भाकृअनुप
ICAR

Annual Report

2013 - 2014

National Research Centre for Orchids
(Indian Council of Agricultural Research)
Pakyong - 737 106, Sikkim, India

National Research Centre for Orchids
(Indian Council of Agricultural Research)
Pakyong- 737 106, Sikkim

Tele No.	03592 – 257954, 257703, 257537
Telefax	03592 – 257289, 257282
Email	nrcorchids@rediffmail.com
Website	www.nrcorchids.nic.in

Published by	R. P. Medhi, Director
Editorial board	R. P. Medhi Ram Pal R. Devadas
Compiled & designed by	N. G. Debnath

Correct citation

NRCO, 2013. National Research Centre for Orchids, Annual Report 2013-14, Pakyong, Sikkim

May, 2014.

Cover photographs

Front : *Cattlya* denlee

Front (inside) : Glimpses of last 5 years Institure annual Reports

Back (inside) : Glimpses of Krishi Mela

Back (outside) :

Center – Hybrids developed by NRCO

Right – Paintings of open drawing competition during Independence Day celebration

Printed at

M/S. Hindustan Printers
Ground Floor, Gupta Market,
Raja Rammohan Roy Road,
Siliguri - 734 001
Cell : 96790 09688

Preface

Orchids have emerged as one of the most important and vibrant component in world floriculture market. In home too, popularity of orchids as cut flowers increased such that these have now become part of each and every important public, private and social functions. Presently, bulk of the demand for orchid cut flowers is met through the imports. The import of orchid flowers has risen from 299.9 lakhs during 2008-09 to 1149.53 lakhs in 2012-13. There is nearly 4 fold increase in import of orchid cut flowers in the last five years and this demand is further expected to increase further. These figures indicate huge and expanding market of orchid cut flowers in India. This is only a tip of ice berg in the sea of floriculture market. The orchid industry does not rest on cut flowers of *Dendrobium.* It also *includes* cut flowers and pot plants of other commercially cultivated genera like *Cymbidium*, *Vanda*, *Oncidium*, *Paphiopedilum*, *Phalaenopsis* etc., micropropagated plants, dry flowers, and extraction of biomolecules and perfumes.

India is rich in orchid genetic resource and about 1,300 species are known to occur across length and breadth of the country. The National Research Centre for Orchids came into being in 1996 to provide research support for upcoming orchid industry in the country on one hand and conserving depleting orchid genetic resources on the other. Since its inception, the centre has made significant progress in conservation genetic resources, breeding of new varieties, molecular characterization of wild genetic resources, developing package of practices for cultivation and postharvest management. This document, Annul Report highlights the significant research achievements of various research programmes and other institutional activities for the year 2013-14. During this year, diversity in *Cymbidium whiteae*, *Dendrobium* species was analysed and barcoade for *Vanda* species was developed. A patent for gDNA extraction protocol from orchid leaves that enhances the recovery and quality of gDNA was filed. The institute is striving towards development of new hybrids which would useful as the cultivars for cut flowers/potted plants or the materials for further improvement programme. Three hybrids, one each of *Cymbidium*, Aranda and *Dendrobium* have been released at institute level. Two *Cymbidium* crosses have been registered with International Cultivar Registration Authority for Orchid Hybrids, Royal Horticultural Society as Darjeelig Nymph and Darjeeling's Delight. Ten clones from these crosses suitable for cut flower and pot plant have been selected for multiplication. Under Crop Production suitable hybrids of *Cymbidium, Dendrobium, Vanda*, *Mokara, Oncidium, Aranda* and *Cattleya* were identified for commercial cultivation in the region. Improved production technologies of *Cymbidium* and *Dendrobium* were standardized. For increasing post harvest life of cut flowers during transit, the efforts were made to standardize harvest stage and

chemicals required for pulsing of *Cymbidium* and *Dendrobium* cut flowers. Several new insects like diaspid scale insect, *Lepidosaphes pinneformis*, Aphid, *Aulacorthum circumflexum*, false spider mites were reported for the first time to infest orchids. Parasitoids, aphelinid wasp, *Aphytis* sp. of *Cymbidium* scale were reported during the year.

Considering the adverse effect of pesticides, the centre is working on biocontrol of orchid pest and several botanicals were identified for pest management.

DUS test guidelines of two commercial orchid genera viz., *Phalaenopsis* and *Cattleya* were finalized and notified.

The staff of the centre was encouraged to participate in different HRD programmes for honing their skill. Research findings were disseminated through organizing trainings and Kishi Mela, Stakeholder's meet and conducting demonstrations.

In order to review, monitor and evaluate the research programmes and development activities of the Centre, RAC, IRC, IMC and Stakeholders' meeting were conducted.

The Institute could attract the attention of the public due to untiring and self-less efforts and energy put by every scientist along with other staff members of the Institute. I want to congratulate all of them for their hard work. I hope this document will be able to depict the various activities of the institute in a focused way and the information contained here-in will be able to help the farmers, researchers and planners engaged in the field of orchid research and development.

