

COMMERCIAL ASPECTS OF ORCHID CULTIVATION IN THAILAND

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Abstract

Orchid cultivation in Thailand has been developed for over 50 years. The export value started from a few million baht to about three billion baht in 2019. Major growing factors in natural growing habitats are concerned for appropriate commercial cultivation. They are altitude, light, temperature, relative humidity, nutrients, and air movement. At present, saran houses constructed with cement poles, cement benches, galvanized pipes for hanging orchid baskets, and black netted nylon roof with 50-60% shade and open sides are developed for low cost, long lasting, and suitability for growing tropical orchids for cut-flower and potted orchids. The cultivation is done mostly for many outstanding cultivars of pink-red, white, and yellow-green flowered dendrobiums and blue, pink, and yellow flowered vandaceous orchids which need hot and humid conditions. A complete cycle of orchid production which needs breeding programme, micropropagation, planting materials (mainly coconut husks, charcoal, and cement block), plastic containers, watering equipments, fertilizer, pest control, post-harvest technology, and transport from farm to packaging houses are effectively implemented. Thailand is famous for exporting cut-flower orchids applying low-cost cultivation but high production. Orchids continue to dominate other ornamental crops in Thailand due to better technology know-how, suitable climatic conditions for dendrobiums and vandaceous orchids, experienced and skillful growers and exporters, as well as their nationwide popularity. Apart from all these, orchids are a symbol of Thailand that reflects the country's pride internationally.

Introduction

THAILAND IS situated in a hot and humid tropical zone of SouthEast Asia with a current population of about 69 million and a total land area of 128.4 million acres. Thailand is the 13th most plant-rich country in the world after Brazil, Colombia, China, Mexico, USSR, Indonesia, Venezuela, USA, Australia, India, Peru, and Malaysia (Cronquist, 1981). Tropical ecosystems, unlike those in temperate zones, provide wider niches and are able to support a much larger variety of plant, animal, and microbe species. It is estimated that there are approximately 15,000 plant species in Thailand including 3,000 species of mushrooms and fungi, 633 species of ferns, and about 1,100 species of orchids. More than 779 species of plants possess active herbal ingredients, and are used for traditional medicines (OEPP, 1996).

Orchids rank the highest amongst the several tropical ornamental crops, especially cut-flower crops, which are important to the Thai agriculture and economy. Orchid growing started as a hobby in Thailand about 90 years ago; until 1966, only small amount of orchid cut-flowers were exported from Thailand to some European countries, but the country attained the status of the world's leading producer and exporter of orchids in a little over a decade and it continues to hold the top rank since 1979. It is estimated that 54 per cent of the orchids produced are exported and the rest 46 per cent are traded in the domestic market. The export of orchid cut-flower was initiated in 1963 with a few hundred-thousand spray of mostly *Dendrobium* Pompadour sent to European market. The export value of cut-flower

orchids increased sharply, from a few million baht in 1969 to about 2.2 billion baht in 2018. The export of cut-flower orchids still predominates, but that of orchid plants has also been on a rapid increase, figuring at about 540 million baht in 2018 (DITP, 2020; Department of Customs, 2020). This article tells the success of orchid cultivation for high income earning from cut-flowers and orchid plants, through concerted national efforts in respect of germplasm resource management, research, training, extension, and technology application.

Factors Affecting Orchid Cultivation

Wild orchid plants, growing continuously from generation to generation in nature, with suitable factors which are altitude, growing place, light, temperature, humidity and water, food, and air movement. Therefore, successful orchid cultivation needs to follow factors mentioned above by making greenhouses long lasting and with low cost.

Orchid Cultivation Area

Being suitable for cultivation of many tropical commercial crops and ornamentals, Thailand produces several ornamental cut-flower crops, such as, orchids, roses, jasmines, marigolds, lotuses, potted plants, other tropical flowers, other temperate flowers, chrysanthemums, and so on. Many of these cut-flower crops are produced abundantly, some up to several million units. Amongst these, only orchids hold economic importance both for local use and export; whereas, others are traded mainly in the local market.

Orchid cultivation has been confined in the Central Plain, mainly in Bangkok, and its nearby provinces, where climatic conditions, water, transportation, and marketing system are the most favorable. Orchid production abounds mainly in three provinces, *i.e.* Samutsakorn, Bangkok, and Nakornpathom followed by the nearby central provinces and a little bit in the North and the South of Thailand. Suitable environment, high orchid genetic diversity, efficient infrastructure, experienced growers, technology applications, extension, training, teaching, and research, as well as business skills, have contributed enormously to the success of orchids in Thailand (Thammasiri, 1997). Many farmers have made orchid growing as their main occupation, being a better source of earning than other crops. Orchid production is made easier by over 10 tissue culture laboratories. Marketing is facilitated for growers by over 50 export organizations engaged exclusively in orchids.

