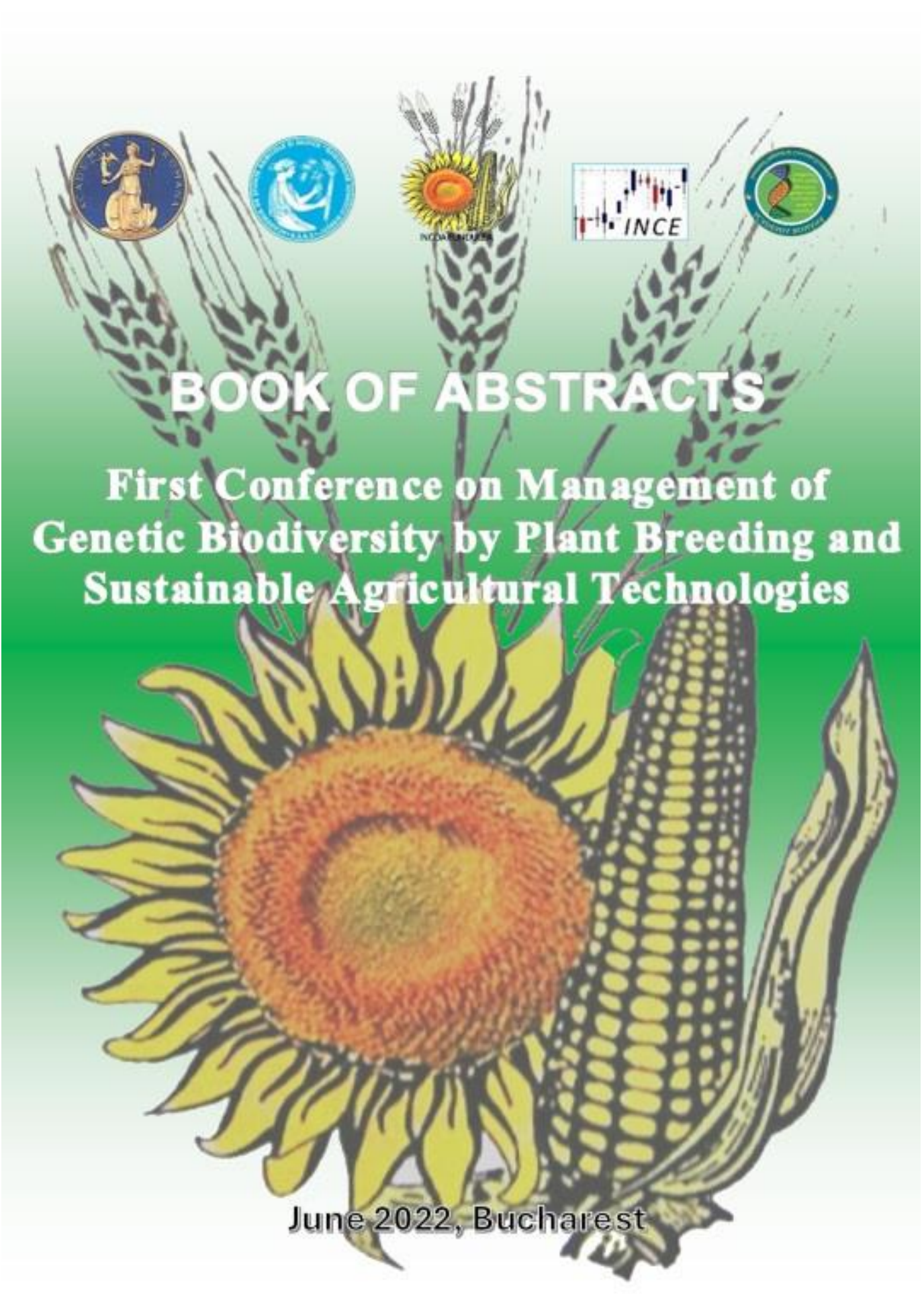

# BOOK OF ABSTRACTS

## First Conference on Management of Genetic Biodiversity by Plant Breeding and Sustainable Agricultural Technologies

June 2022, Bucharest

**National Agricultural Research and Development Institute Fundulea**

# First Conference on Management of Genetic Biodiversity by Plant Breeding and Sustainable Agricultural Technologies

# BOOK OF ABSTRACTS

**10 June 2022,**
**Bucharest**

# First Conference on Management of Genetic Biodiversity by Plant Breeding and Sustainable Agricultural Technologies

Organized by:
National Agricultural Research and Development Institute Fundulea
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# NARDI Fundulea's Contribution to Increasing Genetic Diversity of Cereals Crops in Romania

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**Keywords:** genetic diversity, breeding, wheat, adaptability.

**Abstract:** Plant breeding can lead to the loss of genetic diversity (narrowing of the genetic base) for some traits regarding of adaptive potential, through the selection pressure exerted for productivity and quality, in particular. Diversification of the genetic basis of wheat has been a priority of the breeding team from Fundulea, since the beginning of the breeding program (over 60 years), introducing into the Romanian wheat germplasm various genes for resistance to biotic and abiotic factors. The wheat breeding team also made efforts to diversify the cereal crops, by creating varieties of triticale and durum wheat. The genealogy of the winter wheat varieties from Fundulea includes genitors from 4 continents (Europe, Asia, North America, South America).

In recent years, parents from Australia and Egypt have been used, introducing drought and heat resistance into Romanian germplasm. An intense concern for disease resistance has been at the beginning of the wheat breeding program; thus, the most important resistance genes were transferred, effective in the conditions of Romania, for diseases, such as: brown rust, black rust, yellow rust, septoria, powdery mildew.

The latest wheat varieties of the institute represent a new stage that brings significant progress for yield capacity and disease resistance, achieved by combining adapted germplasm, obtained by recombination and long selection, in Romania, or with the use of rye translocation 1A-1R (varieties *Ursita* - 2021 and *FDL Abund* - 2022) - an approach that has proved useful for genetic progress and biodiversity through the triticale species as a bridge, or by recombining the best varieties previously created in Fundulea (varieties *Pitar* - 2015 and *Voinic* - 2020).

Over more than 60 years of activity, the wheat breeding team from Fundulea has accumulated a large number of genes important for adaptation to environmental conditions in Romania, often more hostile than those found in other breeding centers in Europe.

# Leaf Epicuticular Wax as a Goal if the Wheat Breeding to Improve Resistance to Biotic and Abiotic Stress

Matilda Ciucă[1], Daniel Cristina[1], Alina-Gabriela Turcu[1], Elena-Laura Conțescu[1], Alexandru-Leonard Dumitru[1], Cristina-Mihaela Marinciu[1], Gabriela Șerban[1], Vasile Mandea[1], Elena-Florența Helepciuc[2], Elena Monica Mitoi[2], Ana-Maria Moroșanu[2], Anca Manole[2], Alexandru Brânzan[2], Gabriel Maria[2]
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**Keywords:** epicuticular wax, wheat, *Iw2* locus, electron microscopy, molecular markers.

**Abstract:** Epicuticular wax on the aerial surface of wheat (leaves, stems, sometimes even spike) has the function of protection against many environmental stresses and thus, resulting higher yields under stress.

In this study, analyses regarding the amount of wax and the type of wax crystals (performed using electron microscopy) on a set of wheat varieties, breeding and pre-breeding lines, showed a great variability of the amount of wax and scanning electron microscopy (SEM) showed a greater variation of the type of wax crystals on the leaf abaxial side between the glaucous/nonglaucous genotypes. Therewith, in 2021 field, the yield differences between two wheat lines (glaucous and non-glaucous) cultivated in ten locations in Romania (Brașov, Caracal, Secuieni, Albota, Telorman, Fundulea, Turda, Oradea, Lovrin and Dobrogea) have highlighted the role of the wax layer in certain environmental conditions, the wax (glaucous) line obtaining higher yield at seven locations, with the highest difference (wax line – non wax line yield) of 1414 kg in Brașov. Nevertheless, in three locations the non-wax (non-glaucous) line had higher yield than the wax line, in Dobrogea the yield difference reached 599 kg.

Molecular analyzes performed at the level of three loci involved in the synthesis of the epicuticular wax or in the wax inhibition showed the significant role of the *Iw2* locus, clearly separating the wax and non-wax genotypes from the winter wheat (*Triticum aestivum* L.) except pre-breeding lines obtained by crossing with wild species related to wheat, such as *Aegilops ventricosa* and *Agropyron junceum*. These results lead to the start of studies regarding the composition of the epicuticular wax layer in the adaptation of wheat to unfavorable conditions.

# Evaluation of Productive and Qualitative Performances of New Spring Wheat Genotypes in Different Pedoclimatic Conditions

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**Keywords:** grain yield, grain quality, climate and pedoclimatic conditions, spring wheat.

**Abstract:** Cause to the climatic changes and its negative influence on the main field crops, Agricultural Research and Development Station Turda resumed spring wheat breading program as a response/alternative to the limitations of climate and various agro-phytotechnical factors. In the spring of 2020 were established three experimental crops in the five partner research centers aimed to test the yield capacity and quality performances of 53 spring wheat genotypes in different soil and climatic conditions. Regarding the yield capacity of the new spring wheat genotypes, these have registered yields between 2297 kg $ha^{-1}$ at perspective line T. 3957-19 in specific condition from ARDS Livada, to 6444 kg $ha^{-1}$ at the perspective line T. 4065-19 from ARDS Turda conditions. In the second experimental year (2021) a comparative trial was estabilish in each experimental field of partner research centers with 25 perspective lines of spring wheat, in three repetition. In climatic condition of second experimental year, the yields range between 3332 kg $ha^{-1}$ at T. 3946-19 genotype (at NIRDPSB Braşov), respectively, 7789 kg $ha^{-1}$ at T. 4073-19 (in specific condition of ARDS Livada). Regarding the main qualitative indicies - protein and wet gluten - T. 4071-19 and T. 4107-19 was highlighted with 15.1%, respectively, 15.0% protein content and 36.4%, respectively, 34.6% of wet gluten content. The experimental results highlighted the genetic progress for the newest spring wheat lines for grain, exceeding by over 33% the old spring wheat variety Pădureni, and by over 17% the Triso variety, suggesting that spring wheat may contribute to the increase in national wheat production by expanding this crop in the Central and Northern part of the country.

