

Odissea Seminum

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Odissea Seminum = The Odyssey of Seeds

EDITORIAL

Another year has ended and this year we will gather in Murcia to celebrate 20 years of the germplasm bank of the Region of Murcia, but also to celebrate 20 years since the beginning of the GENMEDA network adventure.

At the beginning we were only 13 partners from 7 Mediterranean countries; today we are 31 and representing 14 countries. We have been able to grow and carry out numerous international projects aimed at conserving, both *in situ* and *ex situ*, the Mediterranean endangered flora.

Together we have faced many challenges and have opened ourselves up to collaboration with numerous public institutions and private foundations to support the battles in defence of our flora, habitats and more generally the cultural heritage of the Mediterranean Basin.

Today, the GENMEDA network is a concrete example of integration, collaboration and policy development aimed at environmental sustainability.

The network partners conserve germplasm in their seed banks and botanical gardens, study and monitor the Mediterranean plant diversity and are actively engaged in preserving it.

Together with the IUCN Mediterranean, we have initiated the Mediterranean Plant Conservation Weeks and after four editions, celebrated in less than 10 years, we are now preparing to organise the fifth to be held in Cyprus in 2025. This adventure, which started in Montenegro in 2016 has also seen an increasing participation and in the last edition, celebrated in Valencia October 2023, more than 600 researchers from 30 European, African and Near Eastern countries joined.

I would like to thank all the partners for their great dedication and commitment over these years and all the public and private institutions that have supported us and continue to support us.

Best wishes to everyone for the New Year 2024 that begins!

Gianluigi Bacchetta, GENMEDA President



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The NETWORK

ARTICLES

15 years of the Germplasm Bank of the Botanic Garden of Castilla-La Mancha. A singular effort for the ex situ conservation of wild flora from the continental Mediterranean area

Santiago A.^{1*}, Celaya N.², García-Saúco G.¹, Ferrandis P.^{1, 2}, Herranz J.M.^{1, 2} ¹ Botanic Garden of Castilla-La Mancha. Avenida de La Mancha, s/n. 02004 Albacete. Spain. ² ETSIAMB, Department of Plant Production and Agricultural Technology, University of Castilla-La Mancha, University Campus s/n, 02071 Albacete

*Correspondence: conservador@jardinbotanico-clm.com

Castilla-La Mancha is a Spanish autonomous community located in the centre of the Iberian Peninsula. It borders Madrid and Castilla y León in the north and northwest, the Valencian Community and Murcia in the east and southeast, Andalucía in the south and Extremadura in the west. Therefore, it occupies an inland position in the centre-south of the oriental part in the Iberian Peninsula.

The region includes mountainous areas such as the Montes de Toledo in the west, which act like a natural barrier, the Sierras of Segura and Alcaraz, in the south of the province of Albacete, and the Serranía de Cuenca in the East. Regarding the hydromorphology, the Tagus is the most important river which runs through the region, and its basin influences the geography and the landscape of the area. Other important rivers are the Guadiana and the Júcar. Wetlands are equally important, such as the Lagunas de Ruidera and the Tablas de Daimiel, and the salt outcrops originated by the evaporation of briny water contribute to the biological diversity and offer important ecosystem services.

However, a big part of Castilla-La Mancha includes a vast central plain known as La Mancha, which mainly occupies the provinces of Ciudad Real and Albacete.

Although the influence of the Mediterranean Sea becomes evident as we move towards the easternmost territories, most of the region has a continental Mediterranean climate. This climate is characterised by hot dry summers and cold winters, in which temperatures can vary considerably from day to night (up to 20 °C), with great interannual variations (up to 60 ºC). On the other hand, rainfall tends to concentrate in spring and autumn, and the region experiments low precipitations, which contributes to aridity in certain areas such as La Mancha or the semiarid Campos de Hellín.

Due to the climate features described above, most of the vascular plant species found in Castilla-La Mancha have orthodox seeds. This is probably linked to the seeds' necessity to overcome the summer drought while keeping their viability, considering the fact that many native species release their seeds at the end of spring or in summer. Regarding the diversity of flora in Castilla-La Mancha, if we evaluate the different checklists of vascular plants elaborated so far with a certain precision and the possible extrapolation of species richness from other Mediterranean areas, in which the number of species by surface grows logarithmically, we could estimate that the regional flora may reach a quantity of 3,500-4,000 taxa (Hernández-Bermejo et al., 2011).

Besides, the region is rich in flora of interest, as the total number of endemic taxa might be around 350 (Herranz et al., 1993). It is at this point that the ex situ conservation of wild plant species plays a major role, as it complements and supports in a decisive manner the in-situ conservation actions that are being implemented with the aim of protecting wild populations and their habitats (Iriondo, 2001).

In addition, wild seed banks (also known as germplasm banks) provide a clear certainty for a successful ex situ conservation, as seeds kept in such institutions are fundamental to understanding the biology and evolution of plants, and to supporting scientific research in different fields such as genetics, molecular biology and ecology. They are also useful tools in rewilding projects and ecological restoration. At the same time, they supply a diverse genetic resource that can be used to improve crops and enhance their resistance to diseases and adverse climate conditions.

Thus, we could argue that the main objectives of the Germplasm Bank of the Botanic Garden of Castilla-La Mancha (BG-JBCLM) have a direct relationship with the phylogenetic conservation of the flora of Castilla-La Mancha and southeast Spain, the scientific research on such resources and the ecological restoration. It is also the source of the wild plants represented in the recreated habitats of the Botanic Garden of Castilla-La Mancha.



Figure 1. Limestone rockery represented in the Botanic Garden of Castilla-La Mancha.

Methods:

This bank was originally designed with the idea of preserving orthodox seeds (they can be dehydrated to a minimum of 4-5% of humidity and subzero temperatures) of endangered regional flora of Castilla-La Mancha, although the range of species subject to collection and conservation has been expanding since its creation.

The conservation process and methodology used is the same as that of the REDBAG (Spanish Network of Wild Native Germplasm and Phytoresource Banks), which was implemented according to the Department of Plant Biology of the Polytechnic University of Madrid (Gómez-Campo, 2007).

Broadly speaking, the conditions of the BG-JBCLM are as follows. After collecting the seeds, the samples are dried inside a desiccator with silica gel. Once clean and desiccated, the seeds are kept in glass vials (long-term collection), that are flame sealed. These vials are then hermetically pun inside Kilner glass jars with silica gel, which can indicate the presence of humidity should the jar break or open accidentally. Other plastic tubes are also used (active collection) in a similar way (Fig. 2). Finally, both collections are stored in cold chambers at a temperature of -11 °C for the long-term preservation of the seeds.



Figure 2. Long-term collection (A), active collection (B).

History:

The Germplasm Bank of the Botanic Garden of Castilla-La Mancha was created in 2007 and was financed by the Castilla-La Mancha regional government through a project called "Creation of an endangered wild flora germplasm bank in the Botanic Garden of Castilla-La Mancha". With this initial investment, two refrigeration chambers were purchased in order to store the samples and a technician was hired temporarily to initiate the process of encapsulation and preparation of the accessions. This was possible thanks to the Department of Education and Science of the Castilla-La Mancha government between 2007 and 2009. The first accessions were not integrated into the collection until 2008, with the first one being registered with the code CM-00001-08 (*Sisymbrium cavanillesianum*, endemic species of central Spain, which appears as Vulnerable in the Red List of the Spanish Vascular Flora). That same year and with around a hundred accessions collected (Fig. 1 and 2), the BG-JBCLM joined the REDBAG, a network founded in 2002 by the Ibero-Macaronesian Association of Botanic Gardens (AIMJB).

From March 2008, when the project began, until July 2011, when it came to an end and the technician's contract finished, a total number of 140 municipalities were visited, most of them from Castilla-La Mancha and nearby regions. This period was, without a doubt, very fruitful for the project, as the ex situ conservation objective of the Germplasm Bank of the Botanic Garden of Castilla-La Mancha was broadly achieved. As a result of these field trips, 577 accessions of 415 different taxa, from 60 families, were collected. 28% of these (164) are endangered species included in the Red List of the Spanish Vascular Flora and/or in the Regional Catalogue of Endangered Species of Castilla-La Mancha, of which 2% are Critically Endangered, 6% are Endangered, 10% are Vulnerable and 10% are of special interest (Santiago et al., 2013).

In the following years, from 2012 to 2014, the Seed Bank increased its accession collection (Fig. 1 and 2) thanks to the project "Seed collection and conservation of 65 taxa belonging to the Lamiaceae family from the southeast of the Iberian Peninsula, with an aromatic, medicinal or ornamental interest", which was financed by the Spanish National Institute of Agronomic and Food Research and Technology (INIA). In this project, we highlight 50 endemic taxa of the Iberian Peninsula, 4 Ibero-African taxa and 8 Mediterranean endemisms, so rare and localised species take precedence, and some of them are catalogued as Endangered in the 2008 Red List of the Spanish Vascular Flora (e.g. *Sideritis chamaedryfolia, S. glauca, S. serrata* and *S. stachydioides*) (Herranz et al., 2014).

In January 2014, the number of preserved accessions amounted to 872 in total, of which 830 had been collected in the wild, and 42 included cultivated material from the Botanic Garden of Castilla-La Mancha, in order to have a higher number of seeds in the case of scarce species which had not been collected much in the wild. The 830 accessions collected in the wild belonged to 60 phanerogams and 496 different taxa. Some illustrative figures of that are as follows: 206 accessions of 114 taxa, belonging to endangered taxa included in the Regional Catalogue of Endangered Species of Castilla-La Mancha and/or in the 2008 Red List of Spanish Vascular Flora, 66 Iberian endemic species and 51 accessions (26 taxa) of endemisms of the Western Mediterranean (North Africa and Iberian Peninsula).

