CHLOROPLAST COMPETITION

Lipid control to win

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Organelle inheritance is commonly perceived to be uniparental, which means offspring inherit organelle DNA from only one parent, typically the maternal side. In fact, a substantial population of flowering plants inherit their chloroplasts biparentally. Therefore, organelle competition may occur. Recently, Stephan Greiner's group at the Max Planck Institute of Molecular Plant Physiology, Germany, proposed a mechanism of chloroplast competition through metabolic regulation in evening primroses.

It is hypothesized that chloroplasts with more inheritance strength may replicate more rapidly and outcompete the others in biparental systems. Sobanski et al. analysed 14 chloroplast genomes from evening primroses and correlated sequence divergence with different inheritance strength. They identified four loci that are significantly correlated with inheritance strength, including the fatty acid biosynthesis gene *accD*, *oriB* and two genes of unknown function (*ycf1* and *ycf2*). To testify the causality between the identified genes and chloroplast inheritance strength, they used a plastome mutator-based mutagenesis approach to isolate plastome variants with altered inheritance strength. Mapping analysis confirmed that *accD* and *ycf2* were strongly correlated with inheritance strength. Interestingly, among the isolated plastome variants they found no notable differences in chloroplast size, photosynthetic parameters and plastid DNA copy numbers compared to the wild type. Therefore, Sobanski et al. concluded that chloroplast competition in evening primroses is a metabolic phenotype that involves variations in lipid biosynthesis.

Competition is a major part of Darwin's theory of evolution. Species, individuals, cells and even organelles could 'struggle for existence'. This study indicates an interesting mechanism for chloroplast competition; hopefully future works will lead to more insights on the evolution of competitive organelles.

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