

51\$ 6HT DQDO\VLV GLIIHUHQWLDQO\ H[SUHV VHG JHQH GNDQ SXU
0DNLQR XQGHU ORZ WHP SHUDWXUH

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Low temperature is the main environmental factor that affects anthocyanin biosynthesis and accumulation in purple pakchoi, which is one of the most popular vegetables in China with high anthocyanin content. In the present study, the transcriptome profiles of the purple pakchoi cultivar "ziyi", which maintained at 5°C (low temperature, LT) and 20°C (normal temperature, NT) for 10 d, were analyzed using Illumina paired-end sequencing technology in order to reveal mechanisms associated with anthocyanin biosynthesis and accumulation at low temperatures. Anthocyanin content under 5°C treatment was gradually increased, and the purple color deepened as compared to that observed under 20°C. A de novo assembly and quantitative assessment of the obtained reads, 114,043 unigenes were obtained, and 76,369 sequences were annotated by aligning the sequences against five public databases. The differentially expressed genes (DEGs), 4,172 and 3,918 up-regulated genes were identified in the 5°C and 20°C treatment groups, respectively. Twelve major anthocyanin accumulation- and biosynthesis-related genes, including transcription factors (TFs), were identified, and their expression levels were estimated. The structural genes PAL, C4H, F3H, CHS, and CUT5 were induced by low temperature conditions. Overall, this is the first transcriptome sequencing analysis of this plant species under low temperature conditions. Studies of the DEGs involved in the anthocyanin accumulation and biosynthesis pathways provide insights into the regulatory mechanisms of anthocyanin synthesis and accumulation in purple vegetables at low temperature.

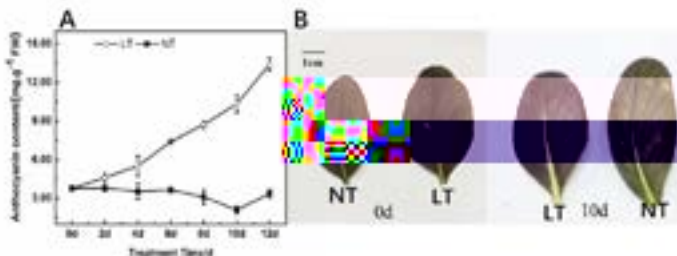


Fig. 1 Anthocyanin content and the color of purple pakchoi at 5°C and 20°C. Anthocyanin content changes in purple pakchoi treated with low temperatures from 0 d to 12 d (A); comparison of color in purple pakchoi under low temperature conditions at 0 d and 10 d.

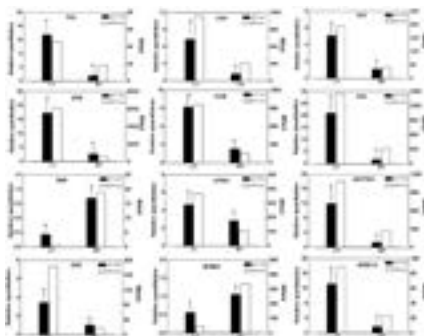


Fig. 2 Real-time PCR. Data represent the mean ± SE (n = 3 or 4). Single and double asterisks indicate statistical differences compared to the control (t-test, p < 0.05). The relative gene expression of 12 randomly selected genes examined using qRT-PCR (5 or 0.01, respectively)

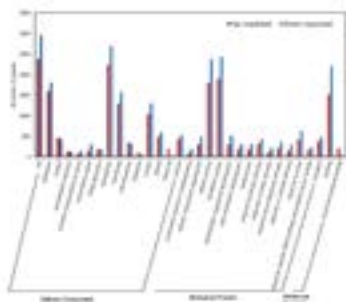


Fig. 3 Four major pathways likely implicated in the effects of low temperatures on purple pakchoi during IMC identified by a KEGG enrichment analysis. Red line represents a p-value of 0.05

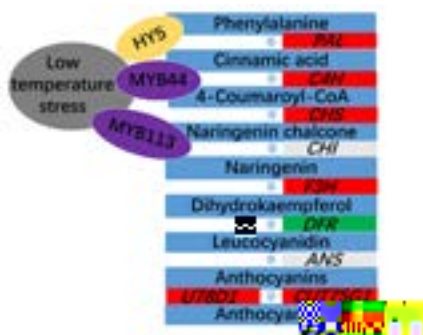


Fig. 4 Anthocyanin biosynthetic pathways in purple pakchoi under low temperature conditions. HY5, MYB44 and MYB113 are transcription factors. Genes involved in this pathway include PAL, C4H, CHS, F3H, DFR, ANS, U78D1 and CUT75G1. Red represents the up-regulation of the gene expression level, while green denotes down-regulation. Gray indicates a non-DEG.