Orchid Production Technology

Thai orchidists, from both the public and private sectors, have developed and improved orchid production

technology in relation to plant improvement, propagation, tissue culture, pest control, and post-harvest management, which help to increase yield and quality, thereby directly enhancing production, quantity of export, and the export value.

Breeding Programme

At the beginning, the introduced species *Dendrobium superbiens*, the hybrid *Dendrobium* Pompadour, and other dendrobiums were used as parents for hybridization. Selection of offspring was conducted carefully and further micropropagation was carried out to make a large commercial scale growing possible. *Dendrobium* Pramot 'No. 1' and 'No. 3', *Dendrobium* Waipahu, *Dendrobium* Intuwong, *Dendrobium* Ekapol 'Panda No. 1', 'Panda No. 2', *Dendrobium* Sonia 'No. 16', 'No. 17', and 'No. 28' provide good examples of successful *Dendrobium* breeding (Fig. 1).

Vanda Rothschildiana (*Vanda coerulea* × *V. sanderiana*) was adopted as the first *Vanda* cut-flower cultivar about 50 years ago. It took 6 years from seedling to flowering

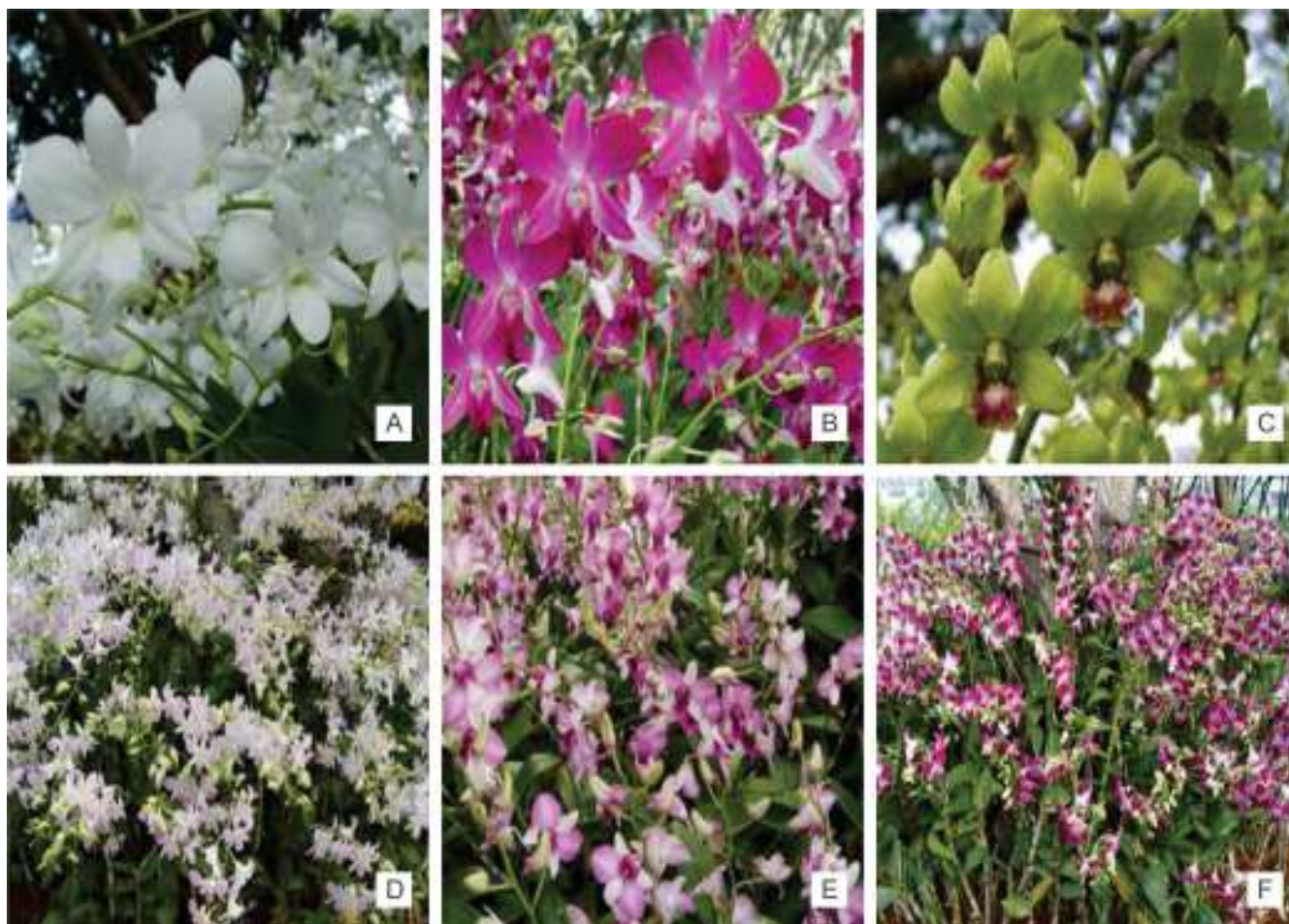


Fig. 1. A-F. New *Dendrobium* hybrids for cut-flowers.

