# DUAL TARGETING AS A CONSERVED EVOLUTIONARY CONSTRAINT ON GENE DUPLICATION

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Multi-compartmentalization of biosynthetic pathways is one of the key aspects of eukaryotic cells that drove the evolution of contemporary organelles. Over evolutionary time two strategies have developed to cope with overlapping functionality in different organelles: gene duplication events followed by acquisition of specific targeting information and a dual-targeting approach. It has long been assumed that gene duplication and their subsequent functional divergence, leading to the formation of evolutionary related families, play an important role in adaptive evolution. In this work, we examine the evolutionary trend of dual-targeted single-gene products in Arabidopsis and rice genomes. The number of paralagous proteins encoded by the gene families and the dual-targeting strategy adopted by the orthologous proteins were analysed for both genomes. We show that both the number of dual-targeted proteins in Arabidopsis and rice and the corresponding gene-family size are similar irrespective of genome size. We also show that dual targeting of methionine aminopeptidase and monodehydroascorbate reductase were maintained despite occurrence of whole-genome duplications in Arabidopsis and rice as well as a polyploidization followed by a diploidization event (gene loss) in the latter. We propose that the comparable number of dual-targeted proteins and their gene family size in Arabidopsis and rice may be caused by selection against gene duplication of dual-targeted proteins, indicating a gene duplication constraint.