In 2014, the Germplasm Bank actively participated in the project Phoenix 2014, by contributing with ex situ conservation protocols and by germinating critically endangered species such as *Vella pseudocytisus* subsp. *pseudocytisus, Sideritis serrata, Coincya rupestris* subsp. *rupestris, Delphinium bolosii and Atropa baetica.*

In 2016, the BG-JBCLM joined the Global Biodiversity Information Facility (GBIF) thanks to an Ibero-Macaronesian Association of Botanic Gardens (AIMJB) project, which was financed by the Fundación Biodiversidad in order to make the data about the species preserved in the REDBAG seed banks more accessible. This project was known as OPENREDBAG, and 909 records of accessions were perfectly georeferenced. In subsequent years, the BG-JBCLM's activity decreased due to a lack of finance, although the outings to collect seeds continued on a smaller scale, and on many occasions, these were in fact financed by the Botanic Garden's staff with voluntary and altruistic contributions (Fig. 3 and 4). Despite the fragile economic situation, in 2020, the Germplasm Bank joined The International Plant Exchange Network (IPEN), which depends on the Botanic Gardens Conservation International (BGCI), which in fact entailed an increase in the external activity of the Bank via its Index Seminum as it was presented jointly with other members of REDBAG.





2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

Figure 3. Representation of the number of accessions collected per year, according to their conservation state (left) and the publication where they are included (right).

*AR (Regulated Use), CR (Critically Endangered), EEP (Strictly Protected), EN (Endangered), IE (Of Special Interest), NT (Near Threatened), SAH (Sensitive to habitat alteration), VU (Vulnerable), NA (With no state of conservation).

*CREA (Regional Catalogue of Endangered Species), ED (European Directive), ERGF (Spanish Strategy for the Conservation and Sustainable Use of Forest Genetic Resources), IUCN (International Union for the Conservation of Nature), LRFVE (Red list of Spanish Vascular Flora), WE (without protection).



Figure 4. Representation of the number of accessions collected per year according to their interest.

*En (Endangered), End (Endemism), F (Culinary), For (Forestry), Med (Medicinal), Orn (Ornamental), Rel (Relict), SF (Singular Flora).

2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

Thanks to these selfless collaborations, the Bank increased its collection to a significant number of 1162 accessions of wild seeds, of 604 taxa in 70 families, mainly Labiatae, Brassicaceae, Fabaceae and Asteraceae. 22% of these taxa are threatened with extinction: 47 are included in the Red List of Spanish Vascular Flora and 85 in the Regional Catalogue of Endangered Species of Castilla-La Mancha. 115 taxa included in the Spanish Strategy for the Conservation and Sustainable Use of Forest Genetic Resources, as well as 85 Iberian endemic taxa and 33 endemisms of the Western Mediterranean area (Herranz et al., 2021).

All the effort that was put into this project was finally recognised by the authorities on 14 April 2022, when the head of Sustainable Development Department of the Government of Castilla-La Mancha signed an agreement with the Albacete City Council, through which the Germplasm Bank of the Botanic Garden of Castilla-La Mancha became the preferential seed bank for the deposit of regional wild flora genetic material, and the official reference centre regarding the conservation of genetic material of endangered wild flora. This laid the foundation for the development of the Network of Genetic Resources of Wild Endangered and Protected Flora of Castilla-La Mancha. Likewise, on 17 July 2023, the BG-JBCLM signed another agreement with the Ministry for the Ecological Transition and the Demographic Challenge of the Spanish Government, through which the BG-JBCLM became the central node of the Network of National Forest and Wild Flora Germplasm Banks.

Finally, on 23 October 2023, during the 4th Mediterranean Plant Conservation Week that took place in Valencia, the BG-JBCLM joined the Network of Mediterranean Plant Conservation Centres (GENMEDA), with a current state of the collection of 1311 accessions of which 30.5% are endangered species, with the following conservation status (Fig. 5): AR (5.88%), CR (7.35%), EEP (4.62%), EN (10.92%), IE (32.35%), NT (4.62%), SAH (3.36%) y VU (30.88%). Additionally, regarding its botanical interest (Fig. 5), it is important to mention that 29.01% are species protected by law, 14.7% are valuable as forest plants, 10.66% have a medicinal interest, 4.35% are endemic taxa, 4.28% have an ornamental value, 3.34% are plants of special interest, 1.52% are edible plants and 1.23% are relict species.



Figure 5.

Proportion of classified flora based on their conservation state (left) and on their interest (right). The percentages represented in the diagrams are those above 10%.

Conclusions

The main objective of the BG-JBCLM is to conserve orthodox seeds of endangered, endemic or singular wild species for its research, as well as for seed exchange with other institutions or botanic gardens, as well as for their use in ecological restoration of wild plant populations, in Castilla-La Mancha and southeast Spain.

Precisely, during its 15 years of history, the BG-JBCLM's main task has been (and should continue to be) the conservation of the seeds of the regional wild flora which could disappear or have their current distribution range, or the number of populations and/or individuals, reduced significantly.

Thus, the accessions conserved in the BG-JBCLM (Fig. 6), are of great value when facing possible extinctions of wild populations or even species. Proof of that is the natural population reinforcements in which the BG-JBCLM has participated in Castilla-La Mancha (*Coincya rupestris* subsp. *rupestris, Delphinium fissum* subsp. *sordidum, Nepeta hispanica, Sisymbrium cavanillesianum, Vella pseudocytisus* subsp. *pseudocytisus, Senecio auricula, Helianthemum guerrae, H. polygonoides, Sideritis serrata* and *S. chamaedryfolia*) (Santiago et al. 2013). Besides, the material contained in the Bank has been used to recreate natural habitats in the Botanic Garden of Castilla-La Mancha, which contributes to general conservation and comprehension of biodiversity and nature, educating visitors and society in general about the importance of native habitats.



Fig 6. Cold storage chambers used to conserve seeds accessions in the BG-JBCLM.

On the other hand, the BG-JBCLM is part of different national networks and it acts as a reference bank for the conservation of genetic resources in Castilla-La Mancha, as well as the main node in the Network of National Forest and Wild Flora Germplasm Banks, which is coordinated by the General Department of Biodiversity, Forests and Desertification of the Ministry for the Ecological Transition and the Demographic challenge of the Spanish Government. It has also taken a big leap towards its internationalisation thanks to its recent inclusion in GENMEDA in 2023, which opens new and exciting horizons for the BG-JBCLM.

All these circumstances, along with the recent hiring of a technician who now works at the Bank thanks to EU funds, allow for good and promising perspectives in the near future, and facilitates our commitment to conserve and protect the phytogenetic plant resources in an area which is barely represented in Germplasm Banks: the continental Mediterranean area in the Iberian Peninsula.

- Gómez-Campo, C. (2007). A guide to efficient long term seed preservation. Monographs ETSIA 170. Univ. Politécnica de Madrid.

- Hernández-Bermejo, J.E., Herranz, J.M. (eds.). (2011). Protección de la diversidad vegetal y de los recursos fitogenéticos en Castilla-La Mancha. La perspectiva existente y el compromiso del Jardín Botánico.

- Herranz J.M., Hernández, J.E., Santiago, A. & Ferrandis, P. (2011). Diseño y prioridades para un banco de germoplasma en el JBCLM. Una respuesta ante el cambio climático y global. En: Protección de la diversidad vegetal y de los recursos fitogenéticos en Castilla-La Mancha. J.E. Hernández Bermejo & J.M. Herranz (eds.) Instituto de Estudios Albacetenses y Jardín Botánico de Castilla-La Mancha, pp. 459-478.

- Herranz, J.M., Santiago, A., Copete, M.A., Ferrandis, P. & Copete, E. (2014) La colección de labiadas aromáticas y medicinales del JBCLM. El Botánico, AIMJB.

- Herranz, J.M., Santiago, A., Copete, E., Copete, M. A., Ferrandis, P. (2021). Conservación de semillas de tipo ortodoxo de especies silvestres en el banco de germoplasma del Jardín Botánico de Castilla-La Mancha. Estatus de las colecciones existentes. Foresta. № 80. Sección: Especial. Subsección: Congreso Español de Botánica. pp 46-51.

- Instituto de Estudios Albacetenses "Don Juan Manuel", 496 pp. (Serie I. Estudios; 197). coed. con el Jardín Botánico de Castilla-La Mancha. Albacete. ISBN 978-84-96800-53-3.

- Iriondo, J.M. (2001). Conservación de germoplasma de especies raras y amenazadas. Investigación Agraria: Producción y Protección Vegetales, 16(1): 5-24.

- Santiago, A., Herranz, J.M. & Ferrandis, P. (2013). El banco de germoplasma vegetal del Jardín Botánico de Castilla-La Mancha: implicaciones para la conservación ex situ de flora silvestre. SABUCO, nº. 9. pp 97-111

ARTICLES

Mission accomplished: Seeds from all 10 Greek plants of the Top 50 Mediterranean Island Plants are now stored in seed banks

Costas A. Thanos¹ and Christini Fournaraki² ¹ National & Kapodistrian University of Athens (NKUA) Seed Bank, ² CIHEAM-MAICh, Mediterranean Plant Conservation Unit

Almost two decades ago, in 2005, the Mediterranean Islands Plant Specialist Group of IUCN (IUCN/SSC) published "The Top 50 Mediterranean Island Plants - Wild plants at the brink of extinction and what is needed to save them" (Montmollin, de & Strahm 2005). The aim of that campaign was to help save plant species that face a high risk of extinction by providing information to and raising awareness among decision makers, conservation practitioners and the general public. The publication was updated in 2017 (Pasta et al. 2017) with the additional goal to assess the impact of the original effort on the conservation status of the plants selected. This initiative has proven of immense value as a driving force together and behind many other conservation initiatives, such as the Biodiversity Treaty (CBD) and the Habitats Directive (Council Directive 92/43/EEC) and numerous relevant projects. In particular, regarding the field of ex situ conservation, Seed Banking gained prominence with two iconic projects: ENSCONET and GENMEDOC/SEMCLIMED, which eventually led to the present day European and Mediterranean networks of Seed Banks (ENSCONET and GENMEDA, respectively).

