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## The pullout mechanical properties of shrub root systems in a typical karst area, Southwest China

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**Abstract:** Roots play a major role in reinforcing and stabilizing soil. The pullout mechanical characteristics of soil reinforcement and slope protection of the root systems of dominant shrub species (*Pyracantha* and *Geranium*) were estimated by in situ pullout tests in a karst area, in which roots were pulled out from soil to reliably test the pulling force. The *F-s* curves were multipeak curves with a noticeable main peak and main double peaks. The curves showed a linear increasing trend at the initial stage of drawing and decreased rapidly after reaching the peak. The *F-s* curves of root systems inserted into rock cracks showed secondary fluctuations in the later stage of drawing, and rock cracks stimulated the tensile efficiency of the root system more effectively. The maximum pulling force had a linear relationship with the increase in soil thickness and a disproportionate increasing trend with the increasing number of broken roots. The displacement of the maximum peak was different between the two tree species and was concentrated at 5-15 cm and 5-25 cm for *Pyracantha* and *Geranium*, respectively. The maximum pulling force of *Geranium* was 1.29 times that of *Pyracantha*, and the root system of *Geranium* had strong pullout resistance. These findings can enrich the theoretical knowledge of vegetation slope protection and provide a reference for the selection of soil and water conservation tree species.