# Properties of Sandwich Panels Produced from MDF and Thermally Compressed Veneers

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# Introduction

COST FP1303
Performance of bio-based building materials

- Densification of wood
- Effects of densification on properties wood
- Surface quality
- MDF

# Objectives

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Performance of bio-based building materials

- To determine some of the physical and mechanical properties of sandwich panels
- To improve mechanical properties of sandwich panels
- To improve water absorsorption and thickness swelling of sandwich panels

# Materials and Methods

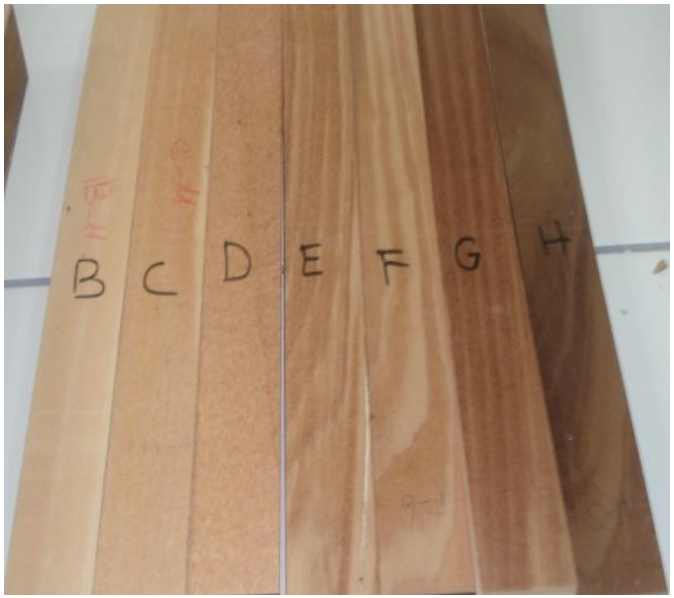
- MDF panels (12x500x500 mm)
- Beech (*Fagus orientalis* Lipsky) veneer (1.5x500x500 mm)

# Thermal compression

- Hot press
- 2 press pressure (4 MPa and 6 Mpa)
- 3 press temperatures (150 °C, 180 °C and 200 °C)
- 8 minutes
- 4 veneer for each trial.

# Production of sandwich panels

- Urea formaldehyde (UF) :160 g/m$^2$
- Press pressure: 2.6 MPa and a
- Press temperature :110 °C
- Press time: 4 min

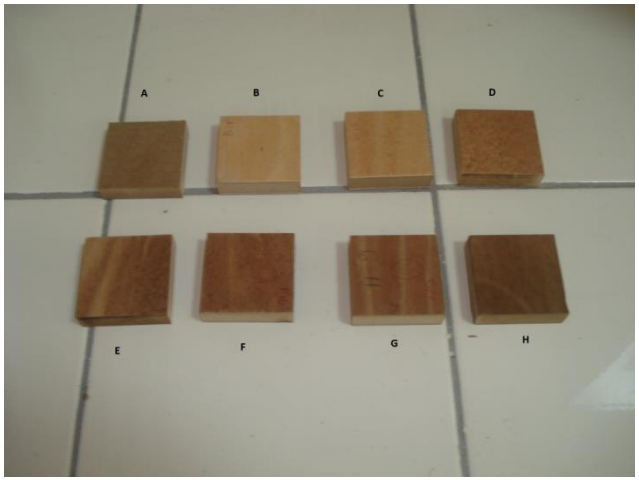



# Experimental design

| Panel Type | Process | Veneer Compression | | | Sandwiched Panels | | |
|---|---|---|---|---|---|---|---|
| | | Pressure (MPa) | Temp. (°C) | Time (min.) | Pressure (MPa) | Temp. (°C) | Time (min) |
| A | MDF Control | - | - | - | - | - | - |
| B | Laminated w/o compression | - | - | - | 2.6 | 110 | 4 |
| C | Laminated | 4 | 150 | 8 | | | |
| D | Laminated | 6 | 150 | | | | |
| E | Laminated | 4 | 180 | | | | |
| F | Laminated | 6 | 180 | | | | |
| G | Laminated | 4 | 200 | | | | |
| H | Laminated | 6 | 200 | | | | |