Among the plants included in the Top 50 Mediterranean Island Plants, 10 species were selected to represent the Island flora of Greece: 4 from Crete and 6 from other Greek islands (Figure 1). Due to the high diversity of the Greek flora, it would be very difficult to make an entirely fair and representative decision: 4 of the plants selected-#3, 4, 6, 7- are from Crete (KK floristic region), 3 from West Aegean (WAe, #2 & 8 from Euboea Island and #1 from Skyros Island), 2 from the islands off southern Peloponnese (Pe, #9 & 10) and 1 from East Aegean (EAe, #5 from Samos Island) while the island floristic regions (Dimopoulos et al. 2013) of Ionian Islands (IoI), North Aegean Islands (NAe) and Kiklades (KiK) were left unrepresented.



FIGURE 1. Greek plants included in the TOP 50 Mediterranean Island Plants.

Table 1 shows a compilation of important information, based in part on the Flora of Greece Web Project (Hellenic Botanical Society, 2017-2023). Except for *Allium calamarophilon* which was initially assessed as DD, due to the lack of population data for the entire period between 1980 and 2023, all other 9 plants have been assessed CR since 2005; however, some of these may change risk category as a current extensive project (implemented by HBS in collaboration with IUCN) of conservation status assessments will conclude by the end of 2023.

TABLE 1. The 10 Greek Island plants of the TOP 50 Mediterranean Island Plants

	Taxon	Family	CS	END	LF	HAB	HD	BRN	PD	SAC	BANK	COL	SEEDS
1	Aethionema retsina Phitos & Snogerup	BRASSICACEAE	CR	YES	С	С	NO	NO	YES	GR2420006	NKUA	2007-08-22 (3)	2,000
2	Allium calamarophilon Phitos & Tzanoud.	ALLIACEAE 1	DD	YES	G	C/P ²	NO	NO	NO	NO	NKUA	2023	1,000
3	Anthemis glaberrima (Rech. f.) Greuter	ASTERACEAE	CR	YES	т	м	YES*	YES	YES	GR4340001	MAICh	2000-23 (12)	70,000
4	Bupleurum kakiskalae Greuter	APIACEAE	CR	YES	С	с	YES*	YES	YES	GR4340008	MAICh	2000-23 (12)	30,000
5	Consolida samia P.H. Davis	RANUNCULACEAE	CR	YES ³	т	Р	YES*	YES	YES	GR4120003	NKUA	2023	1,000
6	Convolvulus argyrothamnos Greuter	CONVOLVULACEAE	CR	YES	С	с	YES*	YES	YES	GR4320002	MAICh	2003-23 (9)	600
7	Horstrissea dolinicola Greuter, Gerstb. & Egli	APIACEAE	CR	YES	G	н	NO	NO	NO	GR4330005	MAICh	2000-20 (8)	17,000
8	Minuartia dirphya Trigas & latroú	CARYOPHYLLACEAE	CR	YES	н	Р	NO	NO	NO	NO	NKUA	2022	1,000
9	Polygala helenae Greuter	POLYGALACEAE	CR	YES	н	Р	NO	NO	YES	NO	NKUA	2023	300
10	Saponaria jagelii Phitos & Greuter	CARYOPHYLLACEAE	CR	YES	Т	М	NO	NO	NO	GR2540002	NKUA	2022-23 (2)	1,500

CS: Conservation Status (2023 assessment is pending); END: Greek Endemic; LF: Life Form (C: Chamaephyte, G: Geophyte; T: Therophyte; H: Hemicryptophyte);

HAB: Habitat Type (C: Cliffs, rocks etc; P: Xeric Mediterranean Phrygana and grasslands; M: Coastal habitats; H: High-mountain vegetation);

HD: Habitats Directive 92/43/EEC (YES*: priority species); BRN: Bern Convention (1979); PD: Presidential Decree (Greece) 67/1981; SAC: Special Area of Conservation;

COL: year(s) of collection(s) (in parenthesis: total # of collections); SEEDS: Total seeds currently banked

¹ AMARYLLIDACEAE according to PoWO;

² New findings: we add P Xeric Mediterranean Phrygana and grasslands (Mediterranean dwarf shrub formations, annual rich pastures and lowland screes);

³ The occurrence in Manisa, Turkey (Minareci et al. 2011) is not proven unequivocally

Most (7 out of 10) of the plants are legally protected within the NATURA 2000 network and 3 of these are further protected by an established Plant Micro-Reserve. Figure 2 shows the 10 plants in flower – 2 of these (#2 & 5) were rediscovered after 42 and 61 years, respectively, and photographed in the field for the first time ever. Figure 3 shows the seeds of all 10 plants (some of them never seen before) which are now collected and stored in our two Seed Banks (NKUA and MAICh). It should be noted that seeds from 5 of these plants were collected for the first time within the framework of the NKUA-RBG Kew joint project "Conserving the Flora of the Balkans: Native Plants of Greece" (2022-2025).

In conclusion, it is evident that the Top 50 Mediterranean Island Plants project has been quite successful in selecting a group of emblematic species and drawing on them significant attention for both in situ and ex situ conservation measures. Nowadays, it is ripe time for a new list of "decorated" TOP plants for the entire Mediterranean Region and we look forward to the launch of this new initiative (Thanos 2023b).

The 10 Greek plants of the Top 50 Mediterranean Island



Aethionema retsina

A small cushion plant, up to 20 cm tall, growing in cliff crevices, endemic to Skyros and Skyropoula Islands. It is found in four (4) subpopulations with very few individuals (less than 100 in total) at dry rocky places near the sea, between 50 and 450 m asl. The major threat for this species seems to be grazing. The plant falls within a SAC (NATURA 2000 network) and in the framework of LIFE09NAT/GR/000323 project (2010-16) "Demonstration of the Biodiversity Action Planning approach, to benefit local biodiversity on an Aegean island, Skyros", a monitoring plan for the species was elaborated but no concrete in situ conservation actions have been undertaken. Occurrence and distribution studies along with some careful seed collections of this species have been implemented within the framework of two projects, namely "SEMCLIMED – Impact du Changement Climatique sur la Flore Méditerranéenne et Actions de Conservation" (2006-2008) and "Conserving the Flora of the Balkans: Native Plants of Greece" (2022-2025, http://users.uoa.gr/~cthanos/NKUASB_SeedConservationoftheFloraofGreece/). Laboratory germination experiments have elucidated its ecophysiology of germination and have led to the elaboration of a germination protocol.



Allium calamarophilon

A small wild garlic, up to 30 cm tall, growing in maritime cliffs (where it was initially discovered in 1980) but also in open rocky spaces within a dry, phryganic (low shrub) vegetation, adjacent to the locus classicus, at altitudes ranging from sea level to 350 m asl. Within the framework of the project "Conserving the Flora of the Balkans: Native Plants of Greece" (2022-2025), this ghost plant was rediscovered in 2022 (after 42 years) and photographed in the wild for the first time in 2023 (Kaltsis 2023). The single population of this plant is composed of no less than 1000 individuals while grazing seems to exert a considerable pressure. The population unfortunately is not lying within a SAC of the NATURA 2000 network and therefore some in situ conservation measures are urgently needed. Seeds of this species were also collected recently, and germination experiments are currently in progress.



Anthemis glaberrima

It is a small (up to 30 cm tall) therophyte, endemic to the uninhabited islets of Agria Gramvousa and Imeri Gramvousa (located off the north-western tip of the island of Crete). It is usually growing together with other halophytes, within cavities of coastal, calcareous rocks and its population shows large interannual fluctuations, estimated between 50,000 and 100,000 individuals, the largest part of which, ca. 80%, occurring in Agria Gramvousa (where a Plant Micro-reserve has been established, Thanos 2008). The germination ecophysiology of the species has been extensively studied and a germination protocol has been devised (Fournaraki 2010). The major threat for the species is the obliteration of its habitat by the rise of the sea level due to climate change as well as by sea pollution (solid waste and oil spills).



Bupleurum kakiskalae

A short-lived monocarpic perennial, endemic to the Lefka Ori (Chania, Crete), known until recently only from its locus classicus (Linoseli, Kakiskala), where a Plant Micro-reserve has been established (Thanos 2008). Recent field surveys have led to the discovery of another five (5) localities (Kaltsis et al. 2013, Thanos et al. 2015, Kaltsis A. and Koutsovoulou K. pers. comm.), at an altitude ranging between 1450 and 1850 m asl. Apart from the locality of Malemou, in the rest four of them (Kalokampos, Petrade, Avlimanakou and Zaranokefala), most individuals grow on unreachable cliffs and can be observed only with a telescope or binoculars. The species is extensively grazed and therefore marginalised to a habitat of vertical, inaccessible cliffs (a quite inhospitable and unpredictable environment for seed dispersal and seedling establishment) which we consider as the major threat for this plant. Only a few individuals are observed flowering each year (fluctuating roughly between 50 and 300) while the plants at vegetative stage are estimated to less than 1000 individuals. The germination ecophysiology of the species has been extensively studied and a germination protocol has been devised (Fournaraki 2010).

