東北林業大學
NORTHEAST FORESTRY UNIVERSITY

Mechanical Properties Measurement of Non-defect logs by Using Stress Wave

Xuechun Yang **Juying Luo**

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Contents

Intrduction

- Log, as a kind of engineering materials, was widely used to build many wooden architectures, such as temples, wooden houses, Olympic gyms, et al.

- How to measure the mechanical properties of log quickly, portably and precisely? The traditional methods or NDT methods?

Materials and Methods

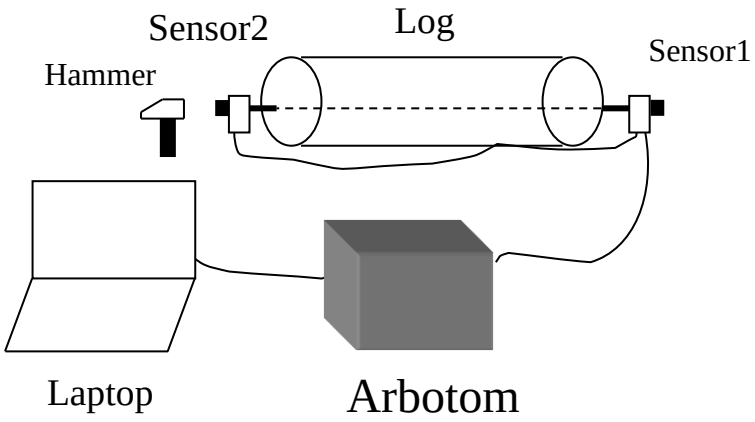
Materials

- Larch and poplar are typical species in the regions of north China.
- The amount of poplar log is 36 and the amount of larch log is 35.
- Length of each Sample is 30cm, not decayed and cracked.
- 15 larch samplings and 13 poplar samplings as compression testing, the rest larch samplings (21) and poplar samplings(22) are used for bending testing.

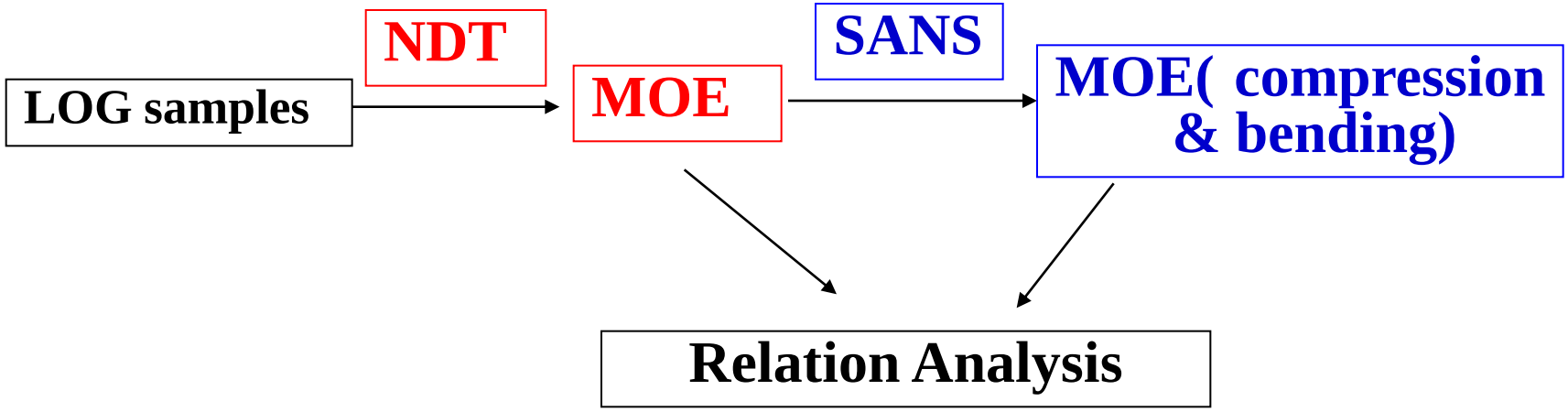
Materials and Methods

Methods

1) Arbotom stress wave instrument from FrankRinn Tech Company in Germany are used to measure the dynamic modulus of elasticity of all samplings.



2) The mechanical experiments of compression and bending resistant to all larch and poplar logs samplings were conducted by using SANS microcomputer control hydraulic mechanics machine.



