ORCHID BIOTECHNOLOGY

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edited by

Wen-Huei Chen

National University of Kaohsiung, Taiwan

Hong-Hwa Chen

National Cheng Kung University, Taiwan

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Foreword

The *Phalaenopsis* is the national flower of Taiwan, first found and collected by the Japanese on Lanyu (Orchid Island) in 1897. After winning back-to-back championships in the International Orchid Exhibition in California in 1952 and 1953, Taiwan's native *Phalaenopsis* has gained worldwide admiration and the pride of the Taiwanese people.

With an optimal climate for growing the *Phalaenopsis*, Taiwan is well situated for commercialization of the flower, being in the northernmost area of *Phalaenopsis*' natural germplasm. Today, the *Phalaenopsis* industry in Taiwan is well developed and has advanced to green house breeding and systematic production. Moreover, Taiwanese product varieties now account for more than 50% of the global *Phalaenopsis* market share. It is no surprise that the *Phalaenopsis* industry is viewed as an example of the most advanced knowledge-based agriculture in Taiwan.

The future of the *Phalaenopsis* is exceptionally bright. On August 24, 2004, the New York Times reported that there is a \$2 billion global market for orchids, with *Phalaenopsis* holding the leading share within that market. *Phalaenopsis* is also recognized as one of the most exciting and elegant indoor flowers by the American Orchid Society (AOS). And recently, Mr. Ed Matsui, owner of Matsui Nursery, the largest *Phalaenopsis* producer in the US, has estimated there will be a five-fold increase in the *Phalaenopsis* market within the next ten years.

Furthermore, according to the December 2004 issue of *Flora-Culture International*, the most influential floral magazine, the *Phalaenopsis*, a newly developing flower with 20% growth each year for the past five years, is the top seller among all pot flowers in The Netherlands and Japan. Moreover, with the advent of mass retail as a new distribution channel, demand has increased for mini-type, low-priced product, and color variants, boosting flower sales in recent years.

All these factors have led to the *Phalaenopsis* being selected as one of the top four most important export products for Taiwan by the Agriculture Product Competition Module (APCM), a group developed

by A-Turn Biotech Company, an advisor to the government for agriculture, to analyze and evaluate potential floral products for export.

However, the value created by the *Phalaenopsis* is greater than that of just the plant itself; strategic alliances with other industries will provide the opportunity for extracting further value and greater margin from the flower. *Phalaenopsis* is recognized as a symbol of elegance amongst flowers. Properly managed, this rare property enables the attraction and development of many complementary products and industries such as gifts, arts, and home decoration.

As Taiwan moves into the future, the establishment of acclimation and overseas sales points is one of the important steps in broadening the market of *Phalaenopsis* globally. Taiwan has a complete range of technologies from seedling acclimation to product vernalization. Through international strategic alliances enabling joint ventures and technology transfer, Taiwan will create higher profits through widening markets internationally for all parties involved.

Currently, due to shipping costs and importation regulations, certain finished *Phalaenopsis* products are not able to reach the US markets. Thus, establishing a local acclimation facility for consumers is now the most cost effective way to market and distribute *Phalaenopsis*. Fortunately, the US government has recently begun accepting the importation of *Phalaenopsis* with moss as a supporting medium, which will provide a new international trading opportunity for Taiwan.

There are many factors that contribute to Taiwan's unique capability to take the greatest advantage of the *Phalaenopsis* phenomenon. As mentioned above, the subtropical climate makes Taiwan a near perfect environment for the production of *Phalaenopsis*. In addition, Taiwan is rich in orchid species, holding a worldwide leading position in new product development fueled by hundreds of professional and amateur breeders who have won gold medals in world competitions. Taiwan has maintained and will continue to maintain its competitive edge on research and development in the *Phalaenopsis* business.

