International Training Course

Plant Conservation Biology: Science and Practice

Friday 1st – Thursday 14th March 2013

New Delhi, India

This International Training Course is being co-organized by the National Bureau of Plant Genetic Resources (NBPGR) and the Royal Botanic Gardens (RBG), Kew, UK. NBPGR is one of the leading institutes for plant genetic resources (PGR) management in the world and is an integral part of the Indian Council of Agricultural Research (ICAR), New Delhi, India. The RBG Kew, UK is a premier organization for plant conservation and seed research. The course will be delivered from **1 – 14 March 2013** at NBPGR, Pusa Campus, New Delhi, India.

Course objectives - This specialized course on plant conservation biology will cover both *in situ* and *ex situ* approaches and is designed for those currently involved in research on seed science and conservation, plant ecology, taxonomy, floristic surveys, genetic resources collecting and maintenance and the preservation of explants.

The course aims to:

- Improve understanding of how to conserve tropical floras with emphasis on conservation planning for endangered, endemic and economic species;
- Enhance knowledge of the physiological, biochemical and biophysical basis of seed handling, processing and storage;
- Equip participants with essential insights into the science of low temperature biology to enable choice of the optimal storage environments for the conservation of various plant genetic resources dependent on the final use of the material;
- Introduce complementary methodologies for the conservation of diverse plant species;
- Acquaint the participants with diagnostic tools for seed quality assessment, including aspects of the molecular basis of seed conservation biology;
- Provide an introduction to the underlying principles of stress related responses during explant processing for conservation and recovery.

Application - Applicants must have prior experience in and/or be actively working on plant conservation biology, seed science, innovation and technology. The application form is attached herewith. The completed application should be sent to:

Prof. K.C. Bansal, Director, National Bureau of Plant Genetic Resources, Pusa Campus, New Delhi-110012, India. Fax: +91-11-25842495
Email: director@nbpgr.ernet.in **AND** skm1909@gmail.com

With a copy to:

Prof. Hugh W. Pritchard, Head of Research, Seed Conservation Department, RBG Kew, UK. Email: h.pritchard@kew.org

Deadline for applications: Wednesday 16 January 2013

Maximum number of participants: 16

NBPGR (ICAR) and The Royal Botanic Gardens, Kew
Building Partnership

The NBPGR (ICAR) and the Royal Botanic Gardens, Kew have committed to a long-term partnership in research and human resources development in various aspects of plant conservation biology to ensure strengthening of capacity in national and international institutions. This International Training Course on *Plant Conservation Biology: Science and Practice* will be supported by faculty from India and the UK who will introduce both theoretical and practical aspects of this important topic. Taking an holistic approach, training will cover a diverse range of conservation approaches for plant genetic resources in the tropics. Active discussion and resolution of exisiting research challenges will form an essential part of this course.

National Bureau of Plant Genetic Resources is the nodal agency for the Plant Genetic Resources activities in India.

About the course

Conservation and effective utilization of plant biodiversity contributes to food and nutritional security, poverty alleviation and environmental protection, which are major challenges faced by humankind in the 21st Century. Conservation biology is a comparatively new science that addresses conservation problems in relation to species, communities and ecosystems. Theoreticians and practitioners of this science aim to provide the principles and tools for preserving biological diversity, increasingly in an integrated way. Conservation of plant germplasm is effectively carried out both *in situ* and *ex situ* through the maintenance of natural habitats and various genebanks, respectively. Field genebanks, seed genebanks, *in vitro* repositories and cryogenebanks are used to conserve diverse germplasm as clonal materials, pollen, shoot tips, embryos, seeds, etc. However, to be applied properly these approaches require a basic understanding of various facets of conservation biology, including: plant collecting strategy and data management, plant phenology, seed morphology and physiology and the biochemistry of propagules. As some species produce difficult-to-store seeds (i.e. non-orthodox) an appreciation of the mechanistic basis of stress (in)tolerance in seeds and the physiology of vegetative tissues is needed to ensure appropriate, advanced techniques of *in vitro* conservation and cryopreservation for their conservation. *In vitro* approaches, including tissue culture maintenance and cryopreservation, are recognized as useful tools for medium- to long-term conservation of these groups of species. Genomics and molecular techniques are now being used increasingly to aid decision making in conservation and to elucidate survival mechanisms in plant cells / seeds.

The course consists of a series of lectures and practical sessions starting from the floristic strength of Indian sub-continent to modern collecting methods and solving the intricacies involved in developing suitable conservation methodologies for diverse species and explants. Emphasis will be given to the various factors that govern the successful conservation of seeds, embryos, embryonic axes and vegetative tissues with particular reference to role of environmental conditions that can mitigate changes during storage at cellular and metabolic levels. Young scientists, currently working or aspiring to work in these fields of conservation science are encouraged to participate in the training course.

