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**NKUA Seed Bank (Plant Genetic Resources Bank)  
of the Native Plants  
of the Greek Flora  
(Τράπεζα Σπερμάτων ΕΚΠΑ)**

**The seeds** of the 'higher' plants (seed plants: gymnosperms and angiosperms) constitute not only the propagation units and the carriers of genetic variation but, in addition, the **most resistant structures** of seed plants, as they are capable of surviving for considerably long periods of time (centuries or even millennia) under appropriate conditions of low temperature and seed water content. Therefore, numerous **Seed Banks** have been established worldwide (more than 1500, nowadays) with the aim to safeguard the ex situ conservation of plant diversity (with emphasis on rare and threatened plant species) through the storage of seed accessions, accessions that may be used for the regeneration of new plant individuals, if and when this becomes pertinent and indispensable.

The **NKUA Seed Bank** of the native plants of the Greek flora **was established in 1991**, at the Laboratory of General Botany (Section of Botany, Department of Biology, National and Kapodistrian University of Athens) and **constitutes the oldest Seed Bank of native plants in Greece**. Co-founders of the Bank were the assistant professors (and currently Prof. Emer.) Kyriacos Georghiou and Costas A. Thanos, who have accumulated a long experience and a considerable expertise on both seed biology and plant conservation (in situ and ex situ), as demonstrated by their numerous scientific publications and conference presentations as well as from many research and applied projects (more than 30 for each one of them) where they have served or are serving as scientific responsible of the entire project or of the participating NKUA team.

The main target of the NKUA Seed Bank and the supporting research team is the **diversity conservation** of the Greek and Cypriot native flora with emphasis on the endemic, rare and threatened plant taxa. In addition to the ex situ plant conservation (by storing seed accessions in the Seed Bank), the research team is devoted to the extensive and detailed study of seed germination physiology and ecology; an 'offline' database is also maintained with all the relevant info of the seed accessions hosted in the NKUA Seed Bank.

The members of the Seed Bank research team are well experienced and qualified in both in situ and ex situ plant conservation studies and applications. During the three decades since the establishment of the NKUA Seed Bank, several important international collaborations have been developed and the Seed Bank has taken part as a founding member in two, very important **international networks**: 1) ENSCONET – European

Native Seed Conservation Network (established in 2010), 2) GENMEDA - Network of Mediterranean Plant Conservation Centres (established in 2010). There is also a long standing collaboration with the Millennium Seed Bank, Royal Botanic Gardens, Kew, UK (the largest Seed Bank of wild plants in the world) for the ex situ conservation of the Greek phytodiversity. Within the borders, our team has shown particular activity in partnering and transferring know-how in several cases of botanical gardens; most important among them is the close cooperation with the Mediterranean Plant Conservation Unit at the Mediterranean Agronomic Institute of Chania (MAICh-CIHEAM). The MAICh Seed Bank is an excellent paradigm of a regional seed bank (dedicated to the Cretan flora), to the design, establishment and functioning of which our team has considerably contributed; currently, there is an ongoing partnership with MAICh and a number of Cretan duplicate accessions are hosted in our Seed Bank.

Today, the NKUA Seed Bank hosts **727 seed accessions from 403 native plants of the Greek and Cypriot floras** (the majority of them representing rare and threatened plant taxa), with the aim of long-term storage (ex situ conservation). The number of the seed accessions accommodated is quite satisfactory considering the austere economic environment and the not always stable flow of resources and personnel. The majority of the stored seed accessions have been collected by the researchers and collaborators of our team, in the framework of the implementation of various research and applied projects in the large field of nature conservation and management. The enrichment of the Seed Bank with new seed accessions is currently ongoing at a quite reasonable rate.

