

RNA-Seq Reveals Transcription Factors Involved in Temperature-mediated Anthocyanin Accumulation and Biosynthesis in Purple Pakchoi (*Brassica campestris* ssp. *chinensis* Makino.)

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Abstract

Temperature is a main environmental factor that affects anthocyanin biosynthesis and accumulation in purple pakchoi (*Brassica campestris* ssp. *chinensis* Makino.). Purple pakchoi is one of the most popular vegetables with high content of anthocyanin in China. Recently, we found that the purple color of purple pakchoi cultivar, "ziyi", deepened after 10-day low temperature (5°C, LT) treatment with increased anthocyanin content compared to plants after 20°C (normal temperature, NT, control) treatment. Contrarily, the color of pakchoi treated with 10-day heat temperature (35°C, HT) became lighter with decreased anthocyanin content than that of control. The transcriptome analysis revealed a total of 51 008 unigenes from plants treated with NT, LT, and HT by RNA-seq. A total of 4 321 and 8 455 differentially expressed genes (DEGs) were identified from HT and LT compared to NT, respectively. Among these DEGs, 173 unigenes were downregulated in LT and upregulated in HT compared to NT. 218 unigenes were upregulated in LT and downregulated in HT. Further Gene Ontology enrichment analysis revealed a series of candidate genes that may be involved in temperature-mediated anthocyanin accumulation, including structural genes and 20 transcription factors. Collectively, our study provides a global view of transcriptomic resources in response to temperature-induced anthocyanin accumulation in purple pakchoi.

Results

Fig1. Anthocyanin content and the color of purple pakchoi at LT (5°C), NT (20°C), and HT (35°C).

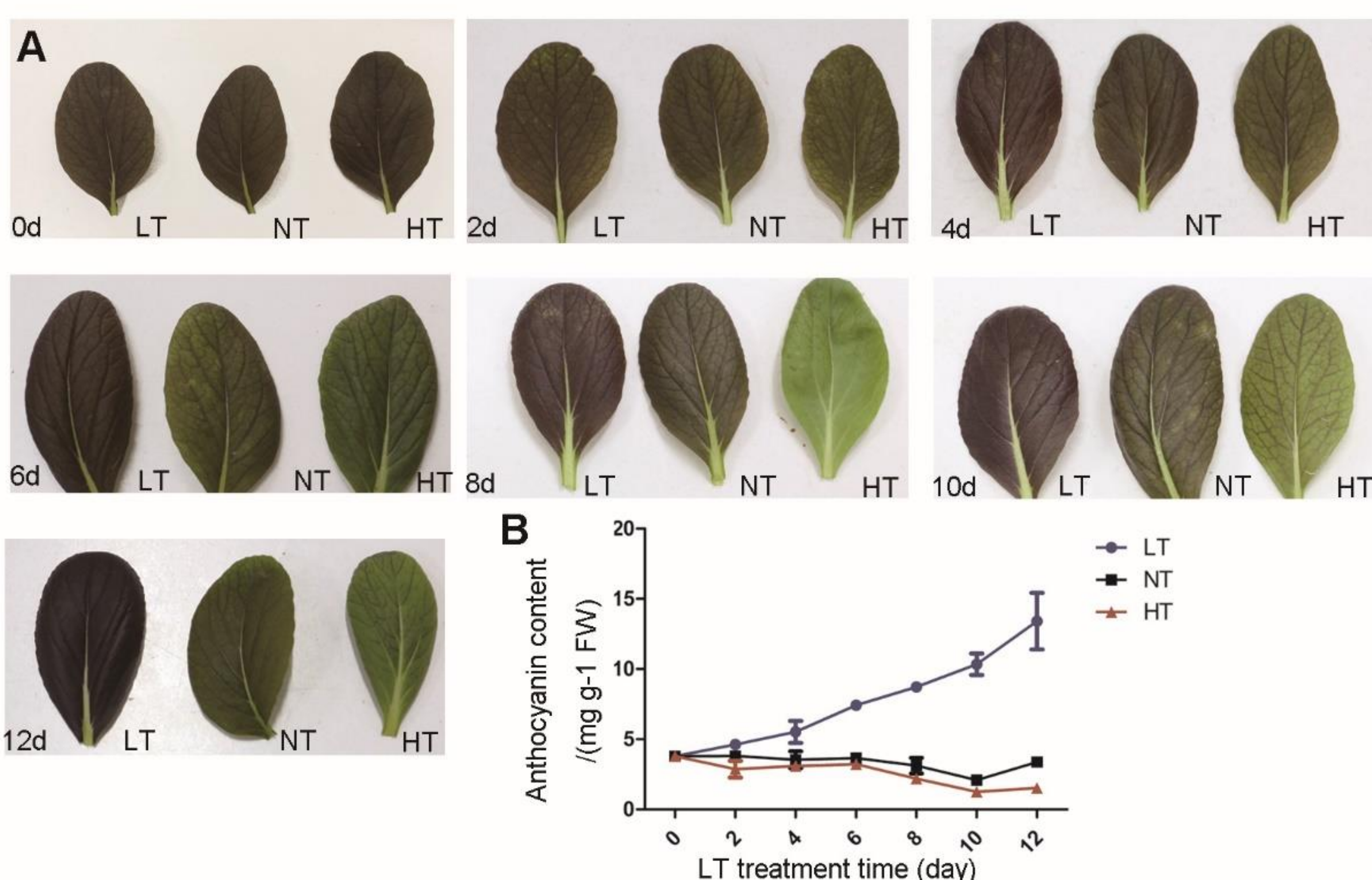


Fig1. (A) Change of leaf color treated with LT, NT and HT for indicated days. (B) Anthocyanin content in purple pakchoi treated with different temperatures from 0 d to 12 d

Table 1 Statics of high-through put sequencing.

