Back to TE future: Understanding the fitness effect of transposable element mobilization under climate change scenarios

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Abstract

Although most mutations induced by transposable element (TE) insertions are likely deleterious, empirical and theoretical evidence indicate that a continuum of selective effects must exist. However, because transposition is typically rare, assessing their rate, landscape, and consequences is extremely challenging. We have developed a TE display followed by high-throughput sequencing method (TED-seq) that enable us to detect new insertions with ultra high-sensitivity. Using this technique, we are investigating the fitness effects of TE insertions in large populations of *Arabidopsis thaliana* plants experiencing an early TE invasion. In particular, we are performing competition experiments in realistic environments reproducing nowadays or climate projections for the end of the 21st century under an extreme greenhouse gas emission scenario. Following each generation, seed samples are collected and bulk for TED-seq analysis, allowing us to measure transposition rates as well as to track population frequencies of each TE insertion. Our study of the first two generations revealed significant variation in transposition rates between present and future climates, as well as numerous TE insertions presenting signatures of positive selection. Our results shed new light on the environmental pressures shaping transposition activity and its potential role in adaptation to future environments.

Keywords: transposition fitness, population genomics, climate change

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