROBLJA, Dinaida TAHIROVIĆ, Aida KUSTURA, Dragana RUŽIĆ-MUSLIĆ, Kenan PODŽO	1506
NATURAL RADIONUCLIDES IN POULTRY FEED AND ASSESSMENT OF RADIATION RISK	

Aleksandra ANGJELESKA, Elizabeta DIMITRIESKA-STOJKOVIK, Radmila CRCEVA-NIKOLOVSKA, Zehra HAJRULAI-MUSLIU, Biljana S. DIMZOVSKA-STOJANOVSKA, Gordana ILIEVSKA	1511
COMPARISON OF THE VEAL QUALITY AND CARCASS VALUE UNDER TWO FEEDING CONCEPTS	
Klára VAVRIŠINOVÁ, Katarina HOZÁKOVÁ, Ondřej BUČKO, Jana TKÁČOVÁ, Peter JUHÁS, Anna TRAKOVICKÁ	1516
NITROGEN USE EFFICIENCY IN DAIRY CATTLE	
Bojan STOJANOVIĆ, Goran GRUBIĆ, Nenad ĐORĐEVIĆ, Aleksa BOŽIČKOVIĆ, Vesna DAVIDOVIĆ	1523
EFFECT OF BLUE LUPINE ON THE GROWTH RATE, CARCASS AND MEAT QUALITY OF HEAVY-TYPE TURKEYS	
Robertas JUODKA, Remigijus JUSKA, Raimondas LEIKUS, Rasa NAINIENE, Violeta JUSKIENE	1529
THE EFFECT OF AGE OF PARENT YOUNG BROILER ON THE EFFICIENCY OF INCUBATION OF CHICKENS	
Tatjana ZDRALIC, Sreten MITROVIC, Darko VUJICIC, Milena MILOJEVIC	1537
CHARACTERISTICS OF LOW FAT YOGURT	
Snezana JOVANOVIĆ, Tanja VUCIĆ, Marija JEFTIĆ	1544
RELATIONSHIPS BETWEEN SOMATIC CELL COUNT AND SELECTED QUALITATIVE PARAMETERS OF SHEEP MILK	
Jan KUČTIK, Leona KONEČNÁ, Vladimír SÝKORA, Martin FAJMAN, Květoslava ŠUSTOVÁ, Radek FILIPČÍK	1550
LIVESTOCK, SUSTAINABLE FOOD SYSTEMS AND THE SUSTAINABLE DEVELOPMENT GOALS	
Victor SERRA PRIETO, Hamid EL BILALI, Giovanni OTTOMANO PALMISANO, Francesco BOTTALICO, Gianluigi CARDONE, Roberto CAPONE	1556
EFFECT OF SPERM STORAGE TIME AND TEMPERATURE ON SEMEN QUALITY IN THE RABBIT LINE ITLV 2006	
Elhassen LANKRI, Khadideja BOUDOUR, Ahmed AICHOUNI, Fatima RECHACHOU, Nacira ZERROUKI	1564
CHARACTERISTICS OF BASIC BEHAVIOURAL FEATURES OF 'HORNLESS HEREFORD' LACTATING COWS RAISED ON A NATURAL GRASSLAND	
Nikolay MARKOV	1573
EFFECT OF SALINE WATER ON WATER INTAKE, GROWTH PERFORMANCE AND BLOOD METABOLITES OF BARBARINE LAMB	
Imtiaz BOUZARRAA, Sourour ABIDI, Hichem BEN SALEM	1579
EFFICIENCY OF BEANS AND PEAS USED IN THE DIET OF DAIRY COWS	
Aiga TRUPA, Baiba OSMANE	1584
FIRST RECORDS OF <i>ICHTIOPHTHIRIUS MULTIFILIS</i> ON CYPRINID FISHES FROM AQUACULTURE FACILITIES IN MACEDONIA	
Dijana BLAZHEKOVIKJ - DIMOVSKA, Stojmir STOJANOVSKI	1590
THE INFLUENCE OF FORAGER BEES NUTRITION WITH DIFFERENT POLLENS ON THE DEVELOPMENT OF HYPOPHARYNGEAL GLANDS	
Goran JEVTIĆ, Bojan ANĐELKOVIĆ, Snežana ANĐELKOVIĆ, Snežana BABIĆ, Dragoslav ĐOKIĆ, Kazimir MATOVIĆ, Nebojša NEDIĆ	1597

