Evolution of self-fertilization in the volvocine green algae

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Abstract:

Outcrossing and self-fertilization are fundamental strategies of sexual reproduction, each with different evolutionary costs and benefits. Self-fertilization is thought to be an evolutionary dead-end strategy, beneficial in the short term but costly in the long term, resulting in self-fertilization species occupying the tips of phylogenetic trees. Here we use the haploid volvocine green algae to investigate the evolution of self-fertilization. We use ancestral state reconstruction to show that self-fertilization has repeatedly evolved from outcrossing ancestors and includes multiple reversals from selfing to outcrossing. We use three phylogenetic metrics to show that self-fertilization is not restricted to the tips of the phylogenetic tree, inconsistent with the view of self-fertilization as a dead-end strategy in the volvocine green algae. We demonstrate that recombination of previously sex-restricted loci into the same genotype occurs with the evolution of self-fertilization, suggesting a genetic mechanism of recombination partially underlies the evolution of homothallic self-fertilization.