



BRESOV 6th Digital Newsletter

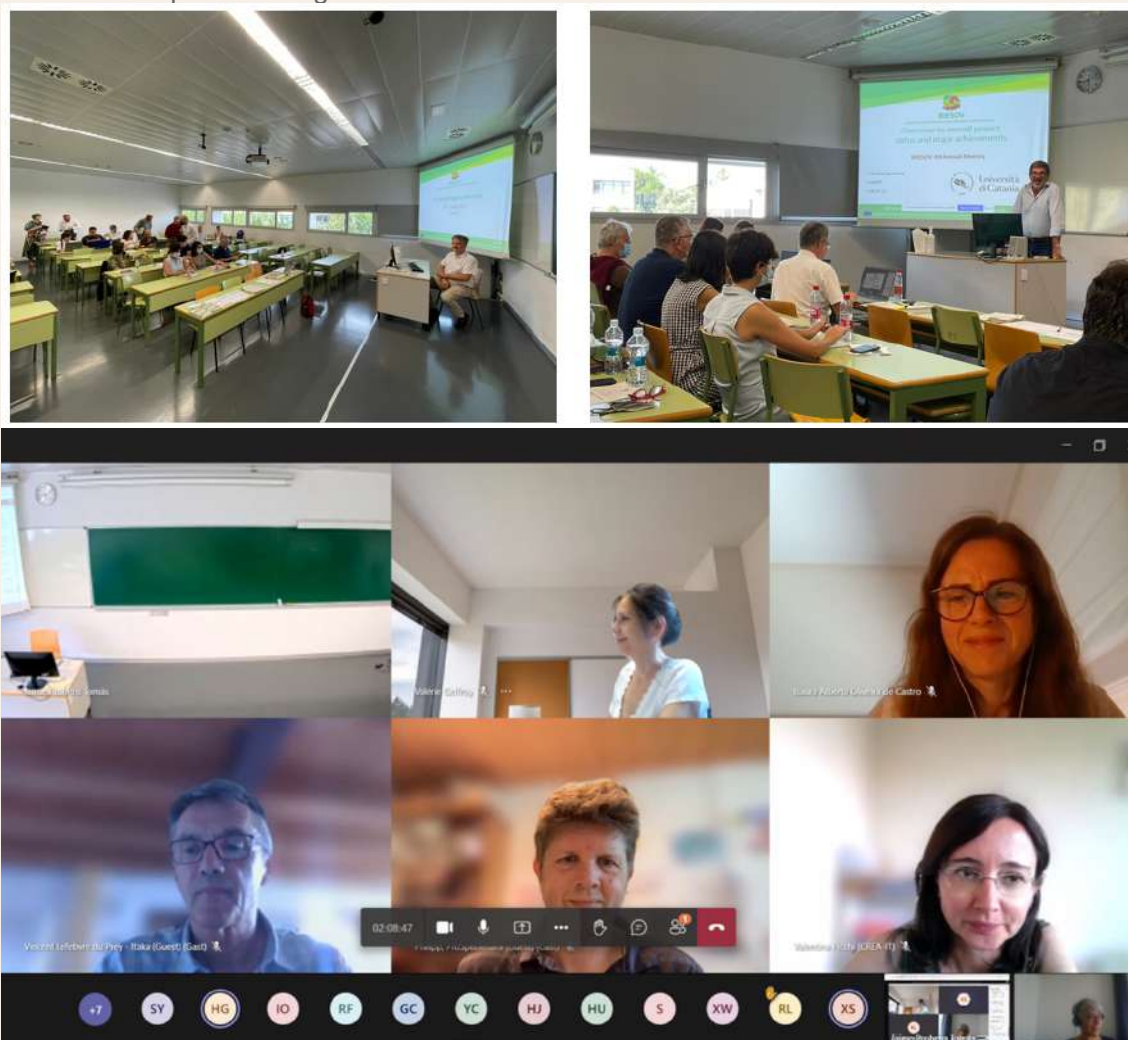


4th Annual Progress Meeting

On 5-7th July the 4th Annual Progress Meeting of the BRESOV (Breeding for resilient, efficient and sustainable organic vegetables) project took place. After travel restrictions having been released it was the first in-person meeting of the BRESOV consortium partners since 2019. 40 participants met in Valencia at the Universitat Politècnica de València (UPV) and more than 30 connected online.

Within three full days of virtual meetings the progress within the different work packages and crop groups of the project was discussed.

