INFLUENCE OF THE STRANDS ORIENTATION IN LAYERS COMPOSITION OF THE LAMINATED STRAND LUMBER

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INTRODUCTION

Engineered wood products (EWPs) are increasing the influence in building construction, laminated strand lumber (LSL) is one of the EWPs with enormous potential as a structural composite lumber. LSL consists of oriented wood strands up to 300mm long bonded and pressed up to 90 mm thick. Based on the reduction of the defects, LSL shows less variability in mechanical properties [1]. All structural applications are possible for LSL such as lintel, beam, joist, ceiling, floor, etc. [2][3]. LSL properties depend on the wood species, panel density, strand geometry, strands orientation [1].

Based on the changes in the forest there is the potential to use less-known wood species for wood-based composites. The decrease of the spruce (Picea abies (L.) Karst.) wood and the increase of the other wood species such as larch (Larix decidua Mill.), birch (Betula pendula Roth), etc. opened the potential for wood-based composites [4].

MATERIAL AND METHODS

Norway spruce, European larch, and birch logs with a length of 300 mm were split in half, debarked, and stranded on the laboratory knife ring flaker (MSF 1400, Dieffenbacher-CZ s.r.o., Czech Republic). Afterward, the strands were dried and sprayed with 3.5% pMDI adhesive and 0.5% paraffine emulsion in a laboratory blender. Two types of LSL panels were made 1) all strands were oriented parallel 2) core layers were oriented at the angle 45° and 135° and surface layers parallel.
Panels were cut on testing specimens with dimensions 50 x 50 mm, specimens for bending were 800 x 75 mm, and specimens for compression were 30 x 105 mm. These specimens were tested on flatwise and edgewise Bending properties (modulus of elasticity (MOE), modulus of rupture (MOR)), compression, moisture content (MC), Internal bond strength (IB), thickness swelling (TS), water absorption (WA), density profile, and density.

RESULTS

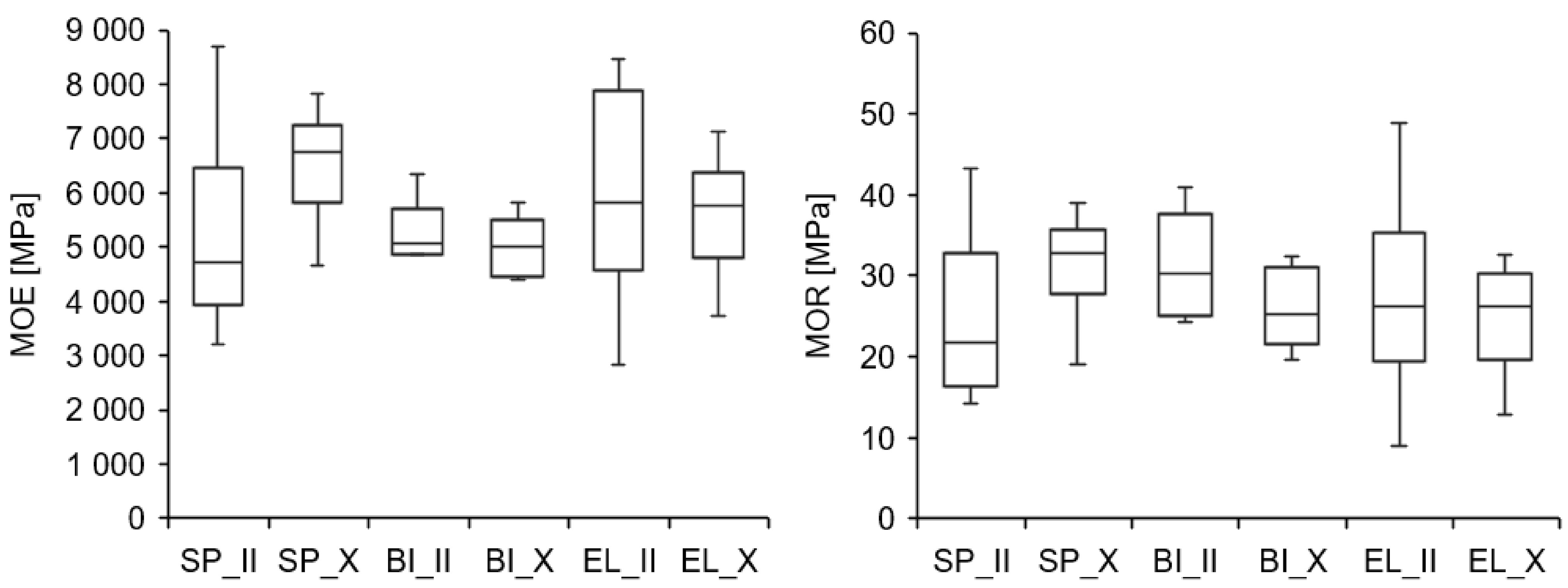

Figure 1 Bending properties of EDGEWISE specimens SP-Norway spruce, BI-birch, EL-European larch; II-all strands parallel; X-core strands oriented in 45° and 135°.