Sample	Raw reads	Raw bases	Clean reads	Clean bases	Error rate (%)	Q20 (%)	Q30 (%)	GC content (%)
COLD1	46341400	6.95E+9	45899300	6.71E+09	0.0114	98.71	96.1	52.15
COLD2	47250524	7.09E+9	46795718	6.85E+09	0.0114	98.69	96.04	52.18
COLD3	41466450	6.22E+9	41048930	6E+09	0.0114	98.72	96.12	52.12
HEAT1	46072536	6.91E+9	45521712	6.65E+09	0.0117	98.58	95.74	52.24
HEAT2	44536370	6.68E+9	44097602	6.48E+09	0.0117	98.57	95.7	52.21
HEAT3	41589980	6.24E+9	41169418	6.03E+09	0.0116	98.62	95.84	52.1
NT1	62621216	9.39E+9	61906522	9.04E+09	0.0119	98.46	95.42	52.32
NT2	41923862	6.29E+9	41508494	6.05E+09	0.0117	98.58	95.74	52.25
NT3	43972542	6.60E+9	43520738	6.33E+09	0.0118	98.53	95.58	52.76

Fig.2 Venn analysis of differentially expressed unigenes

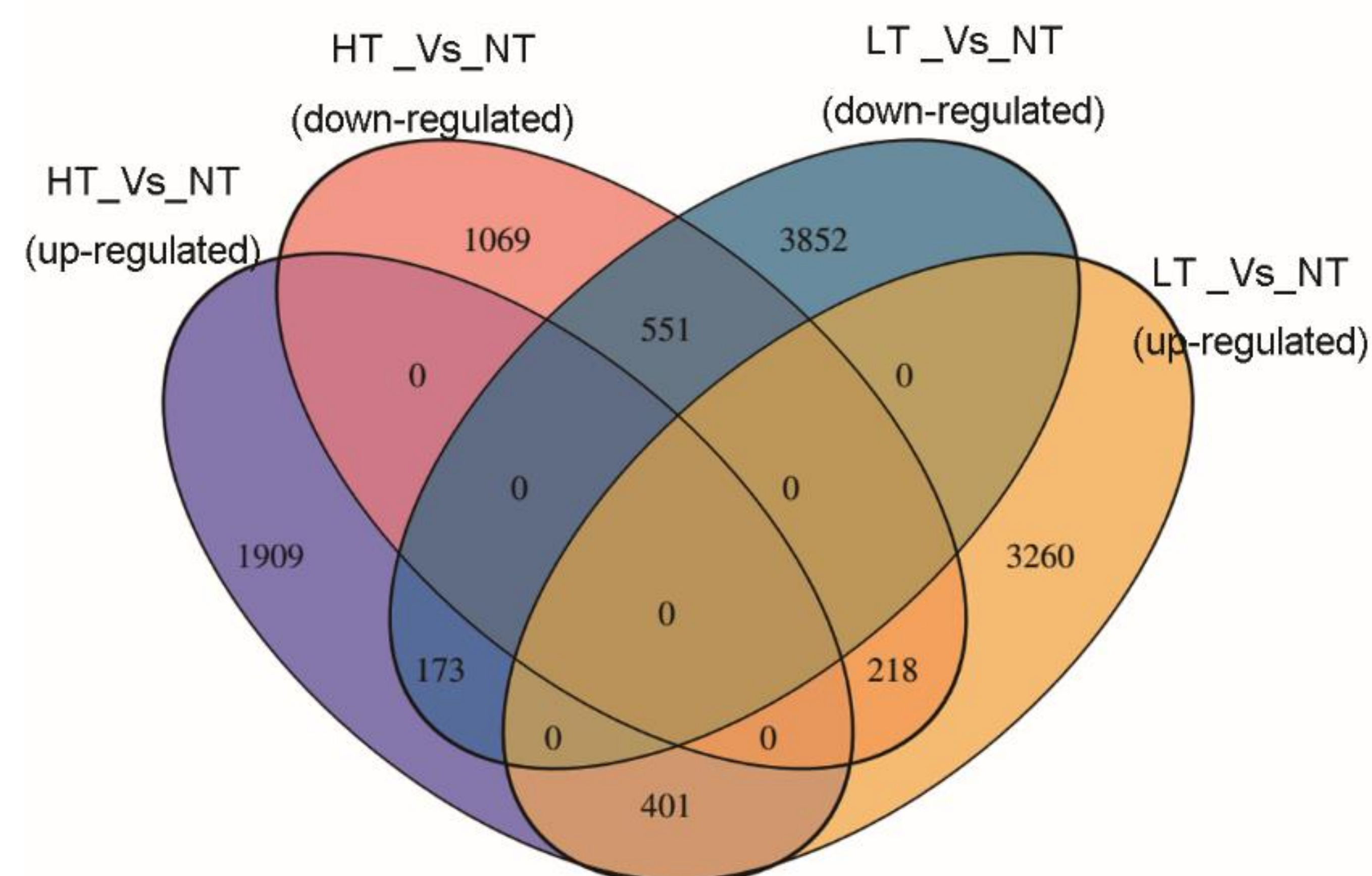


Fig.3 Relative expression (log2) of structural genes and transcription factors in LT and HT in RNA-Seq.