On Day 1, partners focused on the achievements in the pre-breeding work package which looks at the broadening of the genetic bases of tomato, snap bean and brassica, promoting the use of crop wild relatives, landraces and gene discovery, as well as plant breeding work package, looking at the development of populations, advanced breeding lines and improved genetic material for European organic agriculture. Crop group sessions also took place outlining status of main achievement, ongoing and planned activities. Project partners also presented the progress achieved for high quality organic seed production and multi-site evaluation of pre-breeding lines on-farm.



Photos from the 4th Annual Progress meeting (onsite and online)

On Day 2 of the meeting, communication, dissemination, training and exploitation was discussed, followed by crop group meetings and the Exploitation Planning Workshop organized by Euroseeds. Amelie Detterbeck (Euroseeds) opened the workshop, outlining the purpose and giving a short recap on how the BRESOV exploitation strategy has been developed since the beginning of the project. As basis for further discussion, different exploitation routes were introduced by experts:

- Szonja Csörgő (Euroseeds) gave an introduction of possible exploitation routes for direct use of the different Key Exploitable Results of the project under an IP perspective.
- Sandra Goritschnig, Scientific advisor of the BRESOV project and scientific officer at the European Cooperative Programme for Plant Genetic Resources (ECPGR), introduced European evaluation (EVA) networks for harnessing European crop diversity in public private partnerships.
- Nick Vangheluwe (Euroseeds), gave an overview on future exploitation opportunities under the research and innovation programme Horizon Europe.

After the presentation of the different routes, partners split into 2 groups (with a direct commercial exploitation interest / IP possibilities and with exploitation interest via EVA network / further research cooperation) to further discuss the opportunities for the different Key Exploitable Results with experts and to get answers to their questions.



Photos of Amelie Detterbeck, Nick Vangheluwe, Szonja Csörgő (on the screen) and Sandra Goritschnig during the Exploitation Planning Workshop

On the last day of the annual meeting, BRESOV partners had an opportunity to attend a technical visit to two trial sites not far from Valencia: Fundación Cajamar Experimental Station and an organic farm Saifresc.

Specifically on that day Fundación Cajamar held an Open Day where they organized group visits around the premises of the experimental station, including fields and greenhouses. Among all the various vegetables and fruits that Fundación Cajamar is growing, BRESOV partners got to see the EUCARPIA tomatoes.



Photos taken at the Fundación Cajamar Experimental Station



Photo of BRESOV partners with EUCARPIA tomatoes at the Fundación Cajamar Experimental Station

At Saifresc organic farm, BRESOV partners got a chance to get a closer look at the Valenciana Tomato landrace, and of course BRESOV tomato trial fields which feature different collection of varieties, such as Sicilian tomato collection and best hybrids collection.



BRESOV partners at the Saifresc organic farm



BRESOV tomato trial site at the Saifresc organic farm

Survey on the use of alternative fertilizers and microorganisms



In June 2022, FiBL launched the survey on the use of alternative fertilizers and microorganisms, as part of WP5 which looks at production on-farm. The aim of the survey was to collect information on the use and the experience of practitioners with such formulations as well as with alternative fertilizers. The farmer survey, which was available in English, French, German, Italian and Spanish, received a total of 42 complete answers. The respondents originated from all Europe with a majority coming from Mediterranean and central Europe (79%), mainly Switzerland and Italy. 69% of the survey participants were farmers, 81% working in organic agriculture (including Demeter and in conversion) and mostly (49%) producing vegetable. The survey covered areas such as information of the farm (farming system, crops/livestock), the use of natural, alternative or recycled fertilisers, as well as microorganism formulations, their type, the crops they were used on, and the main reason behind their use. Participants were also asked whether they were satisfied with their use, if they recommended them and whether they had additional needs that were not currently covered.

Compost (40%) and manure (40%) are the main alternative fertilisers used by the farmers responding to our survey. Other fertilizers used included in ascending order: sheep wool pellets (2%), shrimp meal (4%), digestate (5%), and horn meal (9%). Sixty one percent of the participants confirmed using alternative fertilisers as the only source of nutrition, mainly to cover Nitrogen needs (51% of uses). Recycled fertilizers are mostly used in open field production and motivated by residue reduction. 69% percent of the respondents were either satisfied or very satisfied with the use of alternative fertilizers and 93% of all participants recommend their use.

Despite this survey not covering the whole range of farming systems in terms of the number of answers and the representation of each type of farming, it provides testimonials on the successful use of alternative fertilizers and microorganism formulations. It shows that farmers are aware of a necessary evolution of production systems and that it is possible to reduce the dependence on chemicals. It also confirms that alternative solutions require farmers and technicians to acquire a good understanding of the mechanisms involved, and therefore the necessity of suitable advisory services to support the transition to responsible farming.

Detailed results of this task will be available on the project's website and [CORDIS page](#).