# New Sunflower Hybrids, Having Good Yield Performances and High Quality, in Order To Be Competitive in the Seed Market, Created at NARDI Fundulea

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**Keywords:** biodiversity, sunflower, hybrids, good yield, high quality.

**Abstract:** Crops biodiversity it means variety and variability of cultivated plants, including other organisms involved in agricultural production. Genetic resources diversity of cultivated species has a great importance in growing biodiversity inside of one specie. By breeding for a cultivated specie it is improved genetic biodiversity. Climate changes have a negative impact on biodiversity - necessary to decrease the decline and build a healthy and sustainable food system.

On the list of the most important oil crops, over the world, sunflowers hold a high position at number four.

Improved genetic progress in sunflower is the production priority to enhance competitiveness with other crops and stability of yield and quality.

Numerous institutes and private companies developed intensive programs for developing sunflower commercial hybrids.

In the last few years, sunflower seed market segmentation has a great impact on breeding goals. This refers to the increase in demand for sunflower varieties with high oil yield, as well as the introduction of herbicide - tolerant hybrids.

At NARDI Fundulea there have been created in the last years, sunflower hybrids resistant/tolerant to herbicides (imazamox or tribenuron metil), well resistant to the main pathogens which attack this crop and resistant to the parasite broomrape *Orobanche cumana* (the new virulent races).

Taking into consideration the climate change, the new hybrids have a good resistance to drought, also to low temperatures in germination and emergence time. Ten hybrids having such characteristics are already registered in the official list of varieties (SIVTR). There are also, new hybrids in comparative trilas which have a very good oil quality, some of them having a high protein content.

# Identification of Valuable Germplasm Sources for the Creation of Soybean Varieties with High Yield Quality

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**Keywords:** soybean, variability, quality, germplasm, breeding.

**Abstract:** To improve the Romanian soybean genetics, continuous research is required in order to create varieties suitable for processing industry as raw material and also to meet the market demands.

This is the priority objective of the soybean breeding program at Research and Development Station for Agriculture Turda (ARDS Turda). The existence of a genetic variability in the germplasm, allows the continuation of genetic progress through classical breeding, using conventional hybridization and selection methods, along with chemical and biochemical analyzes. In order to improve the quality of soybeans, first step consist in the evaluation of the existing biological material. Thus, in the laboratory, in an experiment carried out over a period of three years, using near-infrared spectrophotometric analysis, a non-destructive control of seed quality was performed on 140 soybean genotypes. In the future, the aim is to create soybean varieties with a higher thousand kernel weight, light hilum and an improved chemical composition, especially by increasing the protein and oil content and also an improved profile of fatty acids.

Thus, in this experiment, protein content, fat content and four fatty acids (stearic, oleic, linoleic and linolenic) responsible for the quality and stability of the oil were determined. The studied biological material originated from different ten countries on two continents: Romania, Switzerland, Italy, Poland, France, Austria, Hungary, Serbia, Germany, China. The identification of positive correlations between the analyzed characters helps the selection within the breeding program, while the existence of negative correlations between the analyzed quality parameters makes it difficult to improve them simultaneously.

Based on the experimental results, from the score diagram and cluster analysis it is observed that the 140 genotypes were grouped in pairs and did not form clusters, indicating a high variability that allows the simultaneous or separate improvement of the analyzed quality indices. The analysis of the principal component was performed for all the characters studied, the obtained model explains 99% of the variance.

This model confirm the Person coefficients and expose close positive or negative links between the studied features. The cluster analysis indicates that the experimented biological material has high variability, allowing the successful improvement of the quality of soybeans by the correct choice of genitors.

# Utilization of CERES Maize (DSSAT) Model For Estimation of the Impact of Climate Changes on Corn Yield in South-Eastern Romania

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**Keywords:** corn, climate changes, DSSAT, CERES maize model, RCP 4.5, RCP 8.5.

**Abstract:** The importance of early shaping of an ideotype adapted to local climatic conditions in the coming decades under climate change is also evident in the very long time (about ten years) needed to cover the period between shaping new breeding objectives and approving new maize hybrids. The present paper presents preliminary tests using a deterministic modeling system implemented here by coupling the outputs of regional climate models (CORDEX/CMIP) with a dynamic model for simulating plant growth and development (CERES-DSSAT) with the aim to identify new corn ideotypes. The numerical simulations performed with this system used daily meteorological data for the Fundulea region and included: a set of DSSAT simulations with observed climatic for 1976-2005 (MARS-JRC Ispra), set that was used to calibrate and validate the system; then four sets of DSSAT simulations using modeled climate data, respectively: current climate data (HIST, 1976-2005) and simulated data for two radiative forcing scenarios (RCP 4.5 and RCP 8.5) and 2 time horizons (2021-2051 and 2071-2100). These last 4 sets of simulations were run using 3 climate models: CNRM-CERFACS-CNRM-CM5, ICHEC-EC-EARTH, MPI-M-MPI-ESM-LR (regionalized at 11 km with SMHI-RCA4 model). For the dynamic agro-meteorological simulations, the latest available open-source version of the CERES code was used. In each set of experiments the CERES model was run for each year for 12 agro-technical scenarios (4 sowing dates and 3 levels of fertilization).

Climate data analysis confirmed the general warming trend: in Romania with 1-1.5°C in winter and up to 2°C in summer in CMIP5 data, while the latest scenarios (CMIP6) amplify this signal even more (up to 2°C in winter and 3°C in summer), the southern region of the country having an even more significant growth. Regarding the precipitations, increases of the total seasonal quantities for winter and especially spring are projected, especially in the near decades 2021-2050 (on country average even by up to 8-10%, and in extremes exceeding the values currently registered) but at the same time with a decrease in the number of rainy days which indicates a higher frequency of days with extreme rainfall. Decreases in rainfall are projected in the summer, and more significantly in RCP 8.5.

The implemented system proved stability in operations and the simulated productions for the historical period presented inter-annual variations that are in accordance with the measured data for Călărași County. The signal of climate change was analyzed on 10 agronomic parameters simulated and compared in scenarios versus Hist for each model and for the model's ensemble.

The simulated date of flowering occurs earlier in both climatic scenarios, on the average of the ensemble models this being ahead by up to one week; the gap is

slightly larger for early sowing data. Also, the simulated maturity date is earlier (on ensemble average up to 10 days but the decrease is slightly smaller for early sowing dates).

The work was financed by UEFISCDI through the PrepClim project “System for the identification of corn ideotypes, optimal sowing data and nitrogen fertilization in the context of climate change” (PED 464/2020).

# Effect of the Conservative Agriculture System on Some Physical Properties of the Soil

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**Keywords:** conservative agriculture, no-till, distribution of soil aggregates, water stability of soil aggregates.

**Abstract:** Conservative agriculture provides by direct sowing and soil mulching an alternative to the conventional farming system in which intensive tillage can lead to soil deterioration in the face of climatic factors in the context of climate change. The presented results were obtained at NARDI Fundulea for autumn wheat and corn crops, during 2 years (2020-2021). The distribution of soil aggregates in dry sieving may indicate resistance to wind erosion of the soil. Water stability of soil aggregates in wet sieving has been proposed as a method of measuring the stability of soil aggregates against water erosion.

In both 2020 and 2021, in the case of autumn wheat cultivation, the tillage has significantly higher values of the average diameter of the soil aggregates at the dry sieving in the variant sown directly compared to that worked with the chisel, registering values by 22.7% and 11.1% higher. The influence of soil work on the distribution of soil aggregates in dry sieving in maize cultivation is significant for 2020 and 2021. The average diameter of soil aggregates in the experimental version with uncultivated soil is about 25.6% higher than chisel in 2020. Diameter of the average soil aggregates in dry sieving, the experimental variant with uncultivated soil is approximately 24.2% higher than in the soil worked with chisel in 2021. The influence of crop rotation, soil tillage and plant residue management on the water stability of aggregates in both crops studied recorded insignificant values in both years studied.

# Researches Concerning the Evolution of the Diamondback Moth (*Plutella xylostella*) in Autumn Oilseed Rape Crop, in South-East of Romania

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**Keywords:** colza, diamondback moth, seed treatment.

**Abstract:** This is the first paper from the Romanian literature that reveals a high diamondback moth larva (*Plutella xylostella*) attacked an oilseed rape crop in autumn in the southeast of this country. This study has monitored the invasion of the larva of this pest at an autumn oilseed rape, at NARDI Fundulea, between 2019 and 2021. At the same time, it has monitored the fly patterns of the adults of this specie with pheromone traps. Field observations have effectuated at untreated variant (control) and variant with seeds treated by new technology, with the active ingredient of new generation *cyantraniliprole* (625 g/l), belonging to the diamide class. In the autumn of 2019, the attack degree was 3.04% in the control variant, while in the variant with treated seeds, the attack degree was 2.72%. In the autumn of 2020, it registered the highest attack of the diamondback moth larva; at the control variant, the attack degree was 16.26%, while in the variant with treated seeds, the attack degree was 11.24%. In the year 2021, the diamondback moth larva was insignificant, at the control variant, the attack degree was 0.27%, while in the treated variant, and attack degree was 0.14%.

Concerning larva density from oilseed rape experience, in the autumn of the year 2019, on 20 November, at the control variant, it has registered 0.61 larva/plant, while at the variant with treated seeds, it has registered 0.53 larva/plant; in the autumn of the year 2020, on 11 November, at control variant, it has registered 1.81 larva/plant, and at treated seeds variant it has registered 1.64 larva/plant, while in the autumn of the year 2021, at the end of November and beginning of December, it has registered an insignificant level of the pest pressure, at both experimental variants, the density was bellow 0.10 larva/plant. The results of the fly pattern monitoring of the diamondback moth make evidence that in 2019 and 2020, it was three fly peeks, highest captures number registered in November (88.50 captures/trap on 20.11.2019, respectively, 104.00 captures/trap on 24.11.2020), while in 2021 it was two maximum fly peeks, highest captures number registered on 17 June (80.25 captures/trap). The new seeds treatment technology effectively protects the oilseed rape plants in the first vegetation stages against diamondback moth larva. Data obtained in this study effectuated it the southeast of Romania, suggesting that the diamondback moth becomes the primary pest of oilseed rape crop during autumn.

