INFLUENCE OF THE LAYERS COMPOSITION OF THE LAMINATED STRAND LUMBER

PIPÍŠKA TOMÁŠ, DĚCKÝ DAVID, NOCIAR MAREK, JADRNÝ RADEK, RYCHLÝ VOJTĚCH, ŠULÁK MICHAL

MENDEL UNIVERSITY IN BRNO / FACULTY OF FORESTRY AND WOOD TECHNOLOGY

e-mail: tomas.pipiska@mendelu.cz

INTRODUCTION

Climate change in the last several decades led to the decline of the natural environment for the occurrence of spruce. It was found that suitable conditions for the planting spruce (*Picea abies (L.) Karst.*) stay only on 11,3% of the Czech Republic Forest area in the period 2041–2060 (Čermák et al. 2021). Spruce could be partially replaced by larch (*Larix decidua Mill.*) under conditions of global climate change (Zeidler et al. 2022). Laminate strand lumber (LSL) is a type of wood-based composite consisting of oriented strands compressed with adhesive up to 90 mm thick (Moses et al. 2003). Strands thickness ranged from 0,5 to 2 mm and the length is around 300 mm. LSL could be produced with different physical and mechanical properties. It depends on the pressing cycle, adhesive, density of the panel, the wood species, and the orientation of strands (Moses et al. 2003). LSL has a large range of use in building construction in horizontal and vertical applications (Wang et al. 2015).

MATERIAL AND METHODS

Logs were split in half, debarked, and cut into 300 mm long cutouts. The length of cutouts defined the length of strands. Strands were manufactured on the laboratory knife ring flaker (MSF 1400, Dieffenbacher-CZ s.r.o., Czech Republic). For the strand mixture, it was sprayed 3% pMDI adhesive and 0,5 % paraffine emulsion in a laboratory blender. Four types of LSL board were made 100% larch (RMD), 100% spruce (RSM), a mixture of 60% spruce and 40% larch (MSM), and 3 layers of 20% larch in each surface layer and 60% spruce in core layer (MDV). These four types of boards 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 30 x 105 mm. These specimens were tested on Bending properties (flatwise and edgewise), compression, moisture content (MC), Internal bond strength (IB), thickness swelling (TS), water absorption (WA), density profile, and density.

RESULTS

There was not a statistically significant difference in the moisture content of the specimens with average values of 7.8%. The average density was highest in RMD samples (683 kg/m^3), but significant differences were found only in RSM specimens (599 kg/m^3), their density was statistically significantly lower than the density at other specimens. The average values of thickness swelling were 23% for spruce and 43% for larch after one week submerged in the water, which was a significant difference. In contrary water absorption after one week in the water showed higher values for spruce (87%) and for larch (77%). The thickness swelling and water absorption showed differences in the rate of increase based on the differences in the densities and the compaction ratio of the LSL.

