# The Red Queen Hypothesis and the sex of flowers

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**Résumé**

Charles Darwin was intrigued by the fact that many plant species, which could easily self-fertilize, evolved a large variety of strategies to avoid self-fertilization, adopting a much riskier, complex and, frequently, pollinator-dependent fertilization process to produce their offspring. Others evolved individuals with different sexes, thus discarding once for all the possibility of self-fertilization. After more than a decade of greenhouse experiments in the gardens of his Down House, he concluded that "cross-fertilisation is generally beneficial, and self-fertilisation injurious". The advantages of self-fertilization avoidance have been attributed to inbreeding depression, mostly caused by the expression of deleterious recessive alleles. However, the advantages of outcrossing have been more difficult to determine. The Red Queen Hypothesis states that sex is an adaptation that allow sexual hosts to produce offspring protected by rare or unique combinations of defence-genes, thus presenting a higher fitness in comparison to asexual hosts. Here, we test the Red Queen prediction that plant species under higher pressure by their short-lived natural enemies should invest in traits promoting outcrossing, increasing the probability of producing offspring protected by rare or unique combinations of defence-genes. Using comparative analyses across the angiosperms, we demonstrate that richness of plant-feeding insects increases the probability of multiple sexual and flower traits associated to outcrossing. Thus, the Red Queen Hypothesis help to explain the sexual diversity of the angiosperms.

**Mots-Clés:** Red Queen Hypothesis, angiosperm, insect, evolution, sex, comparative method, flower, herbivory, pollination

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