

PRINT ISSN: 1454-7414  
ELECTRONIC ISSN: 2069-7627

UNIVERSITATEA PENTRU ȘTIINȚELE VIEȚII  
“ION IONESCU DE LA BRAD” DIN IAȘI

# LUCRĂRI ȘTIINȚIFICE

SERIA AGRONOMIE

VOL. 65, Supliment

EDITURA “ION IONESCU DE LA BRAD” IAȘI



2022



## COORDONATORII REVISTEI „LUCRĂRI ȘTIINȚIFICE”

**Redactor responsabil:** Prof. dr. Gerard JIȚĂREANU – USV Iași

**Redactor adjunct:** Prof. dr. Liviu MIRON – USV Iași

### Membri:

- Conf. dr. Denis ȚOPA – USV Iași
- Prof. dr. Liviu IRIMIA – USV Iași
- Prof. dr. Mircea POP – USV Iași
- Prof. dr. Mihai MAREȘ – USV Iași

### COLEGIUL DE REDACȚIE AL SERIEI „AGRONOMIE”

**Redactor șef:** Conf. dr. Denis ȚOPA – USV Iași

**Redactor adjunct:** Conf. dr. Florin LIPȘA – USV Iași

### Redactori:

- Prof. dr. Wolfgang FRIEDT – Justus-Liebig-Universität Giessen, Germany
- Prof. dr. Bernd HONERMEIER – Justus-Liebig-Universität Giessen, Germany
- Prof. dr. Vasile VÎNTU – USV Iași, România
- Prof. dr. Christos TSADILAS – Institute of Soil Mapping and Classification Larissa, Greece
- Prof. dr. Mike RUSSELL - College of Agriculture, Purdue University, Indiana, USA
- Prof. dr. Ioan ȚENU – USV Iași, România
- Prof. dr. Ioan ROTAR – USAMV Cluj Napoca, România
- Prof. dr. Roxana VIDICAN – USAMV Cluj Napoca, România
- Prof. dr. Florin IMBREA - USV Timișoara, România
- Prof. dr. Karoly BODNAR – Universitatea din Szeged, Ungaria
- Prof. dr. Vito Nicola SAVINO – Universitatea de Studii din Bari, Italia
- Conf. dr. Ion BĂCEAN – Universitatea Agrară de Stat din Chișinău, Republica Moldova
- Prof. dr. Jan MOUDRY Jr. – University of South Bohemia in České Budějovice, Faculty of Agriculture, Czech Republic
- Prof. dr. Petr KONVALINA - University of South Bohemia in České Budějovice, Faculty of Agriculture, Czech Republic
- Prof. dr. Carmen del CAMPILLO GARCIA – University of Cordoba, Campus of Rabanales, Spania
- Dr. Virginijus FEIZA – Lithuanian Institute of Agriculture, Lithuania

### REFERENȚI ȘTIINȚIFICI:

- Prof. dr. Mihail AXINTE – USV Iași
- Prof. dr. Daniel BUCUR – USV Iași
- Prof. dr. Viorica IACOB – USV Iași
- Prof. dr. Gerard JIȚĂREANU – USV Iași
- Prof. dr. Teodor ROBU – USV Iași
- Prof. dr. Carmenica Doina JIȚĂREANU – USV Iași
- Prof. dr. Eugen ULEA – USV Iași
- Prof. dr. Vasile VÎNTU – USV Iași
- Prof. dr. Costel SAMUIL – USV Iași
- Prof. dr. Costică AILINCĂI – USV Iași
- Prof. dr. Stejărel BREZULEANU – USV Iași
- Prof. dr. Culiță SÎRBU – USV Iași
- Prof. dr. Mihai STANCIU – USV Iași
- Prof. dr. Elena LEONTE – USV Iași
- Prof. dr. Gavril ȘTEFAN – USV Iași
- Prof. dr. Carmen COSTULEANU – USV Iași
- Prof. dr. Teodor RUSU - USAMV Cluj Napoca, Romania
- Prof. dr. Ioan PĂCURAR - USAMV Cluj Napoca, Romania
- Prof. dr. Simion ALDA - USV Timișoara, Romania
- Prof. dr. Dan MANEA - USV Timișoara, Romania
- Prof. dr. Costica CIONTU - USAMV București, Romania
- Prof. dr. Gheorghe Valentin ROMAN - USAMV București, Romania
- Prof. dr. Viorel IOAN - USAMV București, Romania
- Prof. dr. Boris BOINCEAN - "Alecu RUSSO" University of Bălți, Republic of Moldova
- Conf. dr. Prof. Mihail RURAC - State Agrarian University of Moldova, Republic of Moldova
- Conf. dr. Marcela ȘTEFAN – ASE București
- Conf. dr. Denis Constantin ȚOPA – USV Iași
- Conf. dr. Florin-Daniel LIPȘA – USV Iași
- Conf. dr. Petru Marian CĂRLESCU – USV Iași
- Conf. dr. Feodor FILIPOV – USV Iași
- Conf. dr. Silvica PĂDUREANU – USV Iași

ISSN 1454-7414

© Editura „Ion Ionescu de la Brad” Iași

Lucrări Științifice - vol. 65(Supliment) 2022, seria Agronomie

## COORDINATORS OF JOURNAL “LUCRĂRI ȘTIINȚIFICE”

**Manager Editor:** PhD, Prof. Gerard JITĂREANU – ULS Iași

**Assistant Editor:** PhD, Prof. Liviu MIRON – ULS Iași

### Members:

- PhD, Assoc. Prof. Denis ȚOPA – ULS Iași
- PhD, Prof. Liviu IRIMIA – ULS Iași
- PhD, Prof. Mircea POP – ULS Iași
- PhD, Prof. Mihai MAREȘ – ULS Iași