Consolida samia

A small, up to 10 cm tall therophyte, with astounding pale lilac flowers, a local endemic to Mt. Kerketefs (Kerkis), Samos Island. It has remained a ghost plant since 1962, when it was initially collected and described as a new species for Science. In the framework of the projects "Quest to rediscover *Consolida samia*- exploring the screes of Mt Kerketefs (Samos, Greece)" funded by Mohamed bin Zayed Species Conservation Fund (2022-2025) and "Conserving the Flora of the Balkans: Native Plants of Greece" (2022-2025) implemented by NKUA Seed Bank, the species was eventually rediscovered (and photographed alive for the first time) in the steep SW slopes of Mt Kerkis in May 2023, at an altitudinal range between 800-850 m, in a locality that perfectly matches the locus classicus (Thanos 2023a). The total population covers almost 2 ha of stony, scree-like surface and was tallied up to about 1200-1500 individuals, a number expected to undergo considerable yearly fluctuations (Kaltsis et al. 2023). Mature seeds have been collected and germination experiments are currently in progress.

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Convolvulus argyrothamnos

A chasmophytic, silvery shrub, up to 80 cm tall. The species is endemic to Crete, where it is known from its locus classicus, a single limestone cliff (in Psoriaris Gorge, near lerapetra, Lassithi, at 450 m asl) and a second locality in the northwestern part of the island (Rokka Gorge, Chania, at 150 m asl). A few (5-6) mature individuals are also cultivated in the MAICh Botanic Garden. The two confirmed subpopulations of the species are very small (only 14 mature individuals at Psoriaris Gorge and 60 at Rokka Gorge were recorded in 2015) and are vulnerable to several pressures and threats, such as grazing. The germination ecophysiology of the species has been extensively studied and a germination protocol has been devised (Fournaraki 2010).



Horstrissea dolinicola

A dwarf, perennial geophyte, belonging to a monotypic genus, endemic to Crete. It is known from a single population in a restricted surface of limestone sinks (dolines) on Mt Ida (ca 1,500 m asl). A Plant Micro-reserve was recently established in the area and several monitoring studies of the species, and its habitat are being implemented by the Mediterranean Plant Conservation Unit of MAICh in the framework of funded projects since 2019 (Fournaraki et al. 2021a, 2021b). The population amounts to 17,000 flowering individuals (Fournaraki et al 2022) but it is still subjected to overgrazing. Prior to the recent, intensive studies, it was estimated that less than 100 mature individuals were left in the wild (Pasta et al. 2017). The complicated germination ecophysiology of the species has been studied in detail and a germination protocol has been devised (Fournaraki 2010).



Minuartia dirphya

Short (up to 20 cm tall) plant, woody at the base, growing on ophiolithic substrate, in a north-western slope of Mt Dirfys, Euboea Island, at 950 m asl. It forms a single population with less than 500 individuals, in a very small surface of scarce, thorny vegetation. The major threats for this species are both grazing and road/building constructions. In addition, this species does not fall within a SAC (NATURA 2000 network) and no actions have been undertaken for its in situ conservation. Field studies and seed collections have been implemented within the framework of two projects, namely "SEMCLIMED – Impact du Changement Climatique sur la Flore Méditerranéenne et Actions de Conservation" (2006-2008) and "Conserving the Flora of the Balkans: Native Plants of Greece" (2022-2025, http://users.uoa.gr/~cthanos/NKUASB_SeedConservationoftheFloraofGreece/). Laboratory germination experiments have elucidated its ecophysiology of germination and have led to the elaboration of a germination protocol.



Polygala helenae

Small (up to 30 cm tall) perennial herb with woody base, an endemic of Kythera Island, where it grows in two low-altitude subpopulations, 20 km apart from each other. It is probably very susceptible to grazing and thus it finds shelter within larger thorny or compact shrubs of the xeric Mediterranean vegetation, where it is difficult to be spotted. It is also threatened by habitat loss from touristic and road building pressures, particularly in Kalamos, its locus classicus, in the south of the island. Its total population (as recorded in 2023, Stefi et al. 2023a) does not exceed 250 individuals (50 in Kalamos and 200 in Myrtidia, in the central-west part of the island). Unfortunately, this species does not fall within a SAC (NATURA 2000 network) and no actions have been undertaken for its in situ conservation. The seeds of the plant bear an elaiosome, therefore they are dispersed by ants (myrmecochory); a small number of seeds were collected recently, and germination experiments are currently in progress.



Saponaria jagelii

Small (up to 10 cm tall) annual, found only on a single sandy beach in the small island of Elafonissos, off the southeastern coast of Peloponnese. The population covers a very small surface (0.2 ha) and although seemingly stable (ca 1500 individuals, according to the 2019, 2022 and 2023 censuses), it is under constant threat of touristic development and other anthropogenic disturbances. A second subpopulation (250 individuals in 2019), located in a nearby, quite frequented beach, is now eliminated (Thanos et al. 2022; Stefi & Thanos 2023). Recently, the presence of the species was reported from a sandy beach of Limnos Island in the north Aegean, more than 400 km away (in straight line) from Elafonissos; however, this record lacks further documentation and needs to be confirmed. Seed collections have been implemented within the framework of the project "Conserving the Flora of the Balkans: Native Plants of Greece" (2022-2025). Laboratory germination experiments have elucidated the ecophysiology of germination of this species and have led to the elaboration of a germination protocol (Stefi et al. 2023b).



FIGURE 2. The 10 Greek Island plants of the TOP 50 Mediterranean Island Plants, shown in flowering. Numbering according to Figure 1 and Table 1. (© A. Kaltsis & NKUA Seed Bank [1, 2, 5, 8], © CI-HEAM-MAICh MPCU [3, 4, 6, 7], © A. Stefi & NKUA Seed Bank [9, 10])



FIGURE 3. Scans of the seeds of the 10 Greek Island plants of the TOP 50 Mediterranean Island Plants. Numbering according to Figure 1 and Table 1. 1: one-seeded capsules; 3: achenes; 4 & 7: meristocarps. The side of the small square is 1 mm long. (© NKUA Seed Bank: 1, 2, 5, 8, 9, 10; © CIHEAM-MAICh MPCU: 3, 4, 6, 7)

-Conserving the Flora of the Balkans: Native Plants of Greece. 2023. Collecting seeds of *Consolida samia* (July 3, 2023). http://users.uoa.gr/~cthanos/NKUASB_SeedConservationoftheFloraofGreece/pdfs/Consolida_seeds.pdf

-Dimopoulos P., Raus Th., Bergmeier E., Constantinidis Th., Iatrou G., Kokkini S., Strid A., Tzanoudakis D. 2013. Vascular plants of Greece: An annotated checklist. – Berlin: Botanic Garden and Botanical Museum Berlin-Dahlem; Athens: Hellenic Botanical Society. [Englera 31].

-Fournaraki C. 2010. Conservation of threatened plants of Crete- seed ecology, operation and management of a gene bank. PhD Thesis, N.K. University of Athens, Athens, 439 pp.

-Fournaraki C., Gotsiou P., Markaki E., Kokkinaki A., Choreftakis M. 2021b. Preliminary results of the long-term monitoring of the unique population of *Horstrissea dolinicola* : a steno-endemic, threatened plant of Crete, Greece. Poster presentation, p. 52 in Book of Abstracts : 3rd Mediterranean Plant Conservation Week- Plant Conservation Strategies: from Science to Practice. Chania, Crete, Greece, 27 September to 1 October 2021. Hybrid Conference (http://www.medplantsweek.uicnmed.org/public_html/medplantsweek/en/3rd-mpcw/about-3rd-mpcv/)

-Fournaraki C., Gotsiou P., Markaki E., Kokkinaki A., Choreftakis M. 2022. Final report for the project "Actions for in situ conservation of the unique population of the monotypic plant genus *Horstrissea* in central Crete (Greece)". Unpublished data. The Mohamed bin Zayed Species Conservation Fund, Project no 202523456.

-Fournaraki C., Gotsiou P., Markaki E., Kokkinaki A., Kargiolaki H., Maria E.-A. 2021a. *Horstrissea dolinicola*: A steno-endemic, threatened plant on Mt. Ida (Psiloritis), Crete, Greece. In Global conservation translocation perspectives: 2021: case studies from around the Globe (pp. 298–302). IUCN SSC Conservation Translocation Specialist Group (CTSG). https://iucn-ctsg.org/wp-content/uploads/2021/03/CTSG_Book_Issue_7_Feb_2021.pdf

-Hellenic Botanical Society. 2017-2023. Flora of Greece web. https://portal.cybertaxonomy.org/flora-greece/in-tro.

-Kaltsis A. 2023. *Allium calamarophilon*- the rediscovery of a 'ghost' species. http://users.uoa.gr/~cthanos/NKUASB_SeedConservationoftheFloraofGreece/pdfs/Allium_calamarophilon.pdf

-Kaltsis A., Koutsovoulou K., Fournaraki C., Thanos C.A. 2013. *Bupleurum kakiskalae*, a rare, endemic plant of Crete and the discovery of a new (third) subpopulation. p. 65, Book of Abstracts, 13th Congress of the Hellenic Botanical Society. Thessaloniki (Greece).

