Chapter 1

Introduction

The genus *Curcuma* within the family Zingiberaceae has paramount importance as species, medicines, dyes, cosmetics, starch and ornamentals (Apavatjarut *et al*., 1999). A number of *Curcuma* species have beautiful inflorescence and luxurious foliage that have an immense commercial value in floriculture as a versatile ornamental crop used as cut flower, pot and landscape plant (Paisooktivatana *et al*., 2001a and 2001b). The main cultivar in international trade is *Curcuma alismatifolia* (Lekawatana and Pituck, 1998). This cultivar produce a beautiful, tulip-like, pink inflorescence above the foliage, which makes it attractive in the landscape, as a cut flower, or as a potted plant. This plant is erect and the shoot is a pseudostem which comprised of an axis covered by overlapping, sheathing leaf blades. At the base of a pseudostem lies the true stem, an underground structure known as a tuberous rhizome because of its horizontal rather than vertical growth (Phongpreecha, 1997).

C. alismatifolia is usually propagated from geophytic units, which comprises of a rhizome and several storage roots, termed tuberous root. The rhizome has buds that will produce next season leaves and an inflorescence (Hagiladi *et al*., 1997). The storage roots are swollen, egg-shape at root ends that are thought to act as storage organs for plant growth during dormancy and emergence (Hagiladi *et al*., 1997), thus playing an important role in growth and development.

The transition from vegetative to reproductive development represents one of the major phase changes during the life cycle of a plant. This transition is initiated by both endogenous signals (e.g. age and developmental phase) and environmental factors. The most important environmental signals that affect flowering time are those associated with the changing seasons; temperature and photoperiod, although other external stimuli, such as light quality and nutrition, can also play a role in particular locations. The complex interactions of endogenous and environmental stimuli act to maximize the reproductive success of a plant, by ensuring that flowering occurs only under conditions and at the time, that are favorable for fertilization and seed formation.

In some species, the timing of flowering is primarily influenced by environmental factors, which serve to communicate the time of year and/or growth conditions favorable for sexual reproduction and seed maturation. Other species are less sensitive to environmental variables and appear to flower in response to internal plant such as plant size or number of vegetative nodes. Flowering can also be induced by stresses, such as nutrient deficiency, drought, and overcrowding (Levy and Dean, 1998).

The most striking recent advances in our understanding of the genetic control of the timing of flowering have come from work on *Arabidopsis*. Flowering involves the sequential action of two groups of genes: those that switch the fate of the meristem from vegetative to floral (floral meristem identity genes), and those that direct the formation of the various flower parts (organ identity genes). Therefore, genes that control flowering time can be expected to interact with floral meristem identity genes, which in *Arabidopsis* include *LEAFY* (*LFY*), *APETALA1* (*AP1*), *CAULIFLOWER*

(*CAL*), *AP2*, and *UNUSUAL FLORAL ORGANS* (*UFO*). The floral meristem identity genes are themselves capable of influencing flowering time. For example, overexpression of *LFY* and *AP1* causes early formation of determinate floral meristems whereas mutations in *TFL1* affect both flowering time and meristem identity (Levy and Dean, 1998).

In *C. alismatifolia*, this multifactors affect flowering is not yet known. These studies were conducted to understand the gene expression and environmental factors (photoperiod and temperature) on flowering of this plant.

Objectives of the experiments

1. To determine the effect of photoperiod on growth, flowering, nitrogen fraction (soluble and insoluble nitrogen) and total non-structural carbohydrates content.
2. To determine the effect of temperature (constant temperature and day/night temperature) on growth, flowering, nitrogen fraction (soluble and insoluble nitrogen) and total non-structural carbohydrates content.
3. To study gene expression during flowering.