### EDITORIAL BOARD OF “AGRONOMIE”

**Editor-in-chief:** PhD, Assoc. Prof. Prof. Denis ȚOPA – ULS Iași

**Assistant Editor:** PhD, Assoc. Prof. Florin LIPȘA – ULS Iași

### Editors:

- PhD, Prof. Wolfgang FRIEDT – Justus-Liebig-Universität Giessen, Germany
- PhD, Prof. dr. Bernd HONERMEIER – Justus-Liebig-Universität Giessen, Germany
- PhD, Prof. Vasile VÎNTU – ULS Iași, Romania
- PhD, Prof. Christos TSADILAS – Institute of Soil Mapping and Classification Larissa, Greece
- PhD, Prof. Mike RUSSELL - College of Agriculture, Purdue University, Indiana, USA
- PhD, Prof. Ioan ȚENU – ULS Iași, România
- PhD, Prof Ioan ROTAR – UASVM Cluj Napoca, Romania
- PhD, Prof Roxana VIDICAN – UASVM Cluj Napoca, Romania
- PhD, Prof Florin IMBREA – USV Timișoara, Romania
- PhD, Prof. Karoly BODNAR – Universitatea din Szeged, Ungaria
- PhD, Prof. Vito Nicola SAVINO – Universitatea de Studii din Bari, Italia
- PhD, Assoc. Prof. Ion BĂCEAN – State Agricultural University from Chișinău, Republic of Moldova
- PhD, Prof. Jan MOUDRY Jr. – University of South Bohemia in České Budějovice, Czech Republic
- PhD, Prof. Petr KONVALINA – University of South Bohemia in České Budějovice, Czech Republic
- PhD, Prof. Carmen del CAMPILLO GARCIA – University of Cordoba, Campus of Rabanales, Spania
- PhD, Prof. Virginijus FEIZA – Lithuanian Institute of Agriculture, Lithuania

### SCIENTIFIC REVIEWERS:

- PhD, Prof. Mihail AXINTE – ULS Iași
- PhD, Prof. Daniel BUCUR – ULS Iași
- PhD, Prof. Viorica IACOB – ULS Iași
- PhD, Prof. Gerard JITĂREANU – ULS Iași
- PhD, Prof. Teodor ROBU – ULS Iași
- PhD, Prof. Carmenica Doina JITĂREANU – ULS Iași
- PhD, Prof. Eugen ULEA – ULS Iași
- PhD, Prof. Vasile VÎNTU – ULS Iași
- PhD, Prof. Costel SAMUIL – ULS Iași
- PhD, Prof. Costică AILINCĂI – ULS Iași
- PhD, Prof. Stejărel BREZULEANU – ULS Iași
- PhD, Prof. Culiță SÎRBU – ULS Iași
- PhD, Prof. Mihail STANCIU – ULS Iași
- PhD, Prof. Elena LEONTE – ULS Iași
- PhD, Prof. Gavril ȘTEFAN – ULS Iași
- PhD, Prof. Carmen COSTULEANU – ULS Iași
- PhD, Prof. Teodor RUSU - UASVM Cluj Napoca, Romania
- PhD, Prof. Ioan PĂCURAR - UASVM Cluj Napoca, Romania
- PhD, Prof. Simion ALDA - ULS Timișoara, Romania
- PhD, Prof. Dan MANEA - ULS Timișoara, Romania
- PhD, Prof. Costica CIONTU - UASVM București, Romania
- PhD, Prof. Gheorghe Valentin ROMAN - UASVM București, Romania
- PhD, Prof. Viorel IOAN - UASVM București, Romania
- PhD, Prof. Boris BOINCEAN - "Alecu RUSSO" University of Bălți, Republic of Moldova
- PhD, Assoc. Prof. Mihail RURAC - State Agrarian University of Moldova, Republic of Moldova
- PhD, Assoc. Prof. Marcela ȘTEFAN – ASE București
- PhD, Assoc. Prof. Denis Constantin ȚOPA – ULS Iași
- PhD, Assoc. Prof. Florin-Daniel LIPȘA – ULS Iași
- PhD, Assoc. Petru Marian CĂRLESCU – ULS Iași
- PhD, Assoc. Prof. Feodor FILIPOV – ULS Iași
- PhD, Assoc. Prof. Silvica PĂDUREANU – ULS Iași