Results and Analysis

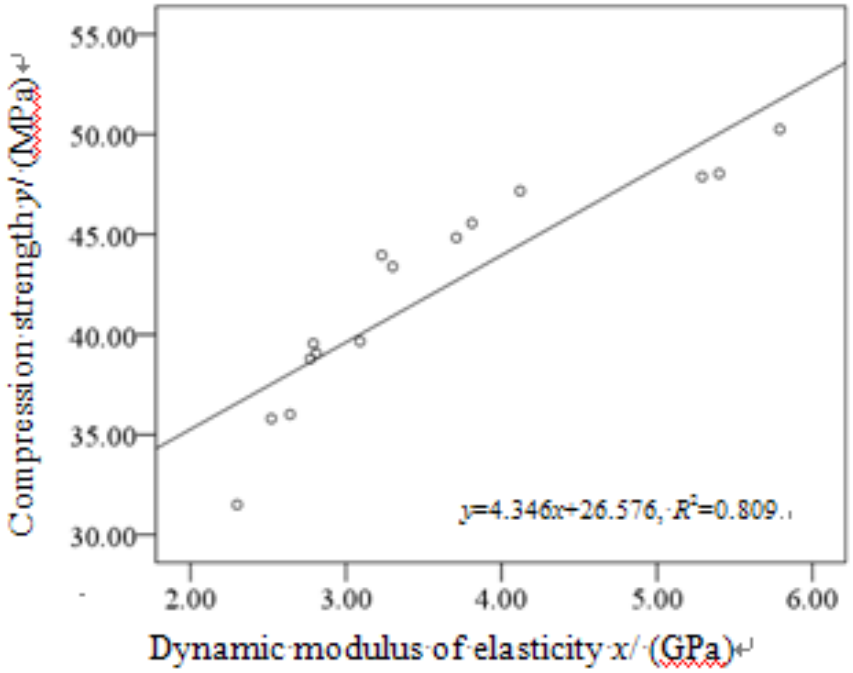
- MOE in Compression and Dynamic Modulus of Elasticity

Table 1 Relationship between MOE in compression and dynamic modulus of elasticity

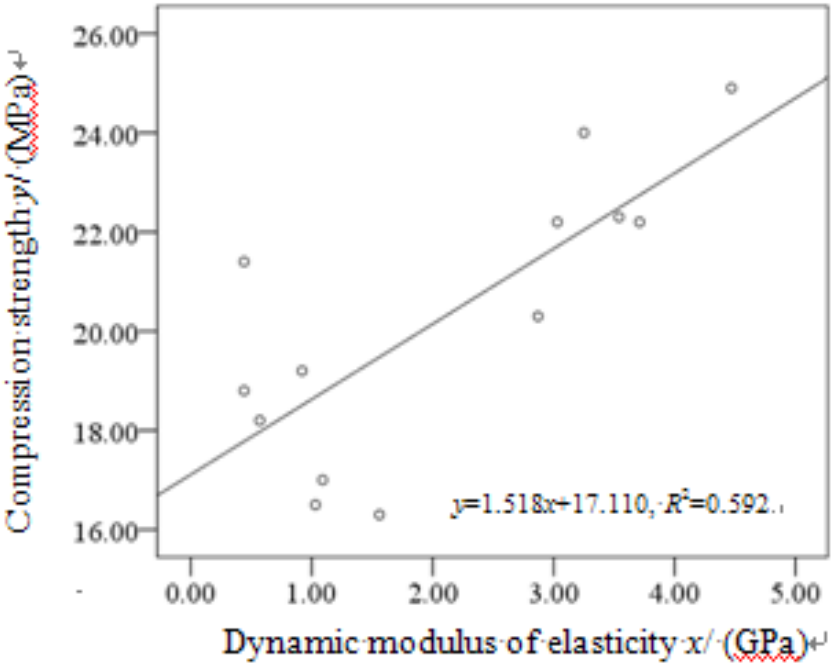
Species	Independent variable	Regression equation	R^2
larch	x_1	$y_1=3.258x_1+4.518$	0.706
poplar	x_2	$y_2=3.433x_2+7.552$	0.518

Taking dynamic modulus of elasticity as an independent variable *x* and the MOE in compression as dependent variable *y*, there were good linear relativity between the MOE in compression and the dynamic modulus of elasticity in the two log samplings.

