MULBERRY GERMPLASM BANK

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The sum total of hereditary material or genes present in a species is known as the germplasm of that species. Therefore, germplasm collection is a collection of a large number of genotypes of a crop species and its wild relatives.

Germplasm collections are known as gene banks. These furnish the richest source of variability which is essential for improvement of a crop through the breeding programmes to meet specific ends.

With modernization of agriculture, large tracts of land are put under pure line varieties, self pollinated crops, hybrid varieties and cross pollinated crops. This has led to a gradual disappearance of local or land or desi-varieties and open pollinated varieties, which are resources of considerable variability. Thus there is a gradual but sure **catastrophe** referred to as **genetic erosion**.

Genetic Erosion is the gradual loss of variability in the cultured forms and in their wild relatives due to their large scale replacement by the cultivated forms derived from them.

Some of the important germplasm collections are

- **Royal Botanic garden, Kew, England.**
- **Institute of plant Industry, Leningrad.**
- **International Rice Research Institute, Los Banos, Philippines.**

- **Thus the need for a germplasm. Germplasm collections contain land varieties, wild forms, primitive races, exotic collections and highly evolved varieties. Maintenance of gene banks cannot be achieved by individual approach and is a matter that involves government and international agencies.**
- **It is mentioned that there are about 560 varieties of mulberry maintained at various Indian Institutes, CSR&TI, Mysore has about 400 accessions, among which 117 are exotic, 182 indigenous and 101 elite F_1 hybrids.**
- **Other centers for conservation mulberry germplasm are Channapatna, Bangalore, Kollegal, Trichi, Culcatta, Berhampore, Kalimpong, Dehradun, Sharanpur and Srinagar.**

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- **Central Sericultural Germplasm Resources Centre (CSGRC), Hosur is the premier centre under Central Silk Board for conservation and utilization of Seri-biodiversity in the country.**
- **The centre is also recognized as a National Active Germplasm Site (NAGS) for mulberry by National Bureau of Plant Genetic Resources (NBPGR), New Delhi and for silkworm by National Bureau of Agricultural Insect Resources (NBAIR), Bangalore.**

Objectives

- **Population sampling, through survey of variability and collection of variants.**
- **Maintenance of variability with a twofold need of maximizing variability for the future and to make the variability available for current use.**

The work programme of a gene pool center invariably includes:

- **Exploration and Collection.**
- **Characterization, Cataloguing and Evaluation.**
- **Conservation.**
- **Utilization.**

1. Exploration and Collection

Explorations are trips for the purpose of collection of various forms of crop plants and their related species. Explorations generally cover those areas that are likely to show the greatest diversity of forms *i.e.*, the centers of diversity. Exploration is the primary source of all the germplasm maintained in the germplasm collections.

Explorations are based on a sound knowledge of the biosystematics of the genera and the species to be collected. Wherein emphasis is laid on ecological aspects

Explorations is of two types

1. **Region specific multi-crop exploration.**
2. **Crop specific exploration.**

The first one requires extensive studies covering the entire flora of a region, which is usually carried out by the Botanical Survey/Natural history Society of a Country. After a preliminary multi-crop exploration or on the data already available on a specific exploration, one should concentrate on the crop specific exploration.

- **Of about 68 species so far recognized in the genus Morus, a greater number occur in Asia especially in china (24 Species), Japan (19 Species) Korea (6 species), India & Taiwan (4 each), Burma & Indonesia (3 each), Thailand, Viet Nam and Afghanistan (2 each), Arabia, Oman and Muscat (1 each), 14 species are found in North America, 7 species in central and South America.**
- **From the distribution pattern of the species of Morus, It is clear that there is a great diversity in the Sino-Japanese and Rocky Mountains.**

Exploration should involve collection and co-operative efforts of international (through IBPGR) as well as national (NBPGR) level. Exploration of varieties or species has been carried out in Japan and China. In India this attempts have been sporadic and isolated, hence there is a need to give exploration of genus Morus in the Himalaya or sub Himalayan region.

