ADER 2.1.1. PROJECT:

Obtaining new potato varieties adapted to climate and economic changes with superior efficiency in water resource management and establishing specific technology packages for the current market demands and farmers solicitations

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General objective of project:

Developing of potato production technologies, so that it can adapted to climate change and economic requirements, to ensure a superior efficiency in the management of water resources.

*It's being watched elaboration and establishment of some specific technology packages current market requirements, to respond to farmers' solicitations and to ensure sustainability of commercial farms in the context of growing environmental performance.*

Project specific objectives:

1. obtaining of new potatoes varieties suitable climate change and superior using of biological and technological resources;
2. ensuring seed links, nucleus şi stock from new varieties for rapid multiplication and spreading to farmers;
3. methodology of *in vitro* and *in vivo* differentiation of new varieties depending on the management of water resources;
4. specific technology of cultivation with low water consumption of new varieties;
5. identification method, extraction, purification and bioeconomic valuation of bioactive principles from potato;
6. specific cultivation technology of new varieties with high content of bioactive components
Phase 1. Elaboration of research method

A.1.1. Research network, study, documentation
A.1.2. Selection of varieties to achieve hybrid scheme adequately for increasing variability (CP+P1+P2+P3+P4)
Inventorization of hybrid combinations and seeds / combination, analysis of behaviour character of hybrid combinations (CP)

✓ Methods of research had been established and a database was created on genetic behavior of varieties and hybrid combinations. Also the most adequate genotypes were selected existing in vivo and in vitro collection.

Phase 2. Applied research

A.2.1. Realization of hybrid combinations (CP)
A.2.2. Realization of experimental population fields year I and II, of descendants and of comparative culture with newly created genotypes (CP+P1+P2+P3+P4)
A.2.3. Introducing resistance genes from genotypes with resistance / tolerance in new creations (CP)
A.2.4. Analysis of hybrid descendants on behavior to diseases and pests and agronomic aspect and cultural of tubers (CP+P1+P2+P3+P4)
A.2.5 Clonal material analysis regarding analysis of thermo-hydric stress (P4)
A.2.6. Specific technology elements to breeding lines of perspective (CP+P1+P2+P3+P4)

✓ The optimum experimental system in field and protected space (greenhouse, solar) was elaborated and applied The experimental field has a complex structure, including populations I, populations II, populations II, progenies (D1 and D2) and breeding lines.
✓ Hybridization were performed for obtaining new genotypes (over 30 hybrid combinations), in greenhouse.
✓ A number of 4201 genotypes were performed in population years I, II and progeny I and II, breeding lines of comparative culture.
✓ Choosing parenting pairs in order to introduce resistances / tolerance genes to thermo-hydric stress
✓ Vegetative descendants were analysed for selection
✓ Dynamic harvesting was made and results for thermo-hydric stress had been obtained
✓ Technology elements specific to breeding lines were elaborated
Phase 3. Applied researches

A.3.1. Analysis of hybrid combination behaviour (CP)
A.3.2. Harvesting of biological material at different stages of breeding process (CP+P1+P2+P3+P4)
A.3.3. Analysis of agronomic aspect and production capacity of new created genotypes (CP+P1+P2+P3+P4)
A.3.4. Identification, extraction, purification and bioeconomic evaluation of the active principles from new genotypes obtained (CP)

✓ Biological material was obtained corresponding to the different stages of breeding process
✓ The agronomic aspect and production capacity were analysed, during vegetation and in final harvesting
✓ They were characterized and classified according to the presence of bioactive principles varieties and breeding lines from project

Phase 4. Applied researches

A.4.1. Planting the biological material corresponding to the different stages of the breeding process, including in comparative crops (CP+P1+P2+P3+P4)
A.4.2. Realization of demonstration plots in the field to farmers (CP)
A.4.3. Selection of the most valuable genotypes according to behaviour in the field to stress, diseases and pests (CP+P1+P2+P3+P4)
A.4.4. Specific technology elements to breeding lines of perspective (CP+P1+P2+P3+P4)

✓ The technical works for planting biological material under different stages of the breeding process has been done
✓ Adequate technical work has been done and analysis of cultural behaviour of breeding creations related to the demonstration field which was made to farmers
✓ Valuable genotypes have been selected according to field behaviour to stress, disease and pests
✓ Experimental data has been obtained to be applied in order to elaboration of specific technologies
Phase 5. Applied researches

A.5.1. Harvesting and economic mark of clonal material regarding production capacity and agronomic aspect of tubers (CP+P1+P2+P3+P4)
A.5.2. Identification, extraction, purification and bioeconomic evaluation of bioactive principles of new varieties (CP)

✓ The clonal material on production capacity and agronomic aspect of tubers has been harvested and evaluated
✓ Selection of valuable biological material and diversified obtained at different stages of the breeding (over 250 genotypes)
✓ They were characterized and classified according to the presence of bioactive principles of genotyping in the project

Phase 6. Applied researches

A.6.1. Planting of biological material corresponding to the different stages of the breeding process, including comparative cultures (CP+P1+P2+P3+P4)
A.6.2. Realisation of demonstration plots in the field to farmers (CP)
A.6.3. Selection of the most valuable genotypes according to the behaviour in the field to stress, diseases and pests (CP+P1+P2+P3+P4)

✓ Biological material in different stages of the breeding process was planted in comparative culture
✓ Demonstration lots have been made for farmers with methods and performant variants from the 3 years of experimentation and varieties / prospective breeding lines from project
✓ A rigorous selection of breeding material was made at different stages of the breeding process (over 100 genotypes)
Phase 7: Finalization and dissemination of researches results