# Biodiversity in Organic Agriculture - the First Strategy of the European Green Deal

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**Keywords:** biodiversity, ecological agriculture, Green Deal strategy.

**Abstract:** Biodiversity, a term first used instead of the expression "biological diversity" at the National Forum of BioDiversity in Washington in 1986, is defined and understood as the variability of different life forms - plants, animals, microorganisms, genes, etc. and the interactions between them and their living environment *(Emilia Cristea, 2005)*. Biodiversity is also invaluable to present and future generations because biological resources are paramount to the economic and social development of humanity and, at the same time, it is a universal asset for reducing human pressure on species and ecosystems.

In organic farming, biodiversity is, along with the land, the most valuable factor of production and, at the same time, an essential technological element that deservedly it is imposed in the European Green Deal as the first strategy for designing the European Action Plan for the Ecological Agriculture Development. In this context, the Action Plan for the Development of Organic Agriculture in Romania must be based on Biodiversity and may contain 6 (six) actions: 8-10% of Romania's agricultural area in the ecological system; more (by 10-20%) operators in organic farming by accelerating conversion of agro-ecological living laboratories (ALLs) to organic farming; doubling incomes in organic farming; 20% of ecologically certified products in public canteens (school and social); use of organic seeds and planting materials on 90% of organically cultivated land, as well as organic breeding animals and more research in organic farming.

# DNA Markers Assisted Selection for Accumulation/Pyramiding of Disease Resistance Genes in Wheat Lines

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**Keywords:** rust, *Septoria tritici* blotch, molecular markers, KASP, wheat.

**Abstract:** Wheat yield is affected by a number of diseases whose impact and spread are directly affected by climate changes. Cereal rust caused by the *Puccinia triticina*, *Puccinia striiformis f. sp. tritici* and *Puccinia graminis f. sp. tritici*, as well as septoria tritici blotch (STB) caused by *Zymoseptoria tritici*/*Mycosphaerella graminicola* are the main diseases of wheat. Durable disease resistance of wheat is a significant component of food security and a major goal of breeders. The accumulation/pyramiding of disease resistance genes in new wheat varieties is the main strategy for improving of wheat disease resistance. In this study, 46 wheat lines (F5 and F6 generation) were analyzed using molecular markers (DNA) in order to select the wheat lines with two, three, four or five diseases resistance alleles: ***Lr34****/Yr18//Sr57/Pm38/Ltn1/Bdv1*, ***Lr37****/Yr17/Sr38*, ***Lr46****/Yr29//Sr58/Ltn2*, ***Lr68****/Ltn4* and ***Stb16q***.

The results, based on molecular markers assays, showed the accumulation/pyramiding of the homozygous resistance alleles in following combinations: *Lr34+Lr46* (one line), *Lr37+Lr46* (2 lines), *Lr46+Lr68* (2 lines).

Allelic combinations, with heterozygous/heterogeneous alleles (H), were also, highlighted: *Lr34(H)+Stb16q*; *Lr37+Lr46(H)*; *Lr34(H)+Lr37+Lr46*; *Lr37(H)+Lr46+Stb16q*; *Lr34(H)+Lr37+Lr68(H)*; *Lr34(H)+Lr37(H)+Lr46+Lr68(H)* and *Lr34+Lr37+Lr46+Lr68(H)+Stb16q*.

Markers assisted selection on each plant from the wheat line with the allelic combination *Lr34+Lr37+Lr46+Lr68(H)+Stb16q* allowed the selection of this homozygous combination. This study proves the value of the wheat breeding strategy, based on selection assisted by DNA markers, to accelerate the development of new wheat varieties resistant to rust and septoria tritici blotch.

# New Varieties of Alfalfa Created at NARDI Fundulea

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**Keywords:** alfalfa, synthetic cultivars, forage, seed, yield, fodder quality, adaptability.

**Abstract:** In alfalfa, the increase in production and quality leads to an increased amount of useful substances per unit area as well as an increase in the amount of residual nitrogen made available to the postmergent plant, between there is a very close positive correlation.

**Constantina** and **Nicoleta** varieties are the result of alfalfa breeding activity in order to create genotypes with improved quality, simultaneously with a high production capacity and good adaptability to biotic and abiotic environmental conditions, in the context of climate change.

Depending on the level of water supply and the year of cultivation, the two new varieties achieved yields between 5.0 and 18 t/ha dry matter at Fundulea and 5.8-32.0 t/ha in the SIVTR network, exceeding the controls, with production increases of up to 10%. The average increase was 6.0%, proving a very good water recovery capacity.

Constantina and Nicoleta varieties offer a very good quality fodder, they have a higher protein content than the control varieties by 0.6-0.7%, this being around 22% in sprouts compared to 21.2% for the control variety, Catinca.

The seed production capacity of Constantina and Nicoleta is higher with 3-7% than the control Catinca, which will allow their multiplication and rapid introduction into the culture.

This paper presents the results obtained in the project: **PN 19-25.02.01**, entitled ***„Increasing the degree of protein assurance by creating varieties of annual legumes (peas and soybeans) and perennial legumes (alfalfa) with performance, agronomic and quality competitive in the context of climate change”*** in the 19-25 Core Program, funded by the Ministry of Research, Innovation and Digitalization, in the period 2019-2022. The alfalfa breeding program conducted at the NARDI Fundulea aims to create varieties with high production capacity for fodder and seed, with quality, respectively, high nutritional value and with good adaptability to the conditions of biotic and abiotic environment.

# Creation of Maize Hybrids for Early Sowing, with Superior Adaptability to Adverse Climatic Conditions, with High Agronomic Performances

Horia Lucian Iordan[1], Daniela Horhocea[1], Teodor Martura[1], Ion Ciocăzanu[1], Caterina Băduț[1]
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**Keywords:** diverse genetic material, maize hybrids and inbred lines, adaptability to climatic conditions.

**Abstract:** Studies to date predict a global warming era caused by the blocking of solar energy by gases in the atmosphere: carbon dioxide, methane, nitrogen oxides and other gases that absorb reflected radiation from the earth's surface. If current trends continue, the concentration of $CO_2$ in the atmosphere will double in the next 50-80 years, leading to an increase in average temperature by 2.0-2.5°C.

Increasing the global average temperature by 2°C will lead to drastic decreases in plant yield. Over time, there will be a gradual increase in average air temperatures in all seasons but more pronounced in the summer and winter seasons. Climate change will lead to changes in the structure of field plants in terms of land cultivation practices, especially the earlier sowing of spring crops and the late sowing of autumn crops in order to avoid thermal and water stresses during vegetation period. Analysts of meteorological phenomena make more or less optimistic predictions about the potential of crops to provide food and conclude that only the success of agricultural research will be able to meet future challenges. Biological and agricultural research shows that there are many possibilities for improving the drought and heat tolerance of genetic material in the main field crops, including maize (*Zea mays* L.). The identification of maize genotypes with high adaptability to adverse climatic conditions is an important goal for plant breeding research. The objective of this experiment (2019-2021) is to analyze the evolution, adaptability, growth and stability of maize genotypes to temperature and humidity variations during critical periods of vegetation.

# The Corn Hybrids Amurg and Miraj, Released By the NARDI Fundulea

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**Keywords:** corn, new hybrids, semi-early, grain yield.

**Abstract:** This paper presents the genetic progress obtained at INCDA Fundulea by creating two maize hybrids, semiearly, Amurg and Miraj, to meet the requirements of farmers in the current climate change.

Amurg and Miraj, maize hybrids have been registered by the State Institute for Variety Testing and Registration in 2022. A new hybrids Amurg and Miraj are a corn single cross, released by the National Agriculture Research and Development Institute Fundulea, Romania. They are a semi-early hybrids, the FAO 360-390 group, convariety dentiformis. Amurg hybrid has a high grain yielding potential of 11.5-12.0 t/ha in non-irrigated conditions and 13.0-14.0 t/ha in irrigated conditions. The plant has an average of 295 cm height, with ear insertion at 120 cm. The ear has the average length of 21 cm, is conico-cylindrical with 16 rows of grains. The kernel is dent, yellow, with thousand kernels weight (TKW) of 300-310 g.

Miraj hybrid has a high grain yielding potential of 11.5-12.0 t/ha in non-irrigated conditions and 13.5-14.5 t/ha in irrigated conditions. The plant has an average of 270 cm height, with ear insertion at 100-115 cm. The ear has the average length of 20 cm, is conico-cylindrical with 16 rows of grains. The kernel is dent, yellow, with thousand kernels weight (TKW) of 300-320 g.

Amurg and Miraj hybrids, are tolerant to drought and heat, tolerant to fusarium ear rot (*Fusarium* spp.) and to *Ostrinia nubilalis* attack.

Amurg and Miraj hybrids have efficient seed production; they are recommended in all suitable zones for corn hybrids from Romania, under both irrigated and non-irrigated conditions.

Grain uses: human food and animal feeding.

# Creation of Productive Hybrids of Maize, Dry Tolerance, Heat Tolerance, Diseases and Pests in View of Reducing the Impact of Global Warming on Romania's Agroecosystems

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**Keywords:** maize hybrids, yield potential, yield stability, water loss rate.

**Abstract:** In this context where climate change poses a serious threat to the suitability of species and agricultural ecosystems essential for food production, the creation of high-productivity maize hybrids with tolerance to biotic and abiotic stress is an important goal. Increasing the stability as well as the level of performance of maize production, in the current unfavorable environmental conditions or with a high degree of variability, is only possible by creating genotypes that show tolerance or resistance to abiotic stress.