RESULTS ON CHROMIUM (Cr) CONCENTRATION IN WILD FISH SQUALIS CEPHALUS & BARBUS BARBUS TISSUES IN VARDAR RIVER, NORTH MACEDONIA	
Lulzim SHAQIRI, Jani MAVROMATI, Vesna ZAJKOVA	1602
GENOMIC DIVERSITY AND LEVEL OF ADMIXTURE IN THE SLOVAK SPOTTED CATTLE	
Kristina LEHOČKÁ, Radovan KASARDA, Anna TRAKOVICKÁ, Ondrej KADLEČÍK, Nina MORAVČÍKOVÁ	1607
RELATION BETWEEN THE FREE SALIVA TESTOSTERONE LEVELS AND BEHAVIOR IN NEW ROOM IN THE PIGLETS UNDER STRESS	
Peter JUHÁS, Juraj PETRÁK, Andrea LEHOTAYOVÁ, Klára VAVRIŠINOVÁ, Katarína HOZÁKOVÁ, Ondrej DEBRECENI	1613
6. RURAL DEVELOPMENT AND AGRO-ECONOMY	1620
CROP PRODUCTION AND FOOD CONSUMPTION FOR FARMERS' WELFARE IN RWANDA	
Aristide MANIRIHO, Edouard MUSABANGANJI, Philippe LEBAILLY	1621
MONITORING AND EVALUATION SYSTEM IN AGRICULTURAL ADVISORY SERVICE	
Gordana ROKVIĆ, Danijela ČIČIĆ ALJETIĆ	1629
THE SYMBIOSIS OF MODERN INFORMATION AND COMMUNICATION TECHNOLOGIES AND MARKETING STRATEGIES IN AGRICULTURE	
Mirjana MAKSIMOVIĆ, Zvezdana GAVRILOVIĆ	1636
MOBILE AND STATIONARY BEEKEEPING – SUCCESSFUL EXAMPLES	
Vesna OČIĆ, Mislav CAR, Zoran GRGIĆ, Dragan BUBALO, Branka ŠAKIĆ BOBIĆ	1642
THE ROLE OF AGRICULTURAL EXTENSION TOWARDS FACING CLIMATE CHANGE IN AL-GHARBIA GOVERNORATE, EGYPT	
Esam Mohamed EL-BAALY, Manal Mohamed EL-KHADRAGY	1648
RURAL WOMEN NEEDS ABOUT EXTENSION KNOWLEDGE REGARDING CLIMATE CHANGE PHENOMENON IN AL-GHARBIA GOVERNORATE, EGYPT	
Esam Mohamed EL-BAALY, Fatma Mostafa SAAD	1654
ATTITUDE OF AGRICULTURAL EXTENSION AGENTS ABOUT ELECTRONIC AGRICULTURAL EXTENSION IN AL-GHARBIA GOVERNORATE, EGYPT	
Esam Mohamed EL-BAALY	1661
RURAL TOURISM AND SUSTAINABLE DEVELOPMENT : THE CASE OF TUNIS VILLAGE'S HANDICRAFTS, EGYPT"	
Hassan REFAAT, Mohamed MOHAMED	1670
THE ROLE OF INNOVATION SUPPORT SERVICE PROVIDERS IN AGRICULTURAL INNOVATION MANAGEMENT	
Hannu E. S. HAAPALA	1679
WHY INVEST ON INNOVATIVE PRODUCTION? A QUALITATIVE EVALUATION OF THE EMERGING AVOCADO SECTOR IN CRETE, GREECE	
Athanasios RAGKOS, Georgia PAPOUTSI, Magdanili BARDOUNIOTI	1686

IMPLEMENTATION OF THE SUSTAINABLE DEVELOPMENT GOALS IN THE MEDITERRANEAN: INSTITUTIONAL AND GOVERNANCE ARRANGEMENTS Hamid EL BILALI, Gianluigi CARDONE, Giovanni OTTOMANO PALMISANO, Francesco BOTTALICO, Roberto CAPONE	1692
CONTRIBUTION OF GRASSROOTS INITIATIVES TO SUSTAINABLE URBAN FOOD SYSTEMS: THE CASE OF A CAMPUS GARDEN IN MÜNSTER, GERMANY Janina WITTENBERG, Hamid EL BILALI, Carola STRASSNER	1700
AGRIBUSINESSES AND RURAL DEVELOPMENT: STATISTICAL EVIDENCES OF POTENTIALS TO GROW NIGERIAN ECONOMY Cornelius Michael EKENTA, Eugenia Chika AKPA, Odekina Menyaga UMAR	1707
CONSUMER BEHAVIOUR AT THE LOCAL FOOD MARKET Marta CZEKAJ, Dawid BEDLA	1713
ECONOMIC ASPECTS OF HAZELNUT PRODUCTION IN REPUBLIC OF SERBIA Aleksandar MILJATOVIĆ, Veljko VUKOJE	1719
COMPARATIVE ANALYSIS OF ONION PRICES Nebojša NOVKOVIĆ, Ljiljana DRINIĆ, Beba MUTAVDŽIĆ, Otilija SEDLAK, Zorica ZDRAVKOVIĆ	1725
FARM PRODUCTION EFFICIENCY IN SERBIA Rade POPOVIC, Zana JURJEVIC, Danilo DJOKIC, Mirjana BOJCEVSKI	1731
THE OPERATIVE PROFIT MARGIN IN RETAIL FOOD Radojko LUKIC, Srdjan LALIC	1737
CROP PRODUCTION IN THE COUNTRIES OF THE WESTERN BALKANS Tihomir ZORANOVIĆ, Vanja ERCEG	1746
STRATEGIC APPROACH TO LAND CONSOLIDATION Milan TRIFKOVIĆ, Žarko NESTOROVIĆ	1752
AGRICULTURAL TRAINING CHALLENGES FACED BY SMALLHOLDER FARMERS IN THE AMATHOLE DISTRICT, EASTERN CAPE IN SOUTH AFRICA Phokele MAPONYA, Sonja Louise VENTER, Christiaan Philippus DU PLOOY, Michael Wolday BAIRU, Erika VAN DEN HEEVER	1758
SOCIAL INNOVATIONS IN MOUNTAIN REGIONS Manfred PERLIK	1768
THE ECONOMIC EFFICIENCY OF THRIFT AND CREDIT COOPERATIVES IN NORTHEAST OF THAILAND Anucha WITTAYAKORN-PURIPUNPINYOO	1773
ROLE OF IMPROVED PRODUCTION TECHNOLOGIES IN ENHANCING FARMERS PRODUCTIVITY IN OILSEED BRASSICAS IN INDO-GANGETIC PLAINS OF INDIA Kartikeya SRIVASTAVA	1779
THE WINE ROUTES IN SICILY AS A TOOL FOR RURAL DEVELOPMENT: AN EXPLORATORY ANALYSIS Marzia INGRASSIA, Luca, ALTAMORE, Pietro COLUMBA, Simona BACARELLA, Stefania CHIRONI	1785

