RESEARCH NOTE

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An Invasive Plant Species Decreases Native Plant Reproductive Success

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Natural Areas Journal 34:465–469

ABSTRACT: Invasive plants may have negative, positive, or neutral effects on the reproductive success of native plant species. In this study, I investigated the impact of the rhizomatous invasive species *Securigera varia* (Fabaceae; crown vetch; synonym: *Coronilla varia*) on the reproductive success of the native prairie species *Tradescantia ohiensis* (Commelinaceae; Ohio spiderwort). In particular, I examined how *T. ohiensis* plant height, fruit set, seed set, and stigma pollen load differed inside or at the edge of crown vetch patches and within native prairie not invaded by crown vetch. A significant reduction in reproductive success and pollen deposition was detected among *T. ohiensis* plants in the interior of a crown vetch patch compared to those at the edge of a crown vetch patch. These, in turn, had lower reproductive success and pollen deposition than plants in the native prairie areas. Also, *T. ohiensis* plants were taller inside crown vetch patches. The results of this study suggest that rhizomatous invasive species such as *Securigera varia* can have direct and indirect impacts on the reproductive success of native species.

Index terms: invasion front, invasive, reproductive success, rhizomatous growth, self-incompatible, *Tradescantia ohiensis*

INTRODUCTION

In the last decade, numerous studies (e.g., Larson et al. 2006; Traveset and Richardson 2006 [and citations therein]; Nielsen et al. 2008; Montgomery 2009a, 2009b; Dietzsch et al. 2011; Thijs et al. 2012 [and citations therein]; Sun et al. 2013) have addressed the question: Do invasive plant species compete with native plant species for pollinators? These studies have shown negative, positive, and neutral effects regarding the impact of invasive species on the reproduction of native species. This range of observed effects can be explained by various factors that can influence the abundance and behavior of pollinators available to native and invasive plant species. These include habitat and blooming overlap, plant species abundance (population size and population density), shared pollinators (including flower similarity and rewards [pollen and nectar]), and plant breeding system (e.g., self-compatible or self-incompatible).

Growth form and the rate of expansion of an invasive species can also influence the seriousness of its impact. For example, invasive species that spread by rhizomes or stolons can form solid mats overgrowing and overcrowding native species and, due to their rate of expansion (Cousens and Mortimer 1995), can overtake the habitat of native species in a relatively short amount of time (e.g., kudzu [*Pueraria montana* (Lour.) Merr. variety *lobata* (Willd.)]; Forseth and Innis 2004). Cousens and Mortimer (1995) noted that an invasive species patch can grow by half the distance of the previous year as long as there is successful recruitment and a constant expansion rate. As such, native species are continually competing with these invasive species for resources.

How good of a competitor a native species is against other native species has not been evaluated in most existing native and invasive plant species studies (i.e., community level, but see Lopezaraiza-Mikel et al. 2007; Dietzsch et al. 2011). The great majority of these studies have determined whether or not a native species is receiving enough pollen (i.e., is pollen limited) by conducting supplemental pollinations (e.g., Powell et al. 2011), or by detecting the presence of heterospecific pollen from invasive species (e.g., Brown et al. 2002). Determining how good of a competitor the native species is in the absence of the invasive species is also important, as this can improve our understanding of the true impact of the invasive species. In the present study I investigate spatial overlap and native species competitive ability by determining how native plant height, fruit set, seed set, and stigma pollen load differ inside an area dominated by an invasive species, at the edge of this area, and within an area of native prairie in which the invasive species is not present.

I used the native prairie species *Tradescantia ohiensis* Raf. (Commelinaceae; Ohio spiderwort) in this study for the following reasons: (1) it is a perennial self-incompatible species (Owens and McGrath 1984), (2) its flowers open early in the morning and wilt by midafternoon (Runkel and Roosa 1989), (3) it shares pollinators (long-tongued bees [especially bumblebees] and