The survey and its results have been also featured on the [EIP-Agri website](#) and the [latest newsletter dedicated to the sustainable use of pesticides in agriculture](#). The EIP-AGRI network helps innovation for agriculture, forestry and rural areas spread faster across the EU.

For more information on the survey, please contact [Joelle Herforth-Rahmé](#), FiBL and [Vincent Lefebvre Du Prey](#), ITAKA

Spotlight

In May 2022, the deliverable “Phenotypic and molecular characterization of PGR for *B. oleracea*, *P. vulgaris* and *S. lycopersicum*” was submitted (EC approval pending)). The deliverable was led by UNIVPM and the involved partners were UNILIV, UNICT, CREA, UTAD, VURV, SERIDA, INRAe, VRDS, UPV, Vegenov, UAL, UTM and ZAAS.

This deliverable is based on the activities related to the phenotypic and molecular characterization of plant genetic resources (core collections and/ or association panels) for

the three crops, Brassica oleracea, Phaseolus vulgaris and Solanum lycopersicum.

Depending on crops and on type of collection and population, different levels of genotyping and phenotyping were applied. The genotyping has been carried out by using high-throughput technologies (e.g., Genotyping by Sequencing, GBS, Whole Genome Sequencing, WGS). For some of the accessions/ lines of the different collections, it was possible to use available genetic data (i.e., GBS and/or WGS) from other projects (e.g., for beans BEAN_ADAPT and NEXT_BEAN).

The phenotyping was performed in controlled conditions and/or multi-location field trials, depending on crop and sets of materials considered. The phenotypic characterization was focused on traits important for organic farming, such as i) resistance/ tolerance to biotic and abiotic stresses, iii) morphological and phenological traits, and yield related traits and iii) nutritional quality traits.



UNILIV waterlogging and salinity trial using BRESOV crop wild relatives and landraces



Screening Brassica accessions for resistance to downy mildew. a. Pots with freshly sown seeds; b. Individually labelled seedlings used for resistance tests; c Downy mildew infection test; d. Outcome of resistance test – resistant vs. sensitive accession.

Some of the authors of the report shared their personal take on the experiments:

Elena Bitocchi (UNIVPM): *Plant genetic resources represent a crucial source of genetic variation that is needed to obtain improvements in breeding. This is particularly true for diversity present in crop wild relatives, wild forms and landraces that was lost during the process of domestication and modern breeding leading to modern varieties that have a very narrow genetic basis. For this reason, the introgression of new diversity into elite germplasm can really have a strong impact on the improvement of cultivated materials.*

A very huge number of genetic resources of different crops are maintained both ex situ, in gene banks, and in situ, in natural environments for wild and crop wild relatives and farmers’ fields for landraces. The major problem related to conservation of such precious materials is that they are mostly unexplored and without any knowledge on their characteristics is difficult to use them in breeding. BRESOV activities of WP2 allowed to characterize very big collections of Brassica, tomato and snap bean collections including landraces, wild materials and crop wild relatives for numerous traits related to organic farming, such as agronomic performances, resistance to different biotic and abiotic stresses, root traits, morphology and nutritional quality of edible parts. We obtained data from several experiments carried out in organic field and controlled conditions. We analysed data and identified very interesting materials that can be directly cultivated as varieties or used in breeding programs to develop new and resilient varieties for organic farming cultivation. We also characterized these materials with the most advanced genomic techniques and investigated their genetic diversity structure. These data are very useful for the identification of markers that can be used in breeding. Data and materials will be made available to stakeholders to really realize the very big efforts done in these research activities and to obtain a real and valuable gain in organic agriculture.

Another deliverable submitted (EC approval pending) in May 2022 was “Phenotypic and molecular characterization of B. oleracea, P. vulgaris and S. lycopersicum

association panels and mapping populations”. This deliverable was led by CREA and involved UPV, UAL, SERIDA, UNIVPM, ZAAS, UTAD, UNILIV, VURV, UNICT, VRDS.

The objective of Work Package 2 is to develop core collections, association panels and segregant populations according to specific needs of Brassica, Bean and Tomato crops and to be characterized genetically and phenotypically for a broad range of traits including biotic and abiotic stresses, morphological and quality traits, yield and yield components.

Different types of materials have been developed as mapping population and association panel and include core collections, hyper-core collection, collection of landraces, recombinant inbred lines, segregant F2:3 populations, EMS mutants, introgression lines and other mapping panel. Genotyping by sequencing-based methods have been applied for high-throughput genotyping. A deeper sequencing (Whole Genome Sequencing, WGS) has been performed only for a small number of control genotypes of specific interest in order to obtain a haplotype reconstruction for the whole set of genotypes from GBS data.