MULTIFUNCTIONALITY, A STRATEGIC PILLAR FOR AGRICULTURE IN DEVELOPING COUNTRIES: AN EVIDENCE FROM NEPAL Kumar BHATTA, Adriano CIANI	1793
THE ECONOMIC AND SOCIAL EFFECTS OF LIGHTING DEVELOPMENT IN THE FIELD OF FISHING ON THE PRODUCTIVITY OF FISH WEALTH IN THE GAZA STRIP Doaa HUSSEIN, Maria LUCCHETTI	1800
FINANCING NON-AGRICULTURAL ACTIVITIES IN THE RURAL REGIONS OF ROMANIA: A REAL SOLUTION FOR RURAL DEVELOPMENT AT THE BEGINNING OF THE SECOND DECADE OF EU MEMBERSHIP? Aurelia - Ioana CHEREJI, Ioan Jr. CHEREJI, Daniela ȚUȚUI	1809
COW MILK ROUTE FROM ROMANIAN DAIRY FARMS TO MARKET Irina - Adriana CHIURCIU, Elena SOARE	1815
LIVELIHOOD DIVERSIFICATION IN THE CONTEXT OF CLIMATE CHANGE: EVIDENCE FROM FARM HOUSEHOLDS IN SOUTH-EAST TUNISIA Fatma ARIBI, Mondher FETOUI, Mongi SGHAIER	1821
AN ANALYSIS OF THE CURRENT SITUATION OF SEED SECTOR IN TURKEY Nilgün GÜMÜŞAY	1828
SALES MANAGEMENT IN THE DIGITAL ENVIRONMENT Rade STANKIC, Niko SADRIC, Natasa PEROVIC	1835
TRADE IN TERMS OF GREEN ECONOMICS Svetlana SOKOLOV MLADENOVIC, Đorđe ČUZOVIĆ	1840
THE OPERATIVE PROFIT MARGIN IN RETAIL FOOD Radojko LUKIC, Srdjan LALIC, Dalibor DONCIC	1846
THE NATIONAL RURAL INSURANCE SYSTEM IN MEXICO: PRIVATE PUBLIC PARTNERSHIP FOR RISK MANAGEMENT J. Reyes ALTAMIRANO-CÁRDENAS, Raquel SOLANO-ALONSO, Tania A. VALDEZ-REYES	1855
7. FORESTRY AND AGRO-FORESTRY	1861
FLAMMABILITY OF CERTAIN CONIFERS AND OAK SPECIES OF NORTH WEST ALGERIA Yacine BENHALIMA, Dehane BELKHEIR	1862
ANALYSIS OF ROAD NETWORK DENSITY AND MEAN SKIDDING DISTANCE IN FOREST MANAGEMENT UNIT "MEŠTREVAC" USING MODERN TECHNIQUES AND METHODS Boban MILETIĆ, Dušan STOJNIĆ, Branislav DRAŠKOVIĆ, Anatoly VASILYEVICH GRYAZKIN, Marko GUTALJ, Stefan BOJIĆ	1872
BIOINDICATION OF VITALITY ON THE BASIS OF DIAMETER INCREMENT OF EUROPEAN SILVER FIR (<i>Abies alba</i> Mill.) ON THE MOUNTAIN BORJA Goran JOVIĆ, Vojislav DUKIĆ, Branko STAJIĆ, Danijela PETROVIĆ	1881
MONITORING ON APPEARANCE AND SPREAD OF HARMFUL INVASIVE PATHOGENS AND PESTS IN BELASITSA MOUNTAIN Margarita GEORGIEVA, Georgi GEORGIEV, Plamen MIRCHEV, Eva FILIPOVA	1887

