

Competition and pollen wars: simulations reveal the dynamics of competition mediated through heterospecific pollen transfer by non-flower constant insects

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Note:

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Abstract:

Heterospecific pollen transfer by insect pollinators has the potential to drive inter-species competition between flowering plants. This phenomenon may newly arise in a region if insect pollinator or flowering plant populations change. An agent-based simulation is presented to assess the potential impact of heterospecific pollen transfer by insects on two co-flowering plant species within an environment consisting of a shared central region and species-specific refugia. Where heterospecific pollen asymmetrically suppressed the reproduction of one competitor, the pollen recipient was rapidly ousted from shared regions. If pollinators made deep, repeated, forays into and out of plant refugia, the clogged species was even unseated from its own refugium. When heterospecific pollen symmetrically suppressed plant reproduction, the same effects were observed, but with one or the other species excluded at random by the pollen clogging mediated interaction. We conclude that both symmetrical and asymmetrical heterospecific pollen transfer may be important elements of inter-species dynamics. In particular, our simulation shows pollen and pollinator visits lost to heterospecific flowers may not always be wasted from the producer's standpoint. Instead, heterospecific pollen delivery may convey a competitive advantage even when the recipient has a refuge safe from direct invasion. This is possible because the pollen producer may use pollinators to clog a competitor's stigmas in a refugium without entering into competition there for space, nutrients, light, pollinators, or other resources. Consequently, the evolution of plant signals to promote pollinator constancy may not be the only effective strategy in inter-species competition.