BRASSICA WG REPORT FOR PHASE X (2019-2023)

Submitted to the 17th Steering Committee Meeting, Oeiras, Portugal, May/June 2023
by: Ferdinando Branca

Date of compilation: 24 April 2023

1. CONTRIBUTION TO ECPGR OBJECTIVES

1.1. Achievements and success stories

- To efficiently conserve and provide access to unique germplasm in Europe through AEGIS and the European Collection

  The EUBRASWILD project will provide new accession to AEGIS at the end of the 2023

- To provide passport and phenotypic information of actively conserved European PGRFA diversity *ex situ* and *in situ* through the EURISCO catalogue

  The EUBRASWILD project will provide passport and phenotypic data to EURISCO database

- To improve *in situ* conservation and use of crop wild relatives

  The BRESOV project provides useful information for use of Brassica CWRs

- To promote on-farm conservation and management of European PGRFA diversity

  The BRESOV project with its stakeholders is conserving some accessions on farm and materials useful for organic breeding and farming

- To promote use of PGRFA

  All the accession are transferred by SMTAs

1.2. Gaps or constraints identified

The *Global Strategy for Brassica* indicated the following collection gaps:
“Ideally, global collections of *Brassica* crops, as for other crops would cover different crop types and wild species at sufficient depth (in terms of numbers of accessions) that crop genepool diversity in terms of alleles and frequencies is represented and conserved. Like most crops, the global collections of *Brassica* crops seem to offer in-depth coverage of some parts of the genepool more than others; this is certainly true even when considering the six major cultivated species (Table 6). Gaps in collections first require identification and description before activities (for example collection missions) are undertaken to address and resolve the gaps.

Gaps in collections were indicated by 18 respondents. The type of gap reported is shown in Table 8. Ecogeographic and genetic gaps were the most commonly identified, but gaps in the taxonomic coverage of collections was frequently identified as well. Much small numbers of respondents indicated gaps in existing CWR samples within their collection, and on respondent indicated that particular crop types were missing. Some collections had plans in place to deal with collections gaps; three respondents indicated collection activities were planned, eight would like to undertake such activities in the future is resources permitted. Four respondents indicated no plans were in place, and a further nine gave no information on future plans. Where comments were given about the nature of gaps and plans to address them, the recognition among collection managers of the importance of ecogeographic coverage was clear. Other desirable targets included specific crop types, acquiring material with novel pest and disease resistance and ensuring that a good representation of genetic diversity within crops from specific countries or regions was conserved.
The workshop discussions on the topic of collection gaps revealed a recognition of the importance of collections working together; it was generally seen as a waste of resources to acquire material already held in other collections which is available for distribution. Joint projects are likely to be needed, particularly to aid smaller collections in meeting their goals in addressing gaps in their collection coverage. An additional constraint on gap filling and collection expansion are the requirements surrounding Access and Benefit Sharing. On the whole, workshop participants felt that in general, CWR are covered less well than cultivated types in collections"

Table 8. Summary of gaps identified by 26 survey respondents

Gap type	Frequency of mention by survey respondents
Ecogeographic	13
Genetic	13
Taxonomic	12
CWR	2
Crop type	1

Several *Brassica* landraces and CWRs need to be regenerated soon

2. GRANT SCHEME ACTIVITIES, WG MEETINGS AND EVA ACTIVITIES

- **Grant Scheme proposals (submitted:2; approved:1 (March 2020))**
  - Capturing Brassica Wild Relatives Diversity in South Eastern Europe (EUBRASWILD) (3rd call)

- **Total number of partners involved: 13 from 7 countries**
  - ECPGR-funded: 7 from 7 countries
  - Self-funded: 6 from 3 countries

- **Meetings held**
  EUBRASWILD
    - 1st Activity meeting, online, 30 November 2020
    - 2nd Activity meeting, online, 3 March 2021

- **Reports and related data**
  EUBRASWILD Interim Activity Report (2022)

- **Funds mobilized**
  - ECPGR granted funds: € 23,500
  - Inputs in-kind declared in Grant activities: Field collection establishment and maintenance expenses

3. OTHER ACTIVITIES (CROSS-WORKING GROUP ACTIVITIES, LINKS WITH OTHER NETWORKS, INTERNATIONAL PROJECTS AND INITIATIVES)

- **Cross-Working Group activities**:
  - H2020 BRESOV project is ended and by it the was an interaction among the Brassica, Legume and Solanacea WGs
  - BRESOV Winter School Sicily 2022
  - BRESOV Conference 2023

- **Others:** The second version of *A Global Strategy for Brassica* coordinated by Charlotte Allender