HEALTH STATUS OF PINE STANDS AS A PART OF THE EXTENSIVE TREE HEALTH MONITORING NETWORK IN BULGARIA Margarita GEORGIEVA, Plamen MIRCHEV, Georgi GEORGIEV, Gergana ZAEMDZHKOVA, Maria MATOVA, Eva FILIPOVA, Peter PETKOV	1893
INVESTIGATING FACTORS AFFECTING CONSUMPTION OF CONSTRUCTION TIMBER FOR TEN SELECTED EUROPEAN COUNTRIES. A FOOTPRINT APPROACH Panagiotis KOYLELIS	1901
CHARACTERIZATION OF <i>POPULUS</i> HYBRIDS BY THEIR DIFFERENT RESPONSES TO ABSCISIC ACID DURING <i>IN VITRO</i> CULTURE Greta STRIGANAVIČIŪTĖ, Jonas ŽLAUKA, Tomas JATKAUSKAS, Iwona SZYB- BOROWSKA, Marzena NIEMCZYK, Sigutė KUUSIENĖ	1911
BENEFITS BROUGHT BY THE ABUNDANCE AND IMPORTANCE OF FOREST FRUITS FROM SATU MARE COUNTY, ROMANIA Ciprian TUDOR, Cristinel CONSTANDACHE, Lucian DINĂ	1917
APPLICATION OF MULTISPECTRAL SENSOR AND SMALL UNMANNED AERIAL SYSTEMS FOR EARLY DETECTION OF STRESS IN FOREST STANDS OF WESTERN SERBIA Nenad ŠURJANAC, Mara TABAKOVIĆ-TOŠIĆ, Marija MILOSAVLJEVIĆ, Filip JOVANOVIĆ	1923
PARASITOID COMPLEX OF <i>BRUCHIDIUS TERRENUS</i> IN BIOCONTROL OF FABACEAE HOST PLANTS AND ITS SPERMATOPHYTIC ENTOMOFAUNA Renata GAGIĆ-SERDAR, Ivana ŽIVANOVIĆ, Tomislav STEFANOVIĆ, Branka SPASOJEVIĆ, Natalija MOMIROVIĆ, Zoran PODUŠKA, Ljubinko RAKONJAC	1930
EFFECT OF DROUGHT ON GROWTH AND MULTIPLICATION OF WHITE POPLAR GENOTYPES IN TISSUE CULTURE Vanja VUKSANOVIĆ, Branislav KOVAČEVIĆ, Saša ORLOVIĆ, Marko KEBERT, Marina KATANIĆ, Lazar PAVLOVIĆ	1936
CURRENT STATUS AND POTENTIAL OF SOME IMPORTANT SPECIES OF MANGROVE FOREST IN KIEN GIANG AND CA MAU PROVINCES, VIET NAM Luom Thanh THAI, Ngon Trong TRUONG	1941
CHARACTERISTICS OF ALKALIZED SOILS IN THE BAČKA REGION (SERBIA) AND THE POSSIBILITY OF THEIR AFFORESTATION Saša PEKEČ, Marina KATANIĆ, Vladislava GALOVIĆ, Velisav KARAKLIĆ	1948
THE EFFECTS OF CLIMATE CHARACTERISTICS ON THE DIAMETER INCREMENT OF DOUGLAS-FIR IN THE CITY OF BELGRADE (SERBIA) Tatjana RATKNIĆ, Mihailo RATKNIĆ, Zoran PODUŠKA, Ivana ŽIVANOVIĆ, Nemanja LAZAREVIĆ, Sabahudin HADROVIĆ	1953
THE CHOICE OF OPTIMAL TECHNOLOGY OF PROCESSING OF WOOD GREENERY IN THE CONDITIONS OF INTEGRATED UTILIZATION OF FOREST DENDROMASS Srđan LJUBOJEVIĆ, Ladislav VASILIŠIN, Goran VUČIĆ	1959
ECONOMIC ASSESSMENT OF THE WATER ECOSYSTEM SERVICE PROVIDED BY FOREST AREAS WITH WATER PROTECTION FUNCTIONS IN NORTHWESTERN BULGARIA	

