



Contribution ID : 58

Type : Poster

Haplotype-resolved genome assembly and single-nucleus sequencing provide insights into the simplest flower development in *Wolffia microscopica*

martedì 29 settembre 2026 17:55 (20)

Evolution does not always lead to increased complexity, and in plants, the loss of floral organs is a recurring phenomenon across different lineages. However, the mechanisms behind this simplification remain poorly understood. To investigate the evolutionary processes leading to floral organ loss, duckweeds, especially *Wolffia microscopica*, provide an ideal system because of the smallest flowers with the simplest morphology – with a single stamen and a unicarpellate gynoecium, which are even simpler than the model species *Arabidopsis thaliana*, yet with essential genetic makeups. Therefore, by integrating single-nucleus multi-omics with comparative genomics, we ask the specific questions: i) which floral cell-types remain in this smallest flowering plant? and ii) which cell-types and genes are showing evolutionary signatures?

We constructed a haplotype-resolved genome assembly of *W. microscopica* with a total size of 666.5 Mb, consisting of 20 chromosomes and 12,623 protein-coding genes. We performed single-nucleus RNA-Seq and single-nucleus ATAC-Seq (10,720 nuclei) to identify all cell-types, including the male and female floral cell-types. We identified the marker genes and the transcription factor-binding motifs enriched in the floral cell-types, which could be responsible for establishing and maintaining the floral cell-type identities. Further, we performed natural selection and gene family evolution analyses to understand the evolutionary mechanisms underlying the development of the world's simplest flower. The detailed single-nucleus multi-omics and evolutionary insights aid in uncovering the fundamental genetic mechanisms and regulatory networks responsible for the development of the simplest flowers, which likely represent the minimal controls of sexual reproduction in plants.

Corresponding author email

Scientific Session

Genes, Genomes and Evolution

Keywords

Genome, Single-nucleus sequencing, Simplest flower

References

1. Siadjeu, C., Chakraborty, A., & Xu, S. Duckweeds as a model for minimal floral development. Trends in Genetics 42, 555-564 (2026).
2. Sree, K. S., Maheshwari, S. C., Boka, K., Khurana, J. P., Keresztes, Á., & Appenroth, K. J. The duckweed *Wolffia microscopica*: A unique aquatic monocot. Flora 210, 31-39 (2015).

Primary author(s) : CHAKRABORTY, Abhisek (Johannes Gutenberg University of Mainz, Germany); Dr. MICHAEL, Todd P. (Salk Institute for Biological Studies, 10010 N Torrey Pines Rd, La Jolla, CA 92037); XU, Shuqing (University of Mainz)

Presenter(s) : CHAKRABORTY, Abhisek (Johannes Gutenberg University of Mainz, Germany)

Session Classification : Poster Session I