and produced a low yield. Later, *Vanda* Varavuth (*V. Lenavat* × *V. coerulea*) was registered in 1973. It took only 4 years to flower. Further, *Vanda* Wirat (*V. Madame Ratana* × *V. coerulea*) and *Vanda* Mahakkaphongs (*V. Boonchoo* × *V. coerulea*) were registered in 1979 and 1982, respectively. Both cultivars took 3 years to flower, produced bright purple flowers and long sprays, and a high yield of 8-10 sprays per year (Fig. 2).

Apart from *Dendrobium* and *Vanda*, other orchids used for self, intraspecific, interspecific, and intergeneric hybridization included indigenous Thai orchid species, for example, *Aerides* spp., *Ascocentrum* spp., *Rhynchostylis* spp. etc. and some introduced genera, such as *Aranda*, *Ascocenda*, *Cattleya*, *Mokara*, and *Renanthera*.

Micropropagation and Asexual Propagation

Success for propagating orchids through tissue culture was first achieved in 1949 in *Phalaenopsis* species. Later in 1967, the successful development of techniques for tissue culture of *Dendrobium* provided a breakthrough for the Thai orchid cut-flower business, since this genus has contributed the most to cut-flower production. At present, successful propagation through tissue culture has been achieved in over 80 genera of orchids (Anuprabha and Pathak, 2019; Anuprabha *et al.*, 2017; Arditti and Ernst, 1993; Decruse and Gangaprasad, 2018; Kaur *et al.*, 2017; Pathak *et al.*, 2017; Vasundhara *et al.*, 2019).

Asexual propagation by division or cutting is also practiced but mainly as a hobby and not for large scale production because multiplication is slower in such cases. This method is, however, unavoidably used when tissue culture fails to work. Tissue culture in orchids remains an indispensable tool for the commercial production of elite selections in Thailand because of low cost, uniformity, fast propagation, and high yield in a short period of time. Most cut-flower orchids, *Aranda*, *Ascocenda*, *Cattleya*, *Dendrobium*, *Mokara*, and *Oncidium* alliances are propagated successfully through tissue culture. Within 1-2 years, one young pseudobulb multiplies to over 10,000 plants from the laboratory and is ready to grow in the greenhouse.

Greenhouses

Air movement is the key factor for successful orchid growing. Most greenhouses are open at the sides to facilitate proper air circulation and also to prevent heat accumulation due to the high temperature of 30-40°C during the day (Figs. 3-5). Greenhouses for orchid growing in Thailand were made of teak wood during the early period. They lasted over twenty years and were

resistant to termites. Roofs made of about 1 inch thick teak wood strips spaced 1 inch apart, allowed 50 per cent sunlight to penetrate in a sufficient quantity as required by the orchids. Later, due to steep escalation in teak wood prices and shortages, other hard woods were used, but due to their high cost, orchid growing remained an expensive proposition. Bamboos were also used for shading of orchids. They lasted only for 2-3 years.

Presently, netted nylon, called saran, is used for shading, at the top and sides of greenhouses, also known as *saran houses*. The saran lasts over 5 years and distributes uniform sunlight with 30-80 per cent shading depending upon the net. There are many advantages to saran, including, very low price, ease of installation or removal, light weight, and low labour input. Galvanized pipes are used for poles and galvanized strings or plastic coated wires to hold the saran in place. These rust-proof construction materials help maintain the greenhouse for long periods.

Planting Material and Containers

Planting material and containers have been gradually improved for producing high yield and quality flowers at a low cost. The locally available, inexpensive, coconut husks are widely and successfully used, especially for *Dendrobium* cut-flower production. These are cut and compacted into 24 × 32 square centimeter blocks (Fig. 6) or cut to fit in small or large pots or just cut longitudinally into chunks and put on the table in the greenhouses. The coconut husks last for about 3 years depending on moisture content. Old *Dendrobium* pseudobulbs from old coconut husk planting materials can be cut into different pseudobulbs and used as a starter for new shoots in new planting material (Fig. 7). Nowadays, cement blocks are replaced for coconut husk blocks in many orchid farms (Fig. 8).