Nevena SHULEVA, Paula MALKOVSKA.....	1967
PLANNING THE SIZE OF SAMPLE PLOTS IN THE RESEARCH MACEDONIAN PINE STANDS IN THE STRICT NATURE RESERVATE "MALI BELEG" IN SOUTH SERBIA	
Aleksandar POPOVIĆ.....	1974
VARIABILITY OF CONCENTRATION OF PHOTOSYNTHETIC PIGMENTS IN LEAVES OF SYCAMORE MAPLE (<i>Acer pseudoplatanus</i> L.) ONE-YEAR-OLD SEEDLINGS OF DIFFERENT HALF-SIB LINES	
Vladan POPOVIĆ, Ljubinko RAKONJAC, Aleksandar LUČIĆ.....	1982
ANALYSIS OF YIELD QUALITY OF BALD CYPRESS (<i>Taxodium distichum</i> L. Rich.) AT THE LEVEL OF SEED STAND RS-2-2-tdi-00-240	
Vladan POPOVIĆ, Ljubinko RAKONJAC, Aleksandar LUČIĆ.....	1988
VASCULAR PLANT DIVERSITY AS A VALUABLE TOOL FOR THE ECOLOGICAL AND CULTURAL PROJECTION OF THE NATIONAL PARKS IN GREECE	
Alexandra D. SOLOMOU, George KARETSOS, Panayiotis TRIGAS, Nikolaos PROUTSOS, Evangelia V. AVRAMIDOU, Evangelia KORAKAKI, Konstantinos KOUGIOUMOUTZIS, Konstantinia TSAGKARI.....	1995
RESTORATION, MANAGEMENT AND VALORISATION OF PRIORITY HABITATS OF MEDITERRANEAN COASTAL AREAS	
Alexandra D. SOLOMOU, Christos GEORGIADIS, Vito E. CAMBRIA, George KARETSOS, Evangelia KORAKAKI, Panagiotis KOULELIS, Evangelia D. AVRAMIDOU, Konstantinia TSAGARI, Panagiotis MICHOPoulos, Luca SCARNATI, Fabio ATTORRE, Efterpi PATETSINI.....	2001
AUTHOR INDEX.....	2007

POSSIBILITY AND EFFECTIVENESS OF MICRO-ORGANISMS IN PURIFICATION OF WASTE WATER, LAGUNA AND WATERWAY

Mirko GRUBIŠIĆ¹, Radislav RADOVIĆ², Ljiljana BOŠKOVIĆ-RAKOČEVIĆ³, Marija PETROVIĆ¹, Jelena PETROVIĆ¹, Jelena MILOJKOVIĆ¹, Marija KOJIĆ¹

¹Institute for Technology of Nuclear and Other Mineral Raw Materials, Belgrade, Serbia

²Eko zona Ada Huja d.o.o., Belgrade Serbia

³Faculty of Agronomy, Čačak, University of Kragujevac, Serbia

*Corresponding author: m.grubisic@itnms.ac.rs

Abstract

The quality of life on Earth in the future will largely depend on the amount of safe water. Any use of water from numerous sources for different purposes, leads to negative changes in its physical, chemical and biological characteristics, resulting in the formation of wastewater in many forms, as industrial, communal, agricultural or rain. This type of water should be collected, and purified using efficient and economical cost-effective technology, or otherwise pose a serious environmental problem. In order to stop this trend, a large number of countries are undertaking extensive measures and invests large resources in order to stop water pollution and return pure, unpolluted water to nature. In this paper, possible biological procedures for purification of the Ada Huja Lagoon Belgrade, using microorganisms from the genus *Bacillus*, are presented. The Laguna Ada Huja is the recipient of all the listed types of wastewater and as such represents a serious environmental problem. The experiment was performed in laboratory controlled conditions using two different doses of microorganisms. Measurements of essential parameters (pH value, Ammonium ion, Nitrites, Nitrates, Consumption of KMnO₄, Chemical consumption of oxygen, Biochemical consumption of oxygen (BPK), Total organic carbon (TOC)) were performed for 1, 15 and 60 days from wastewater treatment. It has been found that proposed technology, a mixture of heterotrophic, aerobic and optional anaerobic microorganisms produces extracellular enzymes for increased degradation of organic compounds in aforementioned environmental conditions. The use of these microorganisms leads to a decrease of the wastewater BOD/COD content, in addition, it reduces the amount of waste suspensions, reduces the filamentous bacterial reduction of the sludge population, and improves the characteristic of deposits, and therefore wastewater meets the regulated boundaries of the outflows and discharges into the watercourses.

Keywords: *wastewater treatment, lagoons, channels, environmental protection, microorganisms.*

Introduction

Municipal wastewater from industry is a major source of pollution in all environments. Municipal wastewater untreated by any technology (mechanical, chemical, biological), directly discharged into watercourses causes pollution of surface and groundwater as well as soil. The biological treatment of industrial and domestic wastewater is an important biotechnological application, constituting a multibillion-dollar global industry. When microbial populations are enhanced in wastewater treatment systems, their beneficial activities result in the efficient removal of organic matter, toxic substances, nutrients and pathogens (Wang *et al.*, 2012). Despite the economic and environmental importance of these processes, understanding of the microbial communities existing in wastewater treatment plants and their potential for continued use is still limited, especially in developing countries. Bacteria are important contributors to the transformation of complex organic compounds in

wastewater treatment systems and are essential for the optimal operation and preservation of biological treatment systems (Moura *et al.*, 2009).

Special interest has been placed treat wastewater with high levels of organic pollutants in the form of fats, oils and greases (FOG), since the removal of these substances represents an important wastewater treatment challenge at a global level (Facchin *et al.*, 2013).

