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**Optimum design for effective water transport through a double-layered porous hydrogel inspired by plant leaves**[1] HYEJEONG KIM, HYEONJEONG KIM, HYUNGKYU HUH, HYUNG JU HWANG, SANG JOON LEE, Pohang Univ of Sci & Tech — Plant leaves are generally known to have optimized morphological structure in response to environmental changes for efficient water usage. However, the advantageous features of plant leaves are not fully utilized in engineering fields yet, since the optimum design in internal structure of plant leaves is unclear. In this study, the tissue organization of the hydraulic pathways inside plant leaves was investigated. Water transport through double-layered porous hydrogel models analogous to mesophyll cells was experimentally observed. In addition, computational experiment and theoretical analysis were applied to the model systems to find the optimal design for efficient water transport. As a result, the models with lower porosity or with pores distributed widely in the structure exhibit efficient mass transport. Our theoretical prediction supports that structural features of plant leaves guarantee sufficient water supply as survival strategy. This study may provide a new framework for investigating the biophysical principles governing the morphological optimization of plant leaves and for designing microfluidic devices to enhance mass transport ability.

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