Different phenotyping experiments have been performed towards the identification of main regions underlying the variation of important genes/QTLs controlling phenotypic variation useful for organic farming.

The authors of the report shared their personal take on the experiments:

P. Tripodi (CREA): *A major goal of the BRESOV project is to develop and characterize advanced genetic materials in Brassica, Bean, and Tomato toward the identification of novel breeding materials that are well suited to organic farming cultivation conditions as well as for gene discovery. To that end, different types of materials, including recombinant mapping populations, association panels, and mutants have been developed and deeply assessed for a broad range of traits including biotic and abiotic stresses, morphological and quality traits, yield, and yield components. Genomic characterization through genotyping by sequencing-based methods and/or whole genome resequencing have been implemented to understand the genetic basis of important genes/QTLs controlling phenotypic variation of traits useful for organic farming. These activities involved the evaluation of several thousands of individuals across multi-location and multi-year trials, generating big data amounts, and broadening both genomic and phenomic information for the three crops. The knowledge provided by BRESOV, is fundamental and can be exploited by different stakeholders in order to boost the varietal sector for organic farming.*

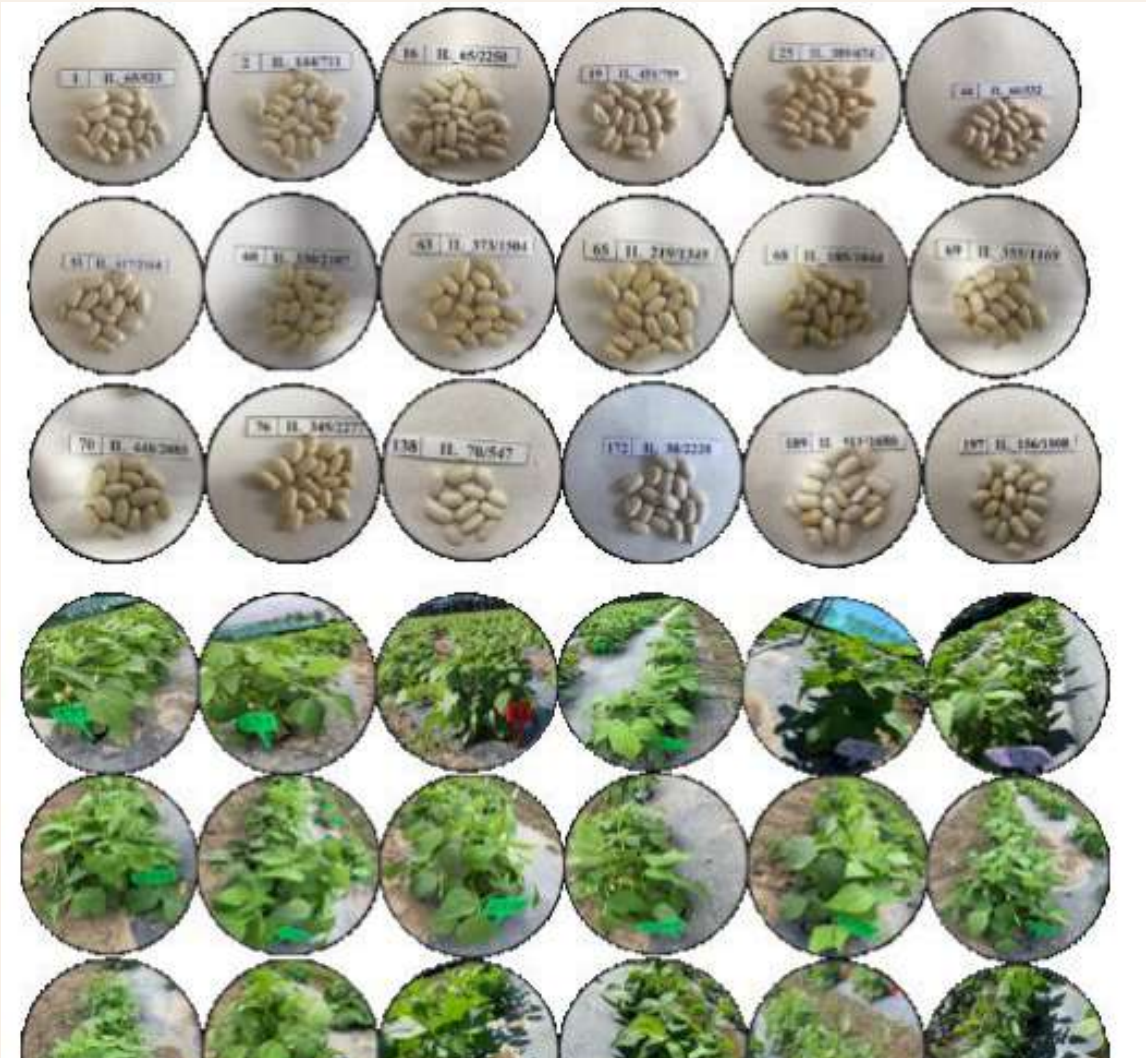
G. Campanelli (CREA): *Tomato cultivation and phenotypic characterization of all the plants were made within an experimental field certified for the organic cultivation method for over 20 years and this field is often visited by Italian farmers and technicians. The field is located in the Marche region in Monsampolo del Tronto in the Adriatic coast.*