ISSN 1454-7414

© Editura „Ion Ionescu de la Brad” Iași

Lucrări Științifice - vol. 65(Supliment) 2022, seria Agronomie

## CONTENTS

|  |           |
|--|-----------|
| <b>Cosmin GHELBERE, Ilie NISTOR, Tudor George AOSTĂCIOAEI, Denis ȚOPA, Gerard JITĂREANU</b><br><b>STUDY ON THE EFFECTS OF CONVENTIONAL SOIL TILLAGE APPLIED TO WINTER AND SPRING PEAS ON SOIL PHYSICAL PROPERTIES .....</b>  | <b>11</b> |
| <b>Ilie NISTOR, Cosmin GHELBERE, Gabriel-Dumitru MIHU, Manuela FILIP, Denis ȚOPA, Gerard JITĂREANU</b><br><b>RESEARCH ON NUTRIENT IMBALANCE CAUSED BY INAPPROPRIATE AGRICULTURAL PRACTICES AND HYDRIC EROSION ON HILLSIDE FARMLAND .....</b>   | <b>15</b> |
| <b>Ana URSU, Sorin CĂPȘUNĂ, Manuela FILIP, Tudor George AOSTĂCIOAEI, Denis ȚOPA, Gerard JITĂREANU</b><br><b>DYNAMICS OF THE MAIN AGROCHEMICAL INDICATORS ON A CROPLAND WITH DIFFERENT SLOPES IN THE MOLDAVIAN SUB-CARPATHIANS .....</b>  | <b>19</b> |
| <b>Gabriel-Dumitru MIHU, Sorin CĂPȘUNĂ, Tudor George AOSTĂCIOAEI, Irina Gabriela CARA, Mariana RUSU, Denis ȚOPA, Gerard JITĂREANU</b><br><b>RESEARCH ON SOIL FERTILITY IN A CALCAREOUS ALLUVIUM FROM THE PRUT RIVER VALLEY AND IN A CAMBIC CHERNOZEM LOCATED ON DOBREANA HILL, VASLUI COUNTY .....</b> | <b>23</b> |
| <b>Mariana RUSU, Irina Gabriela CARA, Manuela FILIP, Denis ȚOPA, Gerard JITĂREANU</b><br><b>ASSESSMENT OF SOIL AVAILABLE MACRO AND MICRONUTRIENTS CONTENT AT S.C. EVEL-H COMPANY S.R.L., ROMANIA .....</b>   | <b>27</b> |
| <b>Gabriel APUCĂLOAIEI, Ana BALAN, Mariana RUSU, Mihaela – Catalina FROICU</b><br><b>OT TRACKING DEVICES REVOLUTIONIZING PRECISION AGRICULTURE .....</b>   | <b>31</b> |
| <b>Gabriel APUCĂLOAIEI, Ana BALAN, Mariana RUSU, Mihaela – Catalina FROICU</b><br><b>PROBLEMS IN COLLECTING DATA TRACKING IN AGRICULTURE.....</b>  | <b>35</b> |
| <b>Irina Gabriela CARA, Denis TOPA, Alexandru Sorin TUDORAN, Gerard JITĂREANU</b><br><b>ASSESSMENT OF SOIL QUALITY THROUGH NDVI-INDEX AT SC AGRO MIXT SPINENI SRL, IASI, ROMANIA .....</b>   | <b>39</b> |
| <b>Diana Elena BOLOHAN, Lucian RĂUS</b><br><b>STUDY ON THE EFFICIENCY OF COMMON STORAGE SOLUTIONS FOR CUT ROSES (ROSA HYBRIDA CV. AVALANCHE).....</b>  | <b>43</b> |
| <b>Vlad Nicolae ARSENOAIA, Roxana Nicoleta RAȚU, Andrei ISTRATE, Ionuț VELEȘCU, Ioan ȚENU</b><br><b>THE USE OF GPS SYSTEM DURING FIELD DEWEEDING .....</b>   | <b>47</b> |
| <b>Vlad Nicolae ARSENOAIA, Anca CALISTRU, Tudor AOSTĂCIOAEI, Roxana Nicoleta RAȚU, Ionuț VELEȘCU, Ioan ȚENU</b><br><b>WORKING PARAMETERS OF ROSTSELMASH TORUM COMBINES.....</b>  | <b>51</b> |

