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"Filling gaps and removing traps
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Mechanical Properties of Native Tree Species for Soil Bioengineering in Northeastern Mexico

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Abstract

In recent years, the effect of soil bioengineering has played a very important role on slope stability. However, our area of study is constantly under the influence of small-scale earthquakes and extreme events of heavy rainfall which cause potentially unstable conditions on the slopes. The mechanical properties of the root systems tensile strength (Ts) and modulus of elasticity (Eroot) of four native species were analysed for a potential use as soil bioengineering elements. We investigated if tensile strength (N/mm^2) and modulus of elasticity of roots (N/mm^2) was different between studied species: *Cercis canadensis, Celtis laevigata, Quercus rysophylla* and *Ligustrum lucidum*. The species considered were selected based on their native characteristics and widespread existence on the slopes. Regarding tree forest species, the tests were conducted with the Universal Testing Machine Shimadzu type SLFL-100KN. The relationships among root diameter, tensile strength (Ts), and modulus of elasticity (Eroot) was negative and could be fitted with a power regression equation, showing highly significant values $p < 0.01$. *Celtis laevigata* showed the maximum value of tensile strength (Ts) 28.11 N/mm^2 while the minimum value of tensile strength was observed in *Ligustrum lucidum* 5.27 N/mm^2. For the variable modulus of elasticity (Eroot) *Celtis laevigat*a showed the maximum value of 90.01 N/mm^2 while the minimum value of modulus of elasticity was observed in *Ligustrum lucidum* 29.16 N/mm^2. Results of mechanical proprieties showed the following ascending order: *Ligustrum lucidum* $<$ *Quercus rysophylla* $<$ *Cercis canadensis* $<$ *Celtis laevigata*. Likewise, *Celtis laevigata* showed the highest tensile strength and modulus of elasticity of all investigated species.

Keywords: Modulus of elasticity, root, tensile strength

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