-Kaltsis A., Mouratidis S., Fakas G., Oikonomidis S., Dimitriadis I., Strid A., Thanos C.A. 2023. The rediscovery of *Consolida samia* 61 years after its initial description: new data regarding the conservation status of a Community priority species of Greece. pp. 63-64, Book of Abstracts. 11th Panhellenic Conference of Ecology- HELECOS 11, Patras, October 4-7, 2023

-Montmollin B. de, Strahm W. (Eds). 2005. The Top 50 Mediterranean Island Plants: Wild plants at the brink of extinction, and what is needed to save them. IUCN/SSC Mediterranean Islands Plant Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK. x + 110 pp.

-Pasta S., Perez-Graber A., Fazan L., Montmollin B. de (Eds). 2017. The Top 50 Mediterranean Island Plants UPDATE 2017. IUCN/SSC/Mediterranean Plant Specialist Group. Neuchâtel (Switzerland). E-book and on line. 141 pp. top50.iucn-mpsg.org

-Stefi A.L., Fatsea S., Thanos C.A. 2023a. Unraveling the story of *Polygala helenae* Greuter. http://u-sers.uoa.gr/~cthanos/NKUASB_SeedConservationoftheFloraofGreece/pdfs/Polygala_helenae.pdf

-Stefi A.L., Katsikis N., Thanos C.A. 2023b. An investigation on the population, ecophysiology and morphology of *Saponaria jagelii*, a critically endangered species. pp. 272-273, Book of Abstracts. 11th Panhellenic Conference of Ecology- HELECOS 11, Patras, October 4-7, 2023.

-Stefi A.L., Thanos C.A. 2023. There's still hope for *Saponaria jagelii*. http://users.uoa.gr/~cthanos/NKUAS-B_SeedConservationoftheFloraofGreece/pdfs/Saponaria_hope.pdf

-Thanos C., Fournaraki C., Koutsovoulou K., Kaltsis K., Skourti E., Gotsiou P., Markaki E., Kokkinaki A. 2015. Protection and conservation of the biodiversity of the Samaria National Park (Lefka Ori): Technical Reports (unpublished): Recording and monitoring of flora species of the Directive 92/43/EEC and other protected species. Project coordinated by the Mediterranean Agronomic Institute of Chania and OIKOM Environmental Studies Ltd and financed by the Management Body of Samaria National Park, in the Framework of NSRF (2007-2013). Chania.

-Thanos C.A. 2008. A Pilot Network of Plant Micro-Reserves in Western Crete – CRETAPLANT (LIFE04NAT_GR_000104). Layman's Report, 16 pp.

-Thanos C.A. 2023a. The rediscovery of *Consolida samia*, a rare species of the Greek flora after 61 years. pp 1-2, 24. Hellenic Botanical Society Newsletter 13.

-Thanos C.A. 2023b. Ex situ conservation of Mediterranean threatened and rare species. p. 24, Book of Abstracts. 4th Mediterranean Plant Conservation Week "Plant Conservation and Ecosystem Restoration in the Mediterranean", Valencia, Valencian Community, Spain, 23-27 October 2023.

-Thanos C.A., Katsikis N., Oikonomidis S., Mouratidis S., Stefi A.L., Willey I., Faruk A. 2022. The swan song for Greek endemic *Saponaria jagelii*? Samara 38, 12.

Improving the Yew (Taxus baccata L.)ARTICLEhabitat in the Valencian Community (Spain):LIFE Teixeres project

Laguna, E.¹, Arizpe, D.^{1,2}, Serena, V.^{1,2}, Cebrián, A.^{1,2}, Seguí, M.², Huesca, S.^{1,2}, Rosell, S.³, Cerdán, V.^{1,2}, Martínez. J.^{1,2}, Ferrer-Gallego, P.P.^{1,2,4}, Ferrando-Pardo, I.^{1,2,4}, Rubio, A.¹, Romero, G.³

¹CIEF, Generalitat Valenciana, 46930 Quart de Poblet, Valencia, Spain; ²VAERSA, Generalitat Valenciana, 46015 Valencia, Spain; ³Vice-Direction General of Nature, Generalitat Valenciana, 46018 Valencia, Spain; ⁴Wildlife and Natura 2000 Service, Generalitat Valenciana, 46018 Valencia, Spain.

Since October 2021, the Valencian Community (Spain) hosts the development of the project LIFE20 NAT/ES/001128 'Conservation and restoration of relict *Taxus baccata* woods', acronymized LIFE Teixeres (Arizpe et al., 2023). The main beneficiary is the Generalitat Valenciana, – regional government of the Valencian Community (Spain) –, through the Centre for Forestry Research and Experimentation (CIEF), partner of GENMEDA. VAERSA, the Generalitat's public environmental company, act as associated beneficiary. The project will end at the end of 2026, and has a total budget of 2,406,410 Eur, 75% co-financed by the European Union (1,804,807 Eur).

The Valencian Community has more than 80 relict populations of Taxus baccata (figure 1) priority habitat 9580 of the Habitats Directive - (Laguna, 2003; Serra et al., 2007), located mainly in the shade face of the highest mountains, at the bottom of ravines or at the base of rocky cliffs, as well as forming part of the understory of sub-Mediterranean forests dominated by Pinus sylvestris, P. nigra subsp. salzmannii, Quercus faginea, etc. (figure 2). However, the vast majority of these populations have an insufficient number of specimens or show sex ratio biases - T. baccata is a dioecious tree -. Furthermore, a large part of these populations lacks natural regeneration, due, on the one hand, to the demographic conditions indicated above, and on the other hand, to the effect of wild ungulates, often introduced or favored by human activity. Furthermore, although the seeds germinate, the new plants cannot develop properly, due to the scarcity of nurse plants with a facilitating effect - thorny species that protect the yew seedlings, deciduous trees that favor the incidence of filtered light, fleshy-fruit shrubs to attract disperser birds. etc. (García et al., 2000) -. A large part of these populations, especially the southernmost ones, have been significantly reduced by the effect of forest fires (figure 3), and their microhabitats are often surrounded by highly combustible vegetation - hyperdense pine forests, shrublands rich in pyrophytic plants, etc. – It must be added that the natural germination of T. baccata is a very slow process that requires the intervention of endozoochorous dispersers, and that the plants can take between 40 and 50 years to start producing flowers and seeds, an excessively long period for highly combustible forests in which they grow, which often burn in shorter periods. Furthermore, given its climatic requirements - cool, shady high mountain areas -, its habitat availability is being significantly reduced by climate change (Draper et al., 2007), as occurs with other high mountain species (Thuiller et al., 2005).



Figure 1. Yew (*Taxus baccata*) leaves and seed covred by its red fleshy aril.



Figure 2. *Taxus baccata* individuals in the understory of stone Pine (*Pinus sylvestris*) woods, at the plants Micro-reserve Barranc de la Pegunta (Vistabella del Maestrat, Castellón province).



Figure 3. Resprouts of ancient Yew forests after several forests fires, at the base of rocky cliffs in the Plant micro-reserve Teixera d'Agres (Agres, Alicante province).

In order to improve their conservation status, the Valencian yew forests have been the subject of various partial interventions in EU's LIFE projects since 1994, developed by Generalitat Valenciana's Direction General of Nature and Animal Life units – CIEF and Wildlife and Natura 2000 Network Service (figure 4) –, such those dedicated to the creation of the network of plant microreserves (1994-1998), conservation of priority habitats (1999-2003), restoration of high mountain habitats (2004-2006) and LIFE 'Renaix el Bosc' for conservation of *Tilio-Acerion* forests (2013-2017). However, none of these projects have been dedicated exclusively to *Taxus baccata* woods, as planned for LIFE Teixeres. Results of former activities can be consulted at Laguna (2003, 2023), Serra et al. (2007) and Ferrer-Gallego et al. (2021)

The activity of LIFE Teixeres project focuses on adaptive forestry and reforestation works on 230 ha (figure 4), distributed in 55 zones, within 10 of the Natura 2000 sites. Of these, 75% are public sites, and 25% are private ones, belonging to landowners who voluntarily give up their lands for experimental work. For all of them, either the sites are previously protected (public utility forests, natural parks, etc.), or the management agreements with landowners ensure their long-term conservation. 14 of them are placed into public and private plant microreserves, following the Valencian pioneer model for these protected areas (Laguna et al., 2004; Kadis et al., 2013), where active conservation practices must be continuously maintained (Laguna et al., 2018). Seeds are being collected from 38 species of trees and large shrubs (figure 5), which characterize the yew habitat (see Laguna, 2003; Fabregat et al., 2015), producing at least 27,000 plants (figure 6), of which 23,000 will be dedicated to the recovery of the yew habitat, following technical directives of ecological restoration (Marzo et al., 2018) and conservation of plant genetic diversity (Dulloo & al. 2008; Kell & al., 2008). All plants are produced in accordance with the standards of optimal genetic origin and plant health controls for forest reproductive material, standardized for the EU, Spain and the Valencian Community (Prada et al, 2012). Another 4,000 plants are being used in educational and public participation activities, and, above all, in the creation of 12 clonal orchards of 0.5 ha (figure 7), each



Figure 4. Planted individual of yew from former experiences of CIEF and Valencian Wildlife and Natura 2000 Service, at the Plant micro-reserve Fuente de la Puerca (Chera, Valencia province).



Figure 5. Seed collection at the clonal orchard "La Lándiga" (Chiva, Valencia province), established by CIEF and the local NGO Plataforma para el Estudio y Conservación de la Sierra de Chiva.

containing around 100 female plants and 20 male individuals, coming from cuttings obtained from the closer populations (figure 8), in order to produce a large quantity of seeds, which cannot be obtained in the natural environment due to the excessive distance between native populations (Ferrer-Gallego et al., 2021). These clonal orchards (figure 7) can allow the natural dispersal of seeds by birds following the quasi in situ conservation model (Volis & Blecher, 2010).



