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Pollination and seed development in *Lemna aequinoctialis*

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Duckweeds possess some of the most highly reduced flowers among angiosperms; however, their sexual reproduction is poorly understood. Although flowering can be induced in multiple duckweed species under controlled conditions, successful seed set remains limited. A better understanding of pollination is required to establish controlled crossing systems, while reliable seed production is essential for the broader application of duckweeds in genetic studies. Here, we characterize the progression of flowering, pollination, and seed development in *L. aequinoctialis* (genotype KSS014), a duckweed species in which we can reliably produce seeds. We define distinct developmental stages from floral initiation to mature seed formation and establish their temporal progression. Under an 8-hour photoperiod, flowering is initiated 7–10 days after induction, after which an individual flower completes development within 2–3 days. Flower maturation proceeds through the simultaneous emergence of the pistil and first anther, followed by asynchronous emergence of the second anther, formation of a stigmatic liquid droplet associated with fertilization, and the onset of seed development. Seed maturation is completed approximately 10 days after fertilization. Based on these developmental stages, we propose the optimal timeframe for crossing in *L. aequinoctialis*. Together, these findings provide a practical framework for controlled fertilization and seed production, facilitating the use of duckweeds in genetic engineering and breeding applications.

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References

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