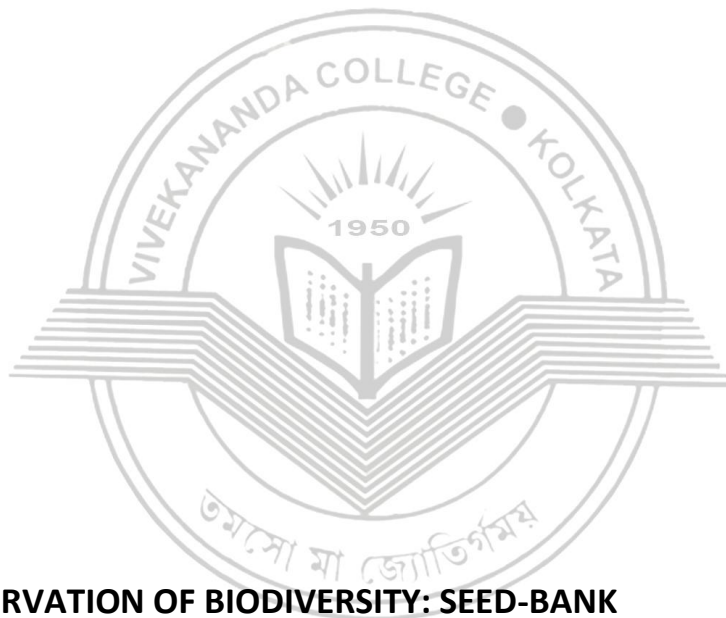


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NAAC ACCREDITED 'A' GRADE



Topic: **CONSERVATION OF BIODIVERSITY: SEED-BANK**

Course Title: Plant Geography Ecology and Evolution

Paper: CC-4

Unit: 4.4

Semester: SEM-IV

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## SEED-BANKS: A METHOD OF *EX SITU* CONSERVATION OF PLANT DIVERSITY

**Seed-banks** are repositories where full genetic complements of plants are stored in the form of seeds. Here seeds are stored as a source of planting material in case seed reserves elsewhere are destroyed. Thus, it serves as a method of *ex-situ* conservation of plant diversity.

### Method of Storage:

- In seed gene banks, germplasm is stored as seeds of various accessions.
- Virtually all gene banks are essentially seed gene banks. Seed conservation is quite easy, relatively safe and ordinarily needs minimum space. Under suitable conditions, seeds of many species can be stored for up to 50-100 years.
- Generally, seeds are dried to a moisture content of about 5% and then stored in freezers at -18°C or below; dehydration is needed to prevent rupture of cell membrane by formation of ice crystals inside the seeds during storage.
- Containers of glass, tin, plastic or a combination of these may be used for seed storage.
- Seed DNA degrades with time, so these seeds need to be periodically replanted and fresh seeds are collected for another round of long-term storage.

Seeds are classified, mainly **on the basis of their storability**, into two major groups:

1. **Orthodox** and
2. **Recalcitrant**

### Orthodox seeds

- Seeds of this type can be dried to moisture content of 5% or lower without lowering their viability.
- Most crop seeds belong to this category. Such seeds can be easily stored for long periods; their longevity increase in response to lower humidity and storage temperature.

### Recalcitrant Seeds

- The viability of this group of seeds drops drastically if their moisture content is reduced below 12-30%. Seeds of many forest and fruit trees, and of several tropical crops like citrus, cocoa, coffee, rubber, oil palm, mango, jackfruit, etc. belong to this group.
- Such seeds present considerable difficulties in storage. Therefore, germplasm of such plants are conserved by alternative approaches.

- The conditions for seed storage depend mainly on the duration of storage.

Generally, **seed bank collections** are classified into three groups: base collections, active collections and working collections. This grouping increases the efficiency of use and the level of management of the collections.

### **Base Collections**

- These consist of all the accessions present in the germplasm of a crop, which are stored at about - 18°C with 5% moisture content; they are disturbed only for regeneration.
- Germination tests are done every 5-10 years. When the germination of an accession falls below, usually, 95% of its germination at the start of storage, the accession is regenerated. For reasons of safety, duplicates of base collections should be conserved in other Germplasm banks as well.
- High quality orthodox seeds can maintain good viability upto 100 years.

### **Active Collections**

- The accessions in an active collection are stored at temperatures below 15°C (often near 0°C) and the seed moisture is kept at 5%.
- The storage is for medium duration, i.e., 10-15 years.
- These collections are used for evaluation, multiplication and distribution of the accessions.
- Active collections are usually maintained by multiplying the seeds of their own accessions. But from time to time, base collection material should be used for regeneration of these collections.
- This is essential to prevent any appreciable shift in the genetic make up of the collections.

### **Working Collections**

- The accessions being actively used in crop improvement programmes constitute working collection.
- Their seeds are stored for 3-5 years at less than 15°C and they usually contain about 10% moisture.
- These collections are maintained by the breeders using them.

## **Importance of Seed banks in conservation of plant diversity**

Virtually all gene banks are essentially seed gene banks. Seed conservation is quite easy, relatively safe and ordinarily needs minimum space. Under suitable conditions, seeds of many species can be stored for up to 50-100 years.

### **1. Conservation of Crop Diversity**

Seed banks undertake and promote long-term conservation of collections of seeds as plant genetic resource of agricultural crops, wild plant species, and rare and endangered plants. In India, National Bureau of Plant Genetic Resources (NBPGR) serves as an organisation for collecting, characterising, evaluating, documenting, conserving and exchanging seeds and plant propagules.

### **2. Protection from Natural Catastrophes**

Storing of seeds guards against catastrophic events like natural disasters, outbreak of disease, war etc. Natural disasters are unforeseen events that could lead to complete annihilation of crops from the face of the earth. The foresight of keeping seeds in a seed bank could save such a situation. Malaysian rice paddies, for example, were wiped out during the 2004 tsunami and international seed banks provided farmers with seeds that helped them start over.

### **4. Protection against pandemic Diseases**

A serious breakout of some diseases could completely eliminate crops. Where diseases have ravaged crops and left no traces, seed banks can intervene and provide the farmers with seeds .

### **5. An authentic source of seed material for research purpose**

Seeds that are stored in seed banks can be made easily available to scientists and researchers who wish to study these seeds especially if such research could lead to improvement of crop production.

**6.** It is a very useful method of long-term storage of **rare and endangered germplasm** of both wild and cultivated plants..

**7.** In case of **food crops**, many useful plants that were used over centuries but are no longer in use for commercial purpose, are becoming rare. Seed banks also conserve these types of germplasms.

Properly stored seeds can stay viable for even millennia, eliminating the risk of losing crops.

The **drawback** of this method is that, the process of evaluation is interrupted when collected germplasms are stored in seed bank. Moreover, the plants which develop from long-term storage seeds may sometimes fail to cope up with the environment.

## Assignments

### A-Type (each carrying 2 marks)

- Differentiate between Orthodox and Recalcitrant seeds.
- What is meant by baseline collection of seed bank?
- Mention the principles followed in seed banks for long term storage of plant germplasm.
- What is seed bank?
- What do you mean by germplasm of a crop?

### B-Type (each carrying 5 marks)

- Write an explanatory note on the importance of seed banks regarding *ex situ* conservation of plant diversity.