Figure 6. Production of new plants of yew at the CIEF nursery (Quart de Poblet, Valencia province)



Figure 8. Preparation of cuttings to produce new individuals of *T. baccata* for clonal orchards.

The majority of plantations will be carried out using plant protections (micro-fencings, figure 4) and establishing small experimental enclosures to avoid the effect of ungulates – predation by browsing, physical damages by trampling, etc. – Seed collections will substantially increase the germplasm stock of the CIEF's forest seed bank for all species involved in the project, and the nursery works will allow the improvement of cultivation protocols for all species, which in many cases are imperfectly known



Figure 7. Clonal orchard, established by CIEF, Wildlife and Natura 2000 service, and Chera-Sot de Chera Nature Park (Valencia province).

(García-Fayos, 2001). Seed storing, as well as viability and germination tests, follow the procedures recommended by Bacchetta et al. (2006, 2008), Ferrer-Gallego et al. (2012), and ISTA rules (ISTA, 2023). Some of these species are plants of Atlantic or Euro-Siberian optimum, which are considered extremely rare in the Valencian Community (i.e., Corylus avellana, Lonicera xylosteum, Prunus prostrata, Rhamnus alpina, Viburnum lantana, etc.) or are even strictly protected (Acer campestre, Daphne laureola, llex aquifolium , Sorbus torminalis, Tilia platyphyllos), for which the actions of LIFE Teixeres have a positive impact on its conservation programs, and, in general, on the Valencian program for the conservation and improvement of forest genetic resources ECOGEN (Prada et al., 2012).

In parallel, the project addresses an ambitious program of participatory meetings with stakeholders and forest owners, to involve them in the long-term bottom-up maintenance of the restored areas. The activities are combined with various social communication actions (web page, information brochures, etc.) and technical participation, through the establishment of an advisory committee. Likewise, the project provides for the financing of various scientific participation events and forums, of which the session on relict forests held within the 4th Mediterranean Plant Conservation Week, last October 2023, has already been developed.

Bibliography

Arizpe D., Serena V., Torrijos J., Huesca S., Cebrián A., Cerdán V., Martínez J., Ferrer-Gallego P.P., Ferrando-Pardo I., Romero G., Rosell S. & Laguna E. 2023: Inicio del proyecto LIFE Teixeres para la conservación de *Taxus baccata* en la Comunidad Valenciana. Conservación Vegetal 27: 47-48.

Bacchetta G., Fenu G., Mattana E., Piotto B. & Virevaire M. (eds.) 2006: Manuale per la racolta, studio, conservazione e gestione ex situ del germoplasma. Linnee Guida APAT nº 37. Rome.

Bacchetta G., Bueno A., Fenu G., Jiménez-Alfaro B., Mattana E., Piotto B. & Virevaire M. (eds.) 2008: Conservación ex situ de plantas silvestres. Principado de Asturias-La Caixa. Oviedo.

Draper D. & Marques, I. 2007: *Taxus baccata* en Portugal y sus perspectivas futuras frente al cambio global. In Serra, L. (ed.): El Tejo en el Mediterráneo Occidental: 171-176. Conselleria de Territorio y Vivienda, Generalitat Valenciana. Alcoi, Spain.

Dulloo, M.E., Labokas J., Iriondo J.M., Maxted N., Lane A., Laguna E., Jarvis A. & Kell S.P. 2008: Genetic Reserve location and design. In Iriondo J.M., Maxted N. & Dulloo M.E. (eds.): Conserving Plant Genetic Diversity in Protected Areas. Population management of Crop Wild Relatives: 23-64. CABI. Wallingford, UK. <u>http://doi.dx.org/10.1079/9781845932824.0023</u>

Fabregat C., Soler J.X., Fabado F.J., Casabó J., Fos S., Nebot J. & Laguna, E. 2015: Manual de identificación de los hábitats protegidos en la Comunitat Valenciana (Decreto 70/2009). Conselleria de Agricultura, Medio Ambiente, Cambio Climático y Desarrollo Rural, Generalitat Valenciana. Valencia.

Ferrer-Gallego P.P., Ferrando-Pardo I., Gago C. & Laguna E. (eds.) 2012: Manual para la conservación de germoplasma y el cultivo de la flora valenciana amenazada. Conselleria de Infraestructuras, Territorio y Medio Ambiente, Generalitat Valenciana. Valencia.

Ferrer-Gallego P.P., Ferrando-Pardo I., Serena V., García-Martí X., Ballester G. & Laguna E. 2021: El tejo (*Taxus baccata*) en el centro de la provincia de Valencia y su conservación. Un modelo integrador para la preservación genética de especies longevas amenazadas. Oleana 36: 47-66.

García D., Zamora R., Hódar J.A., Gómez J.M. & Castro J. 2000: Yew (*Taxus baccata*) regeneration is facilitated by fleshy-fruited shrubs in Mediterranean environments. Biological Conservation 95: 31-38. <u>https://doi.org/10.1016/s0006-3207(00)00016-1</u>

García-Fayos, P. (ed.) 2001: Bases ecológicas para la recolección, almacenamiento y germinación de semillas de especies de uso forestal de la Comunidad Valenciana. Banc de Llavors Forestals, Generalitat Valenciana. Valencia.

ISTA. 2023: International rules for seed testing. International Seed Testing Association (ISTA). Wallisellen, Switzerland.

Kadis K., Thanos C.A. & Laguna, E. (eds.) 2013: Plant micro-reserves: From theory to practice. Experiences gained from EU LIFE and other related projects. PlantNet CY Project Beneficia-ries. Utopia Publishing. Athens.

Kell S.P., Laguna E., Iriondo J.M. & Dulloo M.E. 2008: Population and habitat recovery techniques for the *in situ* conservation of plant genetic diversity. In Iriondo J.M., Maxted N. & Dulloo M.E. (eds.): Conserving Plant Genetic Diversity in Protected Areas. Population management of Crop Wild Relatives: 124-168. CABI. Wallingford, UK <u>http://doi.dx.org/10.1079/9781845932824.0124</u>

Laguna, E. (ed.) 2003: Priority Habitats of the Valencian Community. Conselleria de Territorio y Vivienda, Generalitat Valenciana. Valencia.

Laguna, E. 2023: Estatus y conservación de la flora valenciana rara, endémica o amenazada. In Barba, E. (ed.): La biodiversidad valenciana ante el reto del cambio global: 182-243. Universitat de València. Valencia

Laguna E., Deltoro V., Pérez-Botella J., Pérez-Rovira P., Serra L., Olivares A. & Fabregat, C. 2004: The role of small reserves in plant conservation in a region of high diversity in eastern Spain. Biological Conservation 119: 421-426. <u>http://dx.doi.org/10.1016/j.biocon.2004.01.001</u>

Laguna, E., Thanos C.A., Fournaraki C., Kadis C. & Bou Dagher Kharrat M. 2018: Plant micro-reserves in the Mediterranean area. In Valderrábano, M., Gil, T., Heywood V.H. & de Montmollin B. (eds.): Conserving wild plants in the south and east Mediterranean region: 106-107. IUCN. Gland, Switzerland & Málaga, Spain.

Marzo A., Laguna E., Bou Dagher Kharrat M. & Charbel Sark R. 2018: Habitat restoration. In Valderrábano, M., Gil, T., Heywood V.H. & de Montmollin B. (eds.): Conserving wild plants in the south and east Mediterranean region: 124-126. IUCN. Gland, Switzerland & Málaga, Spain.

Prada A., Herreros R., Ortiz G. & Marzo A. 2012: Ecogen. Programa Valenciano de Conservación de Recursos Genéticos Forestales 2011-2020. CIEF, Generalitat Valenciana. Valencia.

Serra L., Pérez-Rovira P., Olivares A., Laguna E. & Ballester G. 2007: Proyecto LIFE "Gestión y valoración de 3 hábitats de alta montaña": Acciones sobre *Taxus baccata*. In Serra, L. (ed.): El Tejo en el Mediterráneo Occidental: 119-126. Conselleria de Territorio y Vivienda, Generalitat Valenciana. Alcoi, Spain.

Thuiller W., Lavorel S., Araújo M., Sykes M. & Prentice I. 2005: Climate change threats to plant diversity in Europe. PNAS 102: 8245-8250. <u>https://doi.org/10.1073/pnas.0409902102</u>

Volis S. & Blecher M. 2010: Quasi in situ: a bridge between ex situ and in situ conservation of plants. *Biodiversity and Conservation* 19: 2441-2454. <u>https://doi.org/10.1007/s10531-010-9849-2</u>

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Authors:

Mohamed Larbi Khouja, Issam Touhami, Mariem Khouja, Mohamed Tahar Elaieb, Hassen Ben Salem, Naoufel Souayah et Abdelmajid El Hamrouni

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BOOK REVIEW

Seven people from diverse scientific backgrounds gathered thanks to their shared interest in honey eucalyptus and, worked collectively and enthusiastically to realize this work. The book aimed to contribute to the promotion of beekeeping in Tunisia by highlighting the cultivation of the best-performing species of *Eucalyptus*, in a sustainable development perspective.

This 220-page book, illustrated with several tables and decorated with many photos, is a rich source of knowledge about beekeeping in Tunisia. Structured in two parts, the first includes six chapters dealing with various aspects related to the beekeeping sector in Tunisia and the importance of *Eucalyptus* as honey trees. The second part consists of a series of fact sheets describing *Eucalyptus* species whose flowering has been regularly followed by forest research in Tunisia.