(IBPGR- International Bureau for plant genetic resources)

(NBPGR- National Bureau for plant genetic resources)

2. Characterization, Cataloguing & Evaluation

- **Characterization of the material is of utmost important. Since this gives the idea whether the material collected is a new one and if not how far it differs from those of already collected. It should include morphological, cytological, embryological, anatomical, physiological and biochemical studies.**
- **The material should then catalogued by giving it an entry number, information regarding the name of the species/variety, place of origin *etc*.,. The plants may be grouped in to 3 groups. Exotic, indigenous and wild collections.**
- **Cataloguing should be then followed by evaluation, to assess the potential of the different accessions to mark the superior ones to be supplied to different institutions / stations for yield trial and bioassay.**

3. Conservation

Once the material has been identified to be new or having some special attributes, it is necessary to conserve the variant for further utilization and more to prevent its erosion.

Conservation strategy depends on the nature of the material, objectives and scope of the activity. It must be consider the time dimension, whether it is for short, medium or long term preservation and also the location.

Conservation can be carried out in two forms *viz*., *insitu* and *exsitu*.

- ***Insitu* conservation demands the establishment of nature or biosphere reserves, notational parks or special legislation to protect the endangered or threatened species. Since mulberry lacks a natural ecosystem to support, the biosphere reserves are not a solution for mulberry conservation. Thus the best solution is *exsitu* conservation *i.e*., in a gene bank by field planting and *invitro* methods.**

Field Planting

Under optimal agro climatic conditions with uniformity in the agro climatic conditions.

The accessions are usually maintained in the field by planting (45 x 45 x 45 cm) with 1.2 mt x 1.2 mt spacing being found the best. During the establishment period of one year pruning should be avoided. Followed by yearly two pruning schedule. However, filed planting requires lot of space to accommodate the different accessions and it also involves labor and other inputs. Further there is always the liability of losing the genotypes due to phyto-pathological threats and damage from manmade or natural disasters and human error in handling of material. To circumvent the difficulties encountered in preserving germplasm by field planting in vitro methods are currently being adopted for germplasm conservation.

Invitro Culture

- **Can be restored for short or medium term preservation. However for long term preservation cryopreservation is followed. It is done at extremely low temperature, preferably at that of liquid nitrogen (-196°C) so as to immobilize almost all metabolic activities and simultaneously minimize the opportunity for genetic change.**

4. Utilization

In many cases primary introduction has been made which have proved to be very well suited over the local cultivars. Basic work on combining ability *etc*., has to be estimated for further utilization.

Procurement of Germplasm

- **Apart from the exploration for the collection, the germplasm are procured through NBPGR which is responsible for introduction and maintenance of germplasm of agricultural and horticultural plants. In addition to NBPGR, various agencies like forest research institute, Dehradun, Botanical Survey of India, Central Research Institute for rice, tea, coffee, sugar cane, sericulture are responsible for the introduction of crops of their interest by co-coordinating with counterparts in other countries and also with IBPGR**
- **Generally the materials are obtained through correspondence as gifts, in exchange of germplasm, in consideration of past gifts or in anticipation of future gifts or else it is purchased.**

Quarantine

- **It means to keep materials in isolation to prevent spreading of diseases, pests *etc*. The introduced material is thoroughly disinfected for contamination with weeds, diseases and insect pests. Suspected materials are suitably treated. The rules prescribing quarantine are known as quarantine rules.**
- **All the materials being introduced must be covered by an authentic phytosanitory certificate from the source country *i.e*., they must be declared as free from diseases, weeds and insect pests. Introduction not confirming the quarantine rules are suspected to be contaminated are likely to be destroyed or would be returned to the source country.**
- **Quarantine control is exercised by NBPGR at prescribed parts of entry *i.e*., Delhi, Mumbai, Kolkotta, Chennai *etc*., This is followed by cataloguing, Evaluation *etc*.,**

Acknowledgements
to

1. Collection, Conservation and Evaluation of Mulberry (Morus Spp.) Germplasm, C S R & T I , CSB, Mysore, 1986.