Compression Strength and Dynamic Modulus of Elasticity



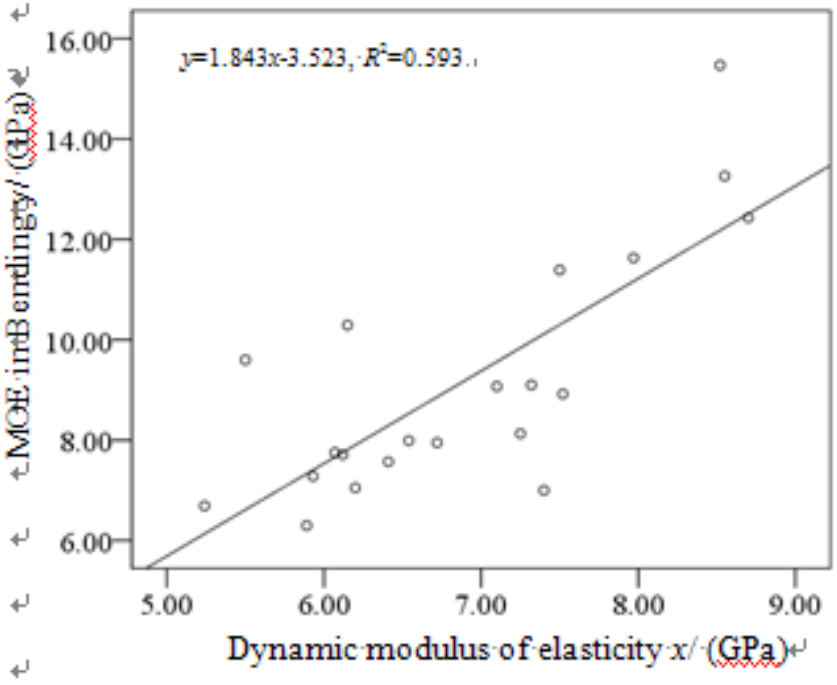
(a) larch logs samples



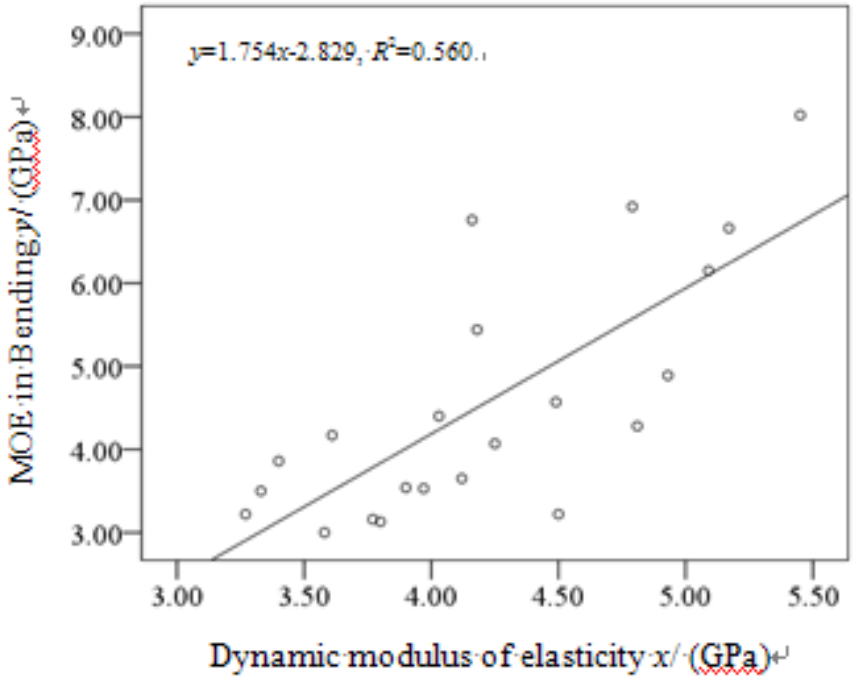
(b) poplar logs samples

Fig. 1. The relation between compression strength and dynamic modulus of elasticity