|  |            |
|--|------------|
| <b>Vlad Nicolae ARSENOAIA, Tudor AOSTĂCIOAEI, Ionuț VELEȘCU, Roxana Nicoleta RAȚU, Anca CALISTRU, Andrei ISTRATE, Ioan ȚENU</b><br><b>RESEARCH OF THE EFFICIENCY OF OPERATIONAL MANAGEMENT IN AGRICULTURAL FARMS THROUGH THE USE OF AGRICULTURAL EQUIPMENT FLEET MONITORING SYSTEMS.....</b> | <b>55</b>  |
| <b>Vlad Nicolae ARSENOAIA, Roxana Nicoleta RAȚU, Ionuț VELEȘCU, Andrei ISTRATE, Ioan ȚENU</b><br><b>RESEARCH REGARDING THE USE OF AGRICULTURAL EQUIPMENT FLEET MONITORING .....</b>  | <b>59</b>  |
| <b>Vlad Nicolae ARSENOAIA, Anca CALISTRU, Roxana Nicoleta RAȚU, Tudor AOSTĂCIOAEI, Ionuț VELEȘCU, Ioan ȚENU</b><br><b>ROSTSELMASH AXIAL FLOW SYSTEM .....</b>  | <b>63</b>  |
| <b>Dan BODESCU, Gavril ȘTEFAN, Adriana MĂGUREANU Alexandru Sorin TUDORAN, Oana COCA</b><br><b>COST ANALYSIS ON FARMS - LIMITS AND DETERMINANTS.....</b>  | <b>67</b>  |
| <b>Alexandra ARGHIR, Ana Buruiana, Ștefan Emanuel COVALIU, Dan BODESCU</b><br><b>NALYSIS OF THE SCALE OF CAPITAL COSTS IN AGRICULTURES .....</b>   | <b>73</b>  |
| <b>Dan BODESCU, Gavril ȘTEFAN, Adriana MĂGUREANU Alexandru Sorin TUDORAN, Oana COCA</b><br><b>OUTSOURCING AGRICULTURAL WORK - A VIABLE ALTERNATIVE FOR FARMERS? .....</b>  | <b>79</b>  |
| <b>Dan BODESCU, Bianca Maria CUCIUREANU, Dan ARGHIR, Gabriela Dana BURUIANA</b><br><b>CRITICAL THRESHOLD FOR THE USE OF WORKING CAPITAL IN AGRICULTURE.....</b>  | <b>85</b>  |
| <b>Anca-Elena CALISTRU, Alina CRETU, Vlad ARSENOAIA, Gabriel MIHU, Denis ȚOPA, Gerard JITĂREANU</b><br><b>RESULTS OF QUALITY TRAITS TESTING FOR MAIZE IN CONTROLLED ENVIRONMENT .....</b>  | <b>91</b>  |
| <b>Cosmin GHELBERE, Ilie NISTOR, Irina Gabriela CARA, Mariana RUSU, Denis ȚOPA, Gerard JITĂREANU</b><br><b>RESEARCH REGARDING THE FERTILITY CONDITION OF FARM LAND IN ORDER TO IMPROVE SOIL AND PROFITABILITY THROUGH DIFFERENTIAL FERTILIZATION... </b>                                     | <b>95</b>  |
| <b>Manuela FILIP, Irina-Gabriela CARA, Mariana RUSU, Denis ȚOPA, Gerard JITĂREANU</b><br><b>EVALUATION OF NUTRIENT CONTENT IN PEA CROP FROM MUNTENI ORGANIC FARM – GALAȚI COUNTY, ROMANIA .....</b>  | <b>99</b>  |
| <b>Sorin CĂPȘUNĂ, Feodor FILIPOV, Gabriel-Dumitru MIHU, Anca Elena CALISTRU, Gerard JITĂREANU</b><br><b>COMPACTNESS OF THE SUBARABLE LAYER OF CHERNOZEM IN THE PRUT - JIJIA INTERFLUVIUM AREA ON THE LAND EXPLOITED BY S.C. AGROMIXT SPINENI S.R.L., IAȘI COUNTY .....</b>                   | <b>103</b> |

|   |     |
|---|-----|
| <b>Tudor George AOSTĂCIOAEI, Anca Elena CALISTRU, Gabriel Dumitru MIHU, Vlad ARSENOAIA, Denis ȚOPA, Gerard JITĂREANU</b><br><b>QUALITY TRAITS TESTS OF SUNFLOWER SEEDS IN FITOTRON GROWTH CHAMBERS</b><br>..... | 107 |
| <b>Lucian RĂUS, Gabriel MIHU, Diana Elena BOLOHAN, Gavril ȘTEFAN</b><br><b>RESEARCH ON THE ROLE OF PEA CULTIVATION IN AGRICULTURAL TECHNOLOGIES FOR ORGANIC PRODUCTION</b> .....                                | 111 |
| <b>Mihai-Marius BĂETU, Petru Marian CĂRLESCU, Ioan ȚENU, Nelu STAMATE</b><br><b>TRENDS IN GRAIN STORAGE IN WAREHOUSES AND SILOS</b> .....   | 115 |
| <b>Petru Marian CĂRLESCU, Marius Mihai BĂETU, Alexandru Sorin TUDORAN, Nelu STAMATE</b><br><b>MODELING HEAT TRANSFER IN A VERTICAL SILO</b> .....   | 119 |
| <b>Petru Marian CĂRLESCU, Marius Mihai BĂETU, Alexandru Sorin TUDORAN, Nelu STAMATE</b><br><b>RESEARCH ON THE EFFICIENCY OF AERATION PROCESS AND ENERGY CONSUMPTION IN A VERTICAL SILO</b> .....                | 123 |
| <b>Diana Elena BOLOHAN, Lucian RĂUS</b><br><b>EFFECT OF BIOHUMUS THROUGH FERTIGATION ON THE YIELDING IN A STRAWBERRY PLANTATION, THE "MARMOLADA" VARIETY, UNDER FIELD CONDITIONS</b> .....                      | 127 |
| <b>Bogdan CIUBOTARU, Ana BALAN, Ștefan VIZITEU</b><br><b>CURRENT ISSUES IN THE ROMANIAN AGRICULTURAL SECTOR: A CASE STUDY ON THE CHALLENGES FACED BY VEGETAL FARMS IN ROMANIA</b> .....                         | 131 |
| <b>Gabriel APUCĂLOAIE, Dinu CĂLĂRAȘI, Ana BALAN, Chiril BOTNARU, Constantin – Dragoș DUMITRAȘ</b><br><b>ANALYSIS OF ROMANIA’S SOFTWARE MARKET</b> .....   | 135 |
| <b>Ana BALAN, Geanina PODARIU, Andrei BOBU, Eduard BOGHIȚĂ</b><br><b>EXPLORING USE CASES FOR AGRICULTURAL APPLICATIONS: PROPOSALS AND POTENTIAL IMPLEMENTATIONS</b> .....                                       | 141 |
| <b>Geanina PODARIU, Ana BALAN, Roxana-Nicoleta RAȚU, Marius-Mihai CIOBANU</b><br><b>AGRICULTURAL SOFTWARE MARKETING: ASSESSING STRATEGIES FOR SUCCESS</b><br>.....  | 147 |
| <b>Alexandrina RATA, Lucia ESANU, Dan DONOSA, Cosmin GHELBERE</b><br><b>AI-ENHANCED CONVERSATIONAL INTERFACES FOR WORKPLACE COLLABORATION</b><br>.....  | 153 |
| <b>Cosmin URSAȚHE, Lenuța ALBOAIE, Chiril BOTNARU, Gavril ȘTEFAN</b><br><b>SEEDING THE FUTURE OF AGRICULTURE WITH DECENTRALISED IDENTITIES AND BLOCKCHAIN TECHNOLOGY</b> .....                                  | 157 |

