



Investigating root system architecture to make climate-resilient buckwheat

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Greenhouse experimental setup of column culture to study the root system architecture of buckwheat.

Greenhouse experimental setup of column culture to study the root system architecture of buckwheat. Plants were grown in polyvinyl chloride pipes, which were filled with equal amounts of soil and sand. Photo courtesy of S. M. Zargar, Diksha Singh, and P. A. Sofi, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir.

Buckwheat is a nutritious crop with potential heart, nerve, and liver health benefits. But the plant is often grown in harsh conditions, lowering yield and leaving the crop underutilized. Buckwheat roots are a promising target to enhance yield under unfavorable growth conditions as positive traits like root diameter are associated with drought tolerance. Root systems, however, are quite complex to study: Growing plants in their natural conditions results in imprecise measurements while using different media leaves out important influences on root growth, like nutrients, moisture, and temperature.

To effectively study buckwheat root system architecture (RSA), column culture—a technique where plants are grown in pipes under controlled conditions—was adopted in the greenhouse. Researchers from SKUAST-K (Srinagar, India) scanned 117 diverse buckwheat genotypes belonging to two different species (*Fagopyrum esculentum* and *Fagopyrum tataricum*) using an Epson Perfection V700 photo scanner and analyzed the root phenotypes with RhizoVision Explorer software. After phenotyping, further genomic analysis of the 117 buckwheat genotypes identified potential candidate genes that contribute to RSA in buckwheat.

This study successfully highlights the superior RSA traits of *F. tataricum*, indicating its potential as a key genetic resource for enhancing drought and stress tolerance in buckwheat. In addition, the candidate genes identified from this study can be used in the molecular breeding of buckwheat for suitable root systems.

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Singh, D., Sudan, J., Verma, A., Bhat, B., Urwat, U., Shikari, A. B., Bhat, M. A., Sofi, P. A., & Zargar, S. M. (2025). Insight into root system architecture of buckwheat through genome-wide association mapping—first study. *Crop Science*, 65, e70092.

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