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GENERALIST POLLINATORS UNDERLIE THE FUNCTION AND EVOLUTION OF HETEROSTYLY: STUDIES ACROSS ALL ANGIOSPERM GENERA AND IN LINUM SPECIES

Violeta I. Simón-Porcar, Marcial Escudero, Mercedes Sánchez-Cabrera, Leticia Rodrigues-Novaes, Rocío Santos-Gally, Steven D. Johnson, Juan Arroyo

ABSTRACT

Heterostylous plants promote cross-pollination between two distinct floral morphs with reciprocal positions of stigmas and anthers, an efficient mechanism for disassortative mating. Since their discovering by Charles Darwin, heterostyly and related stilar polymorphisms have been reported in an increasing number of taxa, up to 199 genera and 28 families in the latest reviews. Apparently, stilar polymorphisms have many independent origins in angiosperm lineages sharing similar floral traits such as actinomorphic and narrow-tubed flowers, suggesting a case of evolutionary convergence that has not been tested empirically. Such convergence has been functionally linked to long-tongued pollinators, which may be more efficient in disassortative pollen transfer. We performed exhaustive literature reviews to (i) update the number of stilar-polymorphic taxa, (ii) record six floral traits possibly associated with the evolution of this breeding system and (iii) retrieve available information on the pollinators of heterostylous taxa. We found 244 style-length polymorphic genera belonging to 34 families, notably expanding known cases by 20%. Phylogenetic and comparative analyses determined numerous independent origins of style-length polymorphism across the angiosperms. These gains were associated with actinomorphic, tubular flowers with a low number of stamens with filaments fused to the corolla, and a low number of carpels. We did not find an association with long-tongued pollinators. Instead, we found that a vast majority of heterostylous taxa have generalist pollination systems. Experimental trials of pollen transfer using heterostylous *Linum* flowers labelled with quantum dots showed that short-tongued generalist pollinators can efficiently promote disassortative pollen transfer.

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