

ANNEX A: HIGHLIGHTS OF THE INAUGURAL CLOUD FOREST ORCHID DISPLAY



***Rhyncholaeliocattleya* Duh's Fantasy 'Mellow'**

This is an intergeneric hybrid between two genera, *Rhyncholaelia* and *Cattleya*. Many hybrids from this group are famous for their large, showy lips. Flowers of *Rhyncholaeliocattleya* Duh's Fantasy 'Mellow' have a strong deep red colour and a ruffled dark fuchsia lip marked with yellow furrows. The flowers also have a fragrance. It was awarded a First Class Certificate from the American Orchid Society for having the highest flower quality.



***Rhyncattleanthe* Duh's Smile 'The King'**

This hybrid produces a large number of flowers for a corsage-type *Cattleya*, which helps to showcase the beautiful sunset tones of the blooms. The hybrid is named as such because the flower resembles a smiling face.



***Rhyncholaeliocattleya* Duh's Wisdom 'Green Star'**

This compact hybrid has wonderfully scented large, jade green flowers with ruffled green lips. This orchid will flower when the plant is still relatively small, and the flowers can last up to three weeks. *Rhyncholaeliocattleya* Duh's Wisdom 'Green Star' was awarded the Bronze Medal at the World Orchid Conference in 2011.



***Brassocattleya* Yellow Bird**

This hybrid that produces many flowers thrives in Singapore's hot climate. Its pedigree is 75 per cent *Brassavola nodosa* and 25 per cent *Cattleya milleri*. The combination of the red *Cattleya milleri* and the white and green *Brassavola nodosa* produces the bright yellow petals and the red dots on the lip of *Brassocattleya* Yellow Bird.



***Rechingerara* Cute Lady ‘Christmas Candy’**

This hybrid has four different groups of orchids in its ancestry – *Laelia*, *Guarianthe*, *Rhyncholaelia*, and *Cattleya*. The magenta tip of its lip contrasts beautifully with its light purple petals.



***Guaritonia* Why Not ‘Roundabout’**

Each bloom of this hybrid which produces many flowers has a flat shape and rich colour. This orchid is compact with two to five flowers on each flower spike. It is relatively easy to grow and can be a frequent bloomer.

ANNEX B: 10 FACTS ABOUT CATTLEYAS

1. The Cattleya is native to Central and South America. Several Central and South American nations have the Cattleya as their national flower.
 - Brazil: *Cattleya labiate*
 - Cayman Islands: *Myrmecophila thomsoniana*
 - Colombia: *Cattleya trianae*
 - Costa Rica: *Guarianthe Skinneri*
 - Honduras: *Rhyncholaelia digbyana*
 - Venezuela: *Cattleya mossiae*

2. The Cattleya is known for producing some of the biggest flowers among orchids. Some hybrids have flowers measure up to 24cm across.

The photo shows *Rhyncholaeliocattleya* Duh's Pride 'Good Hope', which can be seen in the Cloud Forest orchid display, and is an example of how big and showy the blooms can be.



3. Cattleya is called the Queen of Orchids, and is often used in corsages and bouquets. Some people regard this genus among the most beautiful of orchids because of their showy blooms.
4. There are many close relatives of the Cattleya, and over 1,500 species have been discovered.
5. Breeders use these various species in orchid hybridisation to modify the colour, shape and size of offspring. Many of the Cattleya hybrids on the market have a range of different species in their ancestry.
6. Some of the hybrids showcased in the Cloud Forest orchid display have such a complex family tree that they are more than 10 generations away from the species in their ancestry.
7. Orchids can produce up to two million tiny seeds in each pod, which greatly increases the odds of producing a difficult-to-make hybrid.
8. *Myrmecophila*, a species of Cattleya, have hollow stems with a tiny gap at the bottom. Ants use this hole to go inside and build a nest. The ants in turn protect the orchid from predators.

9. *Brassavola*, another species of *Cattleya*, are known as “Lady of the Night” orchids because they are fragrant after sunset to attract night-flying moths to help with pollination.

The photo is of *Brassavola nodosa*, which can be seen in the Cloud Forest orchid display.



10. To mimic their wild conditions closely, *Cattleya* at Gardens by the Bay are grown in a range of unusual potting mediums, such as fern roots and even coral chips.

