Chapter 7

General discusstion

The studies were focused on the gene expression and factors on flowering of *Curcuma alismatifolia* such as gene expression during flowering, photoperiod and temperature affected growth, flowering, nitrogen fraction and total non-structure carbohydrate (TNC). There are 4 differential gene expression patthern in shoot of *C. alismatifolia* during inflorescence initiation which the plant were 11-15 cm in height. In many species must reach a certain age or size before they can flower, the vegetative meristem is thought to first pass through a juvenile phase in which it is incompetent to respond to internal or external signals that would trigger flowering in an adult meristem (Poethig, 1990). Other species are less sensitive to environmental variables and appear to flower in response to internal cues such as size or number of vegetative notes (Levy and Dean, 1998).

The main environmental factors responsible for floral induction are photoperiod and temperature (Bernier, 1998). In *C. alismatifolia*, short day photoperiod was delayed flowering while long day photoperiod promoted flowering and quality of spike. Because *C. alismatifolia* was quantitative longday plant (Hagiladi *et al*., 1997). Similar to Zhang *et al*., (1995) reported that *Lysimachia congestiflora* Hemsl. was quantitative long day plant. Plant given a long day photoperiod (16 hrs) flowered at 21 and 34 days earlier than plant given 12 and 18 hrs photoperiod, respectively. *Achillea millefolium* ‘summer pastels’ grown under 16 hrs photoperiod flowered after 27 days, while those under 8 hrs remained vegetative (Zhang *et al*., 1995).

In flowering process, the leaves must be competent to produce any stimulus that is required by the apex and then the shoot apex must also be competent to respond and must then become progressively determined as the successive floral organs are formed (Lyndon, 1990). In this experiment, under 18-20 °C growth of leaves were retard therefore the required stimulus could not be produced and thus flowering of *C. alismatifolia* could not succeed. Although plant under 22 °C could produce a young flower bud but it could not develop until anthesis. Temperature at 24-26 °C delayed flowering. Depending on the situation and specific plant, the effect of temperature can either speed up or slow down the transition from vegetative to reproductive (flowering) (http://extention.oregonstate.ded/mg/botanyl/light.htm., 2006). In this study, temperature at 28 °C were optimum for growth and flowering of *C. alismatifolia.*

Day and night temperature affected growth of *C. alismatifolia* include plant height and leaf length. The response of plant height and leave areas to day temperature related to optimal night temperature. The number of leaves per plant of *C. alismatifolia* increased when plants grown under higher day temperature. Increasing of night temperature did not affect this parameter. Although, the day and night temperature did not significantly affected leaf width and leaf length but the high day and night temperature increased leave areas of this plant. Dry-weight of leaves, fibrous roots and spike stalk were also the greatest in plants growing at high day/night temperature, compared with the low temperature. High temperature accelerated the decreasing of rhizome and storage roots dry weight. This may be related to the photorespiration increased with increased temperature (Al-Hamdani and Todd, 1990). High temperature promoted flowering and quality of flower.

Nitrogen fraction, total non-structural carbohydrate and C:N ratio in *C. alismatifolia* had affected by photoperiod and temperature, short day photoperiod (6 hrs) increased the insoluble-N-fraction and total nitrogen but decreased total non-structural carbohydrate in leaves, old rhizome and whole plant. Long day (10 and 14 hrs) increased nitrogen fraction and total non-structural carbohydrate in spike of *C. alismatifolia.* Chidburee (2008) reported that the photosynthetic rate of *C. alismatifolia* grown under 13 hrs was significantly higher than those grown under 7 and 10 hrs during 3-4 WAP. Moreover, total chlorophyll content, chlorophyll a and chlorophyll b of plant grown under 13 hrs at 5 WAP were also higher than those in plants grown under 7 hrs. Therefore, it can be concluded that the increase in photosynthetic rate under long daylength was probably brought about by the increase in photosynthates (TNC) which plants used for promoting flowering. Nitrogen promotes the plant growth by influencing the phytohormonal status of plant and by being an elemental constituent of essential molecules, such as protein and nucleic acids. It is involved in the most important physiological processes for crop production (Mengel, 1992). High temperatures increased nitrogen fraction and total nitrogen while constant temperatures did not significantly affect the concentration of total non-structural carbohydrate in whole plant. Low temperature of day and night increased insoluble-N-fraction and total nitrogen but decreased total non-structural carbohydrate in plant. The different of day temperature and night temperature at 12 hrs increased C:N ratio.

Suggestions for future experiment

The result from this research could indicate gene expression and factors affected on flowering. However, the relative factors (photoperiod and temperature) on growth and flowering of this plant should be studied further. Moreover, further characterization of the differentially expressed cDNA band (consist of reamplification, cloning and sequencing as well as quantitative PCR analysis) provides the important candidate genes for flowering of plant. This information should be very beneficial for a better understanding on growth and flowering of this plant.