The participants will be given an opportunity to present a brief seminar on a topic of their work that relates to a plant conservation challenge they are facing in their country / region. Through the sharing of experiences and the expansion of their personal network of collaborators, it is anticipated that participants will be better equipped in the future to analyse and solve problems relating to their work.

Curriculum

Lectures and discussion

1. **Plant genetic diversity: the Indian sub-continent as a case study**
   - Unique charactersitcs of Indian Flora
   - Crises species of Indian Gene Centre and their red listing
   - Genetic basis of collection, suitability of conservation approaches and collections databasing
2. **Seed morphology and development**
   - Seed morphology in relation to conservation
   - Seed developmental physiology
3. **Processing methods**
   - Sample cleaning, drying, processing and purity analysis
4. **Role of moisture and temperature in storage**
   - Moisture in relation to storage and longevity
   - Temperature effects - cryopreservation, freezing injury, natural tolerance and recovery/survival
   - Glassy state and the biophysics of storage
5. **Complementry plant conservation approaches**
   - *In vitro* conservation
   - Cryopreservation - desiccation, pre-growth, encapsulation-dehydration, vitrification
   - Cryobanking - operation, maintenance and management of cryobanks
6. **Seed quality in relation of geographic distribution of species**
   - Seed viability, germination and vigour in relation to environment and climate change
   - Seed certification, quality assurance and health
7. **Seed science – seeds as model systems for research and development**
   - Seed diagnostics for desiccation tolerance and storage (oxidative and biochemical mechanism)
   - Seed germination / dormancy markers
   - Seed chemistry – oils / lipids, protein, sugars, enzymes, etc.
8. **Bioinformatics, molecular marker techniques and data management**
   - Role of genomic tools in seed stress and storage
   - Bioinformatics and database management
9. **Future directions for plant and seed conservation research - discussion**

Practical sessions

Lectures will be reinforced with practical hands-on laboratory exercises and interactive discussions.

1. Red Listing assessment and collections data management
2. Seed morphology, anatomy and seed coat ratio
3. Practical determination of water activity, and moisture content
4. Seed germination, substrates, viability assessment, normal seedlings, etc
5. Processing for seed conservation – traditional seed banking procedures
6. Cryopreservation of seeds, embryos, dormant buds, apices, pollen and cryobanking procedures
7. Cellular, physiological and biochemical markers for stress tolerance during conservation
8. Molecular marker techniques - ISSR, STMS, SCAR, SNPs

Other information -

Resource persons/trainers

Faculty for this course will be from Royal Botanic Gardens, Kew (UK), NBPGR (India), Bioversity International, Botanical Survey of India, Ministry of Environmant and Forests and other organizations involved in plant biodiversity conservation and seed biology.

Course language

All course notes and lectures will be in English. Therefore, participants should have a good command of English and knowledge of the appropriate technical terms used in plant sciences.

Climatic conditions

March is a pleasant time in New Delhi when the winter season ends and the temperature is around 15-25^{O}C during the day and 15^{O}C at night. Woolen/warm clothes are required.

Transportation

Indira Gandhi International Airport and the Domestic Airport in New Delhi are about 20 km and 15 km, respectively from the NBPGR campus. Transport from the airport to the Guest House and back will be provided by NBPGR. Also transport will be provided daily to the participants from the Guest House to NBPGR.

Accommodation

The participants will be accommodated in the Guest House/ Hotel from 28th February to 13th March 2013, inclusive. The cost of any additional days would be at trainee's own expense. Information on extending the stay needs to be given in advance.

Training course fees

This is a fee-based course and participants are encouraged to seek assistance from their own organizations or other funding agencies. However, both the Royal Botanic Gardens, Kew, UK and NBPGR will make efforts to identify sources of funding for a few full or partial scholarships. The course fees are US$2,000 for non-Indian participants and Rs 25,000/- for Indian participants and include the following:

- Lecture and course materials
- Local transportation
- All meals / tea / coffee
- Accommodation in guest house/economy hotel
- Administration charges

Please note that additional information on the course will be provided to all the participants who are selected for admission to the course.

For further information contact:

Prof. K.C. Bansal, Director, National Bureau of Plant Genetic Resources
Pusa Campus, New Delhi-110 012, INDIA.
Email: director@nbpgr.ernet.in and skm1909@gmail.com
(www.nbpgr.ernet.in) **or**
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