Recycled Polystyrene (RP) and senile coconut was used to produce Particleboard at 2 levels of Particle Size (PS), 3 levels of Board Density (BD) and 3 levels of Mixing Ratio (MR). The Modulus of Rupture (MOR), Modulus of Elasticity (MOE), Thickness Swelling (TS) and Water Absorption (WA) were investigated. TS and WA decreases as the PS, BD and MR increases, while MOR and MOE increases proportionately. MOR and MOE initially increases as MR increases from 1:1 to 2:1 and later decreases. Board produced at BD 1200 kg/m³ and MR 2:1 is the strongest, stiffest and most stable. This study proves that RP can substitute formaldehyde based resin. 

Keywords: Recycled polystyrene, particleboard, coconut stem particles.

RESULTS

Thicknes Swelling (TS)

- TS at 24 hours ranged from 0.83±0.01% to 2.74±0.02% and 0.62±0.01% to 2.44±0.01% for fine and coarse particles respectively, while TS at 48 hours ranged from 0.91±0.01% to 5.18±0.01% and 0.64±0.01% to 4.75±0.01% for fine and coarse particles respectively.
- TS decreases with increase in PS, BD, and MR. (Figure 1).
- Board with lowest TS value was produced with coarse particles, BD 1200 kg/m³ and MR 3:1.

Water Absorption (WA)

- WA at 24 hours ranged from 16.21±0.01% to 28.58±0.1% and 18.48±0.01% to 28.23±0.01% for fine and coarse particles respectively.
- WA at 48 hours ranged from 18.02±0.01% to 33.10±0.78% and 20.63±0.01% to 32.23±0.01% for fine and coarse particles respectively.
- WA decreases with an increase in PS, BD and MR. (Figure 2).
- Board with the lowest WA is produced with coarse particles, BD 1200 kg/m³ and MR 3:1.

Modulus of Rupture (MOR) and Modulus of Elasticity (MOE)

- MOR values ranged from 172.21±4.68 N/mm² to 906.56±21.91 N/mm² and 180.19±2.34 N/mm² to 1105.91±37.26 N/mm² for fine and coarse particles respectively (Figure 3).
- MOE values ranged from 24.75±0.00 N/mm² to 165.38±5.83 N/mm² and 30.00±2.12 N/mm² to 187.50±20.15 N/mm² for fine and coarse particles respectively (Figure 3).

Analysis of Variance (ANOVA)

- For WA only the 2 factor interaction between PS, BD and MR has significant (p<0.05) effect.
- 2 factors and 3 factors interactions had significant (p<0.05) effect on TS (Table 1).
- 2 factors and 3 factors interactions had significant (p<0.05) effect on WA.
- DMRT shows significant (p<0.05) differences on the properties at different levels of BD and MR (Figure 1, 2 and 3).

CONCLUSIONS

- Coconut stem particles and recycled polystyrene are suitable for the production of particleboard.
- Increase in PS, BD and MR caused decrease in TS and WA.
- MOE and MOR increases with increase in PS, BD and MR.
- The strongest, stillest and most stable board was produced at PS coarse, BD 2:1 and BD 1200 kg/m³.