|  |     |
|--|-----|
| <b>Roxana IRIMIA, Andi-Gabriel ȚAN, Dan DONOSĂ, Cosmin Costel MOLOCEA</b><br><b>ALGORITHMS FOR CALCULATING ACTUAL WORKED SURFACES IN AGRICULTURE</b><br>.....  | 161 |
| <b>Roxana IRIMIA, Nicoleta MIHALACHE, Cosmin GHELBERE, Monica RUSU</b><br><b>REAL-TIME FUEL CONSUMPTION MONITORING ALGORITHMS FOR ACCURATE FUEL CONSUMPTION DETERMINATION</b> .....                      | 165 |
| <b>Roxana IRIMIA, Bogdan CIUBOTARU, Diana Georgiana ȘUHAN, Monica RUSU</b><br><b>ALGORITHM FOR SEPARATING WORKED SURFACES IN AGRICULTURE</b> .....   | 169 |
| <b>Cosmin URSACHE, Andi-Gabriel ȚAN, Dan BODESCU, Mihaela Cătălina FROICU</b><br><b>DECENTRALISED TRUST ECOSYSTEMS: ADVANCING SUSTAINABLE AGRICULTURE</b><br>.....                                       | 173 |
| <b>Alexandrina RAȚĂ, Andi-Gabriel ȚAN, Ștefan VIZITEU, Alexandru Sorin TUDORAN</b><br><b>DECENTRALISED BRANDING SPECTRUM: COLLABORATION AND COMPETITION ACROSS DIVERSE ORGANIZATIONAL CONTEXTS</b> ..... | 177 |
| <b>Teodor LUPU, Cosmin URSACHE, Beatrice PĂDURARU, Constantin Dragoș DUMITRAȘ</b><br><b>THE ROLE OF DRONES IN MODERN AGRICULTURE</b> .....   | 181 |
| <b>Najib REHMAN, Sînică ALBOAIE, Otilia MURARIU, Mihai CIOBANU</b><br><b>USE OF DIGITALISATION TO REDUCE WASTE IN MANUFACTURING</b> .....  | 185 |
| <b>Vlad POSEA, Lenuța ALBOAIE, Alexandru Sorin TUDORAN, Constantin Dragoș DUMITRAȘ</b><br><b>EXPLORING THE CROPS CLASSIFICATION IN ROMANIA USING SATELLITE IMAGES</b><br>.....                           | 191 |
| <b>Alexandrina RAȚĂ, Sînică ALBOAIE, Gavril ȘTEFAN, Alexandru Sorin TUDORAN</b><br><b>TRANSFORMING AUDITING AND CONTROL IN AGRICULTURE WITH BLOCKCHAIN AND AI</b> .....                                  | 195 |
| <b>Roxana IRIMIA, Sînică ALBOAIE, Dan DONOSĂ, Monica RUSU</b><br><b>AIROBOT: CONVERSATIONAL-BASED USER INTERFACE DRIVING INDUSTRY &amp; AGRICULTURE</b> .....  | 199 |
| <b>Sînică ALBOAIE, Daniel SAVA, Eduard BOGHIȚĂ, Oana COCA</b><br><b>EXPLORING THE LINK BETWEEN META-RATIONALITY AND AI MODELS COMPOSABILITY</b> .....  | 205 |
| <b>Andi-Gabriel ȚAN, Adrian GÂNGA, Diana Georgiana ȘUHAN, Ștefan VIZITEU</b><br><b>APPLICATIONS OF AI IN AGRICULTURE AND INDUSTRY</b> .....  | 211 |
| <b>Emanuel ACHIREI, Alexandrina RATA, Mia MERTICARIU, Mihaela Catalina FROICU</b><br><b>EVOLUTION OF COMPUTER HARDWARE FOR AGRICULTURAL SECURITY</b> .....   | 215 |



