Abstract

- Due to shared environment, neighboring plants are more likely to flower at the same time and cross-pollinate than plants located further apart.
- Wild figs (genus *Ficus*) differ from most plants: they produce separate male and female flowers that develop several weeks to months apart, and so to cross-pollinate one tree must bear male flowers while another bears female flowers.
- If local environmental conditions synchronize flower production, then neighboring fig trees should be less likely to cross-pollinate than trees located farther apart. We tested this prediction in the Sonoran Desert rock fig, *Ficus petiolaris*.
- In contrast to predictions, we found significant but highly variable spatial patterns of flowering and opportunity for cross-pollination both within and across sites and seasons.

**Predictions/Hypotheses**

**Prediction 1.** Patchy local environmental conditions cause neighboring plants to flower at the same time.

**Prediction 2.** In typical plants, neighbors are more likely to flower at the same time and cross-pollinate. Because figs have separate male and female flowers and must be out of phase to cross-pollinate, neighboring trees have a lower probability of cross-pollinating than trees located farther apart.

**Data Collection.** Nine *F. petiolaris* populations in Baja California, Mexico, were mapped and censused for flowering activity. Censuses were conducted four times: in November 2012 and 2013 (wet season) and June 2013 and 2014 (dry season). The production of female and male flowers was measured on each tree, more than 900 trees total for the entire study.

**Data Analysis.** Based on female and male flower production, the probability of cross-pollination was determined for all pairs of trees within a population. This probability was plotted relative to interplant distance, with mean probabilities obtained for successive distance intervals. For each distance interval, the observed mean cross-pollination was tested for a significant difference from the grand mean over all distances using randomization procedures.

**Interpretation.** To test the prediction that neighboring fig trees should have a lower probability of cross-pollinating than trees that are farther apart, we focus on the pattern of significance (p-values) across distance interval at each study site in each season.

**Results**

The probability of cross-pollination varied significantly with distance both within and across sites and seasons. However, in contrast to **Prediction 2**, we only infrequently found lower than expected cross-pollination probability at short distance intervals. Because tests were conducted for 36 site and season combinations, we present results for one population, Site 96, to illustrate how spatial variation in the probability of cross-pollination can differ from one season to the next.

**Figure 3.** *F. petiolaris* study populations in Baja California.

**Figure 4.** Map locations of georeferenced *F. petiolaris* trees at Site 96 that were censused for the production of female and male flowers. Trees are separated by a distance of up to 1,000 m.

**Figure 5.** The relationship between *F. petiolaris* cross-pollination probability and inter-plant distance for wet (November) and dry seasons (June) at Site 96.

**Conclusions**

Spatial patterns of flowering and opportunities for cross-pollination varied significantly from season to season within and across populations of the Sonoran Desert rock fig, *Ficus petiolaris*. In some cases, neighboring fig trees had lower probabilities of cross-pollination than did trees farther apart, as predicted assuming local environmental effects, in others they did not. These results reveal that distances separating pollen producing and pollen receptive trees, and in turn opportunities for cross-pollination, vary unpredictably through time.

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