

Kin selection in seeds and sporophytes: testing the role of inclusive fitness in seed development, dormancy and sporophyte interactions

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The present study explores the role of kin selection and inclusive fitness theory on three distinct features in plants, viz., seed dormancy, seed development, and sporophyte interactions. The imposition of dormancy benefits the mother but reduces offspring fitness, leading to parent-offspring conflict. The study predicts that the imposition of dormancy is proportional to the genetic relatedness of seeds to the mother and is more common in outbreeding plants. The data supporting these findings in sunflowers and the breeding systems of 976 species are provided. Inclusive fitness theory on seed development predicts an optimum level of outbreeding; this was tested in *Hibiscus cannabinus*. A meta-analysis of plant-level interactions indicated strong signals of kin cooperation.

Keywords: Inclusive fitness, kin selection, parent-offspring conflict, seed dormancy, sporophytes

The present study explores the possible roles of inclusive fitness and kin selection in shaping three distinct plant features: seed dormancy, seed weight, and sporophyte interactions.

Seed dormancy

Seed dormancy induces constraints on the embryo's germination; germination of dormant seeds is delayed even under conditions that favour the germination of seeds²³. While there are debates on how to define seed dormancy²⁴, the description offered by Baskin and Baskin²⁵ broadly captures most features and different types of dormancy in plants. A dormant seed does not have the capacity to germinate in a specified period of time under any combination of normal physical environmental factors that are otherwise favourable for its germination²⁴. Thus, even under favourable environmental conditions, dormancy inhibits the embryo from sprouting for a specific period.

In the long run, however, such a delay in seed germination effectively reduces the number of generations in the dormant populations compared to normal plants that