From a technical perspective, Taiwan's *Phalaenopsis* industry has the strength to compete with any of the major floral countries. It is strongly supported by The National Science and Technology Program for Agricultural Biotechnology (NSTPAB), a joint program of the National Science Council, Council of Agriculture and Academia Sinica. The NSTPAB supports universities and research institutions in advancing the technology in genetic transforming, tissue culture, and production.

Most of the chapters in this book have come about as a result of this National Project and I am honored to have served as the team leader since the initiation of the project in 1998.

For many years, significant advances in the biotechnological research of *Phalaenopsis* have been made in the areas of thermo-tolerance, pathogen resistance, flowering control, flower color and virus diagnosis. This strength of research ability and experience should attract international cooperation on technological applications.

Taiwan's *Phalaenopsis* production system has evolved to a commercialized scale by through involvement of many breeders and companies. In addition, it has developed into a complete high tech system, i.e. from product selection, healthy seedling propagation, quarantine systems, and production automation, which form a well-set package in agriculture developments. As such, it is well situated for forming strategic alliances worldwide as a turn key project.

In order to vertically integrate the orchid industry, the Council for Economic Planning and Development, has established and funded the Taiwan Orchid Plantation (TOP) in Tainan County in 2003. TOP was designed and developed by myself together with the management team of A-Turn Biotech. We believe that TOP will be the platform to strengthen the orchid industry in R&D, mass production, exhibition, trading and so forth, which will make Taiwan the largest orchid supplier in the world. In addition, the "TOP" name will provide a strong differentiating brand for Taiwan's *Phalaenopsis*.

Since there are many highly skilled breeders and technology developers on the island, TOP will also be acting as a platform for trading orchid varieties and technologies internationally. Taiwan has the capability to custom-make specific products for every specific market in the shortest possible period because of its rich breeding materials and skillful breeders. This will enhance its position as a global leader of *Phalaenopsis* suppliers.

Technological development is the foundation of the industry; it takes tremendous time and investment to build up, but is absolutely essential. I am glad to see this book published and believe that the book will become the most useful and valuable technological resource for all orchid lovers worldwide.

Dr. Irwin Y.E. Chu
Founder
A-Turn Biotech Co.

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Preface

The appreciation of orchid beauty has a long history in both western and eastern cultures. Over many years of development, the orchid has evolved such that it embraces not just the hobbyists' market but a highly commercial market, thanks to advances in techniques such as breeding, micropropagation, industrial cultivation, etc. Today, orchid cut-flowers of *Cymbidium*, *Dendrobium* and *Oncidium*, and potted plants of *Phalaenopsis* are marketed globally. It is envisaged that growing tropical orchids for cut-flower production and potted plants will benefit from the recent advances in the crop science technology. However, for the orchid industry, producing an improved orchid through biotechnology is only the beginning.

Taiwan has been the main driving force of the world's *Phalaenopsis* breeding and plant production. The orchid research program was firstly supported 10 years ago by the Taiwan Sugar Corporation for the first three years, and currently has been one of the National Science-Tech Program for Agriculture Biotechnology (NSTPAB) for more than six years. The budgets of the NSTPAB are founded by National Science Council, Council of Agriculture and Academic Sinica, Taiwan. The contributors to the book include researchers from the Institute of Plant and Microbial Biology, Academia Sinica, National Taiwan University, National Tsing Hua University, National Cheng Kung University, National University of Kaohsiung, and National Pingtung University of Science & Technology. We collaborate with the growers of Taiwan Orchid Plantation, a government sponsored entity, in terms of research and training, in order to bring the Taiwan orchid industry to a new level of sophistication and profitability.

This book is the first volume devoted exclusively to orchid biotechnology. It is extremely informative as it addresses many aspects of orchid biotechnology, including modern breeding (Chapters 1 and 2), *in vitro* morphogenesis (Chapter 3), somaclonal variation (Chapter 4), application of orchid mycorrhized fungi (Chapter 5), analysis of orchid genomes (Chapters 6–8) and functional genomics (Chapters 9–12), and

genetic transformation (Chapter 13). It will be a valuable guide for readers such as research workers, graduate students, people interested in orchid biology and floriculturists. Its publication will be a milestone sets the foundation for the next level of orchid research.