In June 2022 the deliverable “SELECTED SET of recommended materials for organic agriculture” was submitted (EC approval pending). This deliverable was led by UNICT and involved UNIVPM, SERIDA, VRDS, UNIVPM, CREA, INRAe, PSR, UNILIV.

The objective of WP3 is to develop high-quality, resilient cultivars for brassicas, tomato and snap bean adapted to organic agriculture based on a set of materials identified in early stages of the project (BREEDING SET) based on already existing available information. In this way, WP3 focused on exploiting available genetic diversity from the newly assembled BRESOV repository plus selected plant materials developed in WP2 that was incorporated in WP3 to develop a SELECTED SET of materials.

Selection and breeding schemes, including complementary hybridization, backcross breeding and pyramiding breeding, performed on materials of the BREEDING SET and SELECTED SET, were used to select and develop new materials specifically adapted to organic breeding. Phenotyping kits developed for each crop and genotyping techniques, including those generated in WP2, were used for selection of complex traits related to resilience under organic conditions, specifically tolerance or resistance to crop-specific relevant abiotic and/or biotic stresses. Final product quality traits were scored to identify materials with high organoleptic and/or functional properties.

This deliverable provides a SELECTED SET of recommended materials for organic agriculture. Materials have been selected based on a combination of data obtained in Tasks 3.1, 3.2., and WP2: a) best general performance materials (Task 3.1); b) outstanding WUE, NUE, or tolerance to water and/or nitrogen deficiency stress (Task 3.1); c) tolerance or resistance to prevalent pests and diseases under organic conditions (Tasks 3.1. and 3.2).





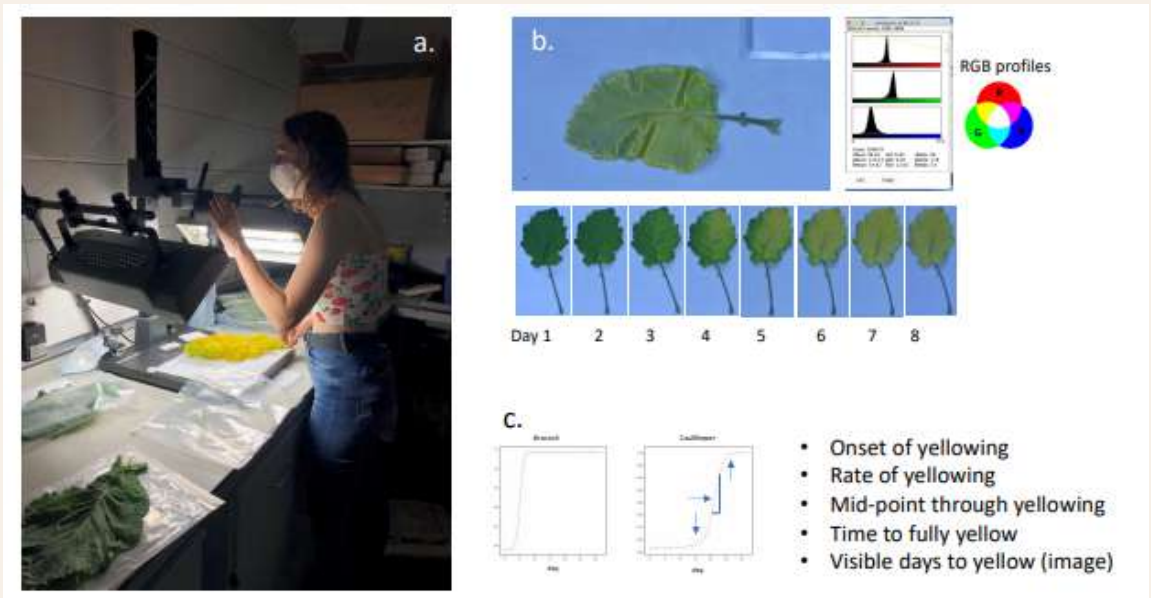
Seeds and growing plants of some ILs selected by VRDS



Fruit morphological variability of some accessions of the selected set



BolAGDH mapping population salinity tolerance trial



Dark-induced time-course experiment. a. leaf image acquisition; b. RGB data extraction from leaves; c. logistic curve plotting.

