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Growing rule in tapered trees under self-weight loading

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ABSTRACT

Growing rule in tapered trees under self-weight loading is clarified. We model trees as cylinder with various tapers ratio $c\ (=r_0/r_l)$ (Fig.1). Dargahi et al. presented FEM based numerical solutions in tapered trees. In this study, we proposed new formula for critical height (Fig.2). From the proposed formula, we found that critical height in tapered trees is inversely proportional to the 1/6 power of the taper ratio.

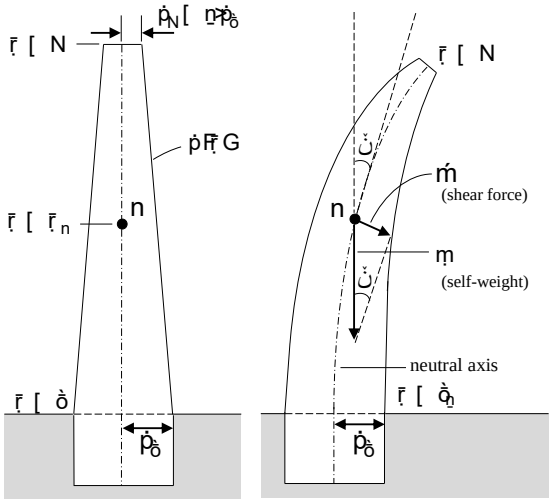

Fig. 1 Calculation model

Previous formula

$$l_c = \left(2\frac{E}{\gamma}\right)^{1/3} r^{2/3}$$

New formula

$$l_c = f(c)\left(2\frac{E}{\gamma}\right)^{1/3} r^{2/3}$$

Fig. 2 New formula of critical height

REFERENCES

Von Karman, T. and Biot, M.A. (1940), "*Mathematical Methods in Engineering*", Cambridge Univ. Press.

Dargahi, M., Newson, T. and Moore, J. (2019), "Buckling behavior of trees under self-weight loading", *Forestry*, **92**(4), 393-405.

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