Wen-Huei Chen and Hong-Hwa Chen
The Editors

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List of Contributors

Ming-Tsair Chan

Agricultural Biotechnology Research Center
Academia Sinica
Taipei
Taiwan

Ching-Chun Chang

Institute of Biotechnology
National Cheng Kung University
Tainan
Taiwan

Doris C. N. Chang

Department of Horticulture
National Taiwan University
Taipei
Taiwan

Wei-Chin Chang

Institute of Plant and Microbial Biology
Academia Sinica
Taipei
Taiwan

Fure-Chyi Chen

Department of Plant Industry and Graduate Institute
of Biotechnology
National Pingtung University of Science & Technology
Pingtung
Taiwan

Hong-Hwa Chen

Department of Life Sciences
National Cheng Kung University
Tainan
Taiwan

Wen-Huei Chen

Department of Life Sciences
National University of Kaohsiung
Kaohsiung
Taiwan

Mei-Chu Chung

Institute of Plant and Microbial Biology
Academia Sinica
115, Taipei
Taiwan, ROC

Yu-Yun Hsiao

Department of Life Sciences
National Cheng Kung University
Tainan
Taiwan

Chien-Hao Huang

Department of Botany
National Taiwan University
Taipei
Taiwan

Yen-Yu Kao

Department of Botany
National Taiwan University
Taipei
Taiwan

Institute of Molecular and Cellular Biology
National Taiwan University
Taipei
Taiwan

Chang-Sheng Kuoh

Department of Life Sciences
National Cheng Kung University
Tainan
Taiwan

Hsiao-Ching Lee

Institute of Bioinformatics and Structural Biology and
Department of Life Science
National Tsing Hua University
Hsinchu
Taiwan

Yung-I Lee

Institute of Plant and Microbial Biology
Academia Sinica
115, Taipei
Taiwan, ROC

Botany Department
National Museum of Natural Science
Taichung
Taiwan

Yi-Hsueh Li

Department of Botany
National Taiwan University
Taipei
Taiwan

Chih-Chung Lin

Department of Botany
National Taiwan University
Taipei
Taiwan

Chin-Wei Lin

Department of Life Sciences
National Cheng Kung University
Tainan
Taiwan

Hsien-Chia Lin

Institute of Biotechnology
National Cheng Kung University
Tainan
Taiwan

Tsai-Yun Lin

Institute of Bioinformatics and Structural Biology
and Department of Life Science
National Tsing Hua University
Hsinchu
Taiwan

Hsiang-Chia Lu

Department of Plant Pathology and Microbiology
National Taiwan University
Taipei
Taiwan

Zhao-Jun Pan

Department of Life Sciences
National Cheng Kung University
Tainan
Taiwan

Sanjaya

Agricultural Biotechnology Research Center
Academia Sinica
Taipei
Taiwan

Jun Tan

College of Bioinformation
Chongqing University of Post and Telecom
Chongqing
China

Ching-Yan Tang

Department of Life Sciences
National University of Kaohsiung
Kaohsiung
Taiwan

Wen-Chieh Tsai

Department of Biological Science and Technology
Chung Hwa University of Medical Technology
Tainan County
Taiwan

Heng-Long Wang

Department of Life Science
National Kaohsiung University
Kaohsiung
Taiwan

Edward C. Yeung

Department of Biological Sciences
University of Calgary
Calgary
Alberta T2N 1N4
Canada

Hsin-Hung Yeh

Department of Plant Pathology and Microbiology
National Taiwan University
Taipei
Taiwan

Kai-Wun Yeh

Institute of Plant Biology
College of Life Science
National Taiwan University
Taipei
Taiwan

Wun-Hong Zeng

Institute of Biotechnology
National Cheng Kung University
Tainan
Taiwan