4. WORKING GROUP DOCUMENTS AND PUBLICATIONS

- Scuderi A., Timpanaro G., Branca, F., Cammarata M., 2023. Economic and Environmental Sustainability Assessment of an Innovative Organic Broccoli Production Pattern. *Agronomy*, *13*, 624. https://doi.org/10.3390/agronomy13030624
- Ben Ammar H., Arena D., Treccarichi S., Di Bella M.C., Marghali S., Ficcadenti N., Lo Scalzo R., Branca F., 2023. The Effect of Water Stress on the Glucosinolate Content and Profile: A Comparative Study on Roots and Leaves of *Brassica oleracea* L. Crops. *Agronomy*, *13*, 579. https://doi.org/10.3390/agronomy13020579
- Treccarichi, S.; Ben Ammar, H.; Amari, M.; Cali, R.; Tribulato, A.; Branca, F., 2023. Molecular Markers for Detecting Inflorescence Size of *Brassica oleracea* L. Crops and *B. oleracea* Complex Species (n = 9) Useful for Breeding of Broccoli (*B. oleracea* var. *italica*) and Cauliflower (*B. oleracea* var. *botrytis*). *Plants* , *12*, 407. https://doi.org/10.3390/plants12020407
- *Treccarichi S.*, Rizzo G.F., *Branca* F., 2022. In vitro culture for micropropagation, somatic embryogenesis, somatic mutation, and somatic hybridization in œBrassica juncea. In Kole C. and Mohapatra (eds.): The Brassica juncea genome. Compendium of Plants Genomes. https://doi.org/10.1007/978-3-030-91507-0_9
- Branca, F., Papa, R., Bitocchi, E., Ferreira, J., Cardi, T., Tripodi, P., Lozano, R., Ovesna, J., Sheng, X., Dever, L., Walley, P. and Prohens, J., 2022. Developing new cultivars of broccoli, snap bean, and tomato for resilient, efficient, and sustainable organic vegetable production: preliminary results of the H2020 BRESOV project. Acta Hortic. 1355, 81-90. DOI: 10.17660/ActaHortic.2022.1355.11
- Arena, D., Treccarichi, S., Di Bella, M.C., Achkar, N., Ben Ammar, H., Picchi, V., Lo Scalzo, R., Amari, M. and Branca, F., 2022. Evaluation of *Brassica oleracea* L. crops

and wild relatives for bio-morphometric and biochemical characteristics. Acta Hortic. 1355, 71-80. DOI: 10.17660/ActaHortic.2022.1355.10

- Di Bella, M.C., Treccarichi, S., Arena, D., Nicotra, R., Mazzaglia, A., Melilli, M.G., Bartoszek, A., Kusznierewicz, B., Parchem, K. and Branca, F., 2022. Evaluation of Sicilian landraces of broccoli (*B. oleracea* var. *italica* Plenck) for quality traits. Acta Hortic. 1354, 343-350. DOI: 10.17660/ActaHortic.2022.1354.44
- Bianchi, G., Picchi, V., Lo Scalzo, R., Campanelli, G., Ficcadenti, N., Dattoli, M.A., Sestili, S., Arena, D., Di Bella, M.C. and Branca, F., 2022. Agrobiodiversity in organic *Brassica* crops: relationship between pigment composition and antioxidant activity. Acta Hortic. 1354, 317-324. DOI: 10.17660/ActaHortic.2022.1354.41
- Di Bella, M.C., Melilli, M.G., Treccarichi, S., Tribulato, A., Arena, D., Ruffino, A., Argento, S. and Branca, F., 2022. Influence of irrigation regime on productive and qualitative traits of kale (*Brassica oleracea* var. *acephala* DC) under organic farming system. Acta Hortic. 1354, 301-308. DOI: 10.17660/ActaHortic.2022.1354.39
- Branca, F., Di Bella, M.C., Arena, D., Tribulato, A., Kusznierewicz, B., Parchem, K. and Bartoszek, A., 2022. Chemical characterization of wild populations of *Brassica oleracea* complex species (*n*=9) for the content of their bioactive compounds. Acta Hortic. 1354, 137-144. DOI: 10.17660/ActaHortic.2022.1354.18
- Treccarichi, S., Infurna, M.G., Malgioglio, G., Arena, D., Ruffino, A., Prohens, J.T. and Branca, F., 2022. Evaluation of tomato rootstock in Sicilian greenhouse growing conditions. Acta Hortic. 1354, 129-136. DOI: 10.17660/ActaHortic.2022.1354.17
- Pepe, A., Palma, D., Leteo, F., Piccinini, E., Campanelli, G., Sestili, S., Ficcadenti, N., Bianchi, G., Picchi, V., Lo Scalzo, R., Treccarichi, S., Amari, M. and Branca, F., 2022. Evaluation of advanced breeding lines of broccoli and cauliflowers for agronomic and quality traits. Acta Hortic. 1354, 119-128
- Ben Ammar, H., Sdouga, D., Di Bella, M.C., Treccarichi, S., Cali, R., Rosa, E., de Castro, I., Branca, F. and Marghali, S., 2022. Detection of glucosinolate metabolite pathway using SSR markers of *Brassica oleracea* complex species (*n*=9) core collection. Acta Hortic. 1354, 105-110. DOI: 10.17660/ActaHortic.2022.1354.14
- Ben Ammar, H., Picchi, V., Arena, D., Treccarichi, S., Bianchi, G., Lo Scalzo, R., Marghali, S., Branca, F., 2022. Variation of Bio-Morphometric Traits and Antioxidant Compounds of *Brassica oleracea* L. Accessions in Relation to Drought Stress. *Agronomy* **2022**, *12*, 2016. https://doi.org/10.3390/agronomy12092016
- Timpanaro, G.,,Branca, F., Cammarata, M., Di Bella, M.C., Foti, V.T., Scuderi, A, 2022. Biodiversity Enhancement for Improving the Sustainability of Broccoli (*Brassica oleracea* vr. *italica* Plenk) Organic Seed Production. *Sustainability*, *14*, 6417. https://doi.org/10.3390/su14116417
- Wu X., Fang P., Zhang P., Sun T., Wang X., Branca F., Xu P., 2022. Improvement for Quality and Safety Traits in Horticultural Plants. Frontiers in Plant Science, 13. https://doi.org/ 10.3389/fpls.2022.927779
- Di Bella, M.C., Toscano, S., Arena, D., Romano, D., **Branca, F.**, 2021. Effects of growing cycle and genotype on the morphometric properties and glucosinolates amount and profile of sprouts, microgreens and baby leaves of broccoli (Brassica oleracea L. var. italica plenck) and kale (B. oleracea L. var. acephala dc.). Agronomy, 2021, 11(9), 1685.
- Cartea, M.E., Di Bella, M.C., Velasco, P., Toscano, S., **Branca, F**., 2021. Evaluation of Italian and Spanish accessions of Brassica rapa L.: Effect of flowering earliness on fresh yield and biological value. Agronomy, 11(1), 29.