Despite the sometimes limited flow of funding, NKUA Seed Bank and the NKUA Research Team of Plant Physiology and Conservation Biology **are in possession of substantial know-how and high standards equipment** which includes, among others, 3 freezing chambers for storing seed accessions, 6 modern germination (growth) chambers, 1 freezer, 1 desiccation cabinet for the reduction of seed water content, 1 stereomicroscope coupled to a digital microscopy camera, 2 field cameras, GPS, various meteorological sensors/loggers and numerous precision sieves as well as various tools for handling and cleaning seed batches, in a fully equipped Laboratory of Seed Biology. Seed collection and handling follow strictly the standardised international rules. The lab members and their associates are well aware of and qualified on the relevant protocols (ENSCONET 2019, CPC 2019 etc.) so that both the optimal quality of seed accessions and the widest possible cover of the genetic variation of the collected populations are assured.

In addition to the **significant research work** carried out in the framework of the NKUA Seed Bank and the Laboratory of Plant Physiology and Conservation Biology, a similarly persistent objective is **educating and training of new researchers** through the diverse fields of plant conservation biology (in situ and ex situ) and seed biology in general, both at graduate and postgraduate levels. During the last three decades, as many as 40 Diploma Theses (a research work, prerequisite for graduation of Biology students) and around 20 PhD Dissertations were successfully carried out on various, relevant topics.

Presently, Dr Maria Doussi is the administrative responsible of the Seed Bank and Prof. Emer. Costas A. Thanos holds scientific responsibility. The rest of the members of the team are: Prof. Emer. Kyriacos Georgiou, Spyros Oikonomidis (PhD student) and the external collaborators/researchers Dr Katerina Koutsovoulou and Apostolis Kaltsis (MSc).

Prof. Emer. Costas A. Thanos  
NKUA Seed Bank Scientific Responsible  
October 2021



Prior to seed collecting we must identify (and sometimes tag) the plant species at the flowering stage: (from left, clockwise) *Androcymbium rechingeri* (an EU priority species, found in Greece only in western Crete) and the Greek endemics *Campanula asperuloides*, *Aethionema retsina* and *Crocus cartwrightianus*.



Collecting dry parts with seeds of *Campanula merxmuellerei* (a Greek endemic) in cliffs of Skyros Isl., with the help of extending scissors. Bottom right: the same plant with flowers.





Collecting seeds in the field requires laborious and skillful teamwork while it must follow conservation-minded, international standards (see the Seed Collection Protocol of ENSCONET).





Field seed collections are transferred to the lab where they are subjected to meticulous handling and cleaning techniques.





In the final stage of lab handling, seed accessions are dried inside moisture-proof chambers (drying incubators, top and middle) before seeds are loaded into moisture-proof vials with cotton and desiccant on top (bottom).







Larger seeds or bulk seed accessions (and seed-containing vials as well) are stored in moisture-proof jars which also contain cotton and desiccant on top of the seeds; the jars are properly labeled and long-term stored in a freezer, at -20 °C.



