

# STUDY OF SUBERINC ACIDS-BONDED WOOD COMPOSITE FOR FURNITURE APPLICATIONS

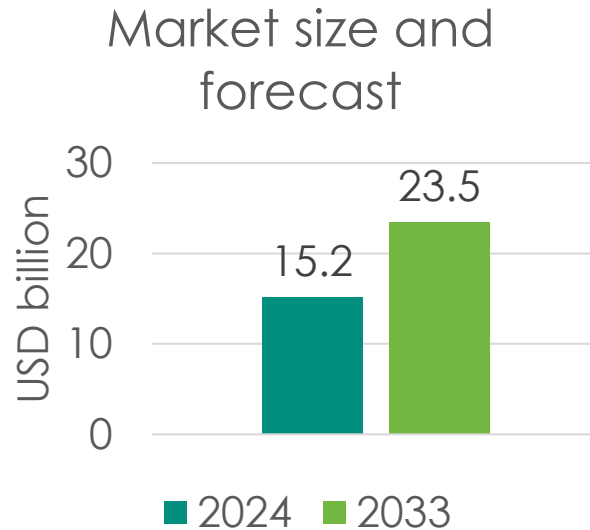
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# BACKGROUND

## Particleboard industry

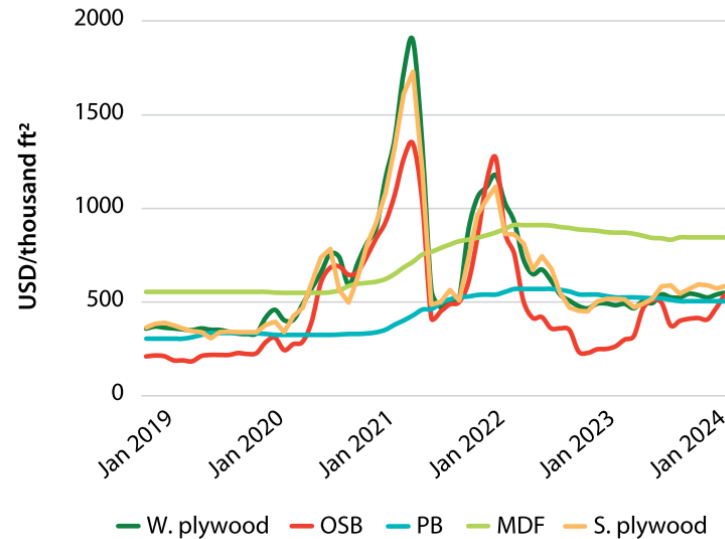
30.9 million m<sup>3</sup> in 2023 in Europe



## Challenges

- Raw materials
- Environmental concerns

North America: Wood-based panel prices, 2019–2024



Source: Forest Products. Annual Market Review 2023-2024. UNECE/FAO

## Perspectives

- Virgin lignocellulosics from wood and agro by-products
- Recycled wood
- Bio-based adhesives

