ABSTRACT

"Whole genome duplications and the origin of novelty"

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Ancient whole genome duplications (WGDs) are ubiquitous throughout the evolutionary history of higher eukaryotic lineages. These events have been hypothesized to be the basisfor major evolutionary transitions, including the origin of novel traits in large species radiations across plants, fungi, protozoa, and animals. Repeated rounds of WGDs, or polyploid events, have been best documented among the flowering plants, and tend to be phylogenetically near the origin of speciose clades. However, the mechanism driving diversification remains poorly understood. We analyzed the impact of the two most recent WGDs in Arabidopsis on diversification rates and the origin of novel phenotypes. Phylogenetic analyses of these two WGDs show thatboth events occurred following mass extinction events. The origin of two novel classes of chemical defenses, indole and met- derived glucosinolates (i.e. mustard oils), are associated with duplicated regulatory and biosynthetic pathways that arose via WGDs. Our analyses suggest that the origin of these novel defense compounds spurred anevolutionary arms-race with insect herbivores, resulting in massive co-radiations of both the host plant and predatory insects.