Orchids with large-roots, such as *Aranda*, *Aranthera*, *Ascocenda*, *Mokara*, and *Vanda* need good aeration and drainage which is provided by charcoal and *Osmunda* or by using large-size planting material. Also, basket or clay pots with more holes at the side are recommended for large-rooted orchids to ensure good aeration and drainage (Fig. 9).

Small-rooted orchids, such as *Cattleya*, *Dendrobium*, and *Oncidium* need clay pots with holes on the sides and filled with charcoal or coconut husks. Charcoal and *Osmunda*, which are more expensive and also rarely available, have been replaced by coconut husks. Coconut husks (although cheaper) cannot be used to grow large-rooted orchids. They can be used to grow only small-rooted orchids. Alternately, these are grown

on 24 × 32 square cm blocks of coconut husks. Clay pots are used for pot-plant sales, while

coconut husk blocks are used for growing cut-flower orchids.



Fig. 2. A-F. New vandaceous hybrids for cut-flowers.



Fig. 3. Orchid greenhouse.

Use of plastic pots, especially designed for growing orchids, or of foam as potting medium and support (Figs. 10-11), has also been used successfully. They reduce the investment cost and weight of the media and containers for orchid growing.

Water Resources

Thailand does not have problems of water shortage because most orchid growing areas, located in the Central Plains, are lowlands with high underground water level. Ponds, canals, and rivers are also scattered all over the area. Thus, there is no problem of water which is essential for orchid growing. The orchid growers pump the water directly from the natural water resources to the farm, or pump to the reservoir in the farm prior to irrigating to the orchid plants. Rain water has the best quality followed by river water, canal water, and tap water.

Fertilizers

Orchid growers use liquid fertilizer once a week. The



Fig. 4. A greenhouse is open at the sides to facilitate proper air circulation and to prevent heat accumulation.



Fig. 5. Growing *Dendrobium* orchids for cut-flowers.

ratio 1:1:1 (N:P:K) fertilizer is used in general. The ratio 1:2:1 (N:P:K) fertilizer is used to stimulate flowering and high Potassium will be applied for high quality flowers.

Pest Control

In order to meet international standards for good health as well as quality of orchid plants and flowers, prophylactic sprays are used periodically. Various diseases, insects, and viruses, which attack orchids in Thailand have been identified and control measures have been established.

Production, Post-harvest, and Packaging Technology

Useful research on postharvest technology for the last 15 years has helped to ensure that orchid cut-flowers and plants arrive at their destinations fresh and have long vase-life. Thai Packaging Center was established under the Thailand Institute of Scientific and Technological Research (TISTR) to improve packaging, decrease losses, increase export efficiency and upgrade packaging standards, particularly of orchid fresh flowers. Efficient media and concerned



Fig. 6. Growing *Dendrobium* orchids for cut-flowers in 24 × 32 square centimeter coconut husk blocks.



Fig. 7. Growing *Dendrobium* orchids from old pseudobulbs on coconut husks.

governmental organizations have been instrumental in dissemination of information on technology to the orchid growers and exporters.



Fig. 8. Growing *Dendrobium* orchids for cut-flowers on cement blocks, watering with sprinkler system.



Fig. 9. Growing orchids using pieces of foam as planting materials.

Secrets of Success (Thammasiri, 1997)

The key factors responsible for success of orchid production and trade vis-a-vis economy in Thailand may be summarized as below:



Fig. 10. Foam using planting material does not inhibit root growth.



Fig. 11. Growing vandaceous orchids in plastic baskets.

- i) Favourable climate;
- iii) Availability of good quality water in plenty;
- iv) Leadership in adoption and popularization of orchid cultivation;
- v) Richness of indigenous orchid genetic resources;
- vi) Improved production technology, greenhouses, containers, post-harvest processing, quality control, packaging and transport, and their application in orchid trade;
- vii) Efficient communication networks; and
- viii) International acceptance vis-a-vis maintenance of standards.

Conclusion

Thai orchid cultivation for the international markets has a bright future. The export values are high and quite stable. Orchids will continue to dominate other ornamental crops in Thailand due to better technology know-how in orchid cultivation, suitable climatic conditions, experienced and skillful growers, and exporters, as well as their nation wide popularity. The orchid cultivation in Thailand is a good example of development of an ornamental crop, which does not fall in the category of staple food, to have become the major crop of this country. It took a long time to be accepted gradually but firmly for earning high income and thereby enhancing the agrarian economy which can follow suit.

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