Tannin  
Lignin  
Acids

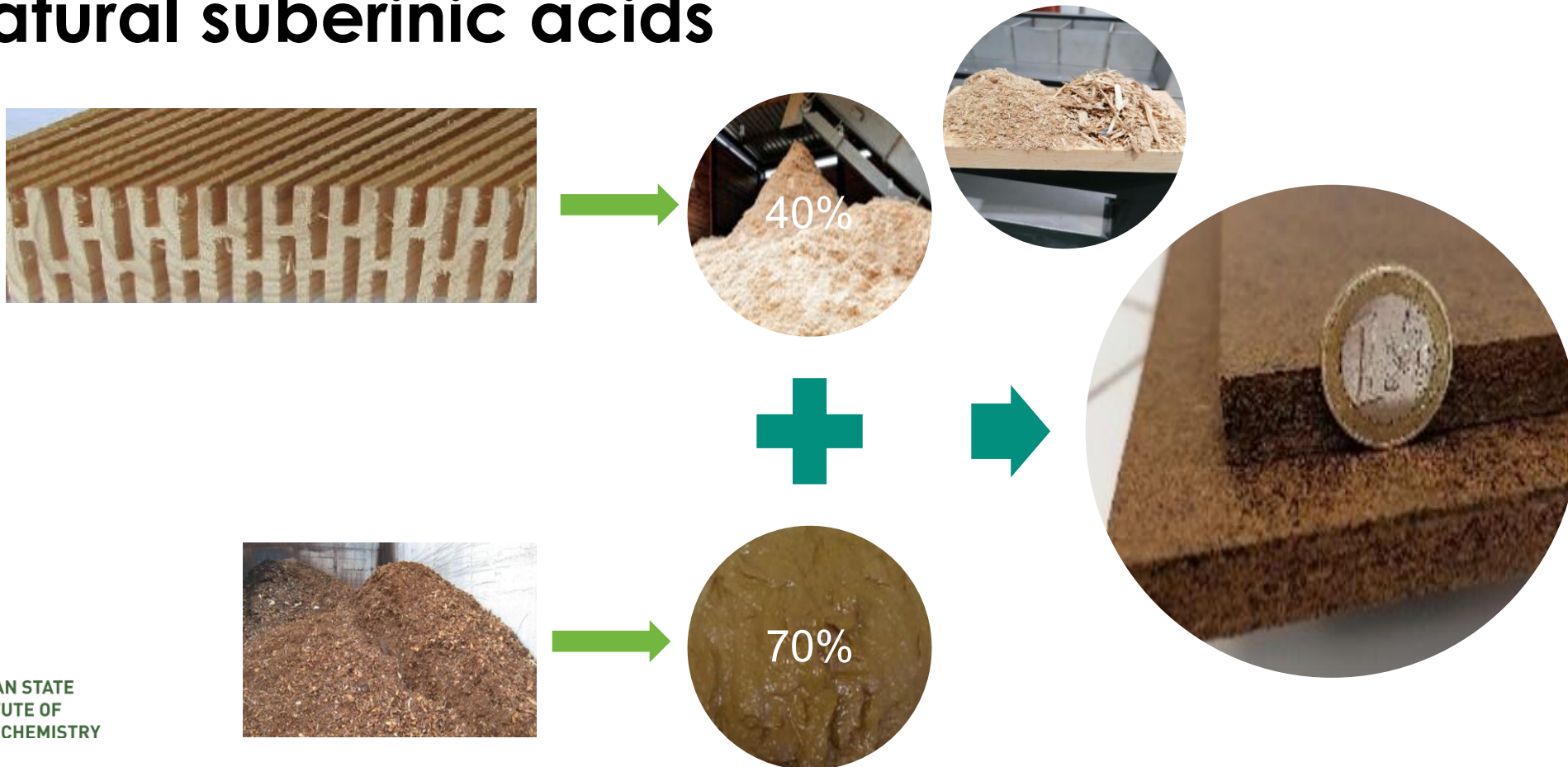




# AIM OF THE STUDY

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**Investigation of particleboard for furniture application composed of different available particles bonded by natural suberinic acids**



# METHODOLOGY

## Preparation of binder

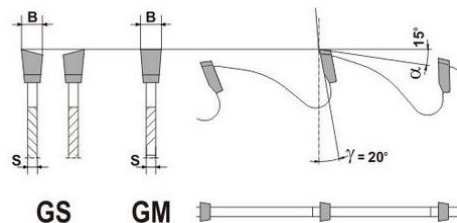
- EtOH-extracted birch outer bark (2 mm)
- Hydrolytic depolymerization (KOH, 30 min)
- Solubility in dimethylsulfoxide ~41%
- Acid number ds 25 %
- S~49 mg KOH/g

## Preparation of sawdust

- Pine solid board 20x100x1000 mm
- Sawblade: HM, Z 18-24, Ø 30x250 mm
- Longitudinal grooves h 15-18 mm

Fractional dimensions:

- < 1 mm (40-50 %)
- 1 – 2 mm (15-45 %)
- > 2 mm (15-30 %)



## Preparation of furnish

- SA binder 15-21%
- Sawdust 79-85%
- Mixing
- Drying → MC 2%
- SA-LS boards
- SA-RE boards



## Hot-pressing

Temperature 200–220 °C

Time 0.8–1.5 min/mm

Density 650/750 kg/m<sup>3</sup>

Measurements 9x300x300 mm



## Testing

MOE/MOR (EN 310)

TS/WA (EN 317)

IB (EN 319)

