Adaptation to Low Temperature - a Group of Fast Expanding Arabidopsis thaliana along the Yangtze River

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Arabidopsis thaliana is found in different geographic regions with different climatic conditions. Divergences of cold response among natural populations provide us a suitable model for studying natural variation of adaptive traits. The natural populations along the Yangtze River, China form a monophyletic group and expanded about 90,000 years ago. Five of the populations with geographic distributions ranging from the northwest China (Altai Mountain region) to southeastern China (along the Yangtze River) were selected for detailed analyses on the differentiation of responding to low temperature and its possible molecular mechanisms. Freezing tolerance assay suggested that the tolerance varied among natural populations, and there was a significantly negative correlation between the freezing tolerance and the average spring temperature in the distribution location. Further transcriptional profile, QTL mapping, and genetic analyses demonstrated that CBFs – cold responding transcriptional factors – had very unique variation pattern in the populations along the Yangtze River. This unique pattern may contribute to the differentiation of freezing tolerance, and could be the result of the adaptation to the local environment over 90,000 years.