This paper presents the results obtained in ADER 113/24.09.2019 project, for the achievement of the general objectivet: the creation of productive maize hybrids, tolerant to drought and heat, to diseases and pests, with favorable agronomic properties.

Maize hybrids were experimented in field trials, in enviroments with different climatic conditions at NARDI Fundulea, ARDS Livada, ARDS Lovrin, ARDS Șimnic, ARDS Valu lui Traian and ARDS Brăila.

The following maize hybrids HSF3877-17, HSF1033-17, HSF4075-17, HSF7375-18, obtained by multiannual and multilocational testing and selection, have been shown to be hybrids with tolerance to drought and heat, disease and pest, with high yield potential production and stability and higher grain water loss rate.

These hybrids were selected to be tested in the State Institute for Variety Testing network for Registration.

The parental lines of these hybrids are valuable lines, tolerant of drought and heat, disease and pests, with high General Combining Ability. The improved germplasm obtained will be the initial material for breeding and it will be used for hybridization in order to obtain experimental hybrids but also in cross breeding for recycling inbred lines.

# New Results in Improving Resistance to Fusarium Head Blight

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**Keywords:** wheat, scab, disease, *Fusarium* head blight, resistance.

**Abstract:** *Fusarium* head blight or scab, is a difficult disease to manage, as it can reduce wheat production by 30-70%. This is why progress in understanding the pathogen for improving resistance to prevent this disease is very important.

This work presents results of a study using artificial inoculations performed at NARDI Fundulea, on 13 genotypes, created by the wheat breeding team of the Fundulea Institute. The study involved injecting separately with the inoculum of *Fusarium graminearum* and *Fusarium culmorum*. The inoculum was grown on Czapek Dox culture medium kept for 7 days under black ultra violet lamps (Philips HPL-N 400 W E40) at room temperature, approximately 23°C. The artificial infection took place in the years 2020 and 2021, in the experimental field from Fundulea Institute by inserting 10 µl of inoculum into the central spikelets of 5 ears randomly selected, during flowering. Resistance assessment was done by counting the diseased spikelets after 10 and 20 frone infection. The parameters calculated to characterize this type of resistance were the severity of the disease, expressed as a percentage of Fusarium infected spikelets, and the area under the disease progression curve, the synthetic AUDPC index, for each genotype. The results were analyzed statistically by analysis of variance (ANOVA).

Results showed a statistically significant difference between the varieties and a very significant difference between the years studied. The cultivar FDL Consecvent was significantly superior to the average of all cultivars. The FDL Consecvent cultivar is being officially tested at SIVTR. This is the first time when superiority for scab resistance has been associated with productivity. This opens new prospects in creating high-yielding cultivars that are genetically protected against *Fusarium* head blight.

# Diversification of Flax Germoplasm by Obtaining Productive Varieties with Yellow Seed

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**Keywords:** flax oil, variety, production potential, oil content.

**Abstract:** The new Coral F flax oil variety resulted from hybridization and repeated individual selection from the hybrid combination Olin / 2 / Mecorette / Nored / 3 / Verne / 4 / Midin RFO, hence the genotype L 9305-15.

The new line was verified in comparative orientation and competition crops for agronomic characteristics, production potential and oil content in the period 2018-2021 in the experimental field of improvement in from NARDI Fundulea.

In the period 2019-2021, the L9305-15 line was tested at SIVTR Bucharest and was registered with the Coral F variety name in 2022.

The Coral F variety is a semi-late variety with a vegetation period of 105-109 days. The plants of the Coral F variety are presented in a chain with a vigorous appearance and a shade of light green leaves. The mature variety has uniform, medium-sized plants, with a height between 62 and 66 cm. The leaves are light green and lanceolate in shape. The inflorescence is erect, with a length between 18-20 cm. The flower is medium in size, with blue petals and anthers. The style (at the base) and the stem filaments (at the top) are white. The capsules are medium-sized, indehiscent, spherical, slightly elongated, with hairs on the false partition walls of the capsule. The medium-sized seed has a yellow color with a normal luster and a mass of one thousand seeds ranging from 6.8 to 8.7 g. The oil content of the Coral F variety varied between 44.7 and 46.9%. It has a higher production potential than the control Lirina in most of the environmental conditions in which it was tested, with an increase of 9.68%.

# Research on the Grape Ripening Process in the Odobești Vineyard Area

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**Keywords:** acidity, climate, percentage difference, ripening process, sugars.

**Abstract:** Grape ripening is a very complex biochemical process on which the quality of the must and the wine depends, its evolution being differentiated according to the variety and the climatic conditions.

The current global and zonal climate changes are also directly influencing the development of physiological and biochemical processes during grape ripening. This study presents the analysis of the process of growing and ripening grapes at four varieties of vines for white wines, created at SCDVV Odobești (Șarba, Băbească gri, Miorița and Vrancea) in the period 2020-2021. The dynamic evolution of the three parameters that define the process of grape ripening (average mass of 100 berries, sugar content and total acidity), from harvesting to grape harvest, indicates the highest percentage increase compared to the initial average mass of 100 grains at the variety Băbească gri (152.0%), and the smallest for the Șarba variety (117.1%). The highest percentage difference compared to the initial sugar content was also recorded at the variety Băbească gri (232.5%) and the lowest in the Vrancea variety (167.1%.) The largest percentage difference compared to the initial acidity was recorded at the Miorița variety, whose final acidity reaches 37.7% of the initial acidity, and the lowest decrease in acidity is registered by the Vrancea variety (48.3% of the initial acidity). During the study period, the average duration of the grape ripening process was shorter (38.3 days), compared to the multiannual average (42.5 days), with small differences between varieties, which confirms the influence of actual climate change in Odobești viticultural area.

# Diversification of Sunflower Germoplasm by Using Interspecific Hybridization with Wild Species of the Genus *Heliantus*

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**Keywords:** sunflower, wild species, interspecific hybridization, sunflower downy mildew, broomrape.

**Abstract:** One of the factors limiting sunflower production is the pathogen *Plasmopara halstedii*, which produces sunflower downy mildew, as well as the parasitic weed broomrape *Orobanche cumana* Wallr. It is necessary to identify/create sources of resistance to the disease and the parasite broomrape, made by interspecific hybrids with species of the genus *Helianthus*, which is a valuable source of resistance genes. The wild sunflower species resistant to the population of the *Orobanche cumana* parasite from Brăila in 2021, were *Helianthus debilis* (A4De), *Helianthus petiolaris* (A5Pe, A6Pe, A7Pe, A8Pe) and *Helianthus praecox* (A9Pr, A10P) with 0 broomrape/5 sunflower plants, and the most infested were *Helianthus annuus* (ANN 0340) with 90 broomrape/3 sunfloweer plants and *Helianthus nuttallii* (NUT-1514-Pl468795) with 22 broomrape/5 sunflower plants. The attack degree of infestation with population of *Orobanche cumana* parasite from Brăila in 2021, was between 5%, at descendant of 0305C x *Helianthus mollis* (P9Mo), in the F5 selection generation, and 53% at descendant derived from the interspecific hybrid 1010B x *Helianthus debilis* (A2De), in the F5 selection generation. The attack degree of infection with the pathogen *Plasmopara halstedii*, in Fundulea, in 2021, was between 0% at descendants in the F4 selection generation, derived from the interspecific hybrids Arg/84-19669 x *Helianthus praecox* (A10Pr), NS-H-24 x *Helianthus debilis* (A3De) and 80% at descendant in the F4 selection generation, derived from the interspecific hybrid Tex.23-602 x *Helianthus neglectus* (A1Ne). The perennial wild specie *Helianthus mollis* (P9Mo), contains genes of resistance/tolerance to race G+, of the parasite *Orobanche cumana* Wallr, and the annual wild species *Helianthus praecox* (A10Pr) and *Helianthus debilis* (A3De), contain resistant/tolerant genes at races 304, 314, 710 and 714 of the pathogen *Plasmopara halstedii*.

# Increase Productivity, by the Creation of Biodiversity, on Agricultural Crops, Corn and Sunflower

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**Keywords:** maize, sunflower, genetic diversity, yields.

**Abstract:** In agricultural production is used a variety of field crops, composed of species, varieties, hybrids, which represent cultivated plants, which differ from each other, through the biological cycle, the requirements of vegetation factors, their morphoanatomy, production destination. The biodiversity of agricultural plants is vital for mankind, being the only safe source of food. Therefore, the conservation and protection of cultivated species, useful to humans, as well as their varieties is one of the pillars of sustainable development of agriculture and determines the health of the population. The biological components of a technology are represented by species, varieties, hybrids, which underlie biodiversity in number and economic importance.

Maize is one of the most valuable cultivated plants in the world and in Romania, being used in human nutrition, animal husbandry and industry. As a result, complex programs for the improvement of maize, in order to obtain commercial, high-performance hybrids that meet the requirements of the market, are being carried out in the world. Such a program also exists at the NARDI Fundulea. Within the breedings programs, important genetic advances have been obtained, regarding productivity, different agronomic and physiological properties, but also the adaptation to the conditions of abiotic and biotic stress.

By creating a diversified initial material, using valuable germplasm, valuable inbred lines with superior properties were obtained, making it possible to obtain new, high-performance hybrids and possessors of the property of rapid loss of water from grains, reaching maturity, at a humidity close to 14%.

At sunflower, a plant of oil culture, very important in Romania, valuable genotypes have been created, with properties that ensure the achievement of very good productions, a high oil content in seeds. The creation of new sunflower genotypes is done taking into account the requirements of the seed market, in the case of this crop plant, there are currently 24 market segments, due to the many changes that occur, taking into account the resistance to certain pathogens/parasites, resistance to a certain type of herbicide, a certain quality of the oil.

Thus, in recent years a series of new hybrids have been created, almost all with herbicide resistance, which allows the realization of very good seed production.

In the present study, we aimed to highlight the importance of creating genetic diversity, hybrids with new features, which would allow overcoming the economic/financiar performance of previously made hybrids.

