THE DIFFERENCES IN MODULUS OF ELASTICITY (MOE) DEPENDING ON THE PLACE OF ORIGIN

J. Siuda*, J. Kawalerczyk, A. Trociński, S. Krzosek and R. Mirski
POZNAŃ UNIVERSITY OF LIFE SCICNCES
FACULTY OF FORESTRY AND WOOD TECHNOLOGY, DEPARTMENT OF WOOD-BASED MATERIALS

BACKGROUND & AIM OF THE STUDY

In recent years, about 40 million cubic meters of wood have been harvested in Poland from pine forest (Mirski et al. 2020a). Due to the ease of access of this species, pine is used as wood and in a circular form e.g. structure supports, hollow wood or supports (Sevik 2015). The quantity and availability of pine material makes it the most universal material in sawmills and wood processing plants in Poland.

Due to which region of Poland the wood comes from, its technological quality varies (Laurow 1994). In Poland in the 1960s, interest of the qualitative variability of available pine wood and its use in construction and industry was increased.

The aim of the study was to compare the properties of timber obtained from three regions of Poland. The comparison is intended to show differences in modulus of elasticity (MOE) depending on the place of origin.

MATERIALS AND METHODS

MOE was found by determining the deflection for a given load in accordance with the diagram shown in Figure 1. The assumed preliminary load was 134.9 N (13.75 kg). At that value, the deformation sensor was reset before increasing the load to 517.5 N (52.75 kg).

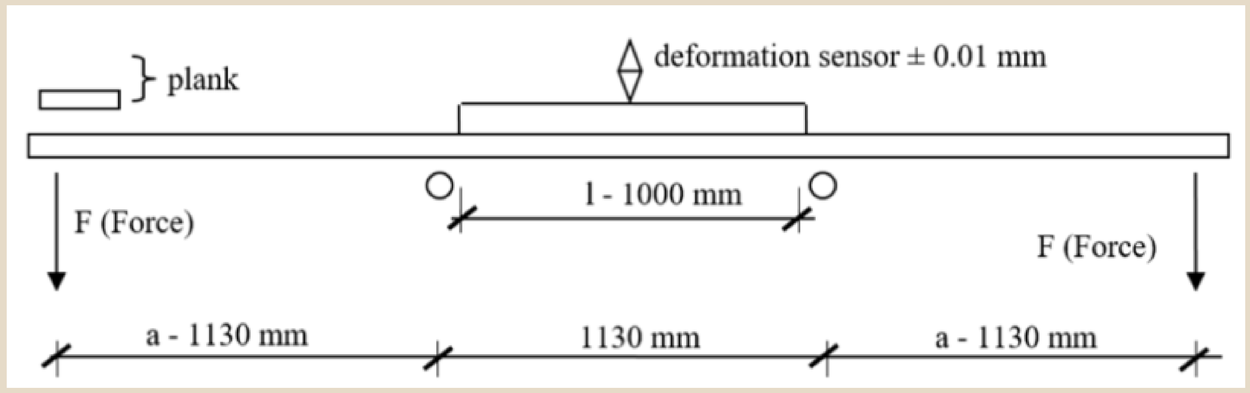

Figure 1. *The experimental setup used to identify MOE parameter.*

For this research, the authors selected pine timber of ages from 90 to 124, from a natural forest regions (NFR): Silesia NFR- Forest Division Olesno (RDLP Katowice); Greater Poland and Pomerania NFR- Forest Division Wymiarki (RDLP Zielona Góra); Baltic NFR- Forest Division Kalisz Pomorski (RDLP Piła).

RESULTS

The slight difference in density was observed according to the region where wood was sourced (Figure 2). The lowest value of density was noted for Olesno region (545 kg/m^3). Density of wood from Wymiarki region was the highest (581 kg/m^3). Comparable value was noted for Kalisz Pomorski. There were no statistically significant difference.