Some of the authors of the report shared their personal take on the experiments:

F. Branca (UNICT): We have selected about 130 accessions for brassica oleracea L., 36 for Solanum lycopersicum L. e 250 for Phaseolus vulgaris with relevant characteristics recommended for organic agriculture: both resistance to water stress and various etiological agents responsible for diseases and loss of productivity related to the different species and agronomic, qualitative and nutritional characteristics valuable for production under organic conditions in order to achieve one of the objective of BRESOV project that is support and innovate the organic agriculture in the global market.

J.J. Ferreira (SERIDA): In the BRESOV project, we were able to collect a set of 311 snap beans (Snap Bean Panel, SBP), including, landraces, all cultivars, and elite cultivars. For three years, the SBP was evaluated in the field in SERIDA (Villaviciosa, Asturias, Spain). The field trials had two or three replicates per line with 10 plants (see field trials) and were carried out in organic conditions. Only a couple of treatments per year were applied to control aphids. These fields were used to study the morphological and agronomic characteristics: plant growth habits, pod traits, presence of naturally infected diseases, and production. The results showed the wide phenotypic diversity of pod phenotypes present in this panel (see publication) and revealed some lines with high and stable productions. Adding all the results, 20 lines were preselected as the best adapted to local organic farming. However, in the context of climate change, permanent efforts to test the behaviour of the varieties in the field along with plant breeding are necessary.





In August, Deliverable “Recommendation for alternative crop fertilization and use of mycorrhiza under water stress conditions” was submitted (EC approval pending). This deliverable was led by ITAKA and involved FibL, UNICT and SECL.

The objectives of this task were to provide farmers with recommendations on the use of alternative fertilisers and microorganisms. The trials were carried under on-farm production conditions as well as controlled conditions, in normal water conditions and situation under drought stress.

The trials did not show significant differences between treatments, in situation of equal total NPK (and different fertilizers) with or without the addition of microorganisms. Working with living material, such as compost, and soils, introduced a great variability especially in terms of microbial composition and organic matter content. The topic proved to be complex and requiring extensive trials over several years. To investigate further, a bibliographic review was made on the factors influencing plant-microbe interaction, which was subsequently published.

Further conclusions indicated that well-structured soils, rich in organic matter were less influenced by the introduction of alternative fertilisers and microorganisms. On the contrary, additional trials performed using poorer, less structural soils confirmed a positive effect from microorganisms, and an interaction between microorganisms, betaines and snap bean genotypes, confirming new opportunities to study the interaction between organic matter, microorganisms and plants.

Additionally, we developed a survey on farmers’ awareness, use and experience with alternative solutions. The majority of respondents were farmers, with a majority working in organic farming. The questions of the survey were technical and related to what they effectively did on their farms. It showed that most respondents have a good understanding of the technical aspects, use alternative fertilisers as well as microorganisms and in general recommend their use.



One of the authors of the report shared her personal take on the task:

J. Herforth-Rahmé: *Our work in this task has shown that there is interest of stakeholders to use alternative fertilizers and microorganism formulations in their production. Alternatives such as compost are broadly used in organic agriculture. The use of alternative fertilizers is recommended by farmers, and in our trials it has led – in the case of compost - to crop production results comparable to the use of commercial fertilizers. Under water stress condition, we could not see a positive effect of the tested microorganism formulation. Too many factors indeed influence the results (e.g. organic matter, soil quality) and the test of several formulations or microorganisms is needed under various controlled and applied conditions to allow for specific recommendations.*

Latest news

Where has the BRESOV team been?

In the last 6 months, BRESOV was showcased at various events, for example: scientific conferences, congresses, exhibitions, open days, seminars, webinars addressing various types of audiences.

Here are the highlights from some of them:

XXVIII Xornaes de les Fabes de Villaviciosa 2022

24 March 2022, SERIDA and Villaviciosa organized a Technical conference on cultivation with the following talks given by J.J. Ferreira and A. Campa respectively:

- Strategies to advance in the sustainability of the bean crops
- Working lines in progress to increase the sustainability of the bean crops in Asturias

In both talks, objectives and results of the BRESOV project were shown.



Photos from the XXVIII Xornaes de les Fabes de Villaviciosa 2022

UNIVPM seminar on BRESOV project with a focus on the characterization of snap bean genetic resources

On 7 April 2022, UNIVPM organized a seminar for students of the Master’s Degree in Food and Beverage Innovation and Management where BRESOV project was presented with a focus on the characterization of snap bean genetic resources.