# Genetic Progress in Winter Barley for Yield and Adaptability to Unfavorable Environmental Conditions

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**Keywords:** winter barley, yield, stability, TKW, protein content, density.

**Abstract:** In the context of climate changes, increasingly unfavorable to the winter barley growing in southern and southeastern Romania, due to the rainfall quantities decreasing in the critical winter barley stages development, obtaining valuable varieties with high yield potential and seeds quality is the most important goal in the process of breeding. Created by the pedigree method, the Iulian winter barley variety, released in 2021, has been tested in different areas of winter barley growing, with different pedo-climatic characteristics in Romania.

In the period 2017-2020, under a classic technology was tested and the winter barley variety Iulian achieved an average yield of 5882 kg/ha in the SIVTR testing network with an increase in yield of 8.8% compared to the check variety Dana and in the research and development stations network (2014-2020), it achieved an average yield of 7081 kg/ha (7% more than the check variety Dana).

For a wide characterization, it was tested at two different densities, namely: a low density, 350 b.g/$m^2$, and a classic density of 500 b.g/$m^2$ at NARDI Fundulea (4 years in southeastern Romania) being analyzed for both yield potential and quality indices (TKW, protein and starch content).

In the four years of experimentation, the Iulian winter barley variety recorded an average production of 6782 kg/ha cultivated at a classical density, and at a low density, it recorded a yield of 7416 kg/ha (a difference of 634 kg/ha).

In terms of grain quality, it registered high values for both the one thousand kernel weight (51.5 g) and the starch content (61.79%). The protein content was lower at low density, which can make the yield of the Iulian variety a very good quality raw material in the malt and beer processing industry, where the protein content requested standard is between 9.5-11.5% (Romanian Brewers Association).

# Variation of Some Winter Barley Quality Indices under Induced Drought

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**Keywords:** winter barley, quality indices, drought, desiccation.

**Abstract:** Within a set of 15 winter six and two rows barley genotypes (varieties and advanced lines), the variation of some quality parameters was caused by the use of a desiccant called potassium iodide (KI-0.4%), which led to the characterization of the grain quality indices, namely the one thousand kernel weight (TKW), protein and starch content. These induced drought conditions have provided results regarding their drought tolerance and the possibility of growing certain genotypes under restrictive water conditions that can register both high yield and appropriate grain quality parameters. The performed analysis of the results revealed significant differences between genotypes, in terms of the influence of treatment applied and also the interaction between genotype and treatment.

In the case of the one thousand kernel weight, the winter six rows barley varieties Lucian, Ametist, and Simbol were noticed, as well as the varieties with two rows Artemis and Gabriela.

Under the same testing conditions, the protein content and the starch content were not influenced by the genotype x treatment interaction and did not decrease below 9.5% and 60%, respectively (standards required by the malt and beer industry).

Results were obtained regarding the identification of valuable genetic resources for the translocation of assimilates in water limiting conditions for use as parents in the breeding program but also the characterization of varieties with reference to the high stability of grain weight and quality indices. These genotypes have a high content of carbohydrates in the stem and leave at the beginning of the grain-filling period but also a high rate of translocation to the grains.

# Impact of Abiotic Factors on the Developmental Stages of Maize Crop

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**Keywords:** climatic conditions, corn, crop development.

**Abstract:** Climate change has become the biggest global challenge, being a real danger to agricultural crops and an inevitable threat to food security. The regional climatic conditions of an area are a key function in the stability over time of crops. In the period 2012-2021, the water reserve in the soil determined for maize cultivation was above the limit of the minimum ceiling (1734.8 $m^3$/ha) in the spring months, but fell below this limit in the months when water consumption for maize it is the highest, but without reaching the wilting index (1202.8 $m^3$/ha). The duration of sunlight, during the vegetation period of maize, decreased significantly from 1655.5 hours (2012) to values between 1174.6 and 1296.7 hours, with a significant decrease in this parameter. In the last three years (2019-2021) it was observed that the temperatures in May were lower than the multiannual average of this month, with a negative impact on the optimal emergence and development of plants in the early stages of vegetation. During the studied period all the analyzed parameters (temperature, precipitation, water supply in the soil, duration of sunshine) deviated from the multiannual average, with negative variations compared to the characteristics of the corn crop. Climatic conditions, especially during the growing season, have a significant influence on the production of a crop, especially when the interaction of several parameters is manifested.

Therefore, the main purpose of this study was the identification of the main climatic parameters that may be involved in the development of the crop, their influence on the stages of development and the stability of production.

# Using Molecular Markers to Determine the Genetic Diversity of Wild Sunflower Species

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**Keywords:** sunflower, wild species, diversity, ISSR markers.

**Abstract:** The sunflower (*Helianthus annuus* L.) is a part of the *Asteraceae* family, one of the most diverse and extensive family of flowering plants. The *Helianthus* genus consists in 51 species and 19 subspecies, from which 14 are annual species and 37 are perennial.

Given the high economic importance of sunflower crops, breeders are constantly concerned with identifying new sources to obtain lines/hybrids with improved agronomic traits. Due to the limited genetic basis of cultivated sunflower genotypes, wild sunflower species may represent new sources of genetic variability for the introgression of traits of interest such as: resistance to biotic, abiotic factors, high oil content etc.

One of the most utilized method in determining the degree of diversity within and between the sunflower populations is based on molecular marker use, respectively polymerase chain reaction (PCR) amplifications. They are several techniques like: RAPD (Randomly Amplified Polymorphic DNA), AFLP (Amplified Fragment Length Polymorphism) or SSR (Simple Sequence Repeats) but they can have significant limitations in their use. Instead, ISSR technique has the ability to overcome these limitations and can be used to detect the genetic variations in determining mutant varieties due to the high level of polymorphism provided by the ISSR markers.

The aim of this study was to analyze the genetic diversity of the genetic material obtained from cross between wild sunflower species *(Helianthus maximiliani*, *Helianthus argophyllus*, *Helianthus debilis* and *Helianthus neglectus*) and cultivated genotypes of *Helianthus anuus*.

Molecular analyzes performed with 19 ISSR markers revealed polymorphism for only ten markers, genetic variability at interspecific but also intraspecific level being noticed.

The results of this study may be useful in future breeding programs.

# The Stability of New Corn Hybrids Created at ARDS Turda, at the Stress of Different Sowing Densities

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**Keywords:** hybrid, density, yield, stability.

**Abstract:** The sowing density is the most dynamic technological factor and is established according to the duration of the vegetation period (FAO group), the architecture of the plant, the water reserve in the soil and implicitly the degree of supply of the soil with nutrients. Grain production correlates positively with the increase in sowing density up to certain limits and negatively with the individual production of each plant.

A number of seven hybrids created at ARDS Turda: Turda 248, Turda Star, Turda 332, Turda 344, Turda 335, Turda 380 and SUR 18/399, tested at four tenths of sowing: 60,000, 70,000, 80,000, and 90,000 plants/ha, in two experimental years, of which five hybrids registered between 2012 and 2022.

Analyzing the results of the seven hybrids studied, the highest yields were obtained for the following hybrids: Turda 248, Turda Star, Turda 332, Turda 344 and SUR 18/399 and were made both in interaction with the density of 60,000 plants/ ha and with a density of 70,000 plants/ ha, and for the hybrids Turda 380 and Turda 335 the highest productions were made at a density of 70,000 plants/ ha (12,036 kg/ha and 10,782 kg/ha).

Based on the data obtained in the two years of experimentation, the densities of 80,000 plants/ha and 90,000 plants/ha constituted a stress on the production of the seven hybrids in the environmental conditions from Turda.

The hybrid SUR 18/399, is the hybrid that has the highest stability in all four tenths of sowing, and Turda Star, Turda 344 and Turda 248 although they obtained average yields of the four tenths between 8,378-9,980 kg/ha, showing a specific stability of production under unfavorable conditions (high densities).

# Mid-Early New Generation Hybrid Turda 380 Adapted to Climate Change in the Center of the Country

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**Keywords:** yielding ability, maize, kernel quality.

**Abstract:** The activity of scientific research and in particular complex and intense activity to improve maize at the Agricultural Research and Development Station Turda led to achieving results in the creation of inbred lines of maize and hybrids with high genetic value.

Recently registered Turda 380 hybrid is distinguished by superiority in yielding ability, quality features and exploiting tehchnological factors. Turda 380 hybrid was tested at the State Institute for Variety Testing and Registration Bucharest, Romania (SIVTR), during 2019-2021 under normal conditions (no irrigation), at nine Variety Testing Centers (VTC). During the same three years (2019-2021) it was also tested at five different research stations. The maize hybrid Turda 380 was highlighted by an average yield of 10728 kg/ha, respectively, situating it self above Turda 332 and Turda 344, with a percentage of 5% and 7%, respectively. Maximum yields (over 10000 kg/ha) of 18759 kg/ha was recorded in 2019 at the Dej VTC, in 2019 at Rădăuți VTC (16607 kg/ha) and in 2020 at the Rădăuți VTC (16594 kg/ha).

Turda 380 is a mid-early hybrid (FAO 380), with dent a good kernel quality grain, especially protein (11.5%).

Turda 380 hybrid is are recommended to be cultivated in the Transylvanian Plain, the neighboring plateaus, the meadows of the rivers Mureș, Someș and Târnave, the center and northeast of Moldova, as well as the hilly regions to the West of the country.

# Exogenous Salicylic Acid Utilization as a Stress-Signal Compound and Its Impact on Germination and Morphogenetic Reaction of Cabbage Plants Cultivated "*In vitro*"

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**Keywords:** shoot, roots, regeneration, defence-related process, germination.