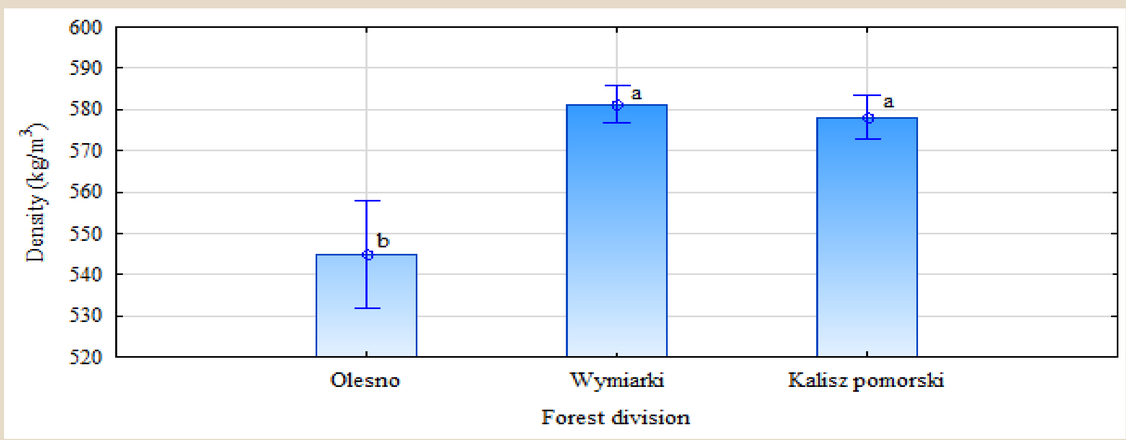

Figure 2. *Density converted to 0% humidity- NIR test.*

Figure 3. presented value of MOE (converted to 12% humidity). Statistical analyses clearly indicate differences in MOE. The highest value was observed for Wymiarki (13,8 kN/mm^2), whereas for Olesno noted MOE at level of 11,9 kN/mm^2. According to obtained results it can be stated that density is not the only factor that influenced on MOE. It is worth emphasizing that wood defect such as cracks and knots has influence for mechanical properties of timber.

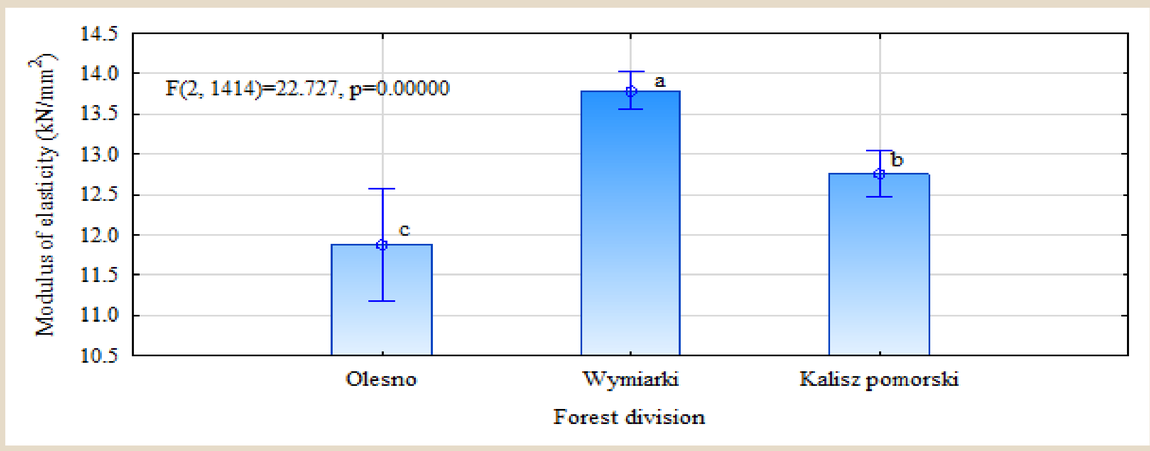

Figure 3. *Modulus of elasticity converted to 12% humidity- NIR test.*

CONCLUSIONS

- Statistically significant differences were observed for MOE.
- Results clearly indicate that wood density was not the only factor affecting MOE. Other parameters of wood e.g. defects, hight of forest stand, anatomical structure should be taken into consideration during determination of mechanical properties of wood. These factors are the subject of further research.

LITERATURE

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