The first chapter deals with the importance of the beekeeping sector in Tunisia, while the second chapter addresses the various introductions of eucalyptus attempted in the country, providing an overview of the size and development of the plantations, as well as the adaptive behavior of the species to the Tunisian conditions. The third and fourth chapters provide important details about the flowering of eucalyptus, supported by photos and patterns, considering the morphological, ecological aspects and their value as a source of nectar and pollen for bees. Following the monitoring of flowering in different arboretums, two floral calendars were developed for Tunisia, one monthly and the other seasonal. The physico-chemical, organoleptic and therapeutic characteristics of eucalyptus honey are explored in the fifth chapter.

In order to promote the sustainable development of the beekeeping sector in Tunisia, the authors, in the sixth chapter, consider the creation of arboretums and the implementation of small planting projects, with the focus on honey eucalyptus, while proposing cultivation models adapted to each context. The second part of the book is devoted to detailed descriptive sheets of the 64 species of Eucalyptus that have been monitored during their flowering. These fact sheets, well illustrated, can serve as a guide for botanical identification and assist in selecting species with abundant and widespread flowering, as well as good adaptation to the different agro-ecological conditions of the country.

Book review



PROJECTS

MEDLENTISK Project 2020-2021 The Good Practices Guide on Lentisk Fruit Fixed Oil: From Field to Laboratory is now available

Author: Joëlle Salameh (AIFM)

As part of the cooperation project "MEDLENTISK, Partnership for the Exchange of Good Practices on Lentisk Fixed Oil, an Emblematic Non-Wood Forest Product in the Mediterranean," co-funded by the ERASMUS+ Program, AIFM and its Mediterranean partners have published a comprehensive work for those interested in learning more about the mastic tree (*Pistacia lentiscus* L.), specifically focusing on the oil derived from its fruits.

The lentisk tree (*Pistacia lentiscus*) is also known as mastic tree. It is an emblematic Mediterranean shrub, although less known and used on the northern shore of the Mediterranean basin. However, it is a significant resource for rural populations on the southern shore, particularly in Tunisia and Algeria. Numerous non-wood forest products can be extracted from this shrub, contributing to the economic development of rural communities.

This guide, a result of a partnership under the Erasmus+ program, aims to introduce or reintroduce fixed oil obtained by pressing the lentisk fruits. Lentisk oil has various virtues suitable for cosmetic, cosmeceutical, and pharmaceutical applications. The guide serves as a support for users and highlights the latest research conducted on this product. Optimizing the extraction of the fruits leads to improved yields and enhanced guality of the

The guide is available in English, French and Greek on: https://aifm.org/ressources/medlentisk-guide-de-bonnes-pratiques-sur-lhuile-de-fruit-du-lentisque-du-terrain-au-laboratoire/

For further information, contact: gestion@aifm.org



WILDFOOD Project 2020-2023 Eating the wild: Improving the value-chain of Mediterranean Wild Food Products (WFP)" – WildFood-

Author: Issam Touhami (INRGREF)

This project is part of the PRIMA Programme supported by the European Union The overall aim of WildFood is to promote the implementation of joint innovative strategies by involving different actors of the Wild Food Products (WFP) value-chain in the Mediterranean area, focusing on selected products (mushrooms, truffles, pine nuts & Aleppo pine seeds, aromatic plants, acorns and berries) in view of improving their quality and safety controls and sustainability. Thedelivrables of the projectitate the market access of Med companies and increase the added

value of local products by implementing innovative marketing strategies, targeted dissemination and outreach activities;

• Strengthen the integration among the main agro-food value-chains actors promoting partnerships and new models of mutual collaboration, as well as, social inclusion and entrepreneurial business culture;

• Facilitate the adoption of technological and organisational innovations by smallholders and SMEs through capacity building and targeted business support as well as interactive knowledge-exchange.

The deliverables :

https://wildfood.ctfc.cat/deliverables/

D1.1 Report on the state-of-the-art of the WFP value-chains

D1.2 Report on actors' characterisation

D1.3 Wild Food Products value chain: comparative analysis

D2.1 Report on management and planning control systems for sustainability and quality in wild food value-chains: pilot experiences

D2.2 Protocols for sustainability

D2.3 Guidelines for product quality, safety and sustainability

- D3.1 Report on innovative marketing strategies for wild food products
- D3.2 Database of key stakeholders
- D3.4 Report on innovative certification and labelling in wild food sector

D3.5 Brochures on wild food products

D3.6 Short video on WFPs addressed to consumers

D4.1 e-platform to share stakeholders data

D4.2 Innovative Network

D4.3 Comparison of relevant business models of the wild food sector

D4.4 Report living-lab sessions on innovative and feasible business models for the wild food sector

D4.5 Report on practical procedures to design an innovative sustainable business models

- D5.1 Training program on Wild Food production and marketing
- D5.2 Communication Plan
- D5.5 Project brochure
- D5.6 Policy Brief
- D5.7 'Success stories to communicate' (1): Pilot projects factsheets
- D5.7 'Success stories to communicate' (2): Scientific publications
- D5.7 'Success stories to communicate' (3): experiences in the WFP sector (short videos)
- D5.7 'Success stories to communicate' (4): conference proceedings
- D5.7 'Success stories to communicate' (5): posters

For further information, contact: marta.rovira@ctfc.cat



Example of factsheets

ResAlliance project 2023-2025 Landscape resilience knowledge alliance for agriculture and forestry in the Mediterranean basin-

Author: Issam Touhami (INRGREF)

ResAlliance (complete name "Landscape resilience knowledge alliance for agriculture and forestry in the Mediterranean basin") is a thematic network project funded by the Horizon Europe Programme of the European Union. The aim is to provide foresters and farmers with the knowledge and tools necessary to implement innovative landscape resilience solutions. Focusing on Mediterranean countries, ResAlliance will gather and assess knowledge, gaps, barriers, and good practices to achieve resilient landscapes, with particular emphasis on measures against the hazards of climate change. This is made effective across 4 thematic areas that will help set specific learning objectives to better address knowledge and implementation gaps:

- 1. Governance
- 2. Management practices
- 3. Technology
- 4. Finance

To achieve that, ResAlliance promotes multi-stakeholder interactive initiatives at two levels: LandNet and LandLab. The LandNet is a Mediterranean thematic network on landscape resilience for forestry and agriculture. By engaging and training farmers, foresters, and other key stakeholders, the LandNet will continuously identify new cooperation and networks to improve and increase knowledge and good practices, also delivering an extensive range of easy-to-access material. The Landlabs are a tool for supporting knowledge transfer and activating regional landscape resilience solutions in 5 different Mediterranean countries: Portugal, Spain, Italy, Greece, and Cyprus. These coutnries were choosen because they share the threats posed by typical Mediterranean hazards aggravated by climate change, especially wildfires and droughts. At the same time, each country has specific social needs and agricultural and forestry challenges that call for tailored solutions.

https://www.resalliance.eu/

https://www.facebook.com/resalliance.eu

EVENTS

GENMEDA-NETWORK OF MEDITERRANEAN PLANT CONSERVATION CENTRES GENERAL ASSEMBLY MEETING

Valencia, 23 October 2023 in hybrid form

VENUE : Valencia Botanical Garden, SPAIN and online Zoom meeting

Author: Adamantia Kokkinaki (MAICh)





GENMEDA General Assembly meeting 2023

The General Assembly annual meeting of GENMEDA took place at the Botanical Garden of the University of Valencia on 23 October 2023. It was a hybrid meeting which took place in conjunction with the 4th Mediterranean Plant Conservation Week (4MPCW), 23- 27 October 2023.

There were 4 new applications for institutions from Portugal (new country for GENMEDA) and Spain to become Associate members of GENMEDA and they were all accepted unanimously by the General Assembly, thus expanding the network distribution to the west and making the total number of GENMEDA members equal to 31. In addition, the 2 previous Associate members were accepted as numerary members.

The activities and next steps of the 4 GENMEDA Working Groups were discussed as well as member activities, projects, and new prospects for collaborations.

The next General Assembly meeting is anticipated to be organised by the GENMEDA member in Murcia, DGMN-CCFS, in the autumn of 2024, when it will also be the celebration of 20 years since the establishment of the Murcia Seed Bank.

New Associate members

- Biopolis Association, Portugal
- Forest Research Center, School of Agriculture (ISA), University of Lisbon (ULisboa), Portugal
- Marimurtra Botanical Garden, Spain
- Botanical Garden of Castilla-La Mancha, Spain

New numerary members

- International Association of Mediterranean Forests (AIFM), France
- Sicilian Plant Germplasm Repository of the University of Palermo (SPGR/PA), Italy

GENMEDA AT THE 4TH MEDITERRANEAN PLANT CONSERVATION WEEK

Author: Adamantia Kokkinaki (MAICh)



The history of the GENMEDA network and its activities as well as the future challenges for the conservation of the Mediterranean flora were presented at the 4th Mediterranean Plant Conservation Week (4MPCW) which took place in Valencia, Spain, from 23 to 27 October 2023 (see presentation here):

https://genmeda.net/uploads/attachments/112/GOTSIOU-GENMEDA_network-4MPCW-oral_7C02.pdf

GENMEDA was among the organisers of the event together with the GENMEDA members Centre for Forestry Research and Experimentation (CIEF, Generalitat Valenciana), Botanical Garden of the University of Valencia (BGUV) and IUCN. The annual General Assembly meeting of GENMEDA took place on the 1st day of the event. Representatives from 27 of the 31 GENMEDA members participated in the 4MPCW as keynote speakers, session chairs and/or with oral or poster communications.

https://www.medplantsweek.uicnmed.org/public_html/medplantsweek/en/4th-mediterranean -plant-conservation-week/

THE CENTER FOR THE CONSERVATION OF WILD FLORA OF THE REGION OF MURCIA UPDATES THE FACILITIES OF THE GERMPLASM BANK

Authors: Sánchez-Saorín, Francisco Javier; Campillo Mateo, Antonio & Martínez Fernández, Juan Faustino



Figure 1. Image of the current state of construction.