# Methods

- Reduction of veneer thickness
- Modulus of rupture (MOR)
- Modulus of elasticity (MOE)
- Water absorption (WA)
- Thickness swelling (TS)




# RESULTS AND DISCUSSION

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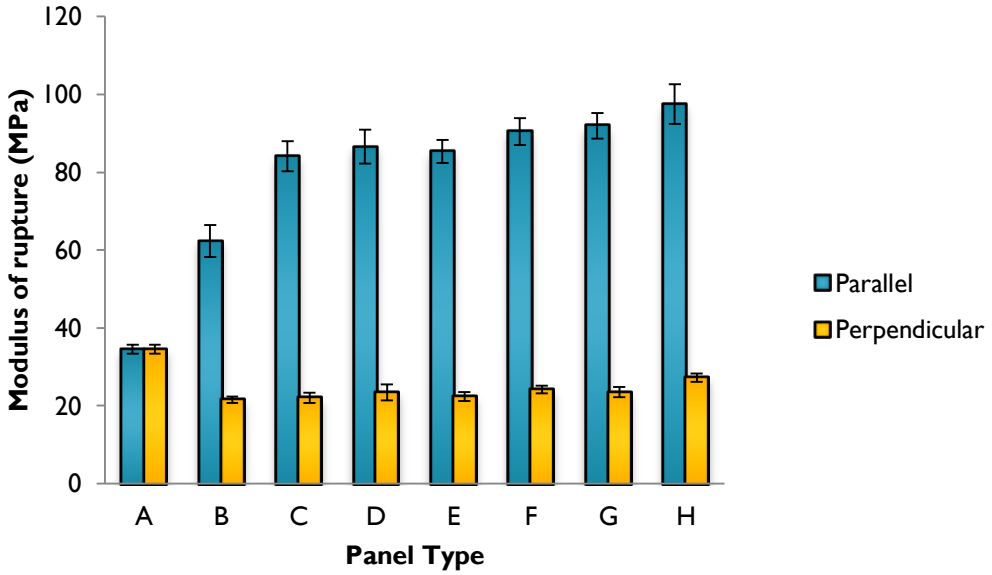
## Reduction of thickness

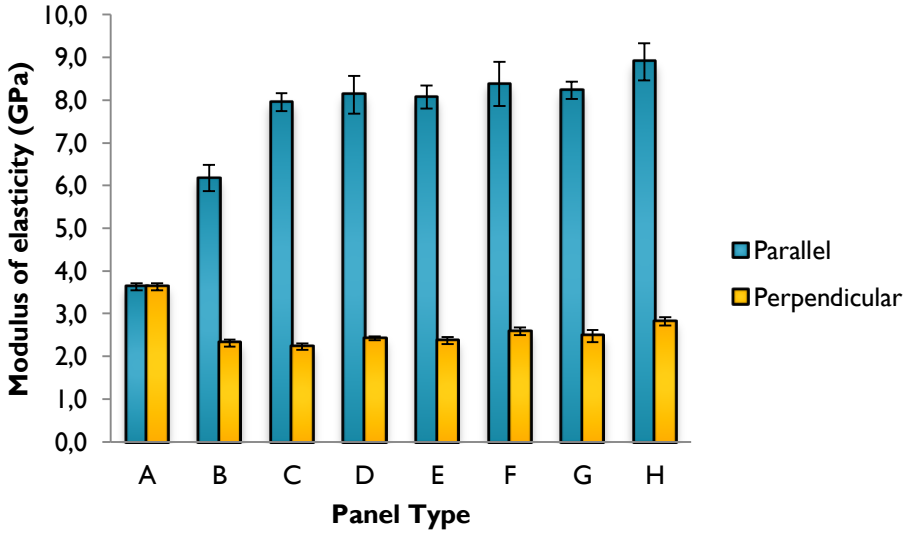
| Panel type | Reduction of thickness (%) |
|---|---|
| A | Uncoated |
| B | Not compressed |
| C | 13.4 |
| D | 21.1 |
| E | 14.2 |
| F | 27.8 |
| G | 21.1 |
| H | 39.8 |

- Group H → compressed at 6 MPa pressure and 200 °C temperature
- Group C → compressed at 4 MPa pressure and 150 °C temperature

