Panumas Kotepong 2010: Anthocyanin Biosynthesis and Gene Expression during Fruit Growth and Ripening of Malay Apple (*Syzygium malaccense*) Cultivars. Doctor of Philosophy (Horticulture), Major Field: Horticulture, Department of Horticulture. Thesis Advisor: Professor Saichol Ketsa, Ph.D. 143 pages.

In Thailand, Malay apple (*Syzygium malaccense*) has two cultivars, namely 'Mamieo' and 'Saraek'. The fruit skin of mature Malay apple is initially glossy red, then changes to purple in cv. Mamieo and red streaks in cv. Saraek. Other group has been identified having mature fruits with white skin in both cultivars. Therefore, both cultivars of red and white fruit were used as a fruit model to study the regulatory mechanisms and gene expression of anthocyanin biosynthesis. The results showed that the fruit growth pattern showed a single sigmoidal curve in all Malay apple cultivars. During ripening, firmness and titratable acidity (TA) decreased significantly, while soluble solids content (SSC) and SSC/TA ratio increased rapidly in all Malay apple cultivars. Anthocyanin pigments were also extracted from fruit skin, identified by HPLC and LC-MS. The skin of red fruit of both Malay apples contained five glucose-based anthocyanins namely cyanidin-3-*O*-glucoside, pelargonidin-3-*O*-glucoside, peonidin-3-*O*-glucoside, cyanidin-3,5-*O*-diglucoside and peonidin-3,5-*O*-diglucoside but peonidin-3,5-*O*-diglucoside was not found in cv. Saraek. Cyanidin-3-*O*-glucoside accounted for a large proportion of the total anthocyanin content which markedly increases during fruit growth and ripening in both red fruits. The cyanidin-3-*O*-glucoside content in the skin of red Malay apple fruit cv. Mamieo was higher than red Malay apple fruit cv. Saraek at the red maturity stage. No anthocyanins were found in both white fruits. The accumulation of cyanidin-3-*O*-glucoside during fruit growth and ripening was correlated with colour development, increased activities of phenylalanine ammonia lyase (PAL) and UDP-glucose:flavonoid 3-*O*-glucosyltransferase (UF3GlucT; here abbreviated to UFGT). The partial-length of seven genes involved in anthocyanin biosynthesis pathway namely phenylalanine ammonia lyase (*SmPAL*), chalcone synthase (*SmCHS*), chalcone isomerase (*SmCHI*), flavanone 3-hydroxylase (*SmF3H*), dihydroflavonol 4-reductase (*SmDFR*), leucoanthocyanidin dioxygenase (*SmLDOX*) and UDP glucose-flavonoid 3-*O*-glucosyl transferase (*SmUFGT*) was characterized. The expression of all genes was determined by semi-quantitative RT-PCR and quantitative real-time RT-PCR. In the red fruit skin, transcripts were detected of seven genes that encode enzymes in the anthocyanin biosynthetic pathway. The expression patterns of *SmUFGT* correlated with anthocyanin accumulation. The skin of both white fruits contained transcripts of all seven genes identified, except an *SmUFGT*. The skin of both white fruits have no UFGT activity. The data indicated that the lack of anthocyanins in the white fruits is due to lack of *SmUFGT* expression. *SmUFGT* is a key biosynthetic gene in Malay apple pigmentation.

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