CHAPTER 1

INTRODUCTION

Phalaenopsis orchid is one of the most important ornamental crops in the world market (Griesbach, 2002). It is the leading indoor plant traded in Netherlands auctions, the largest flower and plant auctions in Europe. The total value of *Phalaenopsis* plants in Netherlands auctions increased significantly from 174 million pounds in 2006 to 230 million pounds in 2007 (Centre for the Promotion of Imports from Developing Countries, 2009). The *Phalaenopsis* varieties used for breeding are usually divided into two groups, the standard big flower group and novelty group. The standard big flower group includes the white, pink as well as the varieties with stripes, being derivatives of the white *P. amabilis* and *P. aphrodite* and the pink *P. sanderiana* and *P. schilleriana*. *Phalaenopsis* has been in the market for more than 20 years, in the past, standard type flowers were in high demand. However, just recently, novelty flowers have been released into the market. They are usually small with some special features. Some have special coloration, some have star-shape flowers, some have fragrances. Species involved in these new novelty varieties are *P. amboinensis*, *P. stuartiana*, *P. violacea* and *P. venosa*. In addition, the pot varieties which have small but plentiful flowers have become a new market trend. *P. equestris* is a common parent variety of this group (Chen and Chen, 2007). Several Thai *Phalaenopsis* species and related genera, *Doritis* and *Kingidium*, are compact plants with small and attractive flowers. They can possibly be introduced as potted

plants to new commercial hybrids. Thai *Phalaenopsis* species are *P. cornu-cervi*, *P.gibbosa*, *P. lobbii*, *P. lowii* and *P. parishii*. Other related genera are *D. pulcherrima, K. deliciosa* and *K. minus*. However, crossability of those species need to be tested. Study on genetic relationships of these species will provide some good information for future hybridization of those plants.

Molecular techniques can help resolve relationships among plant materials (Xiang *et al*., 2003). Random amplified polymorphic DNA (RAPD) based on the polymerase chain reaction (PCR) has been used for cultivar identification and genetic relationship studies in *Phalaenopsis* (Been *et al*., 2002; Chen *et al*., 1998; Chen *et al*., 2001c), *Cattleya* (Benner *et al*., 1995), *Cymbidium* (Choi *et al*., 2006; Obara-Okeyo and Kako, 1998), *Paphiopedilum* and *Phragmipedium* (*Chung et al*., 2006), *Vanda* (Lim *et al*., 1999) and *Vanilla* (Minoo *et al*., 2006). The development of molecular markers for identification of genotype and early detection of interspecific hybrids may be important for breeding program and in protecting plant breeder's rights. RAPD technique provides a useful tool for breeding applications. This technique is simple and fast procedure, it requires a low quantity of DNA and is easily automated.

Another technique, amplified fragment length polymorphism (AFLP) can be employed to distinguish closely related genotypes and specific DNA marker. Molecular marker profiles based on AFLP can be used to detect variation at the DNA level and have proven to be extremely effective in distinguishing closely related genotypes. The advantages of this technique include reproducibility, high resolution, genome-wide distribution of markers, and prior knowledge of genome being studied is not required. This technique has been used to analyze genetic relationship and marker in *Phalaenopsis* (Chang *et al*., 2009; Chen *et al*., 2001a; Liu *et al*., 2003),

Dendrobium (Xiang *et al*., 2003), *Aglaonema* (Chen *et al*., 2004a), *Alpinia* (Wongpunya, 2005), *Caladium* (Loh *et al*., 1999), *Curcuma* (Ngoksamoe, 2003) and *Diffenbachia* (Chen *et al*., 2004b). Therefore, the aims of this study were to evaluate the genetic relationship and marker of genus *Phalaenopsis* and related genera, *Doritis* and *Kingidium*, by RAPD and AFLP techniques, which could support the commercial *Phalaenopsis* improvement in the future.

Objectives

1. To study on genetic relationship of genus *Phalaenopsis* and related genera, *Doritis* and *Kingidium*, by RAPD technique.
2. To study on crossability of genus *Phalaenopsis* and related genera, *Doritis* and *Kingidium*.
3. To find suitable primers that are able to characterize the genetic similarity of the F_1 progenies and their parents by RAPD technique.
4. To find the specific marker for flower color pattern of *Phalaenopsis cornu-cervi* by AFLP technique.