

# Lonesome plants: How isolation affects seed set of a threatened dioecious shrub

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## Abstract

**PREMISE OF THE STUDY** Plant reproductive failure is a critical concern for conserving rare and endangered species that typically have low-density and sparse populations. One important factor contributing to reproductive failure is the spatial arrangement of plants within a population, which can lead to isolation and negatively affect seed output, particularly in obligate outcrossers. Additionally, this effect can be compounded by plant size. Here, we investigate how plants' spatial distribution and size influence the reproductive success of *Carica chilensis*, a threatened papaya species. **METHODS** Using flower exclusion, we first examined whether *C. chilensis* can produce seeds via apomixis. We then used Spatial Point Pattern Analysis (SPPA) in three populations to examine the spatial arrangement of plants and, finally, we assess whether plant size and mate distance influence the reproductive success of this plant species. **KEY RESULTS** *C. chilensis* is a dioecious shrub unable to produce fruits through apomixis. The SPPA revealed significant clustering of female and male plants at different spatial scales, indicating a non-random distribution. Moreover, a significant attraction between the sexes suggested a preference for proximity. In two populations, closer proximity to male plants was linked to higher seed production. **CONCLUSIONS** Our study revealed that the absence of apomixis in *C. chilensis* makes it prone to experiencing distance-dependent reproductive failure. In particular, the seed set was compromised in female plants isolated from male neighbors. This link between isolation and seed production was especially significant in the driest site, and we discuss how environmental factors can exacerbate this effect.

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