



## Mechanics and morphology of permanent attachment systems in plants

By Tina Steinbrecher

Shaker Verlag Mrz 2011, 2011. Taschenbuch. Condition: Neu. Neuware - Permanent attachment pads of climbing plants are an example of highly efficient attachment structures, which have been evolved, tested and optimized in the course of evolution. However, information about the attachment mechanisms is still scarce, although the excellent mechanical performance of attachment structures has been recognized. In this study, the morphology and the biomechanics of attachment pads of Boston Ivy (*Parthenocissus tricuspidata*) as well as the interface between the pad and different substrates were investigated. The self-clinging liana *P. tricuspidata* develops swollen tips at the end of its tendrils which form into attachment pads. Attached and non-attached structures were analyzed using microscopical and mechanical testing methods. The overall strength of the interface was studied using tensile tests on a large number of individual pads attached to different substrates. On the micrometer-scale, the mechanical properties of the constituent materials were studied using nanoindentation. Ontogenetic variations in the morphology of attached and non-attached structures were observed. Cell size, cell orientation and grade of lignification vary over the pad cross-section normal to the interface. Furthermore, cell size, cell wall thickness as well as cell orientation show variations in the plane of the interfacial...



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