|  |            |
|--|------------|
| <b>Daniel VIȘOIU, Andi-Gabriel ȚAN, Nicoleta MIHALACHE, Constantin Dragoș DUMITRAȘ, Alexandru Sorin TUDORAN</b><br><b>SUSTAINABLE AGRICULTURE THROUGH GIS .....</b>                                | <b>219</b> |
| <b>Sînică ALBOAIE, Marco COMO, Andi-Gabriel ȚAN</b><br><b>CORRECTING AI'S CAUSED POWER IMBALANCE THROUGH DECENTRALISED BRANDS .....</b>  | <b>223</b> |
| <b>Sînică ALBOAIE, Daniel SAVA, Andrei Gabriel ȚAN, Lenuța ALBOAIE</b><br><b>AI INSIGHTS THROUGH LINKED QUERIES ASSESSMENT: A META-RATIONAL INVESTIGATION OF BIASES AND WISDOM .....</b>           | <b>233</b> |
| <b>Sînică ALBOAIE, Marco CUOMO, Lenuța ALBOAIE</b><br><b>TOWARDS A ROBUST AI REGULATORY FRAMEWORK: TECHNICAL AND LEGAL ASPECTS .....</b>   | <b>239</b> |
| <b>Teodor LUPU, Adrian GÂNGA, Nicoleta MIHALACHE, Chiril BOTNARU, Monica RUSU</b><br><b>COMBATING AGRICULTURAL AND FUEL THEFT VIA SOFTWARE SOLUTIONS: STANDARD AND AI-POWERED APPROACHES .....</b> | <b>245</b> |
| <b>Ana BALAN, Vasile PODARIU, Beatrice PADURARU, Oana COCA</b><br><b>AGRICULTURAL DECENTRALISED PLATFORMS: ENHANCING MARKETING AND SALES .....</b>   | <b>253</b> |
| <b>Cosmin URSACHE, Lenuța ALBOAIE, Alexandru Dragoș ROBU, Ana URSU</b><br><b>BLOCKCHAIN-BASED AUTOMATION: A NEW FRONTIER FOR BUSINESS EFFICIENCY AND COLLABORATION .....</b>                       | <b>261</b> |
| <b>Vasile PODARIU, Ana BALAN, Ștefan VIZITEU, Diana CREANGA</b><br><b>SOFTWARE SOLUTIONS: MASTERING MARKET DEMANDS THROUGH STRATEGIC COMMERCIALIZATION.....</b>                                    | <b>265</b> |

## RESULTS OF QUALITY TRAITS TESTING FOR MAIZE IN CONTROLLED ENVIRONMENT

Anca-Elena CALISTRU<sup>1</sup>, Alina CRETU<sup>2</sup>, Vlad ARSENOAIA<sup>1</sup>,  
Gabriel MIHU<sup>1</sup>, Denis ȚOPA<sup>1</sup>, Gerard JIȚĂREANU<sup>1</sup>

e-mail: aecalistru@uaiasi.ro

### Abstract

Maize is one of the most often cultivated species around the world, due to its high yield and also due to its use in different food, animal husbandry and industry production. Yield maximization needs considering the hybrid characteristics related to pedo-climatic conditions, pathogen and insects, maturity group, soil moisture and temperature at sowing. In the late years, early sowing for maize has become more frequent in Romanian farms and choosing the right hybrid has great importance. One of the main objectives is choosing the hybrid with seeds that produces strong plants after sowing, in wet and cooler soil conditions. Ten maize genotypes were tested regarding seed germination using four methods: standard germination test at 25 degrees C, cold test, Pioneer stress test and accelerating aging test. The results highlighted one genotype with great performance in all four tests. Eight genotypes had good overall results and only one of them recorded low values.

**Key words:** maize, genotype testing, seed germination

Maize is one of the most cultivated species around the world, due to its high yield capacity but also due to its various uses in animal husbandry, industry and human consumption.

The increased yields of grains or green mass, together with a great diversity of its valorization possibilities, through various processing methods, have determined that this crop is among the most important components of modern intensive agriculture and implicitly, of the programs of economic and social development.

Selecting the best hybrid is, probably, the most important management decision to take by farmers. Choosing the right hybrid and the correct density bring 30% of the final yield, so great attention must be paid to these two elements.

In 2021, in Romania, maize was sown on 2493000 ha, with total seed production of 14445000 tones (www.insse.ro).

Maize is sown in early spring, when soil temperatures can be sometimes low, and so the seeds imbibe, but do not germinate and are

attacked by soil fungus. Therefore, it is necessary to evaluate the hybrids that a farmer intends to sow, in order to obtain high yields that are not affected by early sowing in wet and cold soil in spring (Woltz J.M. and TeKrony, D.M, 2001; Lovato *et al*, 2005, Matthews S. and Khajeh Hosseini M.K, 2006).

In order to determine the seed quality, germination tests are carried out, in controlled conditions of substrate and temperature, in which the optimum temperature is the one in which highest germination percentage is obtained within the shortest period of time (Lopes J.C. *et al*, 2005).

The aim of the research was to evaluate the germination of maize seeds under four tests taken into study: standard germination test at 25 degrees C, cold test, Pioneer stress test and accelerating aging test.

### MATERIAL AND METHOD

The research was carried out in 2021 at the Research Institute for Agriculture and Environment, belonging to Iasi University of Life Sciences.

<sup>1</sup> Iasi University of Life Sciences, Romania

<sup>2</sup> Romanian Association of Corn Producers, Bucharest, Romania

The maize seeds were provided by the Romanian Association of Maize Producers, and they belonged to 10 different hybrids, coded from 1 to 10.

**Standard Germination Test (SGT).** For this test, 50 seeds, in 4 replications, were sown in boxes containing vermiculite (*figure 1*). The boxes were kept in the Fitotron® Growth chambers - Weiss Technik at a temperature of 25 °C for 7 days. The vermiculite was kept with proper moisture, using bi-distilled water. The viable sprouted seedlings were counted in the 8<sup>th</sup> day.



Figure 1 **Standard Germination Test**

**Cold Test (CT%).** The Cold Test (CT%) was performed to determine the behavior of the seeds in suboptimal conditions (high humidity/low temperatures), similar to field conditions after sowing. It shows seed vigor. Low vigor seeds will have poor germination and slow growth in response to induced stress. For this, 50 seeds, were sown in 4 replications, in boxes containing vermiculite. The boxes were kept in the Fitotron® Growth chambers - Weiss Technik at a temperature of 10 °C for 7 day. The substrate was kept with proper moisture (75%), using bi-distilled water. In the 8<sup>th</sup> day, temperature was increased to 25 °C for 5 days, with a lighting regime of 12 hours light / 12 hours darkness and air humidity of 50%. The evaluation was carried out after 5 days (*figure 2*).