Several techniques involving microorganisms have been complemented in complementary treatment systems to process wastewater with high FOG content. These techniques have used enzyme extracts of pure cultures obtained by solid state fermentation of agro-industrial residues (Leal *et al.*, 2002) or active consortia grown in the wastewater to be treated (Fadile *et al.*, 2011).

Previously, *Bacillus* sp. has been described as a novel strain with a good performance of nitrogen removal. For example, *Bacillus* sp. LY was isolated from the membrane bioreactor system in which the efficiency of TN removal was up to 80%. After 24-day incubation, the removal efficiency of COD by *Bacillus* sp. LY was 71.7%. It also can denitrify nitrate while nitrifying (Lin *et al.*, 2007). The *Bacillus* sp. strain YX-6 is highly effective in removing nitrite. It could degrade the nitrite nitrogen (nitrite-N) from 10 mg/L to zero in 14 h and the nitrite-N degradation rate was approximately to 100% at the DO concentration of 5.2–5.8 mg/L (Song *et al.*, 2011).

Nitrogen has become a key factor leading to the eutrophication of receiving waters. Accordingly, in order to reduce its discharge, increasingly stringent environmental regulations are carried out, under which circumstance it is urgent to create a novel technological solution to improve nitrogen removal. As a fact, many solutions such as physical, chemical and biological methods have been applied widely, among which biological methods seem to be more promising for some advantages. It is well known that conventional nitrogen removal is composed of two steps: (1) nitrification by autotrophs under aerobic conditions and (2) denitrification by heterotrophs under anaerobic conditions. As such, this technology usually requires extra facilities and land, resulting in high costs of treatment. Thus, it is especially necessary to explore more cost-efficient and less land-occupied technology to remove nitrogen from wastewater. Simultaneous nitrification and denitrification (SND) might be an alternative, and a variety of microorganisms have an ability of SND like *Acinetobacter calcoaceticus* (Zhao *et al.*, 2010), *Pseudomonas stutzeri* (Zhang *et al.*, 2011), *Halomonas campisalis* (Guo *et al.*, 2013).

This study aimed to determine whether bioaggregation with the strain *Bacillus* sp. and enzymes could successfully improve the removal of nitrogen, organic matter, under laboratory conditions. Attention was focused on the stability and efficacy of microorganisms in such an environment and on detecting the possible path of transformation of the present nitrogen compounds based on the measured data (pH, Ammonium ion, Nitrites, Nitrates, Consumption of KMnO₄, Chemical oxygen consumption, Biochemical oxygen consumption (BOD₅), Total organic carbon (TOC). This study is of great importance to investigate the potential application of strains of microorganisms and enzymes and to establish an effective wastewater treatment system in lagoons and lakes.

Material and Methods

The Danube lagoon "ADA HUJA", Belgrade represents a water habitat of about 30 ha, which in the past few years has been the wastewater collector of the Mirjevski Potok. For many years, the lagoon was transformed into a fecal recipient. Samples of 50 l wastewater were taken from the most contaminated part of the lagoon (X 44° 49' 10.41" "Y 20° 31' 14.75" "Z 69 m) for laboratory investigation. Homogenization (obtaining a representative sample) of the waste water samples "MULTI-Control sample" was performed under laboratory conditions. Experiments are performed in plastic buckets with a volume of 10 liters, with the

following variants: 1. Control (untreated sample), 2. Variants 1 - treated wastewater sample with lower dose, optimal condition, 3. Variants 2 - treated wastewater sample with higher dose. Samples were left for two days under laboratory conditions to stabilize the optimum wastewater temperature for microorganisms (*Bacillus* sp) and enzymes: 22-25 °C. Wastewater quality was controlled and monitored by measuring pH value, ammonium ion content, nitrite content, nitrate content, potassium permanganate consumption, chemical oxygen demand (HPK), biochemical oxygen consumption (BOD 5), total organic carbon (TOC). Controlling was done at two time intervals of 15 and 60 days from biological treatment. Catalysts were added to maintain the optimal C: N: P ratio.

Results and Discussion

The chemical and biochemical changes of the untreated wastewater sample (Control) as well as the changes that occurred after the treatment of the wastewater with two different dose-variants are shown in Table 1.

According to results, it can be concluded that the Ada Huja is seriously endangered area and due to it cannot be used in the purpose as an Eco Zone for sports, recreation, rehabilitation and business.

The wastewater pH in the Control sample showed increased value and increases from 7.6 to 7.9 after 60 days. In the treated samples the pH value decreases from 7.7 to 7.6 in the first 15 days and from 7.1 to 7.2 after 60 days.

The average concentration of ammonia nitrogen in the control sample is 32.36 mg N / l which is significantly higher than legal values for V class water (1.5 mg N / l). After biological treatment of wastewater, there was an increase in the content of ammonia nitrogen due to both: bio-enzymatic activity and partially added catalysts, nitrogen-phosphate compounds for biological activation of microorganisms.

