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Identification of warm day and cool night conditions induced flowering-related genes in a *Phalaenopsis* orchid hybrid by suppression subtractive hybridization

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ABSTRACT. The influence of warm day and cool night conditions on induction of spikes in *Phalaenopsis* orchids has been studied with respect to photosynthetic efficiency, metabolic cycles and physiology. However, molecular events involved in spike emergence induced by warm day and cool night conditions are not clearly understood. We examined gene expression induced by warm day and cool night conditions in the *Phalaenopsis* hybrid Fortune Saltzman through suppression subtractive hybridization, which allowed identification of flowering-related genes in warm day and cool night conditions in spikes and leaves at vegetative phase grown under warm daily temperatures. In total, 450 presumably regulated expressed sequence tags (ESTs) were identified and classified into functional categories, including metabolism, development, transcription factor, signal transduction, transportation, cell defense, and stress. Furthermore, database comparisons revealed a notable number of *Phalaenopsis* hybrid Fortune Saltzman ESTs that matched genes with

unknown function. The expression profiles of 24 genes (from different functional categories) have been confirmed by quantitative real-time PCR in induced spikes and juvenile apical leaves. The results of the real-time PCR showed that, compared to the vegetative apical leaves, the transcripts of genes encoding flowering locus T, AP1, AP2, KNOX1, knotted1-like homeobox protein, R2R3-like MYB, adenosine kinase 2, S-adenosylmethionine synthetase, dihydroflavonol 4-reductase, and naringenin 3-dioxygenase accumulated significantly higher levels, and genes encoding FCA, retrotransposon protein Ty3 and C3HC4-type RING finger protein accumulated remarkably lower levels in spikes of early developmental stages. These results suggested that the genes of two expression changing trends may play positive and negative roles in the early floral transition of *Phalaenopsis* orchids. In conclusion, spikes induced by warm day and cool night conditions were complex in *Phalaenopsis* orchids; nevertheless, several molecular flowering pathway-related genes were found. The acquired data form the basis for a molecular understanding of spike induction by warm day and cool night conditions in *Phalaenopsis* orchids.

Key words: *Phalaenopsis*; Flowering gene; Spike induction; Gene expression; Flowering locus T