**Abstract:** Salycilic acid is a phenolic compound that can reduce the sensitivity of plants to biotic and abiotic stresses through the activation of stress-responsive gene expression. It enhance defence-related processes such as: rate of transpiration, stomatal movement, photosynthetic rate, polyphenol and chlorophyll content, cell wall thickness, simultaneously with the regulation of growth and development. It is well known that "*in vitro*" culture is one of the most effective experimental models in the investigation of various aspects related to the structure and functions of the plant cell and tissues. Despite the positive impact that this stress-signal molecule has on the antioxidant defence system, there are few studies on the establishment of the most effective concentration and its impact on the growth and development of cabbage plants cultivated "*in vitro*". Thus, in our experiment we assessed the impact of three different concentration of salycilic acid (1 mM/l, 0.5 mM/l and 0.1 mM/l) on seed germination indexes, shoot initiation and proliferation, root development as well as physiologic traits (phenolyc and chlorophyll content).

The results show that a concentration of 1 mM SA inhibited both seed germination and shoot development, which is probably related with supression of GA-mediated pathway. Instead, the addition of 0.1 mM SA stimulated shoot proliferation rate, shortened the time for shoot initiation and increased shoot and root elongation. The content in phenolyc and chlorophyll was higher in plants regenerated on this variant also, which indicates the beneficial effect of addition of 0.1 mM SA on defence related processes.

Our results provide the foundation of further studies related to the plant`s agronomic performances when cultivated in the field.

# Advances Achieved in Winter Peas (*Pisum Sativum* L.) Breeding at NARDI Fundulea

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**Keywords:** winter peas, varieties, yield, winter hardiness.

**Abstract:** Among the protein-producing crops, peas have the advantage of a shorter vegetation period and a less expensive technology, being at the same time an excellent precursor for autumn cereals. Despite all the progress made in creating more fall-resistant and more productive varieties, the expansion of the pea crop is hampered by large crop fluctuations (generated by the delay in sowing in certain years).

An already proven way to increase yields and reduce crop fluctuations can be to sow autumn peas. For this, at NARDI Fundulea started an extensive breeding program for obtaining pea genotypes that can be sown in autumn. The paper presented the news winter peas varieties (four) realised in the winter peas breeding program of the National Agricultural Research and Development Institute Fundulea. Ghittia F, Lavinia F, Andrada F and Olguța F are the most recent Romania winter peas varieties (*Pisum sativum* L.), those was selected by the pedigree method from the parental lines beeing of spring Romanian and foreign winter peas varieties. By creating the new winter pea varieties we have tried to combine the high TGW and plant height of spring pea line with the good winter hardiness and earliness from winter pea varieties.

Following the selection process, was identified a genotypes with good winter hardiness, associated with high yield and a good adaptability to the climatic conditions from Romania.

Experimental results obtained in centers of the State Institute for Varieties Testing and Registration (SIVTR) during the period 2018-2020 and also those obtained at NARDI Fundulea, were accessed to characterize the news varieties Ghittia F, Lavinia F, Olguța F and Andrada F in comparison to Nicoleta and Spectral F used as control varieties.

# Germlines, Diversity, and Climate Change

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**Keywords:** diversity, genetics and plant breeding, climate change.

**Abstract:** The current conference's focus on these pressing issues facing the global ecosystem is timely. The role of plant breeding in response to changing climates must be researched and practical endeavours focused on harnessing new technology for:

- food security;
- production of viable varieties for a protected set of climatic parameters from the 2040s onward;
- to shorten the period between the discovery of suitable varieties and their commercial exploitation;
- to make affordable seed stocks available to countries living on the margins of climatic change;
- to embed new production methods that retain soil structures, embed natural nitrogen cycles, and preserve moisture in soils through different tilling methods;
- preservation and growth of pollinators.

Mendel's discovery of 1866 set out the basic parameters for the genetics of heritable traits. Subsequently, a revolution in the understanding of plant breeding has taken place. First through the classical plant breeding approach of cross-pollination to produce new varieties with different traits. Second, the understanding of dominant and recessive alleles has enabled plant breeders to have a more considered approach in the methods they used to plan the traits they wished to transfer to the offspring of a breeding programme. Third, these discoveries were later interpreted as functions of chromosomes and subsequently our understanding of gene loci. Fourth, the discovery of DNA and its role in templating the combination of amino-acids into an organism's genome allowed a greater understanding of the fundamental shift in the application of technology to allow gene mapping and recombinant DNA production. The production of new varieties through a novel combination of the heritable traits and indeed the insertion of alien traits into varieties of plants was now possible.

While the laboratory bench techniques have allowed controlled changes to be made, it has proved rather harder to accelerate the time to produce manageable quantities of seed in commercially viable quantities. My first role in biotechnology, with Agricultural Genetics limited in the 1980$^{s}$ brought together the newest forays in monoclonal antibody production, cell continuous flow cell culture, and gene insertions together with traditional plant breeding. This was one of the first venture capital-backed companies seeking to revolutionize plant breeding; forming new recombinant combinations for designer crop protection agrichemical sprays; new plant varieties with resistance to these new synthetic agrichemicals. Thus, the whole world of plant breeding had been potentially changed forever. The aggressive use of intellectual property in the form of plant breeders' rights became core to the

commercialization of new plant varieties as did the production of sterile F1 hybrid varieties to maximize the commercial value of seed and prevent re-use of seed from harvest to harvest. It was now possible to insert alien genes from insects into plants as natural insecticides to convey disease resistance to certain insects came into sight.

The growing demand for food from a rapidly expanding global population led to the investment into the production of drought-resistant varieties, low nitrogen tolerance, salt-tolerant varieties, and disease-resistant varieties. In contrast, the impact on the natural growing environment was largely ignored: traditional farming practices, tilling techniques, and practices, rotations, use of fertilizers etc. It was also established that while modern technology could shorten the development time of new varieties with potential benefits, did not always accelerate the growing phase successfully and often proved difficult. Traditional plant breeding, even, with its long production cycles often produced more stable and reliably produced commercially viable seed stocks of new varieties.

While the markers used to monitor the transfer of new genes were very often the same traditional measure of traits associated with grain yield measured through ear height and plant height, used in conventional plant breeding. Importantly, these new genetic markers allow new approaches to plant breeding and increase the screening opportunities through data mining of the libraries of genetic markers to improve the rapid selection of candidate genes.

It is well reported that two major issues are affecting the global ecosystem at present:

- loss of diversity of plant and animal species;
- climate warming and consequently the changing climate's impact on insect and plant species and pollination risk.

There is now a general moratorium on gene manipulation and only the brave continue to introduce alien species' genes into an organism. Now, a more traditional view of augmenting traditional plant breeding by using genetic markers from natural and more ancient stock, to monitor and assess the potential augmentation of these new combinations and varieties.

Thus, plant breeders can now incorporate these molecular markers identified in inbred and wild lines of plant varieties to offer cheap and reliable measures of diversity that are independent of the growing environment and developmental stages.

Climate fluctuations have been with us for thousands of years forcing dramatic changes in the terrain and cultural practices in gathering and producing food. Yet these changes occurred over thousands of years. The climate change debate evolves around the speed of change. Speed of change is the major threat to the world as we see it today. Plants can evolve given time as can pollinators. However, the mismatch in climate changes to plants and pollinators' ability to evolve in the same timelines is extremely challenging.

Understanding the genome of plants has offered us a link to the past as well as to the future. Harnessing knowledge about tied up in these genomes may provide the answer to plant breeding in the future through novel wild variety traits or inbred traits not currently dominant in varieties today.

These approaches may have a significant impact on future varieties' tolerance to:

- climate change and its consequences;

- stability of such variants;
- unknown risk to future food security.

In conclusion, the rapid development of recombinant DNA genomic information and the availability of data mining tools for identifying potential climate change-resistant traits will greatly enhance the discovery of new plant varieties going forward. However, fundamental challenges will still be faced in the nature and culture of farming practices that will need to change in parallel with climate change. It appears the ability to think globally about climate change, may in the end be achieved only through acting locally.

This will require a very significant human change to the food we eat, the origin and food miles required to supply food, and the threats posed by globalization in an unstable world, economically and socially. National self-sufficiency must be a goal of this genomic revolution to allow developed and less developed nations to survive climate change and provide time for these new climate tolerant varieties to take root. Then, and perhaps only then will it be possible to feed the world. Consequently, the real need to feed your national population will provide a new perspective on the role of plant breeding research and the risk of over-extended supply chains promoted through globalization.

The current conference and the papers presented offer an insight into some of the research techniques and technologies available in Romania. The focus on the fundamental challenges of generating new plant varieties in response to global climate change is clearly rehearsed in the participants' research.

# The Effect of Crop Management Practices on the Disease Caused by *Septoria tritici* on Wheat Crops

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**Keywords:** wheat, foliar diseases, crop management practices.

**Abstract:** Septoria leaf blotch (caused by *Septoria tritici*) is one of the most important wheat diseases in Romania however its severity has varied significantly over the years.

Annual harvest losses due to diseases can reach up to 30%, its variations depend on climatic conditions, cultivar resistance and crop management.

Diseases control is a high priority in order to minimize yield and grain quality losses.

The aim of the present study was to determine the effect of different variants of management practices on the development of winter wheat leaf diseases.

Disease development caused by *Septoria tritici* was followed during the period 2018-2020, in trials located in the experimental field, at NARDI Fundulea.

The disease development was assessed in a four-factor experiment:

- (a) sowing season - 3 sowing seasons (early, optimal, late);
- (b) nitrogen fertilizers - 4 dose of nitrogen fertilizers ($N_0$, $N_{90}$, $N_{150}$, $N_{200}$);
- (c) soil tillage system - 2 variants of soil tillage (conventional tillage, minimum tillage);
- (d) crop rotation - 2 previous crop (wheat, rapeseed).

The variety of winther wheat used as biological material in these experiments was FDL Miranda.

A high variability of the climatic conditions during the three years of trial was registered, both in terms of temperatures and the amount of rainfall especially during April-May, when wheat is highly susceptible to *Septoria disease.* The significant effect of meteorological factors on the occurance and severity of foliar disease was registered.

The study highlighted that the monoculture, high doses of nitrogen, early or too late sowing and minimum tillage have led to an increase in the severity of wheat *Septoria disease.*

# Research Regarding the Selectivity and the Efficacy of Herbicide Treatments Applied for Weed Control in Barley Crop under Pedoclimatic Conditions from NARDI Fundulea

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**Keywords:** weeds, herbicides, selectivity, efficacy, yields.