A.7.1. Harvesting and economic value of clonal material on production capacity and agronomic aspect of tubers (CP+P1+P2+P3+P4)
A.7.2. Selection of genotypes (breeding lines) to be transmitted to ISTIS for patenting (CP)
A.7.3. Finalizing specific technology packages for breeding lines proposed to ISTIS for patenting (CP)
A.7.4. Preparing of documentation for 2-3 lines patenting (ISTIS) (CP)
A.7.5. Organization of meetings with farmers, workshops, participation at national / international conferences, etc. (CP)
A.7.6. Elaboration and distribution of a Brochure presenting new varieties (CP)
A.7.7. Presenting the results obtained on the Institute site (CP)

- The clonal material regarding production capacity and agronomic aspect of tubers has been harvested and evaluated
- A rigorous selection of genotypes has been made to be transmitted to ISTIS for patenting
- Two new varieties of potato have been homologated: CEZARINA and ERVANT
- The documentation for the variety patents was drawn up
- There were done 2 technological packages specific to new potato varieties of Cezarina and Ervant
- Meetings and workshops with farmers were organized
- Results were disseminated by participation at conferences with scientific papers
- A brochure for the presentation of new potato varieties has been done for distribution
- The results obtained will also be uploaded on the site of NIRDPSB Brasov, www.potato.ro, under the section dedicated to projects
An ample breeding program that targeted to obtain new potato varieties (2-3 varieties) adapted to climatic and economic changes with superior yields in water management was took place within the project.

Thus, after selection au fost transmise were transmitted for ho,ologation to ISTIS and enroiling Official catalogue of culture plants in Romania (2018 year) a number of two (2) potato breeding lines:

- 14 - 1574 / 4
- 15 – 1677 / 31

The breeding lines were tested within the project in the experimental fields of NIRDPSB Brașov and the partners involved (SCDC Târgu Secuiesc, SCDC Miercurea Ciuc, SCDA Suceava, CCDCPN Dăbuleni). At the same time, the two breeding lines were tested in the ISTIS testing network, respectively in 8 national testing centers: Târgoviște, Tg. Secuiesc, Sibiu, Satu Mare, Rădăuți, Hărman, Luduș, Bacău.

The results obtained in the research network of the project have shown that the two potato breeding lines correspond both to production capacity, the resistance to diseases and pests, quality and the suitability for the industrial processing, as well as ecological plasticity due to current climate change.
To confirm the stability of the varieties and the rigor with which the selection was made in the field, within the project also were made molecular researches through the use of genetic markers. Using of DNA analysis methods, allowed to obtain a "genetic imprint" characteristic of each genotype (Research contract: no. 1079/11.06.2018, between University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, as Performer and National Institute of Research and Development For Potato And Sugar Beet Brasov as Beneficiary).

For breeding line 14 – 1574 / 4 the documentation afferent to validation of proposal name of variety has been submitted to ISTIS, name requested by NIRDPSB Brasov. Thus, for the reference name of breeder 14-1574 / 4, name of ERVANT variety was proposed, which was accepted by ISTIS.

For breeding line 15 – 1677 / 31 the documentation afferent to validation of proposal name of variety has been submitted to ISTIS name requested by NIRDPSB Brasov. Thus, for the reference name of breeder 15 – 1677 / 31 name of CEZARINA variety was proposed, which was accepted by ISTIS.

The two new varieties were included in the Official catalogue of culture plants from Romania in 2018. The description of 2 new varieties is detailed in the technical report.
Potato variety CEZARINA
Potato variety ERVANT
The specific technology recommended for the CEZARINA and ERVANT varieties has as target:

1. Choosing the land with a suitability for potato culture
2. Rational alternation of crops by 4-5 years, preferably with a leguminous in rotation
3. Correct execution of deep ploughland
4. Preparing of germinative bed
5. Basic fertilization
6. Planting
7. Maintaing
8. Control of diseases and pests
9. Destroying of haulms
10. Harvesting
11. Keeping and storage
Considering that two breeding lines selected in the research project were approved as new potato varieties and entered in the Official Catalog of Culture Plants in 2018, the documentation afferent for obtaining the two patents was submitted.

For CEZARINA variety, the registration number of the patent request is v 2018 012 from 20.04.2018. Name accepted on was published in the Official Bulletin for the Protection of New Varieties of Plants no.3/2018, from 28.09.2018.

For ERVANT, the registration number of the patent request is v 2018 013 din 20.04.2018. Name accepted on was published in the Official Bulletin for the Protection of New Varieties of Plants no.3/2018, from 28.09.2018.

In order to promote the two new varieties of potatoes, CEZARINA and ERVANT, a presentation brochure has been elaborated, which will be given to the potential beneficiaries of the results, in the scientific manifestations at which the Institute will be an organizer or participant, as well as manifestations with themed exhibition.
At project coordinator level, NIRDPSB Brasov, and all partners in the project (SCDC Târgu Secuiesc, SCDC Miercurea Ciuc, SCDA Suceava and CCDCPN Dăbuleni) the activities from the 7 phases included in the achievement plan of project were fully realized.

From the analysis of the results obtained on the production capacity, the precocity of tuberization and the adaptability to biotic conditions the new creations correspond to the proposed breeding objective.

Considering that the two breeding lines selected within the research project were homologated as new potato varieties registered in the Official catalogue of culture plants in 2018 with the trade name CEZARINA and ERVANT, the documentation afferent for obtaining two invention patents was submitted.

Two technological packages specific to the current market requirements for the CEZARINA and ERVANT varieties have been elaborated and established.

As a final conclusion we can say that the breeding works have highlighted both the role of the genotype and the ecological conditions and the influence of their interaction in realization of potato production.