The concentration of mineral forms of nitrogen is low in the control sample of wastewater, so that it can be classify to the first class. In the first 15 days of biological treatment the NO₂ and NO₃ content decreases and after 60 days significantly increases.

The chemical oxygen consumption values of HPK-Kubel (KMnO₄ consumption) in the control sample are very high. The maximum measured value in the sample "Control 60" was 1286.5 mg / l, which belongs to the V class (Legislation 50/12), ie. corresponds to "very poor ecological quality" and that kind of waters cannot be used for any purpose. After biological treatment of wastewater, after 15 days, there was a significant decrease in chemical oxygen consumption by 6.3-7 times depending on the treatment procedure.

A high concentration of fresh organic matter in wastewater causes high HPC values. The average HPK value in the control sample of the Ada Huja lagoon is significantly higher than the HPK value defined by Class V wastewater (> 125 mg / l), indicating a significant degree of pollution of the lagoon. Concentrations of organic matter, expressed through the chemical oxygen consumption, are very high for this type of surface water. Based on the classification (Legislation 50/12), water from the Ada Huja lagoon corresponds to a very poor ecological status and cannot be used for irrigation and industrial use as well as for its proposed purpose. After biological treatment of wastewater, there was a significant decrease in HPC values by 6.1 - 7.8 times depending on the treatment variant. HPK value decreases from 1760 mg / l to 226-289 mg / l after 15 days of treatment in Variants 1/15 and 2/15 and after 60 days of biological treatment there is significant decreasing of HPK value.

Tabela 1. Wastewater characteristic before treatment, and 15 i 30 days after treatment

Sample	pH value	Amonijum jon (NH ₄) ⁺ -N (mg/l)	Nitrits NO ₂ ⁻ -N (mg/l)	Nitras NO ₃ ⁻ -N (mg/l)	Consumption KMnO ₄ (mg/l)	Chemical oxygen consumption (K ₂ Cr ₂ O ₇) O ₂	Biochemical oxygen consumption BPK ₅ (mg/l)	Total organic carbon TOC (mg O ₂ / l)
Control	7,7	32,36	0,024	0,23	1111,6	1760	1376,8	64,6
Variant1/15	7,6	40,2	0,011	0,23	158,1	226	11,2	28,8
Variant2/15	7,6	37,8	0,031	0,19	176,7	289	22,3	34,1
Control (60)	7,9	1,19	0,025	0,48	1286,5	1430	221,9	22,57
Variant 1/60	7,1	37,04	0,38	1,6	179,8	220	27,4	15,9
Variant2/60	7,2	37,34	0,27	1,68	148,8	239	42,8	21,25

The content of organic matter expressed through BOD-5 are very high (1376.8 mg O₂ / l) for surface water in the control sample, indicating a high content of organic matter and pollution. The average value of BOD-5 in water from the Ada Huja lagoon is much higher than the value defined by the legislation for Class V. Water with an organic matter content of BOD-5 greater than 25 mg O₂ / L cannot be used for bathing and recreation and "cannot be used for any purpose" (Legislation 50/12). After biological treatment of wastewater, there was a significant decrease in BOD-5 depending of the treatment variant ie. from 1376.8 mg O₂ / l to 11.2-22.3 mg O₂ / l after 15 days in Variants 1/15 and 2/15. Also, a decrease in BOD-5 was observed in the experimental variants (Variant 1/60, Variant 2/60) after 60 days.

The presence of biodegradable substances in wastewater is manifested by higher levels of COD relative to BOD. Biodegradable organic substances include: cellulose, coal dust, lignin, tannin and other synthetic organic compounds. HPC is always greater than or equal to BOD in lagoons, lakes and rivers. The HPK / BOD5 ratio is a characteristic of individual wastewater and their quality can be defined by this ratio.

The total TOC in the wastewater control sample is higher than defined value for the V surface water class (> 50 mg / l), ie. is 64.6 mg / l. After biological treatment of the wastewater from the Ada Huja lagoon, the organic carbon content was reduced to 28.8 mg / l in 1/15 variant and to 34.1 mg / l in 2/15 variant after 15 days. After 60 days in treatment variants 1/60 and 2/60, there was also a decrease in TOC content relative to control sample 60.

Additionally, organoleptic characterization (color, odor) was carried out. Based on this it was concluded that the effect of microorganisms usage was achieved, Figure 1.