**Abstract:** This paper presents the results obtained in the winter barley plots of experimental field of plant protection laboratory from National Agricultural Research and Development Institute Fundulea, during 2019-2021. During this experiment, the degree of selectivity (%) of the barley plants and the degree of control (%) of the weeds were followed by applying the treatments in different stage of applications - Stomp Aqua (455 g/l pendimethalin), Battle Delta (400 g/l flufenacet + 200 g/l diflufenican), Bison (100 g/l diflufenican + 15 g/l penoxsulam + 3.75 g/l florasulam). Stomp Aqua (455 g/l pendimethalin) and Battle Delta (400 g/l flufenacet + 200 g/l diflufenican) were applied pre-emergent immediately after sowing. Instead, the Delta herbicide (400 g/l flufenacet + 200 g/l diflufenican) was applied in autumn in the post-emergence (stage BBCH 12-13). The herbicide treatments results highlighted their effectiveness in a single application.

The weather conditions from the three years were quite variable from the point of view of recorded precipitation, but the monthly average temperatures were, in most of the cases, above the long-term average.

The barley yields from the plots treated with herbicides were much above the untreated plots (control) (between 211 and 236% of control value in 2020 și and 130-169% from control in 2021).

The treatments with herbicides must be correlated with the degree of weeds infestation, their spectrum and dominance, local climatic conditions, time of application and their technical potential for efficacy.

# Role of Foliar Treatment with Salicylic Acid on Tomato Plants Affected by Water Stress

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**Keywords:** plant growth, stimulating growth, stress factors, VRDS Bacău.

**Abstract:** A pot experiment was carried out at the Vegetables Research and Development Station from Bacău to observe the effect of salicylic acid (SA) on the growth of tomato plants under water stress conditions. The experiment was conducted in a growth chamber and consists of four variants [V1 - normally watered plants (WW); V2 - normally watered plants combined with salicylic acid treatment (WW+SA); V3 - plants under water stress (DS); V4 - plants under water stress and salicylic acid treatment (DS+SA)] in four replicates with ten plants per replicate. A salicylic acid treatment was applied to WW+SA and DS+SA 30 days after the seedlings were sprouted and placed in pots. Leaves were sprayed with a 1 mM SA solution until both sides were completely moistened. Water stress was applied on DS and DS+SA variants for ten days after treatment application, by stopping watering the plants.

On day 11, all plants on the experimental variants were watered, and after 48 hours, measurements were taken.

The results showed that tomato plants exposed to water stress and treated with salicylic acid grew better than those not exposed. They were comparable to the values recorded in plants of the WW variant. Plants of the DS variant remained undeveloped compared to those of the other variants. In general, the SA action stimulated development and growth of tomato plants.

# PGR Treated Winter Wheat Genotypes Behavior to Different Rates of Nitrogen Application

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**Keywords:** grain protein content, nitrogen fertilization, winter wheat, yield, plant height.

**Abstract:** Winter wheat (*Triticum aestivum* L.) is one of the main cereal crops cultivated on Earth. It provides basic food for half of Earth population that is why the preoccupation for increasing grain yield and grain quality is a primary concern.

Nitrogen fertilization is the most important factor for plant growth and development which can increase yield and grain quality. But the high rates of applied nitrogen fertilizer combined with high precipitations favor stem elongation and increase risk of cereal lodging. Lodging is a common phenomenon that occurs near harvest time, which can significant decrease both quantity and quality of the yield.

Plant growth regulators (PGRs) such as retardants are widely used for lodging control in winter wheat due to their effect of reducing plant height.

In order to study the effects of PGR treatment and different nitrogen fertilization rates on plant height, lodging resistance, grain yield and grain protein content of winter wheat, an experiment was initiated in 2015 at Agricultural Research and Development Station Turda using eight Romanian winter wheat genotypes tested at different rates of applied nitrogen fertilizer, in combination with foliar treatment with trinexapac-ethyl based plant growth regulator (PGR) sprayed over the foliage, in a three years field experiment (2015-2016, 2018-2019 and 2019-2020).

Results showed that high rates of applied nitrogen fertilizer and high rainfall stimulated stem elongation and increase the risk of cereal lodging. The trinexapac-ethyl application on wheat cause shorter plants and less lodging.

On yield and grain protein content nitrogen fertilization had a bigger influence than the trinexapac-ethyl treatment, both yield and grain protein content increase as the amount of nitrogen fertilizer applied was higher.

# The Influence of Sowing Date and Row Spacing on Grain Yield of Wheat

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**Keywords:** wheat, seed multiplication ratio, sowing date, row spacing, yield.

**Abstract:** Wheat production is influenced by environmental conditions, but it can be optimized by the sowing date. The nutrition space of the plants is ensured by the row spacing and by the distance between the plants in a row, an adequate spacing determining the optimization of the twinning capacity of the plants and a good development of the productivity elements. At ARDS Turda, the effect of these two technological elements (sowing date and row spacing) on wheat yield was studied in the period 2018-2020 on 9 varieties of wheat (Arieşan, Andrada, Codru - autumn wheat, Pădureni, Granny, Triso - spring wheat, Taisa, Ciprian, Lennox - facultative wheat). The research included 5 experiments corresponding to the 5 sowing dates (3 in autumn: I-III, 2 in spring: IV-V), the plants being sown in rows spaced at 12.5 cm (D1) and 25.0 cm (D2).

The aim was to establish an optimal sowing date and seed multiplication ratio for the studied varietes.

The best yield results were obtained in sowing dates II and IV, corresponding to the calendar periods October 30 - November 6 and March 1-15. By delaying sowing date, the productivity elements varied according to the variety. The number of fertile spikes/sqm decreased (except Taisa and Lennox in sowing date II), while the number of grains/spike increased. The weight of the grains/spike increased significantly only for the Arieșan, Andrada, Codru and Pădureni varieties. Pădureni is the only variety whose TKW has grown significantly by delaying sowing date.

To a wide row spacing, the number of fertile spikes/sqm and the yield decreased significantly, the number of grains/spike and the weight of grains/spike exceeded the control and the thousand kernel weight did not show statistically significant differences compared to the control (D1).

To a wide row spacing, in optimal conditions, the value of the seed multiplication ratio increases by up to 50%.

# The Influence of the Tillage Systems and Foliar Fertilizations on Physiological Parameters and Production at Wheat, in the Transylvanian Plateau

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**Keywords:** wheat, photosynthesis, foliar fertilizer, tillage system, production.

**Abstract:** The research was conducted during the vegetation period, 2019-2020 and 2020-2021 using the winter wheat variety, Andrada created at ARDS Turda, treated with 2 types of foliar fertilizers, Folimax Gold and Microfert U which were applied in two tillage systems, plowing and non-plowing.

The number of treatments and the application phenophases were different resulting in 6 graduations and a control variant in which the mineral fertilization was not completed by foliar fertilization.

Measurements of physiological parameters and chlorophyll concentration were performed on the standard leaf, in the phenophase of wheat grain filling (BBCH 71-73), after 5 days of the last treatment with foliar fertilization, non-destructive research method the leaves were not detached from the plant and was based on the use of the foliar gas analyzer CIRAS-3 and the apparatus for determining the concentration of chlorophyll Apogee MC-100, without damaging the plant material. In the conditions of the Transylvanian Plain, the technology used showed that physiological parameters and yield were higher, registering higher values in the conventional system (plowing), net assimilation recorded average values 26-29.5 $\mu molm^{-2}s^{-1}$ and an increase of production, of over 850 kg/ha, the values being statistically ensured, significantly positive, as compared to the conservative no-tillage system.

The main purpose of this paper is to emphasize the influence of foliar fertilization, in two systems, conventional agriculture “tillage” and conservative “no tillage” and identification of the most favorable application phases. The assessment of the physiological parameters according to the foliar fertilization and the tillage systems allow to make pertinent decisions that can positively influence the wheat production.

# Influence of Different Tillage Systems on Abundance and Dynamics of Pests in Maize Crop

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**Keywords:** pests, maize, tillage systems, pheromones, abundance and dynamics.

**Abstract:** Air pollution, avoiding soil compaction, conserving soil water reserves and reducing farm inputs are just some of the factors that have contributed to new studies regarding maize cultivation technology. In order to evaluate the influence of different tillage systems on abundance and dynamics of pests in maize crop, at Research and Development Station for Agriculture Turda (ARDS Turda) research has been done on estimation the insect populations in these systems. The compared tillage systems were: conventional tillage system (plowing) and minimum tillage system (with chisel). The research consisted of observations and determinations on the monitoring, abundance and dynamics of the most common species pests of maize crop: western corn rootworm (*Diabrotica virgifera virgifera* LeConte), silver Y (*Autographa gamma* L.) and turnip moth (*Agrotis segetum* Den. & Schiff.). Pheromone variants were replaced every four weeks and the adhesive plate every two weeks. The number of males trapped was recorded weekly. The pests monitoring, with economically importance for maize crop, was evaluated using F-1 pheromone traps, with synthetic sex pheromones (atraGAM- 9, atraSEG-21 and atraVIRG). By minimizing the tillage system, there has been an increase in the pest population, especially in *Diabrotica virgifera virgifera* LeConte.

An almost perfect synchronization of the first generation with the optimal threshold of specific temperatures for insect biology was observed in the three monitored species. These mechanisms formed over the course of evolution and have imposed permanent adaptations of insects to climate changes.

Experimental data reveals that the thermal regime, as expected, has a more important influence on the dynamics of these pests.

# The Influence of the Tillage System on Water Conservation and Yield at Maize on ARDS Turda

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**Keywords:** fertilization, tillage system, maize, yield, water reserve.

