



### Wild species

Wild relatives of crops may have properties of potential importance for future breeding programmes.

In crop wild relatives of *Brassica*, sunflower and barley the underlying mechanisms of seed dormancy and viability loss are used to translate the knowledge gained on model species and crops to wild plant species.

### Participants

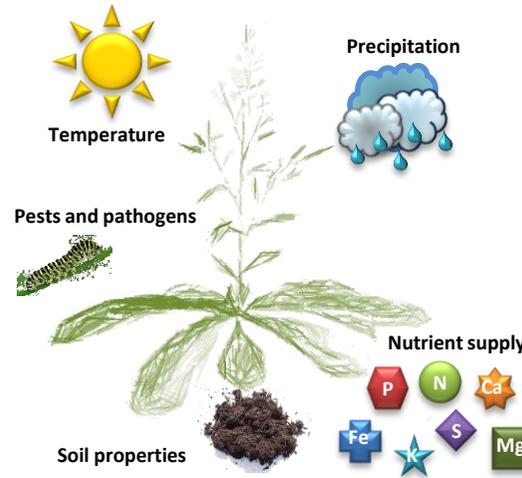
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- Royal Botanic Gardens , Kew - *UK*
- Leibniz Institute of Plant Genetics and Crop Plant Research (IPK) - *Germany*
- Université Pierre et Marie Curie (UPMC) - *France*
- Max Planck Institute for Plant Breeding Research (MIPZ) - *Germany*
- Warwick University - *UK*
- Institute National de la Recherche Agronomique (INRA) - *France*
- University of Leeds - *UK*
- Universidad de Salamanca - *Spain*
- Commissariat à l'énergie atomique et aux énergies alternatives (CEA) - *France*
- Limagrain Europe - *France*

### More information:

<http://www.uibk.ac.at/botany/ecoseed/home/>

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### Environmental stress on the mother plant



Changing environmental conditions during seed production, including temperature and water availability, can cause problems in commercial seed production and are major components in climate change scenarios.

EcoSeed aims to reveal how seed quality is modulated by changing environmental factors predicted in climate change scenarios, focussing on heat and drought.

### Effects of seed storage on seed quality



Long-term cold storage in gene banks



Artificial seed ageing in the laboratory

Temperature and relative humidity upon storage greatly affect seed viability.

EcoSeed partners study the storage behaviour of seeds from plants that were subjected to heat or drought, to see if the environmental conditions experienced by the mother plant affect subsequent seed storage.



## ECOSEED

Impacts of Environmental Conditions on Seed Quality



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## The Project

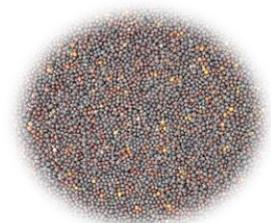
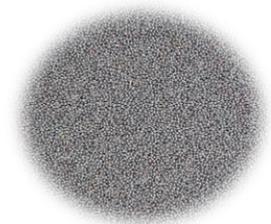
Seed quality is of paramount importance to agriculture, food security and the conservation of wild species. Considerable economic losses result from sub-optimal seed performance, undermining food security and livelihoods. Seed quality is strongly influenced by the environmental stresses experienced by the mother plant. Climate change will further exacerbate economic losses and decrease the predictability of seed yield and quality for the farmer.

The looming challenges of climate change and food security require new knowledge of how stress impacts on seed quality, as well as a re-appraisal of optimal seed storage conditions. Coordinated by the University of Innsbruck, Austria, EcoSeed addresses these challenges by bringing together a group of distinguished European experts in seed science and converging sciences to characterise seed quality and resilience to perturbation.

EcoSeed combines state-of-the-art "omics", epigenetics, and post-"omics" approaches, such as nuclear and chromatin compaction, DNA repair, oxidative and post-translational modifications to macromolecules, to define regulatory switchboards that underpin the seed phenotype. Special emphasis is placed on the stress signalling hub that determines seed fate from development, through storage, germination and seedling development, with a particular focus on seed after-ripening, vigour, viability and storability.

Translation of new knowledge gained in model to crop and wild species is an integral feature of EcoSeed project design, which will create a step-change in our understanding of the regulatory switchboards that determine seed fate.

Novel markers for seed quality and new "omics" information generated in this project will assist plant breeders, advise the seed trade and conservationists alike. In this way, EcoSeed will be proactive in finding solutions to problems with seed quality and storability, and also play a leading role in enabling associated industries to better capture current and emerging markets.



### **Arabidopsis**

*Arabidopsis thaliana* L. is a winter annual plant native to Europe, with a short life cycle and a relatively small genome. Molecular and biochemical pathways implicated in plant and seed resilience to perturbation are studied in selected ecotypes and mutants.

### **Brassica**

*Brassica oleracea* L. is representative of vegetable crops. The genus is highly diverse. It is native to western and coastal southern Europe, and has a diploid genome. Brassica diversity and its influence on seed quality will be examined in the project.



### **Sunflower**

*Helianthus annuus* L. is an annual plant native to America and the second-most important oil crop in the EU.

A major focus is placed on dormancy and ageing of seeds from plants that were subjected to drought.

### **Barley**

*Hordeum vulgare* L. is the fourth most important cereal crop, and high seed quality is essential for the brewery industry.

The effects of environmental conditions during seed development and storage conditions are analysed in more than 180 genotypes.