# RESULTS: SA-LS BOARDS

Sample	min/mm	Tpress, °C	D, kg/m³	WA, 24h %	TS, 24h %	MOE, MPa	MOR, MPa	IB, MPa
SA-LS-/	1.4	200	823	71	21	1153	6.6	0.73
SA-LS-/	1.4	200	963	49	20	1737	10.3	0.94
SA-LS-/	1.0	210	665	95	16	443	2.1	0.16
SA-LS-/	1.0	220	673	79	9	598	2.9	0.25
SA-LS-/	1.0	210	774	68	15	954	4.5	0.27
SA-LS-/	1.5	220	649	89	9	390	2.0	0.41
SA-LS-/	1.5	220	714	75	10	867	4.7	0.63
SA-LS-	1.5	220	622	99	9	440	2.7	0.29
SA-LS-	1.5	220	728	75	10	737	4.4	0.66
SA-LS/>05-650	1.5	220	699	76	10	719	4.5	0.79
SA-LS/>05-750	1.5	220	805	57	11	1092	5.9	1.19
SA-LS   >05-650	1.5	220	703	77	11	697	3.9	0.46
SA-LS   >05-750	1.5	220	814	56	12	1244	7.4	0.80
Standard requirement (EN 312 Type P2)						1800	11	0.40

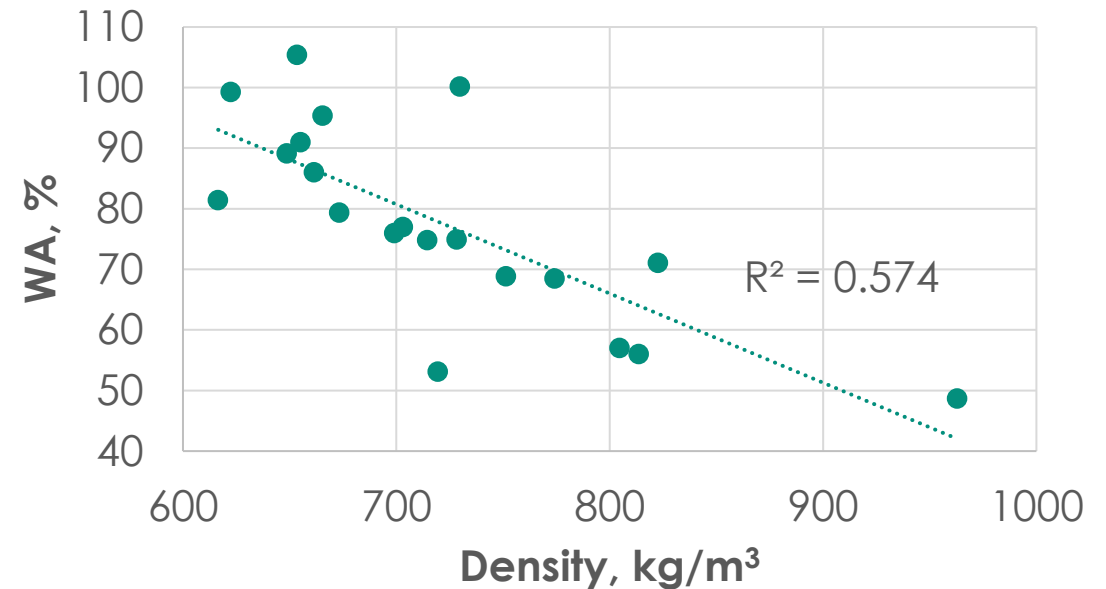
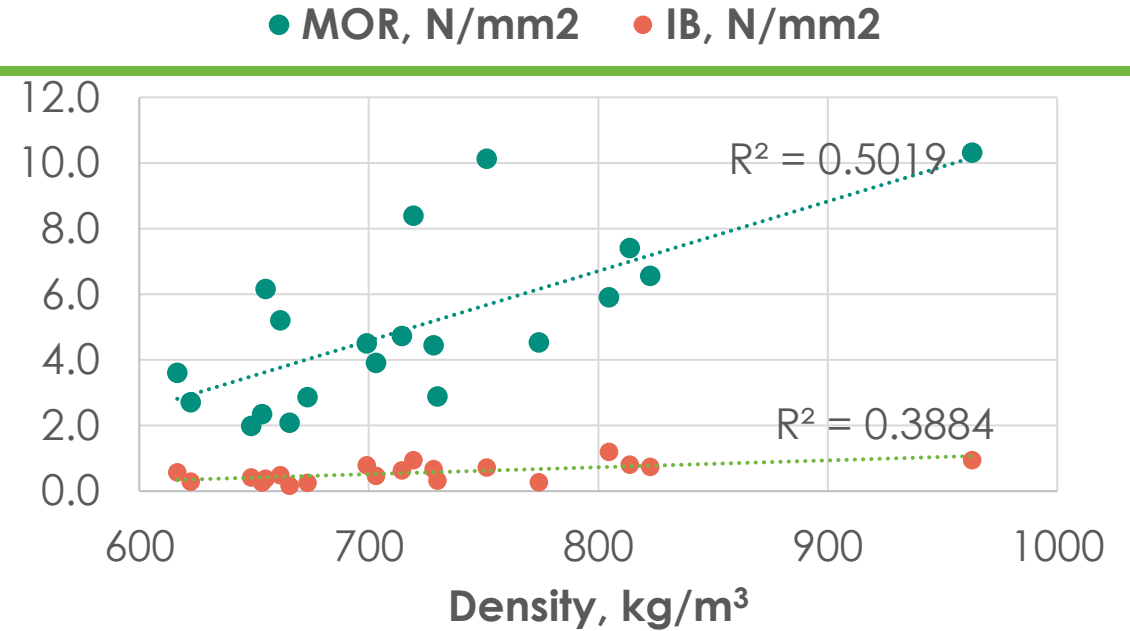
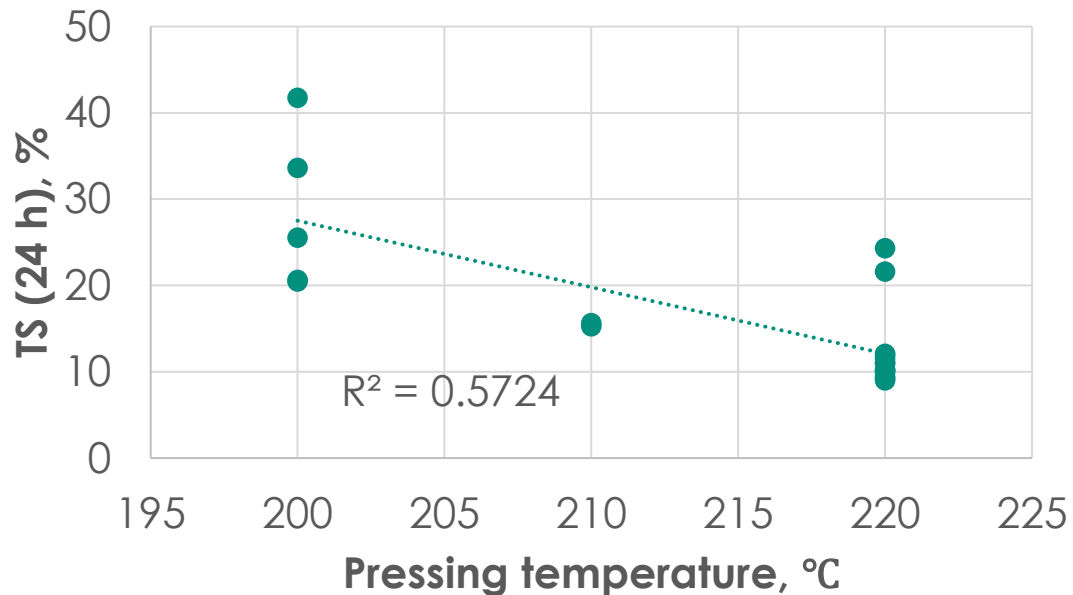
# RESULTS: SA-RE BOARDS

