Transcriptomic analysis of postharvest toon buds and key enzymes involved in terpenoid biosynthesis during cold storage

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Abstract

Toon buds have been used in China as an important woody vegetable for its unique flavor. However, the changes of volatile terpenoids related to flavor and their biosynthesis in postharvest toon buds after cold storage remain largely unknown. Therefore, a transcriptomic database must be constructed to analyze the molecular mechanism of terpenoid biosynthesis in toon buds during cold storage. The chemical profiles of volatile terpenoids over postharvest storage periods were comparatively analyzed by gas chromatography–mass spectrometry. Results showed that the total content of volatile terpenoids and their oxidates, except for monoterpenes and a small portion of sesquiterpenes, increased significantly after cold storage. The transcriptome database derived from different cold storage times was established using BGIseq500 technology. Approximately 6.5 g of clean nucleotides were obtained and *de novo* assembled into 152 127 non-redundant unigenes, approximately 72.36% of which could be aligned to public databases. Many candidate genes involved in terpenoid biosynthesis were identified. Furthermore, 29 513 unigenes were demonstrated to be differentially expressed under different cold storage times. These differentially expressed genes were functionally annotated by gene ontology enrichment and Kyoto Encyclopedia of Genes and Genomes enrichment analyses. The expression of 20 putative unigenes involved in terpenoid pathways was confirmed by qRT-PCR, the results of which were consistent with the RNA-seq data. These genes with different expression patterns correlated well with the changes in the volatile terpenoids in the toon buds during low-temperature storage. In summary, our results showed that the high expression levels of terpenoid backbone biosynthesis pathways contributed to sesquiterpene biosynthesis after cold storage, which led to high sesquiterpene accumulation in toon buds during low-temperature storage.