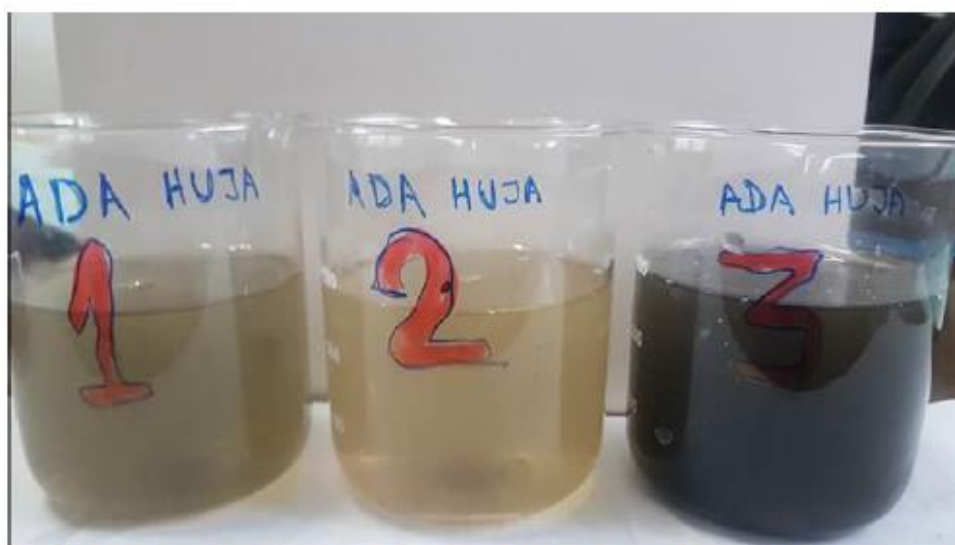


Figure 1. Wastewater samples: ADA HUJA, 1-Variant 2/60, 2-Variant 1/60, 3-Control 60.

Conclusions

The applied technology represents application of unique bacterial *Bacillus* strains that increase the degradation of complex organic compounds into simpler compounds by the hydrolysis process. Used *Bacillus sp.* for verification of technology is formulated with four major enzymes that are important for the degradation of complex organic matter: Amylase, Protease, Cellulase, Lipase. Catalysts are defined as substances, food for microorganisms, which will accelerate or change the speed of reactions. Used *Bacillus sp.* is an advanced mixture of heterotrophic, aerobic and facultative anaerobic microorganisms known for production of extracellular enzymes for increased degradation of organic compounds. Purified bacterial strains and enzymes result in non-pathogenic, non-toxic and non-corrosive formulations.

Acknowledgements

This study is part of the project TR 31003, "Development of technologies and products based on mineral raw materials and waste biomass for protection of natural resources for safe food production", supported by the Serbian Ministry of Science and Technological Development of Republic of Serbia.

References

- Facchin S., Alves P.D.D., Siqueira F., de F., Barroca, T.M., Victória, J.M.N., Kalapothakis, E., 2013. Biodiversity and secretion of enzymes with potential utility in wastewater treatment, *Open Journal of Ecology*, 03, 34–37.
- Fadile A., El Hassani F.Z., Aissam H., Merzouki M., Benlemlih M., 2011. Aerobic treatment of lipid-rich wastewater by a bacterial consortium, *African Journal of Microbiology Research*, 5, 5333–5342.
- Guo Y., Zhou X.M., Li Y.G., Li K., Wang C.X., Liu J.F., 2013. Heterotrophic nitrification and aerobic denitrification by a novel *Halomonas campisalis*, *Biotechnology Letters*, 35 (12):2045–2049.
- Leal M.C.M.R., Cammarota M.C., Freire D.M.G., Sant'Anna Jr. G.L., 2002. Hydrolytic enzymes as coadjuvants in the anaerobic treatment of dairy wastewaters. *Brazilian Journal of Chemical Engineering*, 19, 175–180.

- Lin Y., Kong H., He Y., Liu B., Inamori Y., Yan L., 2007. Isolation and characterization of a new heterotrophic nitrifying *Bacillus* sp. strain, *Biomedical and Environmental Sciences*, 20 (6), 450-455.
- Moura A., Tacão M., Henriques I., Dias J., Ferreira P., Correia A., 2009. Characterization of bacterial diversity in two aerated lagoons of a wastewater treatment plant using PCR-DGGE analysis, *Microbiological Research*, 164, 560–569.
- Song Z.F., An J., Fu G.H., Yang X.L., 2011. Isolation and characterization of an aerobic denitrifying *Bacillus* sp. YX-6 from shrimp culture ponds, *Aquaculture*, 319(1), 188–193.
- Legislation 50/12, Uredba o graničnim vrednostima zagađujućih materija u površinskim i podzemnim vodama i sedimentu i rokovima za njihovo dostizanje, 2012, Službeni glasnik RS, br. 50/12, 1-20.
- Zhang J., Wu P., Hao B., Yu Z. 2011. Heterotrophic nitrification and aerobic denitrification by the bacterium *Pseudomonas stutzeri* YZN-001, *Bioresource Technology*, 102, 9866–9869.
- Zhao B., He Y.L., Hughes J., Zhang X.F. 2010. Heterotrophic nitrogen removal by a newly isolated *Acinetobacter calcoaceticus* HNR, *Bioresource Technology*, 101 (14), 5194–5200.
- Wang X., Hu M., Xia Y., Wen X., Ding K., 2012. Pyrosequencing analysis of bacterial diversity in 14 wastewater treatment systems in China, *Applied and Environmental Microbiology*, 78, 7042–7047.