


Twelfth International Symposium on Pollination (ISPXII)

16 - 20 October 2023

Kirstenbosch Botanic Gardens, Cape Town, South Africa

THE ECONOMY OF POLLEN DISPERSAL IN FLOWERING PLANTS

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ABSTRACT

Mating success of flowering plants depends strongly on the efficiencies of pollen removal from flowers and its subsequent dispersal to conspecific stigmas. Based on the pollen fates for 241 plant species, the overall percentage of pollen removed from flowers varied up to two-fold according to type of pollen dispersal unit and was >80% for plants with granular monads or sectile (segmented) pollinia, but <45% for orchids and milkweeds with solid pollinia. The percentage of removed pollen reaching stigmas (pollen transfer efficiency, PTE) varied markedly and, on average, was 2.4% for species with granular monads, 10.4% for orchids with sectile pollinia, 18.7% for milkweeds with solid pollinia, and 27.0% for orchids with solid pollinia. The high PTE for orchids and milkweeds results from firm attachment systems (clips or glue) and lack of consumption when pollen is packaged in pollinaria (pollinia plus attachment device), as well as the potential for complete deposition of solid pollinia. The percentage of pollen produced that disperses to stigmas (relative pollen export) varies mostly with PTE among species. Species with specialized pollination or adaptations to a particular pollinator functional group do not realize distinctly greater pollen economy, though PTE tended to be lower in plants pollinated by animals, such as bees, that groom actively. Nectar production increases the probability that flowers receive pollen, but does not generally influence PTE. These findings confirm the key importance of floral traits, particularly pollen-packaging, for pollen dispersal outcomes and highlight the under-appreciated pollen-transfer effectiveness of non-hymenopteran pollinators.