MOE in Bending and Dynamic Modulus of Elasticity



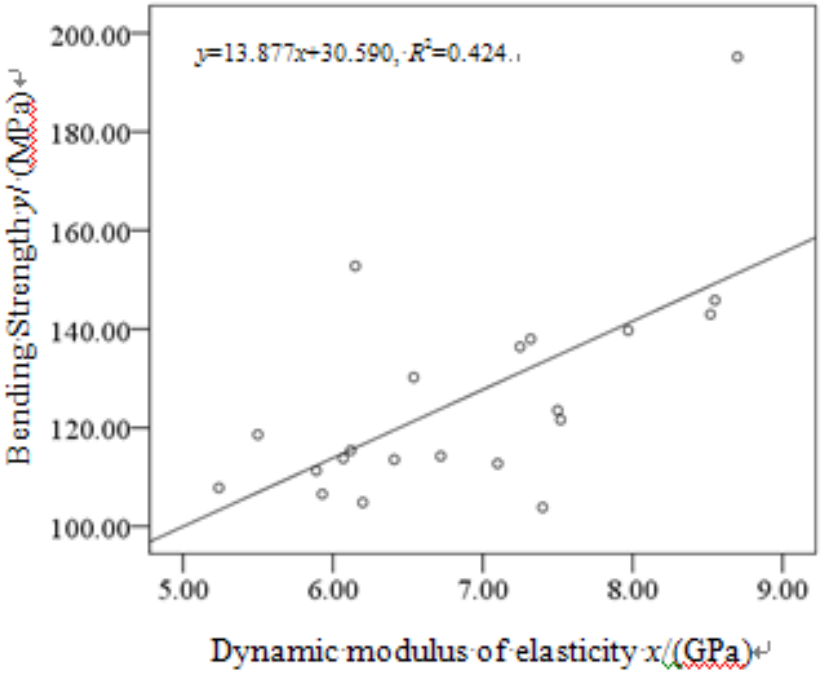
(a) larch log samples



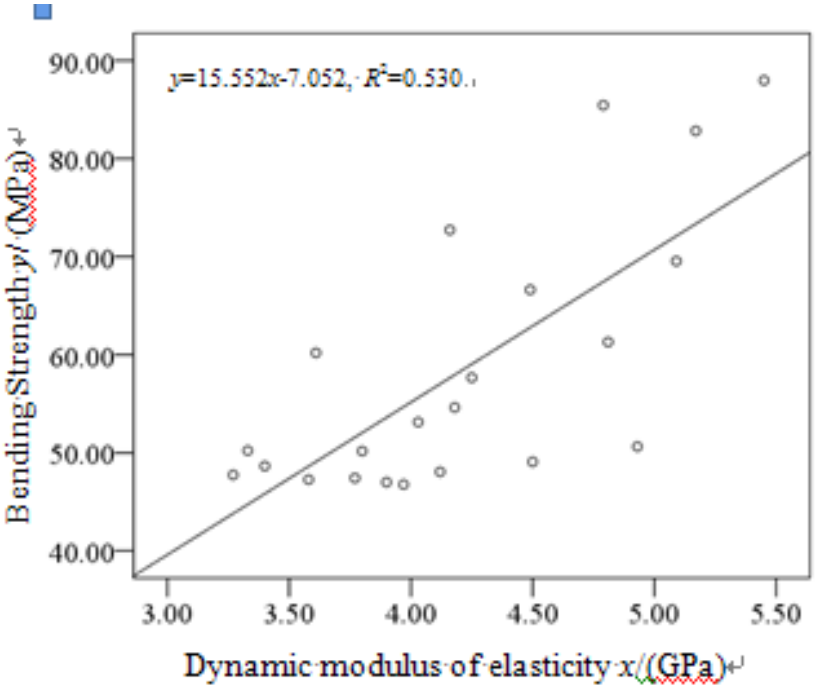
(b) poplar log samples

Fig. 2 The relation between MOE in bending and dynamic modulus of elasticity

Bending Strength and Dynamic Modulus of Elasticity



(a) larch log samples



(b) poplar log samples

Fig. 3 The relation between the bending strength and dynamic modulus of elasticity

Conclusions

1) There were good linear correlations between the MOE in compression and the dynamic modulus of elasticity in larch and poplar log samplings.

2) It had linear relativity between the dynamic modulus of elasticity and the compression strength in the larch and poplar log samplings.

3) It also had good linear relativity between the MOE in bending and the dynamic modulus of elasticity by stress wave

4) There were good positive linear relativity between the bending strength and the dynamic modulus of elasticity.

Acknowledgments

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Thank you !
A Dreamy World