I consider it a privilege to place on record the encouragement and support given by Dr. S. Ayyappan, Secretary, DARE & Director General, ICAR. We would have not made such achievement without the support and guidance of Dr. N. K. Krishnakumar, Deputy Director General (Horticulture). We are also grateful to Dr. S. K. Malhotra, ADG (Hort. II) for all the support and advice given to us time to time. I am equally thankful to the Chairman and members of Research Advisory committee for their suggestions to reorient our research programmes. Last but not the least, I am thankful to Dr. J. Poorani (Principal Scientist) and Dr. Sunil Joshi (Principal Scientist) of National Bureau of Agriculturally Important Insects, Bangalore for identifying and confirming of the insect and parasitoid species whenever my scientist approached them.

Place: Pakyong, East Sikkim.
Dated: 30th April, 2014

(R. P. Medhi)
Director

Executive Summary

- A survey was carried out at Kodagu region of Western Ghats during June to August and 40 species were recorded. The collections were added to NAGS (Orchids) for conservation. Three varieties *viz.*, *Cymbidium* 'B. S. Basnet', *Aranda* 'Kunga Gyatso' and *Dendrobium* 'V. Nagaraju' were released at institute level.

- Two *Cymbidium* crosses have been registered with International Cultivar Registration Authority for Orchid Hybrids, Royal Horticultural Society as Darjeelig Nymph and Darjeeling's Delight. Ten clones from these crosses suitable for cut flower and pot plant have been selected for multiplication.

- Total 10 superior breeding lines were identified after selection from crosses *viz.*, PBX-05-772, PBX-05-751, NRCO/HxB, NRCO/BxH and NRCO/PlxPw. The *in-vitro* seed germination protocol for seed crosses of *Phalaenopsis* (PBX-12-99) and *Paphiopedilum* (PBX-11-162 & 165) was standardized.

- Genetic diversity analysis in a small population of *Cymbidium whiteae*, a rare & endangered orchid species of Sikkim Himalaya was done using RAPD markers and found higher percentage of polymorphism within the population. All the 20 plants were distributed into two major clusters and similarity between two clusters was only 31 %, suggesting the possibility of sub-guoups with in small population. To confirm reliability, the results from two different clusters were tested with other 22 *Cymbidium* species of India.

- Simple sequence repeat (SSR) markers were used to determine the genetic relationship among 20 species of medicinal *Dendrobium* orchids. Four SSR primers sets had amplified a total of 149 loci and produced total 75 polymorphic bands; with high Rp and PIC value indicating the efficiency of primers capable of detecting polymorphism.

- Genetic divergence of some native wild species of *Dendrobium* orchids having unique floral traits was determined using two extensively used simple molecular techniques RAPD and ISSR. Genetic similarities of some species are same in both RAPD and ISSR. The result of the present study provides important information about the genetic distance of among species and helps to select distant parents for breeding programme.

- Twenty decamer primers of RAPD were tested to study the genetic variability in 12 samples of *Dendrobium anceps*. The results showed monomorphic bands in all the samples, which indicates that there was no genetic variability among the samples and the morphological variations might resulted due to environment.

- DNA Barcoding of native 18 *Vanda* species was done using 6 microsatellite markers (bar code primers) and the results are to be submitted in NCBI. Sequence

characterized amplified regions (SCAR) method was used to study 24 native species of *Cymbidium* orchids as SCAR markers reactions provided more polymorphic markers on a per reaction basis than RAPD.

- One patent filed under Indian Patent Application No.826/KOL/2013 of 11.07.2013 in the name of INDIAN COUNCIL OF AGRICULTURAL RESEARCH on a simple modified CTAB method for isolation of high quality genomic DNA from fresh matured leaves of orchids.

- The mesophyll cell collapse of Phalaenopsis caused by low temperature occurred in severe winter, when the air temperature goes down below 10°C and water temperature ranges within 4-5°C.

- Water content of plant parts of *Dendrobium* 'Thongchai Gold' deteriorate drastically after withheld of 20th day of emergence of flower spike. The normal growth can be recovered after 60days of emergence.

- Cocopeat is a better growing media for hardening tissue cultured plantlets of *Zygopetalum* as compared to sand, moss and leaf mould. High radical scavenging activity was observed in the stem of *Aerides odoratum*. The optimum temperature for hardening is 25°C.

- In *Phalaenopsis*, Brother & White, Kaleidoscope, Maki Watanabe, Ox Prince Thunder, Strawberry, Memoria Francis Hunter, ChianXen Magpie and Hsing Ying Fortunewere found promising almost round the year except December and January.

- In *Phalaenopsis*, Detroit, among five impregnation treatments, $CoCl_2$ (1000 ppm) for 45 minutes had maximum vase life (75.6 days) followed by 1000 ppm NiCl2 for 45 minutes (62 days) over control (45 days.)

- In *Cym*. 'PCMV', packing of loose bud stage cut spikes with cellophane paper had maximum vase life (60 days) over control (49 days)

- Morphological descriptors of *Paphiopedilum* (76) finalized and DUS Test Guidelines of *Oncidium* was submitted to the Plant Authority for registration.