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Master’s Degree in Food and Beverage Innovation and Management (LM
FABIAM)

Course ‘Genetic Resources and Food Traceability’

SEMINAR
Thursday 07 April 2022

**BRESOV project: focus on the characterization of snap
bean genetic resources**

*BRESOV project presentation and focus on activities related to quality traits
characterization of snap bean genetic resources*

Prof. Elena Bitocchi
e.bitocchi@univpm.it

BRESOV – Breeding for resilient, efficient and sustainable organic vegetable production, funded by the European Union’s Horizon 2020 research and innovation programme under grant agreement No 774244.

Screenshot of the poster of the seminar organized by UNIVPM

Horizon Results Booster webinar

On 25 May 2022, Horizon Results Booster, webinar took place, where Amelie Detterbeck, Euroseeds Technical Expert on BRESOV project was one of the invited speakers and shared the positive experience that the project partners had with the HRB service to further shape the exploitation strategy of BRESOV.

Info Session on the Horizon Results Booster

HRB for BRESOV project – Breeding for Resilient, Efficient and Sustainable Organic Vegetable Production

prepared by Dr. Amelie Detterbeck, Euroseeds/BRESOV



Screenshot of the presentation of Amelie Detterbeck (Euroseeds) at the HRB webinar#

The Night of Scientists

VURV took part in the Night of Scientists where they presented their involvement and contribution to the BRESOV project in the field of brassica vegetables.



Photo of the VURV stand at the Night of the Scientists.

Zhejiang Seed Industry Expo

On 20 May 2022, ZAAS research groups of BRESOV project participated in the annual Zhejiang Seed Industry Expo, where they showed the varieties of broccoli, tomato and common bean suitable for organic planting, as well as the supporting technologies.





Photos from ZAAS at the Zhejiang Seed Industry Expo.

The Association of Producers and Marketers of the Valencian Tomato landrace meeting

On 26 May 2022, the Association of Producers and Marketers of the Valencian Tomato landrace was presented today at the UPV. Several Horizon2020 projects such as BRESOV and HARNESSTOM have contributed to the enhancement of this local variety.



Photos from the Association of Producers and Marketers of the Valencian Tomato landrace meeting at the UPV.

XX EUCARPIA Meeting of the Tomato Working Group

On 31 May -3 June 2022, UPV organized the XX EUCARPIA Meeting of the Tomato Working Group, where BRESOV project was presented by the Tomato Crop Group Leader CREA.



Teodoro Cardi (CREA) presented the BRESOV project at the XX EUCARPIA Meeting of the Tomato Working Group.

FibL Open Day

On 26 June, FiBL organized the Open Day with guided tours on the activities of FiBL including their work in the vegetable research team. A poster about BRESOV was displayed throughout the day and the project was presented during the tours.



Photos from the FiBL Open Day.

Ecobreed's 4th Annual Meeting

BRESOV Project Coordinator Prof. Ferdinando Branca (UNICT) took part at the Ecobreed's 4th Annual Meeting as part of the Scientific Advisory Group.





Screenshot of the virtual participants of the Ecobreed's 4th Annual Meeting (including Prof. Branca).

BRESOV at the National Agrosalon Země živitelka, Czech Republic

On 25-30 August VURV took part in the National Agrosalon Země živitelka presenting BRESOV in their stand. This event attracted over 100 000 visitors ranging from general public to competent authorities.



The VURV booth at the National Agrosalon Země živitelka

31st International Horticultural Congress, Angers (France)

Several BRESOV partners (UNICT, FiBL, VRDS, Euroseeds) presented their work at the 31st International Horticultural Congress.



Presentations of BRESOV partners (UNICT and FiBL) at the 31st International Horticultural Congress.