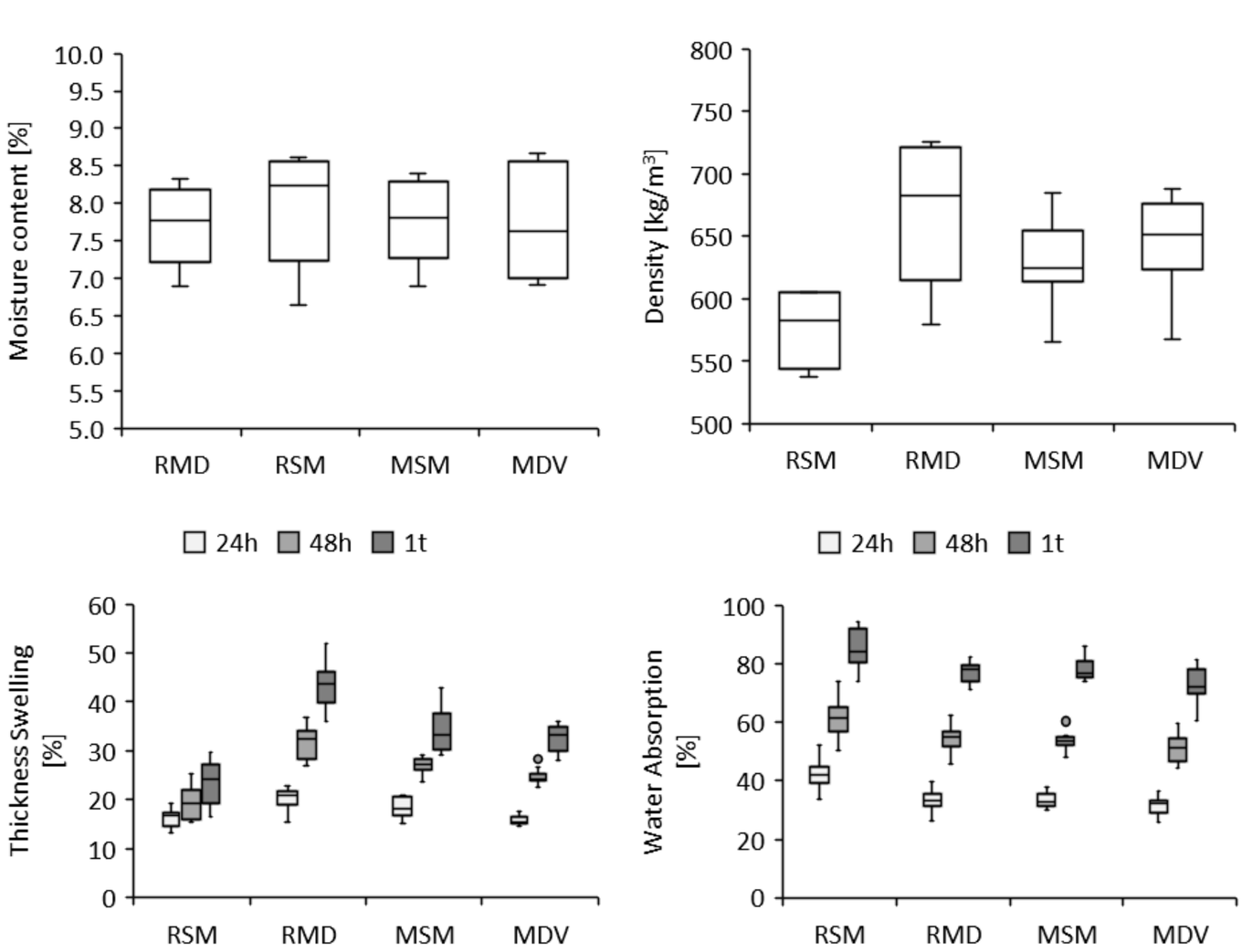

Figure 1 Physical properties of spruce and larch LSL: RMD (100% larch), RSM (100% spruce), MSM (mixture of 60% spruce and 40% larch), and MDV (3 layers 20% of larch in surfaces and 60% of spruce in core layer).

CONCLUSION

- Possibility of the utilization of the spruce and larch in LSL production
- Higher thickness swelling and lower water absorption for LSL with the utilization of the larch

ACKNOWLEDGEMENT

This work was supported by the Specific University Research Fund of the FFWT Mendel University in Brno (Grant No. LDF-22-TP-005).

REFERENCES

Zeidler, A., Vacek, Z., Cukor, J., Borůvka, V., Vacek, S., Prokůpková, A., Linda, R., Vacek, O., (2022). “Is European larch (Larix decidua Mill.) a suitable substitute for Norway spruce (Picea abies (L.) Karst.) for agricultural land afforestation?” Forest Ecology and Management, 517, 120257., 120257.

Čermák, P., Mikita, T., Kadavý, J., Trnka, M., (2021). “Evaluating Recent and Future Climatic Suitability for the Cultivation of Norway Spruce in the Czech Republic in Comparison with Observed Tree Cover Loss between 2001 and 2020.” Forests. 12(12):1687. https://doi.org/10.3390/f1212168

Moses, D. M., Prion, H. G. L., Li, H., Boehner, W., (2003). “Composite behavior of laminated strand lumber,” Wood Science and Technology, 37(1), 59–77. DOI: 10.1007/s00226-003-0169-5

Wang, Z., Gong, M., & Chui, Y. H., (2015). Mechanical properties of laminated strand lumber and hybrid cross-laminated timber. Construction and Building Materials, 101, 622-627.