ANNEX C: HYBRIDISATION OF ORCHIDS AT GARDENS BY THE BAY

Stage 1: Selection of parent plants

The research team from Gardens by the Bay chooses mother and father plants with the desirable characters to breed into the hybrid. Characteristics the team assesses include the colour, shape, size, scent and longevity of flowers, as well as the frequency of flowering. Knowledge of orchids, experience and an intuitive sense of what characteristics can go together are qualities the breeder should possess.

Stage 2: Pollination

Pollen from the father plant is transferred to the stigma pad of the mother plant by hand. It is critical the removal of pollen from the mother plant is carried out at the same time, so that no self-pollination occurs.

Stage 3: Seed pod formation and harvesting

If pollination is successful, a seed pod forms on the mother plant. The development and maturing of the seed pod takes between two months to more than a year. The research team has to be vigilant when checking on the maturity of seed pods, because they must be harvested just when they reach maturity. Seed pods harvested too early may not yield viable seeds, while waiting too long may result in a split seed pod that loses its tiny seeds. There are also instances when seed pods abort after a few months of successful pollination.

Stage 4: Seed pod sent to Gardens by the Bay's laboratory

The harvested seed pods are sent to the laboratory at HortPark to be germinated in flask culture. The germination period from seeds to plantlets can take a few months to several years, depending on the type of orchid. Seed pods may fail to germinate due to factors such as immature seeds, fungal infections and contamination.

Stage 5: Growing of seedlings

Seedlings housed in sterile culture flasks or bottles are sent back to Gardens by the Bay's nursery. The seedlings are taken out of the flask, washed and transplanted into pre-potting media in the Gardens' Support Biome, a temperature-controlled cool glasshouse. They are kept in high humidity and allowed to acclimatise to the growing environment. After acclimatisation, the seedlings are re-potted into growing media. These re-potted seedlings are transferred to the Gardens' nursery to be nurtured until they flower for the first time.

Stage 6: Evaluation and selection of matured hybrid

Once there is flowering, a record is made of the flowers, so that an evaluation can be done on which hybrid has the best flower and ultimately chosen as the orchid to be registered.

Stage 7: Registration and production of new hybrid

When a hybrid is selected to be named, it needs to be registered with the International Orchid Register of the Royal Horticultural Society. This particular orchid will be mericloned so that it can be reproduced vegetatively to duplicate the characteristics.

Stage 8: Documentation of work process

Data collection is vital in any orchid breeding program. Photos of both parent plants, location of the plants, date of pollination and seed pod harvesting are diligently recorded so that the parentage of the new hybrid can be tracked. This documentation serves as a repository of useful information such as the time taken for seed pod formation and micro-propagation. It also allows breeders to reflect on the success or failure of their choice of parent plants.

ANNEX D: *DENDROBIUM* KIAT TAN

Dendrobium Kiat Tan is a hybrid between the highland orchid *Dendrobium victoriae-reginae* from the Philippines, and lowland orchid *Dendrobium crumenatum* (commonly known as the Pigeon Orchid) that is native to Singapore.

It is the first success of Gardens by the Bay's orchid hybridisation programme, which started in 2015 and focuses on crossing highland orchids with lowland orchids.

This hybrid has achieved a better-sized flower and the ability to bloom both in a highland climate and outdoors in Singapore's lowland tropical weather.

The size of the flower as well as its ability to bloom in the lowland tropics are both inherent qualities contributed by its pollen parent *Dendrobium crumenatum*, which has a flower size of 4.5cm by 5.5cm. The size of this hybrid's flower is 6cm by 6cm – significantly larger than the flower of its pod parent, *Dendrobium victoriae-reginae*, which measures 3cm by 3.5cm.



Duration of this hybrid's bloom is between five to seven days in a lowland tropical climate, which is a trait derived from *Dendrobium victoriae-reginae*, as the flower of *Dendrobium crumenatum* only lasts a day.

Both parents have influence on the range of flower colouration. This hybrid produces flowers with colours such as a light shade of purplish-blue, whitish-blue and white.

As this hybrid continues to mature, Gardens by the Bay's breeders hope to observe that it blooms as prolifically as *Dendrobium crumenatum*.