Last October, it was twenty years since the ex situ conservation strategy of wild flora in the Region of Murcia was initiated. Following the publication and entry into force of Decree No. 50/2003 of 30 May 2003, which creates the Regional Catalogue of Protected Wild Flora of the Region of Murcia and lays down rules for the use of various forest species, an incipient germplasm bank was set up with the aim of initiating the techniques of conservation of the species included in the Catalogue, as a practice to be developed for the ex situ conservation of threatened species of wild flora.

In 2006, those first facilities were expanded, giving rise to the current Wild Flora Germplasm Bank which, over the years and the progress in ex situ conservation work, has become insufficient to be able to work properly and continue increasing the germplasm collections conserved in its facilities, to the point that it has been necessary to carry out its expansion. At the moment, a new building is under construction that will house the new Germplasm Bank of Wild Flora and Forest Genetic Resources of the Region of Murcia, of larger dimensions, with facilities adequate to current needs and equipped with modern instruments that allow us to continue working effectively, increasing the number of collections and advancing in the strategy of ex situ conservation of wild flora and forest genetic resources. In addition, the space dedicated to plant production in the old forest nursery of "El Valle" is being refurbished, adapting it to current needs and allocating a part of the surface area to the establishment of collections of endangered species under cultivation. The work is expected to be completed during the first half of 2024.

SUSTAINABLE MANAGEMENT OF ECOSYS-TEMS FOR AGROECOLOGICAL TRANSI-TION AND FOOD SECURITY

20th INRGREF International Scientific Days

10-11 Oct 2023 City of Sciences (Tunisia)

Author: Issam Touhami (INRGREF)



Highlights

One of INRGREF's most significant events is the Scientific Days. Since their inception, these days have addressed a variety of subjects, most notably the management of natural resources, with a constant focus on the management of water and forest resources

The current global trends of increasing pressure on ecosystems are characterized by a low level of resilience due to environmental change drivers and intensifying destructors related to climate change and land use. Moreover, long-term human impact on forests has resulted in highly anthropogenized ecosystems that constitute complex socio-ecological systems. Provided this fact, it is important to think critically about ecosystem management and to develop innovative and efficient alternatives. The INRGREF concludes that its scientific days in 2023 be centered around the sustainable management of ecosystems for the agroecological transition and food safety, in accordance with its mission to contribute supporting the agriculture scientific research system. These scientific days will allow INRGREF researchers as well as researchers from other national and international institutions the opportunity to present and share their research. Considering the INRGREF successful collaborations at national and international levels, developed over time, this event will get the support of ICARDA, GIZ/ACTA through their PROSOL programs, and INGC as a development partner at the national level. The INRGREF scientific days will cover the most important scientific events including invited talks, contributed presentations, posters and side events in presence of the Tunisian Union of Agriculture and Fisheries (UTAP) representing professional agriculture body. As a result, this event will potentially contribute to strengthen the link between research development and profession, which is considered not enough established

2024 Events

- Fourth Mediterranean Biogeographical Seminar, 17 – 19 April 2024, Larnaca, Cyprus
- 26th European Forum on Urban Forestry 2024 22-24 May 2024, Zagreb, Croatia
- XXVI IUFRO World Congress 2024 23-29 June 2024, Stockholm, Sweden
- 20th International Botanical Congres (www.lbcmadrid2024.com) 21-27 July 2024, Madrid, Spain
- 8th Mediterranean Forest Week Save The Date! 4-8 November 2024, Barcelona, Spain

THE NETWORK

Members

- 1. Centre for Forestry Research and Experimentation (CIEF) of the Valencian region, Spain
- 2. National and Kapodistrian University of Athens (NKUA), Greece
- 3. Institut Botànic- Jardí Botànic de Barcelona (JBB), Spain
- 4. Conservatoire Botanique National Méditerranéen of Porquerolles (CBNMed), France
- 5. Center of Conservation of Wild Flora of the Region of Murcia (CCFS), Spain
- 6. Fundació Jardí Botànic de Sòller (JBS), Spain
- 7. University of Catania- Department of Biological, Geological and Environmental Sciences (DBS), Italy
- 8. CIHEAM Mediterranean Agronomic Institute of Chania (MAICh), Greece
- 9. University of Cagliari- Centre for the Conservation of Biodiversity (CCB), Italy
- 10. Botanic Garden of the University of Valencia (JBUV), Spain
- 11. University of Malta, Department of Biology (DBUM), Malta
- 12. Institut Scientifique de Rabat (ISR), Morocco
- 13. Mansoura University, Faculty of Science (FSUM), Egypt
- 14. Agricultural Research Institute (ARI), Cyprus
- 15. Office of the Environment of Corsica, Conservatoire Botanique National de Corse, France
- 16. National Research Institute for Rural Engineering, Water and Forests (INRGREF), Tunisia
- 17. Arid Zones Research Institute (IRA), Tunisia

18. Saint Joseph University (USJ), Laboratory for Seed Germination and Conservation and 'Jouzour Loubnan' Seed Bank, Lebanon

19. Hamma Botanical Garden (JEH), Algeria

20. Institute of Mediterranean & Forest Ecosystems-Hellenic Agricultural Organization "DEME-TER" (FRIA), Greece

21. Rete italiana banche del germoplasma per la conservazione ex situ della flora spontanea italiana (RIBES), Italy

- 22. Natural History Museum Rijeka (NHMR), Croatia
- 23. IUCN/SSC Mediterranean Plant Specialist Group (MPSG), Switzerland
- 24. Sapienza University of Rome, Botanical Garden of Rome (BGR), Italy
- 25. University of Tuscia, Tuscia Germplasm Bank (TGB), Italy
- 26. International Association of Mediterranean Forests (AIFM), France
- 27. University of Palermo, Sicilian Plant Germplasm Repository (SPGR/PA), Italy

Associate members

- 28. Biopolis Association, Portugal
- 29. University of Lisbon, School of Agriculture, Forest Research Center (ULisboa), Portugal
- 30. Marimurtra Botanical Garden, Spain
- 31. Botanical Garden of Castilla-La Mancha (JBCLM), Spain

THE NETWORK



Representatives

President

Gianluigi BACCHETTA (CCB, Italy) Secretary/Treasurer Adamantia KOKKINAKI (MAICh, Greece) Steering Committee coordinator Emilio LAGUNA (CIEF, Spain) Steering Committee members Lara DIXON (CBNMed, France)

Sara MAGRINI (RIBES, Italy) Joseph BUHAGIAR (DBUM, Malta) Boštjan SURINA (NHMR, Croatia) Evangelia DASKALAKOU (FRIA, Greece)

Working Groups

WG1 - Communication: Adamantia KOKKINAKI (MAICh)/Lead, Lou BARBE (CBNC), Ana CEBRIAN (CIEF), Bertrand DE MONTMOLLIN (IUCN/SSC/MPSG), Caroline FAVIER (CBNC), Francesca MELONI (CCB), Joëlle SALAMEH (AIFM)

WG2 - Database: Lara DIXON (CBNMed)/Lead, Costantino BONOMI (RIBES), Lou BARBE (CBNC), Inmaculada FERRANDO (CIEF), Panagiota GOTSIOU (MAICh), Ali KHORCHANI (INRGREF), Angelos KY-RATZIS (ARI), Chouaib MOUJAHDI (ISR), Marco PORCEDDU, Gianmarco TAVILLA (DBS)

WG3 - Orchids and microbiota: Sara MAGRINI (RIBES)/Lead, Fabio ATTORE (BGR), Joseph BUHAGIAR (BDUM), Vito Emanuele CAMBRIA (BGR), Jalal EL OUALIDI (ISR), Spyros OIKONOMIDIS (NKUA), Boštjan SURINA (NHMR), Magdalena VICENS (JBS)

WG4 - Seed Force International: Vito Emanuele CAMBRIA (BGR)/Lead, Mohamed ABDELAAL (FSUM), Miriam AIXART (JBB), Daniel ARIZPE (CIEF), Fabio ATTORE (BGR), Lou BARBE (CBNC),

Costantino BONOMI (RIBES), Joseph BUHAGIAR (DBUM), Antonia CRISTAUDO (DBS), Evangelia DASKALAKOU (FRIA), Jalal EL OUALIDI (ISR), Elena ESTRELLES (JBUV), Christini FOURNARAKI (MAICh), Laetitia HUGOT (CBNC), Abdelhamid KHALDI (INRGREF), Sara MAGRINI (RIBES), Faten MEZNI (INRGREF), Mohamed NEFFATI (IRA), Francisco Javier SÁNCHEZ-SAORÍN (CCFS), Boutheina STITI (INRGREF), Boštjan SURINA (NHMR), Issam TOUHAMI (INRGREF), Magdalena VICENS (JBS), Nassima YAHI (JEH)

GENMEDA current members



Associate members





NETWORK OF MEDITERRANEAN PLANT CONSERVATION CENTRES

N: 1988 **Odissea Seminum**

8 : December 20

GENMEDA Newsletter