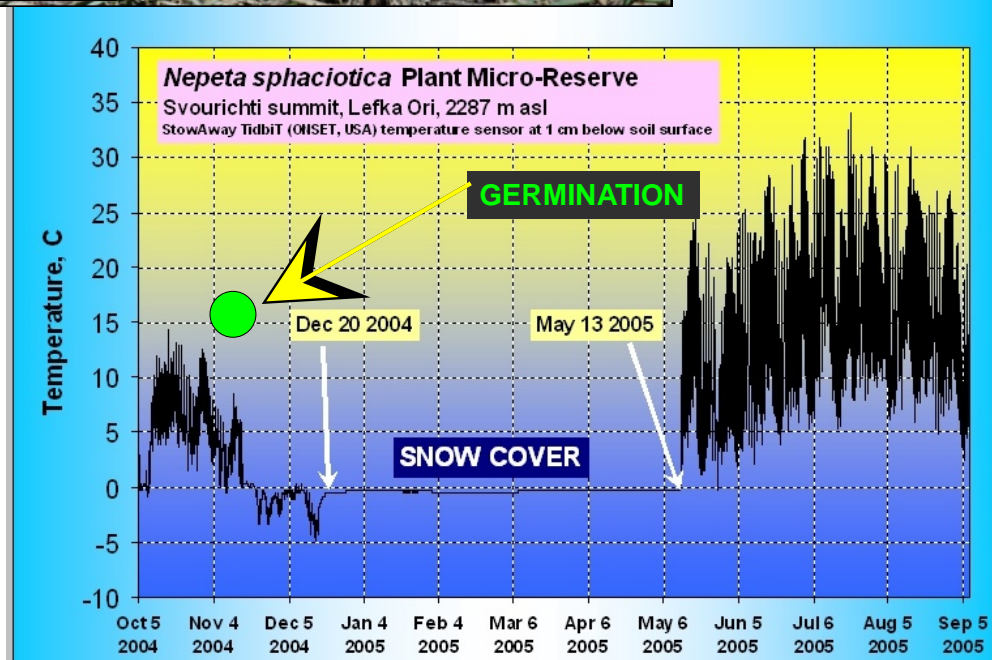
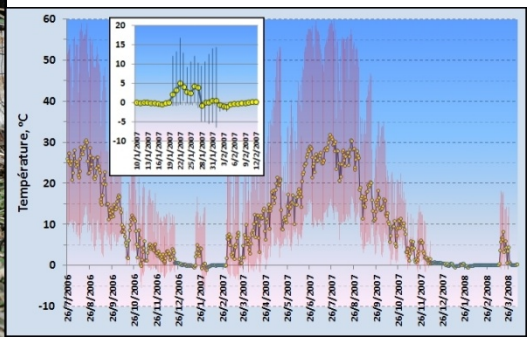
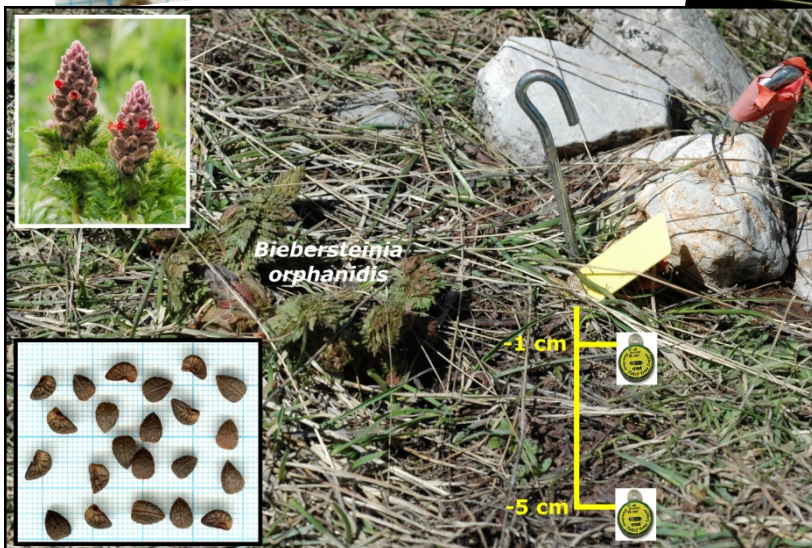
The seed containing, moisture-proof, storage vessels are placed within various freezers, for long-term storage at a continuous temperature of -20 °C.





Apart from preserving plant diversity (ex situ conservation), Seed Banks can provide seeds for in situ conservation actions, such as enhancing or reintroducing plant populations of threatened species. Above: Reseeding *Veronica oetaea*, a critically endangered annual plant, growing only in a few temporary ponds on Mount Oeta (Central Greece).





An imperative element of a Seed Bank operation plan is the research on seed structure and function, and especially the investigation of their germination both under controlled laboratory conditions as well as in the field. Top: Seeds of *Biebersteinia orphanidis* (left) and *Aethionema retsina* (right). Middle: Establishing temperature sensors/loggers in the natural microhabitat of a *Biebersteinia orphanidis* plant and the recording (graph) of temperature fluctuations in the soil, where seed germination takes place. Bottom: soil temperature graph in the habitat of *Nepeta sphaciatica* and the investigation of its seed germinability in the particular field conditions as well as the projected impacts of climatic change on germination timing.