Figure 2 **Cold Test**

**Pioneer Stress Test (PST).** For this test, 50 seeds, in 4 replications were placed between paper towels and moistened double-distilled water for 3 days at 4 °C, this way being simulated the conditions with humidity and low temperatures in spring. Three days later, the seeds were sown in polypropylene boxes with vermiculite substrate, watered daily with demineralized water and kept at 25 °C in the climatic chambers for 6 days.

the light regime was 12 hours of light and 12 hours of darkness, and the air humidity was 50%. After this period, an evaluation was made, quantifying the normally developed plants (*figure 3*).

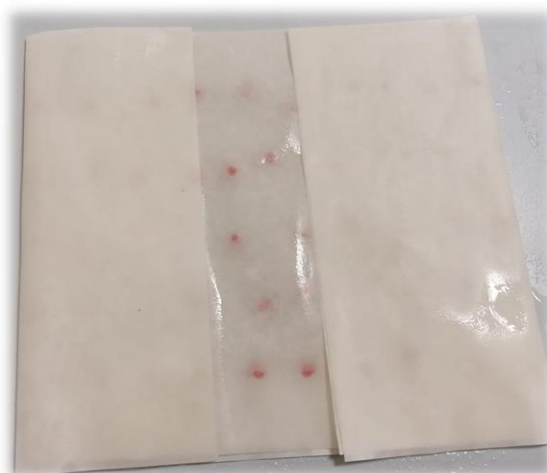


Figure 3 **Pioneer Stress Test (PST)**

**Accelerated Aging Test (AAT).** The test consists of moistening the seed with an amount of water above the normal limit and keeping it at a high temperature of 45°C and a relative humidity of around 100%, for a short period of time (72 hours). The seeds are then placed in optimal germination conditions. High vigor genotypes will withstand these extreme stress conditions and deteriorate at a slower rate than low vigor genotypes. Fifty seeds in 4 replications were placed in a perforated polypropylene jar, which allows the seeds to be in contact with the atmosphere saturated in water vapor. In turn, this jar was inserted into one with a capacity of 300 ml, filled with approx. 100 ml of distilled water and featuring a cap that allows for a tight squeeze (*figure 4*). The jars were placed in a forced convection oven and maintained for 72 hours at 45 °C, and after that, the seeds were sown in polypropylene boxes, in vermiculite and watered with the same amount of distilled water. The boxes were then placed in the climatic chambers, at a constant temperature of 25 °C, relative humidity of 50% and a photoperiod of 12 hours, for the germination test.



Figure 4 Accelerated Aging Test

## RESULTS AND DISCUSSIONS

The results for the Standard Germination Test are presented in *table 1*.

Table 1

| GERMINATION AT 25 °C, MAIZE, 2021   |                 |                       |                                 |               |
|---|-----------------|-----------------------|---------------------------------|---------------|
| Hybrid  | Germination (%) | % compared to witness | Differences compared to average | Signification |
| 4   | 99.0            | 101.96                | 1.9                             |               |
| 6   | 99.0            | 101.96                | 1.9                             |               |
| 8   | 99.0            | 101.96                | 1.9                             |               |
| 10  | 99.0            | 101.96                | 1.9                             |               |
| 2   | 98.5            | 101.44                | 1.4                             |               |
| 3   | 98.5            | 101.44                | 1.4                             |               |
| 1   | 98.0            | 100.93                | 0.9                             |               |
| average   | 97.1            | 100.00                | 0.0                             | control       |
| 5   | 94.5            | 97.32                 | -2.6                            |               |
| 9   | 93.0            | 95.78                 | -4.1                            | o             |
| 7   | 92.5            | 95.26                 | -4.6                            | o             |
| DL5%=4.1, DL1%=5.5, DL0.1%=7.3<br>(average = control, is the average of the experiment) |                 |                       |                                 |               |

The statistical analysis showed that only two of the 10 hybrids taken into study had significant negative differences compared to the average of the experience. The hybrid no. 9 had a difference of -4.1% compared to the control, and hybrid no. 7 had -4.1% compared to the control.

Regarding the results obtained for the Cold Test, they are presented in *table 2*.

Table 2

| COLD TEST, MAIZE, 2021  |                 |                       |                                 |               |
|---|-----------------|-----------------------|---------------------------------|---------------|
| Hybrid  | Germination (%) | % compared to witness | Differences compared to average | Signification |
| 6   | 97.0            | 115.61                | 13.1                            | xx            |
| 8   | 95.5            | 113.83                | 11.6                            | x             |
| 10  | 94.0            | 112.04                | 10.1                            | x             |
| 3   | 93.0            | 110.85                | 9.1                             | x             |
| 1   | 91.0            | 108.46                | 7.1                             |               |
| 2   | 87.5            | 104.29                | 3.6                             |               |
| average   | 83.9            | 100.00                | 0.0                             | control       |
| 9   | 81.5            | 97.14                 | -2.4                            |               |
| 5   | 80.0            | 95.35                 | -3.9                            |               |
| 4   | 78.5            | 93.56                 | -5.4                            |               |
| 7   | 41.0            | 48.87                 | -42.9                           | ooo           |
| DL5%=8.0, DL1%=10.9, DL0.1%=14.6<br>(average = control, is the average of the experiment) |                 |                       |                                 |               |

The germination analysis throughout the cold test at 10°C shows a greater variation of the results, the values ranging between 41 and 97%.