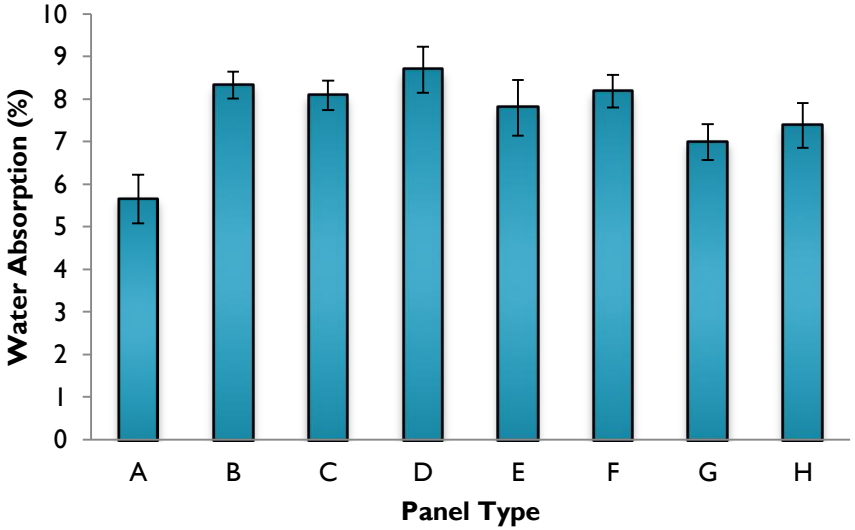
# Flexural properties

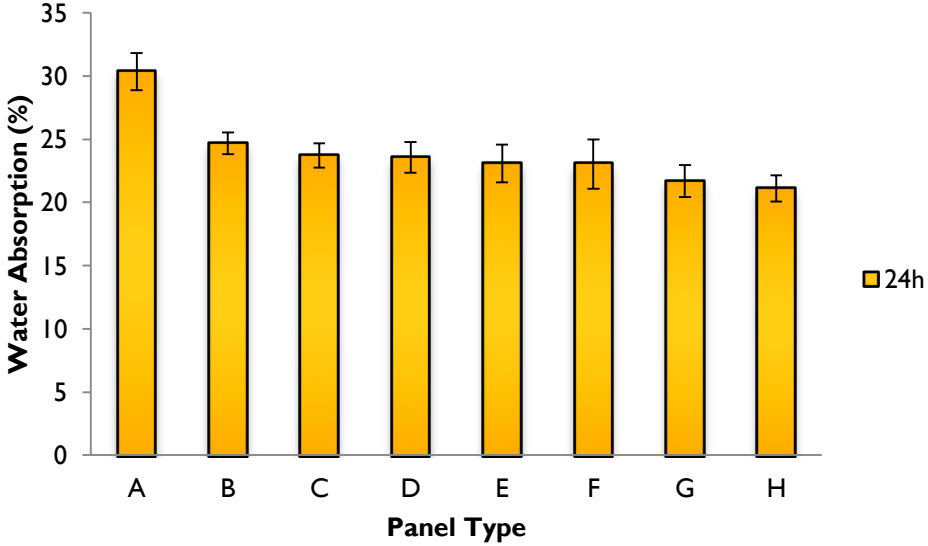


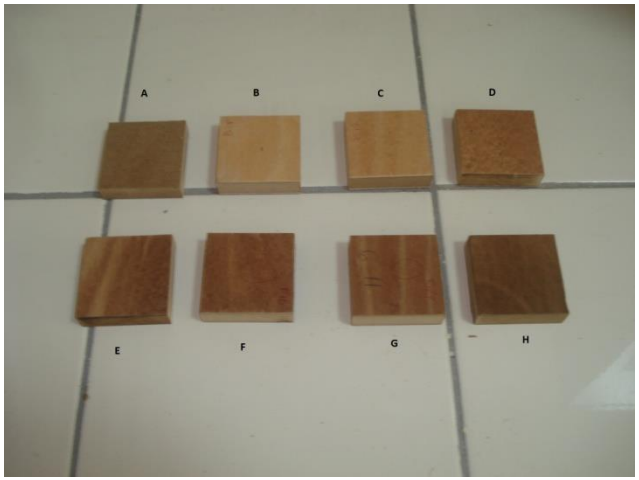

**182% and 56% higher**



# Water absorption

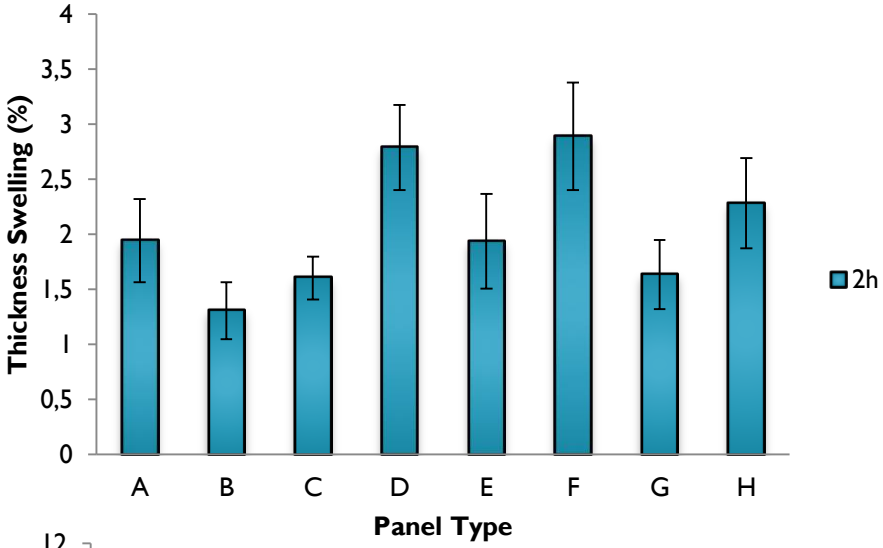


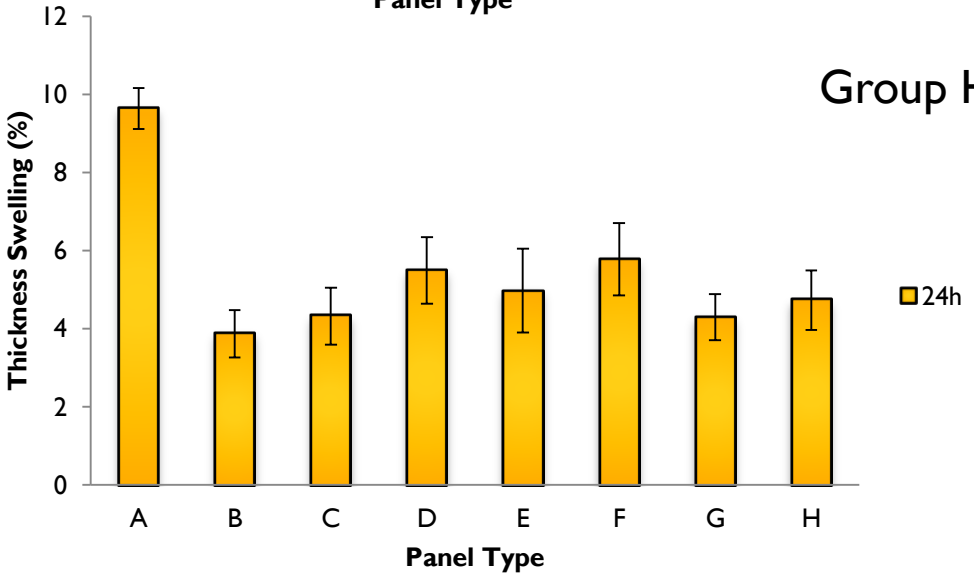



Group H ➡ 6 Mpa and 200 °C

# Thickness swelling




Group H ➡ 6 Mpa and 200 °C

# CONCLUSIONS

- Sandwich panels had higher flexural properties compared to MDF panels.
- The increasing of press pressure and temperature improved flexural properties of sandwich panels.
- Sandwich panels had lower WA and TS value for 24-h immersion time.
- Compressed veneer by using different press temperature and pressure levels **could be considered as an alternative way** to develop sandwich type products with satisfactory structural properties.

THANK YOU
for your
ATTENTION !