

Cite this as: Jia YAO, Xubo KE, Xinyue GU, Zhihan JIANG, Zhengzheng YING, Chenze LU, Chongbo SUN, Pei XU, 2026. Optimized substrate selection for enhanced orchid growth based on high-throughput lysimetric arrays. *Journal of Zhejiang University-SCIENCE B*, 27(5):437-449.
<https://doi.org/10.1631/jzus.B2500195>

Optimized substrate selection for enhanced orchid growth based on high-throughput lysimetric arrays

Key words: Orchid; Cultivation substrate; Phenotypic platform; Plantarray; High-throughput monitoring

Research Summary

Background: Orchids are highly valued ornamental plants whose growth conditions directly impact the economic returns of the horticultural industry. The substrate, acting both as a physical support and a nutrient reservoir, is critical for orchid development. Therefore, the careful selection of an appropriate growth substrate is of paramount importance.

Methods: we evaluated three distinct substrate types including peat soil mixed with perlite, pine bark, and river sand, applied to two orchid species, *Cymbidium goeringii* and *Cymbidium faberi*. Using the high-throughput Plantarray lysimetric system, we continuously recorded environmental parameters (photosynthetically active radiation, humidity, and temperature) as well as key growth metrics (biomass accumulation, canopy conductance, and transpiration rate).

Results:

- The type of substrate significantly affects orchid growth.
- Under controlled conditions, mixed substrates that provide balanced nutrition and excellent drainage enhanced orchid growth compared to other substrates.
- When comparing the data obtained from the high-throughput phenotyping platform with traditional manual measurements, the automated system showed higher reliability and accuracy.

Innovation points

- We used **high-throughput phenotyping platforms**
- This platform allowed for precise and rapid quantification of orchid growth indicators.

(a) 3 substrate × 4 replicates × 2 species
Precise sampling

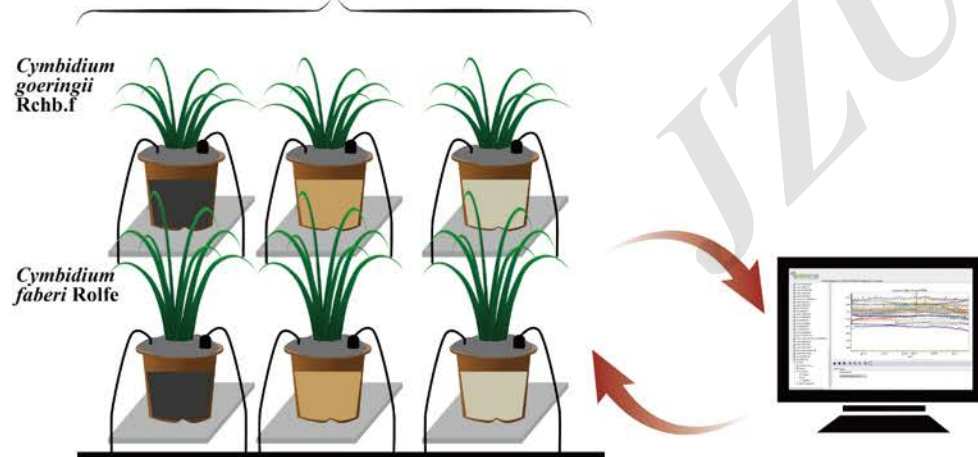


Fig. 1 Structure of experimental units in the Plantarray functional physiological phenotyping system and the experimental scenario.