**Abstract:** The experiment was designed and carried out at ARDS Turda and includes four cultivation variants, a conventional system (with plow) in parallel with three unconventional systems (minimum - chisel, minimum - disk and no tillage - direct sowing), in a three-year crop rotation: winter wheat - maize - soybeans, with two levels of fertilization. In unconventional systems, water accumulates in the soil harder, but it is lost more slowly than in the conventional system in which water accumulates more easily but it is lost faster, according to the data recorded by HOBO-MAN station which was incorporated into the soil. The soil temperature is lower especially in no tillage and minimum tillage-disk variants.

Compared to the CS (control) variant in which an average yield of 8134 kg/ha was achieved, a close result (8007 kg/ha) was obtained in the soil processing variant with the boot (MC) and superior to the MD (6741 kg/ha) and NT (5440 kg/ha) systems, they have a very significant negative influence in the formation of the crop, the difference from the CS being between 1394 and 2695 kg/ha. The experimental results also showed that, in this soil area conditions under the soil conditions, the minimum system (chisel variant) can be considered as an alternative to the conventional system, the yield difference (127 kg/ha) between the two systems is insignificant. From the obtained data it is outlined that, in the research area where the soil has high clay content (over 40%), maize is pretentious to the depth of soil processing, the yield data confirming this fact. It should be noted that lower fertilizer doses were used in this experiment ($N_{56}P_{56}K_{56}$ + $N_{40}CaO_{10}$), in accordance with the rules of the European Commission's Green deal Project (20% reduction of chemical fertilizers).

# Evaluation of the Useful Arthropods Diversity Incereal Agroecosystems from Transylvania Center

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**Keywords:** useful arthropods, pests, agroecosystems, agroforestry curtains, evaluation.

**Abstract:** The increase in agricultural production is conditioned by a number of factors, among which plant protection against pests plays a very important role. Sustainable exploitation, by implementing sustainable agricultural practices, can make an important contribution to the proper functioning of the ecosystem. These good agricultural practices also include the provision of natural habitats for useful entomophagous species as well as biological pest control. Along with chemical methods, lately, methods of biological control of crop pests have become widespread and one of these methods is the use of entomophagous (predators and parasites). Therefore, during the years 2016-2018, a study was carried out on the monitoring of useful entomofauna for the winter wheat crop, in two types of agroecosystem, at Turda and Bolduț, from Agricultural Research and Development Station Turda. The two locations are quite close in terms of distance, but very different in terms of territorial organization, the farm from Bolduț being framed by a network of agroforestry curtains. In Turda, the soils are located in open field conditions and are protected from rare spontaneous marginal edges. The research aimed to evaluate the diversity of entomophagous in the two agrobiocenoses, but also the influence of the agroecosystem on the useful entomofauna.

Based on the observations made it can be stated that the entomophagous arthropods identified in the two agroecosystems, differs only in terms of ecological indicators, they belong to the same groups of entomophagous, their diversity being closely related to climatic conditions, applied technology, but also to the type of agroecosystem. The Presence of entomophagous in both agrobiocenoses reflects the predominance of spiders with absolute values of 644 individuals in Turda and 933 individuals in Bolduț.

# The Influence of Soil Tillage on Maize Yields and Some Agrochemical Characteristics of the Soil

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**Keywords:** maize**,** soil tillages, soil agrochemistry, drought, yield.

**Abstract:** The paper presents the results obtained in a long-term experiment with different soil tillage systems, on the cambic chernozem from Fundulea. The data reflect the influence of tillage on maize production in 2020 and 2021, two very different years in terms of climate (2020 very dry and 2021 an average year). In the dry year, the highest yield (3828 kg/ha) was obtained in the plots where mechanical chiseling was applied, ensuring a better accumulation of water from the soil, while the lowest yield was obtained in the control plot without work. In 2021, the highest yield (7510 kg/ha) was obtained in the plots where the autumn plowing was applied, and the lowest in the control plots (2036 kg/ha). In both years, the spring plowing ensured distinct and very significant increases in yield, but much smaller than in the plots with autumn plowing or in those where chisel work was carried out. The agrochemical analyzes performed in the 2 years of experimentation showed the highest values for humus, total nitrogen, phosphorus and potassium in mobile forms and the total cation exchange capacity in the no-tillages plots and the lowest values of these characteristics in the plowing autumn plots. Although disk tillages and spring plowing provided similar values, in the plots with disk tillages the amount of water recorded higher values. Spring plowing is not recommended, as it causes rapid water loss from the soil, and by increasing aeration negatively influences the decomposition of humus. It will be replaced by disk or chisel tillages. Autumn plowing ensures the highest production, but also the highest consumption of nutrients and fuel and the increase of greenhouse gas emissions, but ensures better conditions for the decomposition of organic matter.

# Yield Dynamics and Harvest Increases under the Influence of Mineral Fertilization on Maize Crop

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**Keywords:** maize, the influence of fertilization, production dynamics, increased yield.

**Abstract:** Corn, although a large nutrient-consuming plant, the crop is closely related to the humidity conditions, depending in particular on the distribution of rainfall during the growing season. The period when corn consumes large amounts of nutrients overlaps with the period when it also consumes large amounts of water, and the drought in July and August greatly reduces production.

In the area of the chernozems in the Transylvanian Plain, although they are well-fertile soils, fertilizers, especially nitrogen fertilizers, are well used in maize cultivation on these soils, in addition to nitrogen fertilization, phosphorus fertilization is also required. Under these conditions, climatic factors, not only the temperature but also the water influences the normal development of the corn, capitalization of the applied fertilizers and finally the level of the realized productions. The study presents the evolution in time of the maize hybrids cultivated at ARDS Turda during 1971-2021 in the with long-term experiments of NP fertilizers.

Experimental variants:

- Factor A: were analyzed cycles of 5 years 1971-1975, 1981-1985, 1991-1995, respectively, 2017-2021;
- Factor B: phosphorus doses with 5 graduations each $P_0$ $P_{40}$ $P_{80}$ $P_{120}$ $P_{200}$;
- Factor C: nitrogen doses $N_0$ $N_{50}$ $N_{100}$ $N_{150}$ $N_{200}$.

The dynamics of yields and harvests increases under the influence of fertilization also show the evolution of maize hybrids over a longer period of time in the conditions of the Transylvanian Plain.

# Studies on Biodiversity Conservation of Cowpea Plant Resources in Sandy Soil Conditions in Southern Oltenia

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**Keywords:** drought, cowpea germplasm, biology, productivity, type of plant growth.

**Abstract:** Research conducted during 2016-2021 at Research and Development Station for Plant Culture on Sandy Soils, Dăbuleni on the conservation of biodiversity of traditional cowpea plant resources has shown a great variability of biological and morphological characteristics that can be used in the future in the process of improving existing varieties. A number of 130 cowpea genotypes (*Vigna unguiculata* L. Walp) were studied, during which the vegetation period took place during 84-116 days, in conditions of an average air temperature of 22.4°C. The grain production obtained in the germplasm collection in cowpea was between 928.6-3164.3 kg/ha, with an average of 2239.3 kg/ha, being marked significantly positively correlated with the number of pods per plant (r=0.683**) and distinctly significant negative with disease resistance (r=-0.376$^{oo}$). The type of plant growth allows the selection and use of cowpea biotypes in the process of plant improvement depending on the desired variety.

Out of the total of 130 genotypes studied, 46.9% allow the selection for obtaining varieties for grains, 33.1% allow the selection of cowpea genotypes for fodder, and 20% allow the selection for obtaining genotypes for green manure. Due to the biological properties of the plant, regarding the increased resistance to drought and the reduced requirements for soil fertility, cowpea can be a good alternative for growing beans and soybeans, plants very sensitive to stressors in areas with excessive drought. In this sense, the analysis of the physiological behavior of four cowpea genotypes (*Jiana, Aura 26, Ofelia, Doljana*) underlined a diurnal variation of the physiological processes, in the conditions of recording, at the level of the leaf, some temperatures of 32.8-33.1°C (at 9 o'clock), 39.8-40°C (11:30 o'clock) and 45.1-46.4°C (15:30 o'clock) and an active solar radiation between 1290-1760 µmol/m$^2$/s. Thus, a distinctly significant correlation was established between photosynthesis and solar radiation, which shows the tendency to decrease the intensity of photosynthesis with the increase of solar radiation over the value of 1600 µmol/m$^2$/s. The degree of opening of the stomata is an important indicator of the response of plants to thermohydric stress, and the results obtained in cowpea showed that the variation of stomatal conductance, in the range 0-0.19 mol $H_2O$/m$^2$/s, directly influenced the rate of photosynthesis (0.20-21.5 µmol $CO_2$/m$^2$/s) and the rate of foliar perspiration (0.36-4.2 mmol $H_2O$/m$^2$/s). The statistical analysis of the obtained results highlighted the distinctly significant positive correlation of the stomatal conductance with the photosynthesis process (r=0.935**) and with the foliar perspiration process (r=0.663**).

# Agrotechnical Measures to Reduce the Influence of Drought on Sunflower Yield

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**Keywords:** plow, disc chisel, unworked, sunflower, yield.

**Abstract:** The sunflower is a less pretentious plant than the preceding plant, if the soil is well supplied with water and nutrients and the crop rotation and rotation are respected.

The components of the technological system of plant cultivation that have been studied on the vermic chernozem from ARDS Valu lui Traian refer to: the basic work or the main way of loosening and mobilizing the soil. Irrigated (sprinkler) and non-irrigated variants were studied.

The experimental variants were the following:

- conventional work at a depth of 28-30 cm, plowing with the return of the furrow;
- reduced work performed by discussion at 18-20 cm;
- conservative work performed with a chisel plow at 28-30 cm, without turning the furrow.

The experiments were of the Latin square type, with four variants and four repetitions. Given the results obtained on sunflower cultivation, the technology of loosening the soil with a chisel can be accepted as a method of conservative work. Sunflower harvest was also decisively influenced by climatic factors, especially by low rainfall in the first part of the growing season. The harvest obtained through the technology of conservative loosening of the soil by chisel, in irrigated and non-irrigated soil, was equal to that of the conventional technology.

Conservative tillage, by chisel loosening without turning the furrow and keeping an appropriate amount of plant debris on the surface, can be considered a viable alternative to conventional tillage technology.