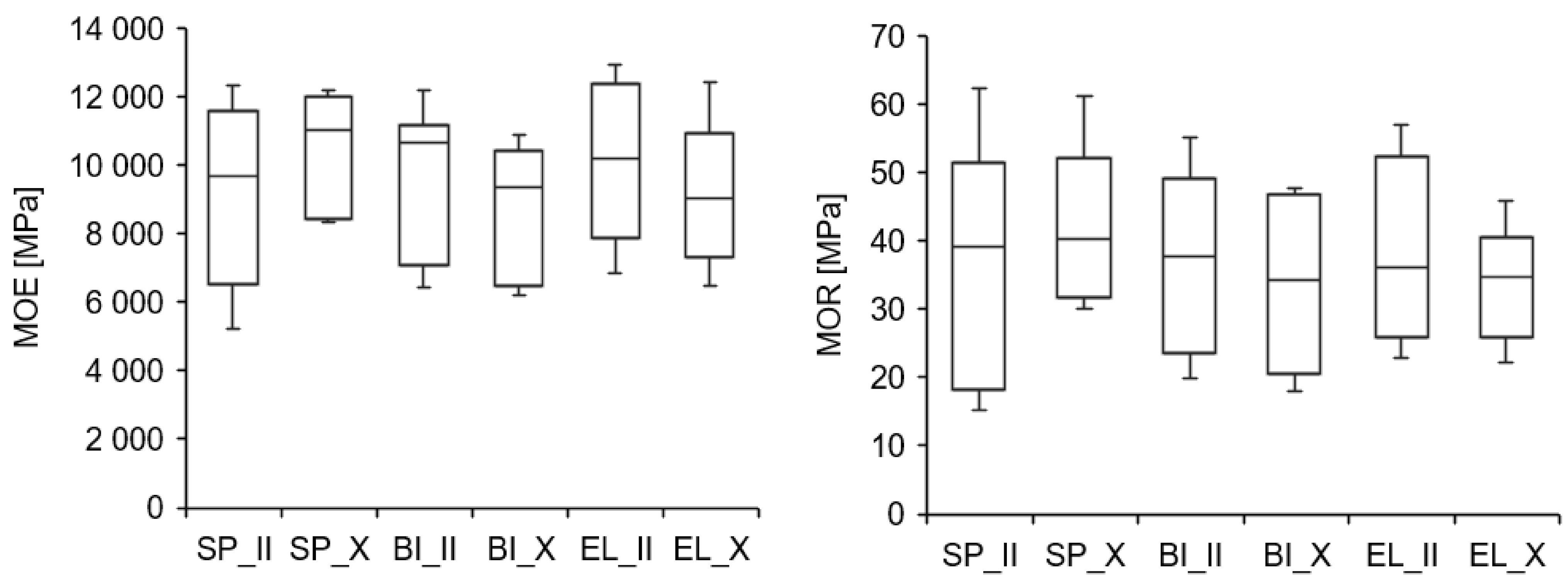

Figure 2 Bending properties of FLATWISE specimens SP-Norway spruce, BI-birch, EL-European larch; II-all strands parallel; X-core strands oriented in 45° and 135°.

The average density was 608 kg/m3 (spruce), 620 kg/m3 (birch), and 641 kg/m3 (larch) without significant differences between wood species. The modulus of elasticity (MOE) measured on EDGEWISE specimens was lowest on BI_X (5021 MPa) and highest on SP_X (6531 MPa). The modulus of rupture (MOR) was lowest on SP_II (25 MPa) and highest on SP_X (31MPa). The bending properties measured on FLATWISE specimens showed higher average values of 70% for MOE and 34% for MOR. The highest values on FLATWISE specimens were measured on SP_X MOE 10494 MPa and MOR 42 MPa. Due to the high variability of MOE and MOR results, statistically significant differences were not observed.

CONCLUSION

- The possible potential of using larch, birch, and spruce in LSL production
- There is no influence of the orientation of the strand layers on bending properties

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