- Tribulato, A., Toscano, S., Di Bella, M.C., Romano, D., **Branca, F**., 2020. Brassica oleracea complex species in Sicily: Diversity, uses and conservation strategies. Acta Horticulturae, 2020, 1297, pp. 61–68.
- Toscano S., **Branca F**., Romano D., Ferrante A., 2020. An Evaluation of Different Parameters to Screen Ornamental Shrubs for Salt Spray Tolerance. Biology, 9(9), 1-16.
- Sheng X.-G., **Branca F**., Zhao Z.-Q., Wang J.-S., Yu H.-F., Shen Y.-S., Gu H.-H., 2020. Identification of Black Rot Resistance in a Wild *Brassica* Species and Its Potential Transferability to Cauliflower. Agronomy, 10(9), 1400.
- Picchi V., Lo Scalzo R., Tava A., Doria F., Argento S., Toscano S., Treccarichi S., **Branca F**., 2020. Phytochemical Characterization and In Vitro Antioxidant Properties of Four *Brassica* Wild Species from Italy. Molecules, 25(15), 3495.
- Di Bella M.C., Niklas A., Toscano S., Picchi V., Romano D., Lo Scalzo R., **Branca F**., **2020**. *Morphometric Characteristics, Polyphenols and Ascorbic Acid Variation in* Brassica oleracea *L. Novel Foods: Sprouts, Microgreens and Baby Leaves*. Agronomy, *10*, 782. https://doi.org/10.3390/agronomy10060782
- Argento S, Melilli MG, Branca F. 2019. Enhancing Greenhouse Tomato-Crop Productivity by Using *Brassica macrocarpa* Guss. Leaves for Controlling Root-Knot Nematodes. (773,3 KB) Agronomy 9:820. doi:10.3390/agronomy9120820
- Branca, F. 2019. Position paper: What do bean, broccoli and tomatoes have in common?

5. EXPECTED ADDITIONAL ACHIEVEMENTS AND FUTURE ACTIVITIES THAT COULD CONTRIBUTE TO THE IMPLEMENTATION OF THE PGR STRATEGY FOR EUROPE

- Trends in terms of the number of *in situ* conservation sites with management plans that specifically address crop wild relatives and wild food plants and percentage of these sites out of the total.
- The increase of collecting and conserving *ex situ* crop wild relatives and minor crops for climate change preparedness, were highlighted as a need.
- Germplasm collection can be used to identify specific alleles that are useful for developing crop varieties that are adapted to new condition needs.
- Agricultural systems that depend too heavily on a limited number of crop varieties and species lack resistance and can be prone to yield losses due to pests and diseases.