BRESOV at GPZ German plant breeding conference

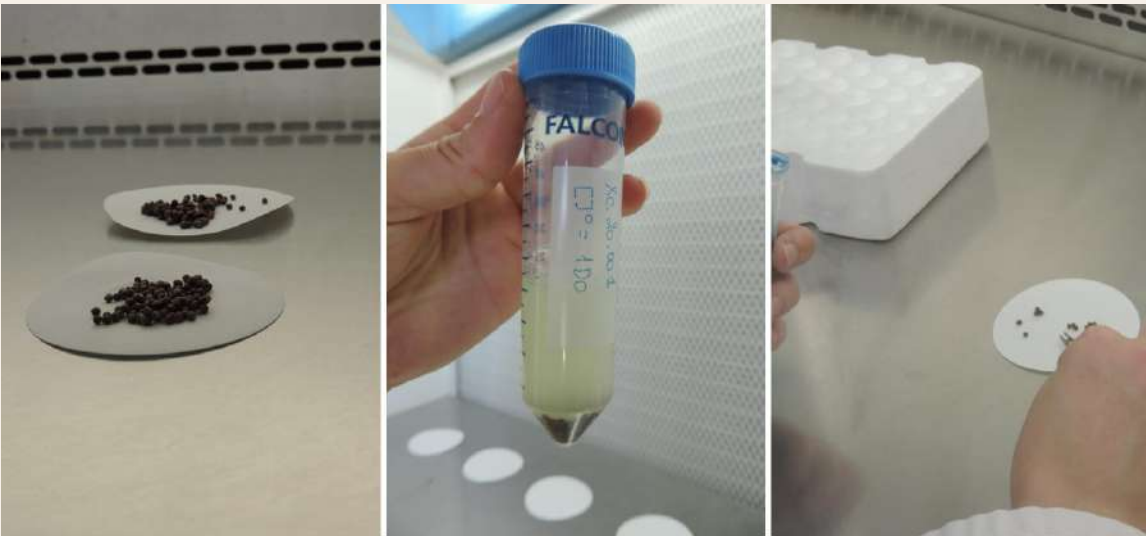
BRESOV project results, as well as the possibilities of facilitating research uptake by the private plant breeding sector were presented by Euroseeds at the GPZ German plant breeding conference at the Heinrich-Heine-Universität in Düsseldorf on 12 September 2022.





Poster presentation of BRESOV at the GPZ German plant breeding conference

News from the lab and the field



Vegenov preparing the 2021 trial on broccoli - evaluation of seed treatment towards Xanthomonas infection in seeds (1st cycle on variety Ironman).



Vegenov performing a trial on broccoli - evaluation of seed treatment towards Xanthomonas infection in seeds- set up and observations of the 2021 trial (1st cycle on variety Ironman).

Scientific publications

In the last 6 months, BRESOV project has published several scientific publications:

- Pasquale Tripodi, Maria R. Figàs, Fabrizio Leteo, Salvador Soler, María José Díez, Gabriele Campanelli, Teodoro Cardi, Jaime Prohens
Genotypic and Environmental Effects on Morpho-Physiological and Agronomic Performances of a Tomato Diversity Panel in Relation to Nitrogen and Water Stress Under Organic Farming
Frontiers in Plant Science, 13, 2022; 10.3389/fpls.2022.936596
- Timpanaro,Branca ,Cammarata, Di Bella, Foti, Scuderi
Biodiversity enhancement for susatinability organic seed production of Broccoli (Brassica oleracea var. Italica Plenck)
Sustainability 2022, 14(11), 6417, 2022; https://doi.org/10.3390/su14116417
- Hajer Ben Ammar, Valentina Picchi, Donata Arena, Simone Treccarichi, Giulia Bianchi, Roberto Lo Scalzo, Sonia Marghali and Ferdinando Branca
Variation of Bio-Morphometric Traits and Antioxidant Compounds of Brassica oleracea L. Accessions in Relation to Drought Stress
Agronomy 2022, 12(9), 2016; https://doi.org/10.3390/agronomy12092016
- P. Schwitter, A. Detterbeck and J. Herforth-Rahmé
Effect of harvest frequency, seed extraction time point and post-harvest cooling on organic tomato seed production
Sustainability 2022, 14(18), 11575; https://doi.org/10.3390/su141811575
- Maria Jurado, Ana Campa, Juan Jose Ferreira
Differentially expressed genes against Colletotrichum lindemuthiamum in a bean genotype carrying the Co-2 gene revealed by RNA-sequencing analysis
Front. Plant Sci., 15 September 2022; doi: 10.3389/fpls.2022.981517

Visit [BRESOV website](#) to consult all scientific publications of the project.

BRESOV throught the camera lens

In the past 6 months, BRESOV partners have developed a number of video material showcasing their work on the project:

P16-SERIDA created several videos:

- A [slideshow](#) of the 2022 bean field trial that was completed (15 prebreeding lines from BRESOV).
- A [slideshow](#) showing new snap bean genotypes that are being tested in the 2022 organic field.
- A [video](#) where they show the process of identifying the bean plants resistant to bean common mosaic virus which is a common disease in the local bean crops
- A [video](#) showing 20 homozygous snap bean families in greenhouse

What is next?

- 19-22 September 2022: [X Plant Genetic Improvement Congress](#), Pontevedra (Spain)
- 24-26 October 2022: [Euroseeds 2022 Congress](#), Berlin (Germany)
- 18-21 October 2022: [International Legume Society Conference](#), Granada (Spain)
- postponed to 19-22 September 2023
- April 2023: 5th and final BRESOV Progress Meeting in 2023, Catania (Italy)

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