Sample	min/mm	Tpress, °C	D, kg/m³	WA, 24h %	TS, 24h %	MOE, MPa	MOR, MPa	IB, MPa
SA-RE-15	1.0	200	654	105	34	1153	2.3	0.26
SA-RE-15	0.9	200	730	100	42	1452	2.9	0.32
SA-RE-15	0.9	200	655	91	26	1483	6.2	0.37
SA-RE-15	0.9	220	661	86	22	1366	5.2	0.48
SA-RE-15	0.9	220	751	69	24	2037	10.1	0.72
SA-RE-21	1.5	220	617	81	12	819	3.6	0.57
SA-RE-21	1.5	220	719	53	12	1639	8.4	0.94
Standard requirement (EN 312 Type P2)						1800	11	0.40

# RESULTS: Impact of factors

## The correlation analysis showed that

- WA, MOR and IB values have been highly improved with increasing density;
- TS values were strongly improved by increasing the pressing time and temperature.





# CONCLUSIONS

- Suberinic acids-derived binder obtained from birch outer bark have a potential to be used for particleboard production.
- The most influencing factors for the preferable board properties are density ( $750 \text{ kg/m}^3$ ) and pressing temperature ( $220 \text{ }^{\circ}\text{C}$ ).
- Recycled particles vs longitudinal-sawn sawdust showed better results on the board properties achieving the standard requirements for boards for interior fitments according to EN 312, Type P2.





# THANK YOU



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# THANK YOU!

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