

# COMPARATIVE FLORAL ECOLOGY AND BREEDING SYSTEMS BETWEEN SYMPATRIC POPULATIONS OF *NOTHOSCORDUM BIVALVE* AND *ALLIUM STELLATUM* (AMARYLLIDACEAE)

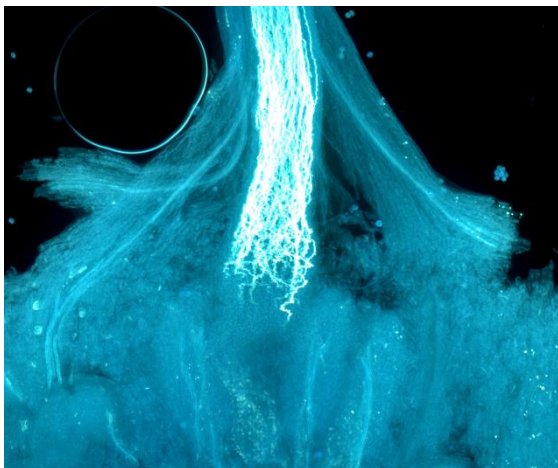
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In the American midwest, prairie onion (*Allium stellatum*) blooms from late summer to early autumn while the closely related, false garlic (*Nothoscordum bivalve*) flowers in early spring. We compared the pollination and breeding systems of two extensive populations of both species within the same limestone glade at the Shaw Nature Reserve, Missouri (2018 and 2019).

This required recording their respective flowering periods, individual floral life-spans, and pollinator attractants. We recorded the development of sexual organs, including length and timing of maturation. We collected and identified insects foraging on flowers, measured insect dimensions, and identified their pollen loads. To determine the breeding systems of both species we bagged flowers to exclude insects and performed hand-pollination experiments to determine whether fruits and seeds were more likely to be the results of cross- or self-pollination. We compared our results to flowers that were exposed to insects and never bagged. Some flowers of both species were collected after pollination and observed using epifluorescence microscopy to count and measure the development of pollen tubes penetrating pistils. We recorded the number of flowers that set fruit under both regimes and counted the number of ovules in each fruit that developed into seeds.

Prairie onion showed characteristics of cross-pollination including prolonged blooming and asynchronous maturation of male and female sexual organs. Hooded nectar glands forced bees and beetles to struggle and transfer pollen as they collided with sexual organs. Fruit set was higher in insect-pollinated and hand-crossed flowers but self-pollinated flowers produced few fruits suggesting that this species has a self-incompatible breeding system.

In contrast, *Nothoscordum bivalve* showed characteristics of self-pollination. The flowering period was much shorter, production of nectar glands was irregular, and when flowers closed at night the tepals pressed pollen in open anthers onto receptive stigmas. Massive numbers of pollen tubes grew down the styles in bagged, unmanipulated flowers. These flowers continued to attract early emerging bees including *Andrena nothoscordii*, known to primarily visit false garlic. However, fruit and seed set were high in both exposed flowers and bagged, unmanipulated flowers, but low in cross-pollinated flowers. Indeed, this self-compatible breeding system is unique in that this species has given up the ability to reproduce with other individuals in favour of more dependable reproduction with itself.



*A dense cluster of pollen tubes in Nothoscordum bivalve paused at the entrance to the ovary.*