

Background: Global climate change has the potential to shape evolutionary trajectories of invasive species *via* many routes, including through changes in mating systems. Many cleistogamous (CL) plants adjust investment in CL (selfed) vs. chasmogamous (CH, potentially outcrossed) progeny across environmental gradients. However, the details of such adjustments are lacking for highly invasive plant species.

Aims: We used a highly invasive grass, *Microstegium vimineum*, as a model for understanding how changes in water-induced stress (including potential associated changes in soil nutrient availability) might affect mating systems and thus evolutionary change in invasive species. We predicted that plants would respond to increased water-induced stress through a relative reduction in investment in CL vs. CH reproduction (i.e., a decrease in the CL:CH ratio).

Methods: Under greenhouse conditions, we measured fecundity (number of inflorescences and florets per plant) as well as relative investment in CL vs. CH florets (CL:CH ratios for number of inflorescences, florets per inflorescence, overall florets) in response to three watering treatments approximating mesic (low) to inundated (high) conditions.

Results: Plant biomass was significantly lower in high-watering treatment relative to intermediate and low treatments, indicating that the high-water condition was stressful. Contrary to expectations, stressed plants significantly increased relative investment in CL reproduction, a pattern associated with decreased inflorescence number and increased numbers of CL florets per inflorescence.

Conclusions: We conclude that changes in water-induced stress could strongly influence realised rates of outcrossing in this invasive plant, leading to mating system evolution, and altered invasiveness.