- Based on monitoring several pests like mites, aphids, thrips, scale insects, shoot borer and other minor pests like grasshoppers, snails and slugs were found to infest different species and hybrids of orchids under polyhouse conditions. Diaspidid scale insect, *Lepidosaphes pinnaeformis* (Bouche) reported as pest of several *Cymbidium* species and hybrids.

- Aphid, *Aulacorthum circumflexum* commonly called lily aphid or mottled arum aphid reported as pest of *Cymbidium* hybrids 'Baltic Elegans' and Winter Beach 'Sea Green'. False spider mite reported as pest of around 12 orchid species and hybrids.

- *Coccophagus ceroplastae* (Howard), an *aphelinid wasp* reported as a parasitoid of soft brown scale, *Coccus hesperidum* infesting Orchids from Sikkim. Aphelinid wasps, *Aphytis* sp. and *Pteroptrix sp*. reported as parasitoid (biocontrol agent) of Cymbidium Scale, *Lepidosaphes pinnaeformis* (Bouche) infesting Cymbidium orchids.

- The bio-pesticide treatments, *viz.,* neem oil 0.03 EC (5%) with highest mortality (75%) of mites, followed by *Allium sativum* @ 5% (72%) were found effective on *Cymbidium* under laboratory and polyhouse conditions.
- Culturing of scale insect (*Lepidosaphes pinnaeformis*) on pumpkins was initiated to develop stock culture for carrying out several experiments on its biological control, using its natural enemies. An attempt was also made for culturing Lily aphid, *Macrosiphum luteum* on pea plants under laboratory conditions.

Contents

Acronym

BAP	Benzyl Amino Purine
$CoCl_2$	Cobalt Chloride
CTAB	Cetyl Trimethyl Ammonium Bromide
DMA	Dry Matter Accumulation
DNA	Deoxyribonucleic Acid
DUS	Distinctiveness, Uniformity and Stability
EC	Electrical Conductivity
FRA	Farmers Right Authority
IBA	Indole-3- Butyric Acid
IMC	Institute Management Committee
IRC	Institute Research Committee
ISSR	Inter Simple Sequence Repeat
MS	Murashige and Skoog's
MLT	Multi Location Trial
NAGS	National Active Germplasm Site
NCBI	National Centre For Biological Information
$NiCl_2$	Nickel Chloride
NAA	α-Naphthalene Acetic Acid
PCMV	Pine Clash Moon Venus
PLB	Protocorm Like Body
PIC	Polymorphic Information Content
PPV	Protection of Plant Variety
RAC	Research Advisory Committee
RAPD	Random Amplified Polymorphic DNA
RWC	Relative Water Content
SSR	Simple Sequence Repeat
SCAR	Sequence Characterized Amplified Region
TBARS	Thiobarbituric Acid Reactive Substances
TDZ	Thidiazuron
UPGMA	Unweighted Pair Group Method with Arithmetic Mean

Introduction

The National Research Centre for Orchids was established on 5th October 1996 by the Indian Council of Agricultural Research (ICAR), New Delhi to organize research programme on improvement in productivity, quality and commercialization of orchids. The Sikkim state authorities handed over 22.19 acres of land belonging to Regional Agricultural Centre along with all other assets to ICAR for establishment of the centre. In October 1997, the centre also took over the CPRS, Darjeeling from CPRI and established a campus for research on temperate orchids.

In the initial years of establishment the major focus of research was on collection, characterization evaluation, conservation and utilisation of available germplasm in the country in general and north eastern region in particular. With the changing scenario of floriculture in the country, the centre has modified its approach and thrust areas of research to meet the challenges. Today, the focus is on development of marketable varieties/hybrids, molecular characterization, standardization of agro-techniques, post harvest management, production of quality planting materials through tissue culture and creation of repository of information related to all aspects of orchids in the country. On the basis of recommendations of RACs the research programmes have been modified on the mission oriented research projects on crop improvement, crop production, crop protection and post harvest management.

Mandate

- To collect, characterize, evaluate and conserve germplasm of orchids
- Molecular characterization to check biopiracy and IPR protection of orchids
- Development of protocol for mass multiplication
- Production of quality planting materials for large scale cultivation
- To develop hybrids/ varieties suitable for domestic and export market
- To develop production, protection, and post-harvest technologies for orchids
- To act as a national repository of scientific information on mandate crops
- To coordinate research with other scientific organizations and act as a centre for training

The research work is being carried out in 11 different institutional projects. In addition to these, research work is also being carried out under 4 externally funded projects viz. Horticulture Mission for Northeast and Himalayan States (HMNEH), Network Projects on Distinctiveness, Uniformity and Stability on Orchids (DUS), DBT funded project on 'Development of Protocol for Commercialization of Paphiopedilum orchids in NE states' and NAIP's A Value Chain on Selected Aromatic Plants of North East India.

2.1 Research Achievements NRC(O), Main Centre

2.2 Research Achievements NRC(O), Darjeeling Campus

ANNEXURE