The results are of course in concordance with the results of the previous test, hybrids no. 9, 5 and 7 having values below the control.

The Pioneer Stress Test (PST) results are presented in *table 3*.

Table 3

| PST, MAIZE, 2021  |                 |                       |                                 |               |
|---|-----------------|-----------------------|---------------------------------|---------------|
| Hybrid  | Germination (%) | % compared to witness | Differences compared to average | Signification |
| 8   | 98.0            | 113.03                | 11.3                            | xxx           |
| 1   | 97.5            | 112.46                | 10.8                            | xxx           |
| 3   | 97.0            | 111.88                | 10.3                            | xxx           |
| 2   | 95.5            | 110.15                | 8.8                             | xxx           |
| 10  | 94.0            | 108.42                | 7.3                             | xx            |
| 4   | 91.5            | 105.54                | 4.8                             | x             |
| 5   | 91.5            | 105.54                | 4.8                             | x             |
| average   | 86.7            | 100.00                | 0.0                             | control       |
| 6   | 84.5            | 97.46                 | -2.2                            |               |
| 9   | 72.0            | 83.04                 | -14.7                           | ooo           |
| 7   | 45.5            | 52.48                 | -41.2                           | ooo           |
| DL5%=4.6, DL1%=6.2, DL0.1%=8.3<br>(average = control, is the average of the experiment) |                 |                       |                                 |               |

Is considered that a hybrid has excellent traits if the percentage for normal plants after the PST is above 75%. From the data obtained, we notice that 8 of the 10 hybrids taken into study had values that exceeded 75%, from which the hybrids no. 9, 1 and 3 with a germination percentage between 97 and 98%, being above the control with at least 10.3%. On the other hand, hybrid no. 7 had only 45.5% of normal seedlings, indicating that it has issues related with the thermic stress during the spring.

Seven genotypes had higher values compared to the control, with positive significant, distinct significant and very significant differences compared to the control. Hybrids no. 9 and 7 had negative very significant differences compared to the average.

The results for the last test performed, the Accelerated Ageing Test are presented in *table 4*.

Table 4

| ACCELERATING AGEING TEST (25 °C), MAIZE, 2021   |                 |                       |                                 |               |
|---|-----------------|-----------------------|---------------------------------|---------------|
| Hybrid  | Germination (%) | % compared to witness | Differences compared to average | Signification |
| 8   | 96.5            | 120.63                | 16.5                            | xx            |
| 10  | 96.0            | 120.00                | 16.0                            | xx            |
| 6   | 95.0            | 118.75                | 15.0                            | xx            |
| 5   | 90.0            | 112.50                | 10.0                            | x             |
| 3   | 87.5            | 109.38                | 7.5                             |               |
| 4   | 82.0            | 102.50                | 2.0                             |               |
| 2   | 81.0            | 101.25                | 1.0                             |               |
| average   | 80.5            | 100.00                | 0.0                             | control       |
| 9   | 76.0            | 95.00                 | -4.0                            |               |
| 1   | 69.5            | 86.88                 | -10.5                           | o             |
| 7   | 31.0            | 38.75                 | -49.0                           | ooo           |
| DL5%=9.3, DL1%=12.5, DL0.1%=16.7<br>(average = control, is the average of the experiment) |                 |                       |                                 |               |

For this test also, hybrids no. 9 and 7 had values below the control.

## CONCLUSIONS

Choosing the right maize hybrid, it's the most important decision a farmer has to take, in order to have high yield even for an early sowing.

The Standard Germination Test, The Cold Test, The Pioneer Stress Test and the Accelerated Ageing Test were developed to simulate adverse field conditions and measure the ability of seeds to emerge. They are the most widely used vigor tests for maize.

From all 10 hybrids that were tested, one had very good results for all tests, 8 had good results, depending on the test, and one had lower values in all situations.

## ACKNOWLEDGMENTS

This research is co-financed by the European Regional Development Fund through the Competitiveness Operational Program 2014 – 2020, project "Establishment and implementation of partnerships for the transfer of knowledge between the Iasi Research Institute for Agriculture and Environment and the agricultural business environment", acronym "AGRIECOTEC", SMIS code 119611.

## REFERENCES

- Lal, Mohan & Singh, Sunil & Correspondence, Mohan & Lal, & Yadav, Rajender & Jat, H.s. 2017- Maize seed vigour** - Mohan Lal -- RK Yadav. 1712-1715.
- Lopes J.C., Pereira M.D., 2005** - *Germination of seeds on different substrates and temperatures*. Revista Brasileira de Sementes, v.27, n.2, p.146-150.
- Lovato, A., Noli, E. and Lovato, A.F.S., 2005** - *The relationship between three cold temperatures, accelerated ageing test and field emergence of maize seed*. Seed Science and Technology, 33, 249-253.
- Matthews, S. and Khajeh Hosseini, M.K., 2006** - *Mean germination time as an indicator of emergence performance in soil of seed lots of maize (Zea mays)*. Seed Science and Technology, 34, 339-347.
- Woltz, J.M. and TeKrony, D.M., 2001** - *Accelerated aging test for corn seed*. Seed Technology, 23, 21-34.
- www.insse.ro**