Chapter 1

Introduction

Litchi (*Litchi chinensis* Sonn.) is a subtropical fruit widely grown in the world. It can be processed into various products, e.g. canned litchis, litchi nectar, juice, dried whole fruit and litchi wine as well as frozen litchi (Subhadrabandhu and Yapawattanaphun, 2001). Presently, the main litchi industries are found in China, Taiwan, Vietnam, Thailand, India, Madagascar and South Africa (Menzel, 2001; Ghosh, 2001) while Malaysia, Singapore, Hong Kong, Europe and the USA are major imported countries. The total volume of world trade 100,000 metric tons per year, with a third of it supplied from South Africa and Madagascar into Europe (Menzel, 2002a).

In Thailand, litchi positions the eleventh in the list of economic fruit crops, whereas longan, same Sapindaceae family as litchi, is in the top third (Menzel, 2002b). The major growing area concentrates in Chiang Mai (60% of production), Chiang Rai, Phayao and Nan provinces in the north and in Samut Songkram province in the central part of Thailand (Mitra, 2002). The production of fresh litchi in Thailand in 2002 was 101,798 metric tons from 18,957 hectares, whereas the total cultivating area was 23,199 hectares. In year 2003, Thailand exported 5,237 metric tons of fresh litchis with the value of 146.7 million baht and 13,139 metric tons of canned litchis with the value of 461.3 million baht. The exporting amount and value should increase according to the world's kitchen policy of Thai government. However, only 16% of country fresh litchis were exported currently in the year 2002 (Department of Agricultural Extension, 2004). Comparing to world producing countries, litchi in Thailand has a longer harvesting period of up to 3 months, from mid-March to mid-June (Sethpakdee, 2002), and also an earlier harvesting season than China or India (Menzel, 2002b).

However, litchi in Thailand also has a big disadvantage of irregular bearing due to a long duration cold temperature requirement (Mitra, 2002; Sethpakdee, 2002). Sethapakdee (1997) reported that 'Hong Huay' cultivar required continuously low temperatures of less than 17°C for 10-12 days for floral induction. Appropriate cool temperature regime to promote flowering is however differed among cultivars, e.g. a cool day/night temperature regime of 15/10°C induced

full flowering of litchi in Chinese and Australian seven cultivars (Menzel and Simpson, 1995) and day/night temperature regime at 22/12°C induced abundant flower in 'Mauritius' and 'Floridian' litchi (Stern and Gazit, 2003). Physiological of cool temperature on flowering of litchi is not fully understood and required a lot more studies. The knowledge should increase the potential of litchi for exporting.

Nowadays several fruit trees can be produced as off-season crop. Paclobutrazol (PBZ), a gibberellin synthesis inhibitor, has been widely used in mango and durian orchards for induce flowering. In longan orchard, potassium chlorate ($KClO_3$), one of the chemical components in firework and festival rocket's mixture, is normally used as an active substance for flower induction. However, floral induction of litchi does not seem to response to $KClO_3$ and/or PBZ or any chemicals whereas girdling could enhance sensitivity of plants to low temperature.

Actually, floral induction may be regulated by many factors; such as floral promoting substances, assimilate and endogenous phytohormones (Bernier, 1988; Bernier *et al.,* 1993), which work as the multifactorial control model. How this multifactor affected flowering in litchi is not known yet. These studies were conducted to understand the relationship between the balance of endogenous hormones and assimilative substances in plant tissue with the floral induction in litchi. Under the collaboration with the University of Hohenheim, radio-immunoassay (RIA), is simultaneously used to detect three major hormone concentrations in buds, leaves, bark, wood, xylem sap and leaf diffusate.

Objectives of the experiment

1. To study change in endogenous hormones and biochemical substances of 'Hong Huay' litchi when grown under low temperature for floral induction
2. To analyze the relationship between major endogenous hormones, biochemical substances contents and floral development.